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Length-age Characteristic and Fluctuation of American Plaice (*Hippoglossoides platessodies*) Abundance in Division 3M From 1983 to 1990

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ABSTRACT

Length-age characteristic and abundance fluctuation of the American plaice from the Flemish Cap Bank in 1983-1990 are considered. The abundance of some year-classes in this period is assessed.

INTRODUCTION

Significant variability is peculiar to the American plaice abundance in the Flemish Cap Bank area (Bowering and Chumakov, 1990). The Soviet investigations showed the fish abundance varied from 33.4 x x 10^6spec. (maximum value) in 1986 to 2.6 x 10^6spec. (minimum value) in 1990. The dynamics of the American plaice length-age composition in this period as well as the alteration of some year-classes abundance by years, that is necessary to determine the reasons of such considerable fluctuations, are analysed in the paper.

MATERIAL AND METHODS

The abundance fluctuation and length-age characteristic in the Flemish Cap Bank area are considered since 1983, when the annual spring-summer trawl-acoustic survey conducted by the USSR has become to be carried out as a random-stratified one. The fish annual abundance was calculated by the age groups to determine strong and poor year-classes (Table 1). Length-frequencies were estimated by the length-age keys to study the dynamics of the catches age composition (Fig.1). It was analysed by variational curves (Figs.2,3).

RESULTS AND DISCUSSIONS

Since we had a length-age key for Div.3M in 1977, that key and the length-age keys obtained by the Spanish scientists in Div.3M during the summer surveys of 1988 and 1989 conducted by the sampling trawl with a cover (Vazquer, 1989, 1990) were united (Table 2,3). A comparison of the catches age composition of 1988 and 1989 obtained in calculating by the key united and, separately, by the Spanish keys (catches of 1988 were calculated by the key of 1988, those of 1989 - by that one of 1989) indicated the deviation observed in correlation of 5 and 7 years old males from the catches of 1988 and in that one of 8 years old females from the catches of 1989 (Fig.4). However, the

results obtained may be compared, as a whole, and show the similar correlation of age groups predominating. Therefore, the calculations by the key united may be used in analysing the dynamics of the catches age composition.

Variational curves of the American plaice length composition show the deficiency of large fishes in the catches of 1983 and 1984 (Figs.2,3). A great number of 3 and 4 years olds from the 1979 and 1980 year-classes was noted in those years (Fig.1). Those year-classes as well as the 1981 year-class were the bulk of catches in 1986 (Table 1, Fig.1), when the fish abundance in Div.3M was found to be maximum for the whole period of 1983-1990 (Fig.5). In the following years (1985-88) the older age groups prevailed. A considerable recruitment by 3 years olds from the 1986 year-class was recorded again in 1989. According to the Spanish data, that year-class was estimated as abundant too (Vazquer, 1990; Zamarro and Brodie, 1990).

Although significant year-to-year fluctuations of the American plaice abundance in the Flemish Cap Bank area were observed the reasons of them have not yet been recognized. Considering the lack of commercial press on the Flemish Cap American plaice population a great variability of reproduction conditions is suppoused to be one of the reasons. Year-to-year differences in ichthyoplankton survival conditions (Borovkov et al., 1978; Kudlo et al., 1984; Kudlo et al., 1984) were found to be one of the sources of variability of the year-class strength of commercial fishes from the Flemish Cap Bank having pelagic eggs and larvae. Formation of cod and redfish abundant year-classes are expected to be when a high recurrence of two types of circulation is observed in the periods between the fish spawning and its sinking to the near-bottom layers. The type of spacious well-pronounced anticyclonic gyre, first of all, and also that one of spacious anticyclonic gyre with some local centres within it are noticed. And, in contrast to, poor year-classes of commercial fish are suppoused to be in the years when two contrary types of gyre are recorded, i.e. the water flow crosses over the Bank as a transit not forming a closed gyre in its central part or when there are both local gyres and transit water flow passing through the Bank. Besides, distribution and concentrations of phytoplankton accumulation of which in the gyre centre has a positive impact on the larvae and fingerlings food supply are connected with the currents field structure (Elizarov, Movchan, 1973).

However, a comparison of the data on water circulation in the Flemish Cap Bank area in 1977-1986 (Kudlo et al., 1984; Chumakov and Borovkov, 1986; Chumakov and Borovkov, 1987), results from the annual ichthyoplankton surveys (Akhtarina and Chechenin, 1986; Akhtarina, 1987; Serebryakov et al., 1987) and the data on some year-classes abundance (Table 1) show the lack of this dependence.

So, the year-classes of 1979, 1980 and 1981 were found to be abundant (Table 1). Well-pronounced anticyclonic gyre was actually observed in 1979 and 1981 (Kudlo et al., 1984), though, according to the results from the ichthyoplankton surveys, the American plaice eggs abundance was lower than in 1980 (Serebryakov et al., 1987). However, there was no closed water circulation in 1980 (Kudlo et al., 1984). Comparing to the previous years, high abundance of the American plaice eggs was noted in 1986 (Akhtarina, 1987). But the anticyclonic vortex was weakened and, therefore, the 1986 year-class was assumed to be poor (Chumakov and Borovkov, 1987). Nevertheless, that year-class was abundant.

Probably, the circulation has no significant influence on the eggs and larvae drift of the American plaice, the spawning of which is observed, mainly, in the central shallow Bank, as on the eggs and larvae drift of cod and redfish spawning, chiefly, in the Bank outlying parts. Perhaps, the American plaice year-class strength, mainly, depend on such factors as food supply in passing from plankton feeding to the bottom one.

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Table 1 Abundance of the American plaice in Div.3M from 1983 to 1990, estimated by year-classes, thou.spec.

Year-classes	Years of surveys							
	1983	1984	1985	1986	1987	1988	1989	1990
1988								8
1987							42	206
1986						50	1665	283
1985					6	301	583	721
1984				300	969	603	1332	489
1983			59	1335	969	2110	1498	386
1982		69	784	2336	3230	2110	1332	309
1981	101	1904	1372	8342	3715	2009	1165	129
1980	3036	2251	5097	8676	3230	1808	416	51
1979	3643	5714	5293	5673	2584	603	166	-
1978	6477	3463	3333	4004	808	201	50	8
1977	2429	1731	1764	1335	323	40	42	
1976	1417	1039	784	667	81	40	33	
1975	1417	519	392	200	81	30	7	
1974	810	346	98	233	81	5	17	
1973	405	52	118	200	11	9	7	
1972	101	87	74	33	11	5		
1971	162	69	20	33	24			
1970	121	35	20	33				
1969	40	17	20					
1968	40	35						
1967	61							

Table 2 United length-age key of the American plaice (males) in Div.3M, %

Length, cm	Age, years										Total number, spec.
	2	3	4	5	6	7	8	9	10	11	
14-15	0.29	0.19									5
16-17	0.29	1.06	0.10								15
18-19	0.48	0.58									11
20-21	0.19	1.92									22
22-23	0.10	6.44	0.48	0.19							75
24-25		7.30	1.15	0.58							94
26-27		2.99	1.25	1.44	0.29						62
28-29		0.86	1.82	1.82	0.86						56
30-31		0.10	1.92	4.03	0.96						73
32-33			1.44	4.51	2.98	0.38					97
34-35			0.86	4.32	5.76	2.11	0.19				138
36-37			0.29	2.88	8.64	4.61	0.96	0.10			182
38-39			0.10	0.67	4.61	3.75	1.34	0.29			112
40-41				0.10	0.77	1.63	1.25	0.29	0.19	0.10	45
42-43					0.29	0.38	1.73	0.58	0.10		32
44-45						0.29	0.48	0.58	0.19		16
46-47						0.19		0.19			4
48-49							0.10				1
50-51										0.10	1

Table 3 United length-age key of the American plaice (females) in Div.3M, %

Length, cm	Age, years														Total number, spec.
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16+	
12-13		0.08														1
14-15	0.08	0.16														3
16-17	0.47	0.86														17
18-19	0.70	0.39														14
20-21	0.31	1.18	0.16													21
22-23	0.08	3.62	0.54													54
24-25		4.64	0.55	0.24												69
26-27		2.28	0.87	0.71	0.08											50
28-29		0.79	1.26	1.42												44
30-31		0.08	1.26	2.52	0.16											51
32-33			0.79	2.91	0.63											55
34-35			0.55	2.44	1.42	0.31										60
36-37			0.24	2.44	2.20	0.94	0.08									75
38-39			0.08	1.50	2.99	1.73	0.47		0.08							87
40-41				0.71	1.50	4.09	2.36	0.31								114
42-43					1.26	3.94	6.93	0.78	0.16		0.08					167
44-45					0.54	4.96	7.56	2.20	0.24	0.16						199
46-47						1.73	3.78	2.28	0.24	0.08	0.08					104
48-49						0.16	0.87	1.81	0.71	0.08				0.08		47
50-51							0.08	0.24	0.63		0.24					15
52-53								0.16	0.24	0.08	0.08	0.16	0.08	0.08		11
54-55									0.16	0.16	0.08	0.16				7
56-57											0.08	0.08			0.08	3
58-59													0.08		0.08	2

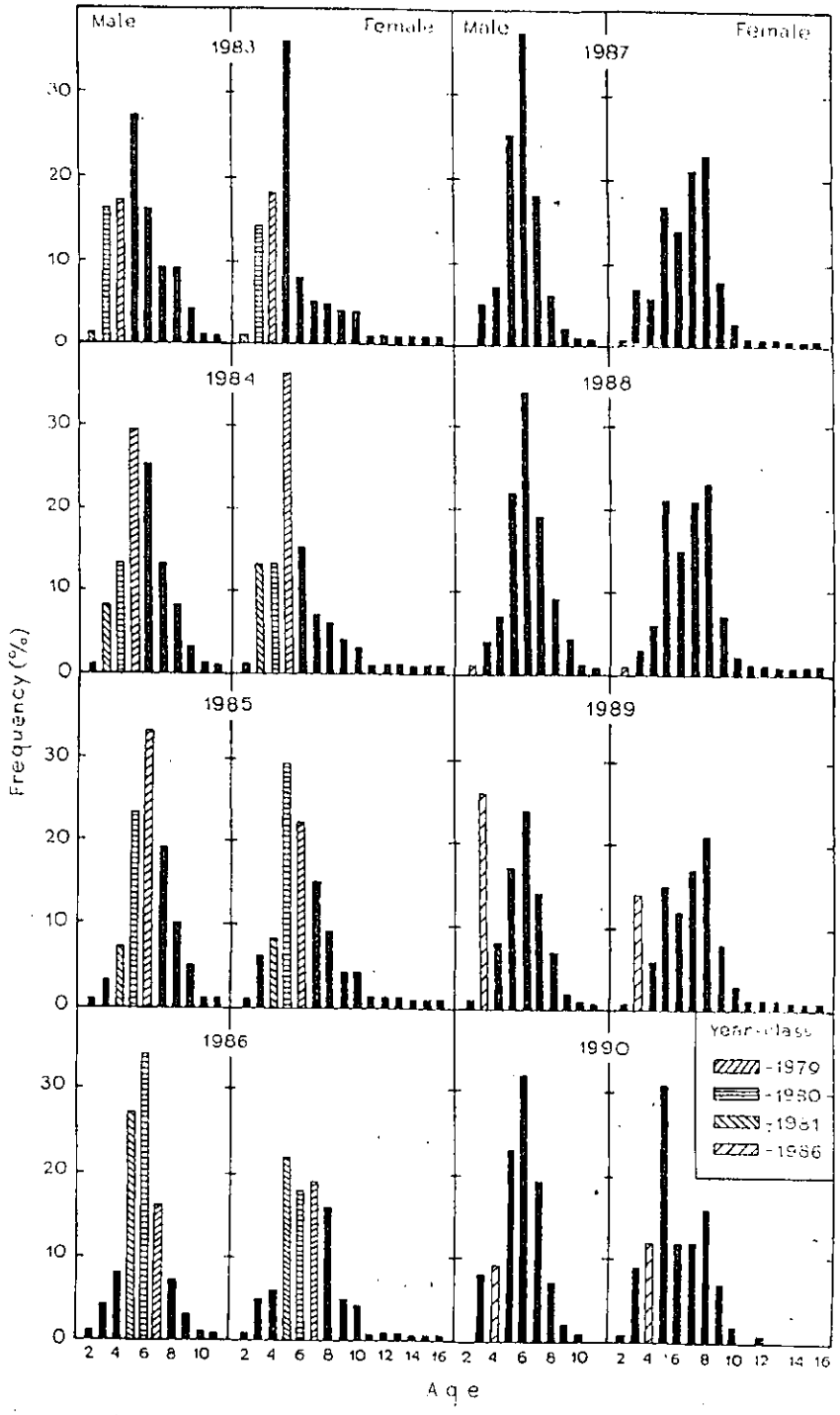

Fig.1 American plaice age composition in the trawl catches in Div.3M from 1983 to 1990
(Abundant year-classes of 1979, 1980, 1981 and 1986 are shaded)

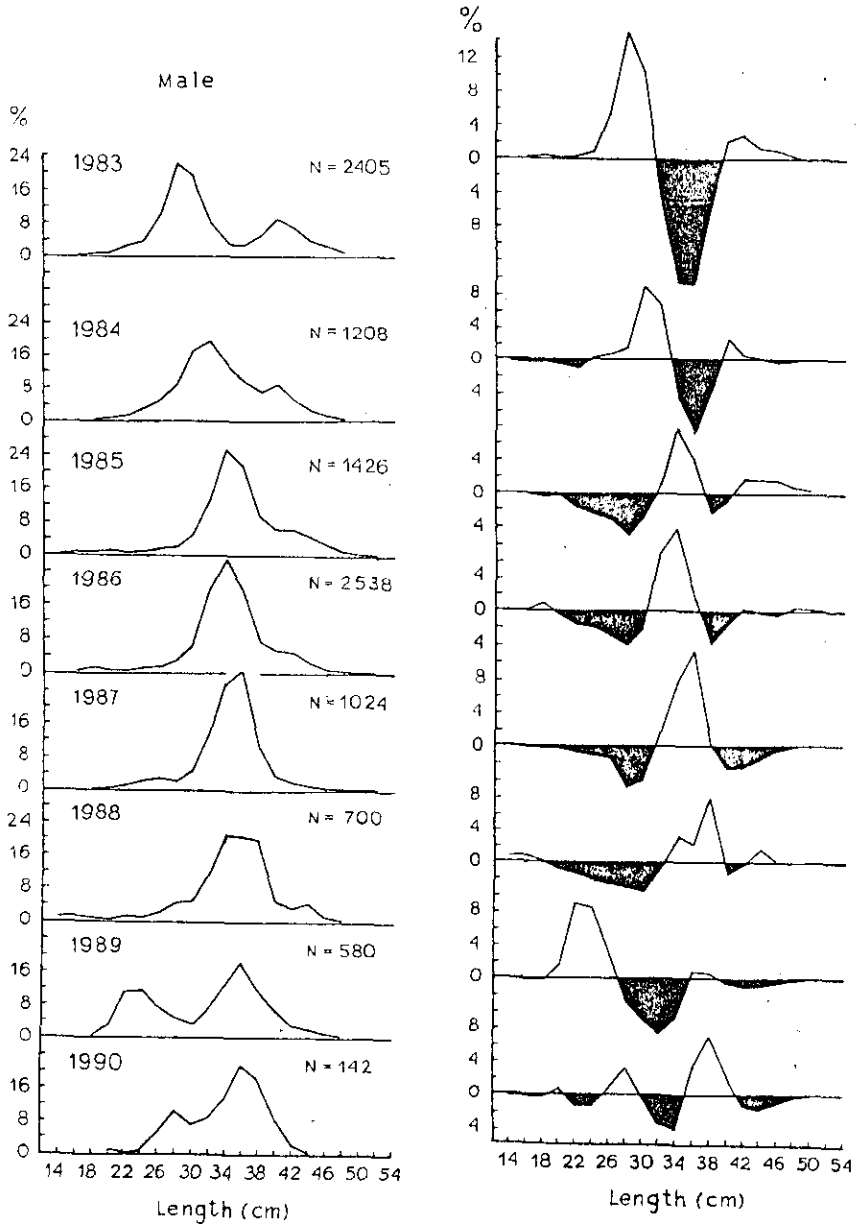

Fig.2 American plaice : males length composition in the trawl catches in Div.3M (data for 1983-1990). Deviation of the length composition from long-term mean length frequencies is shown in the right part of the figure.

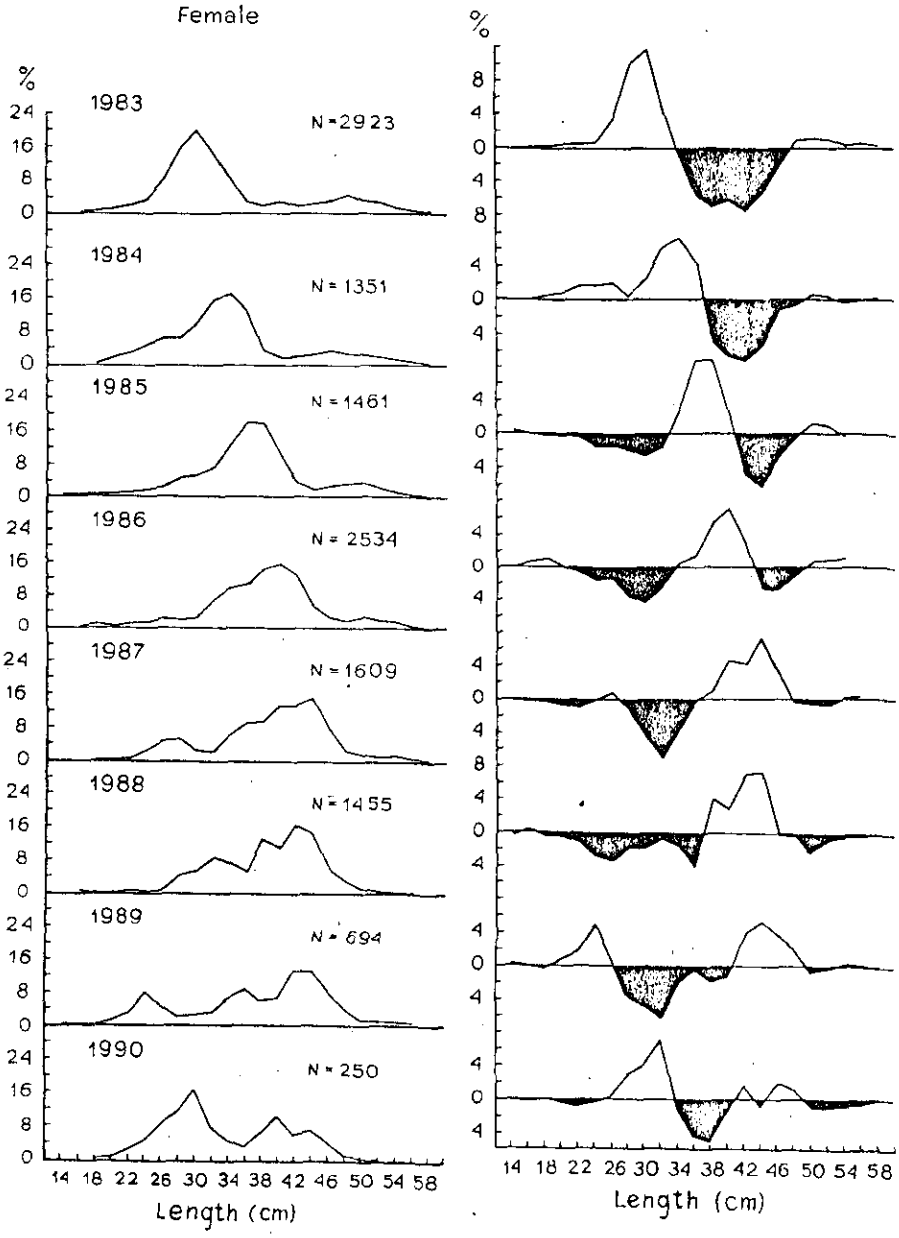

Fig.3 American plaice females length composition in the trawl catches in Div.3M (data for 1983-1990). Deviation of length composition from long-term mean length frequencies is shown in the right part of the figure.

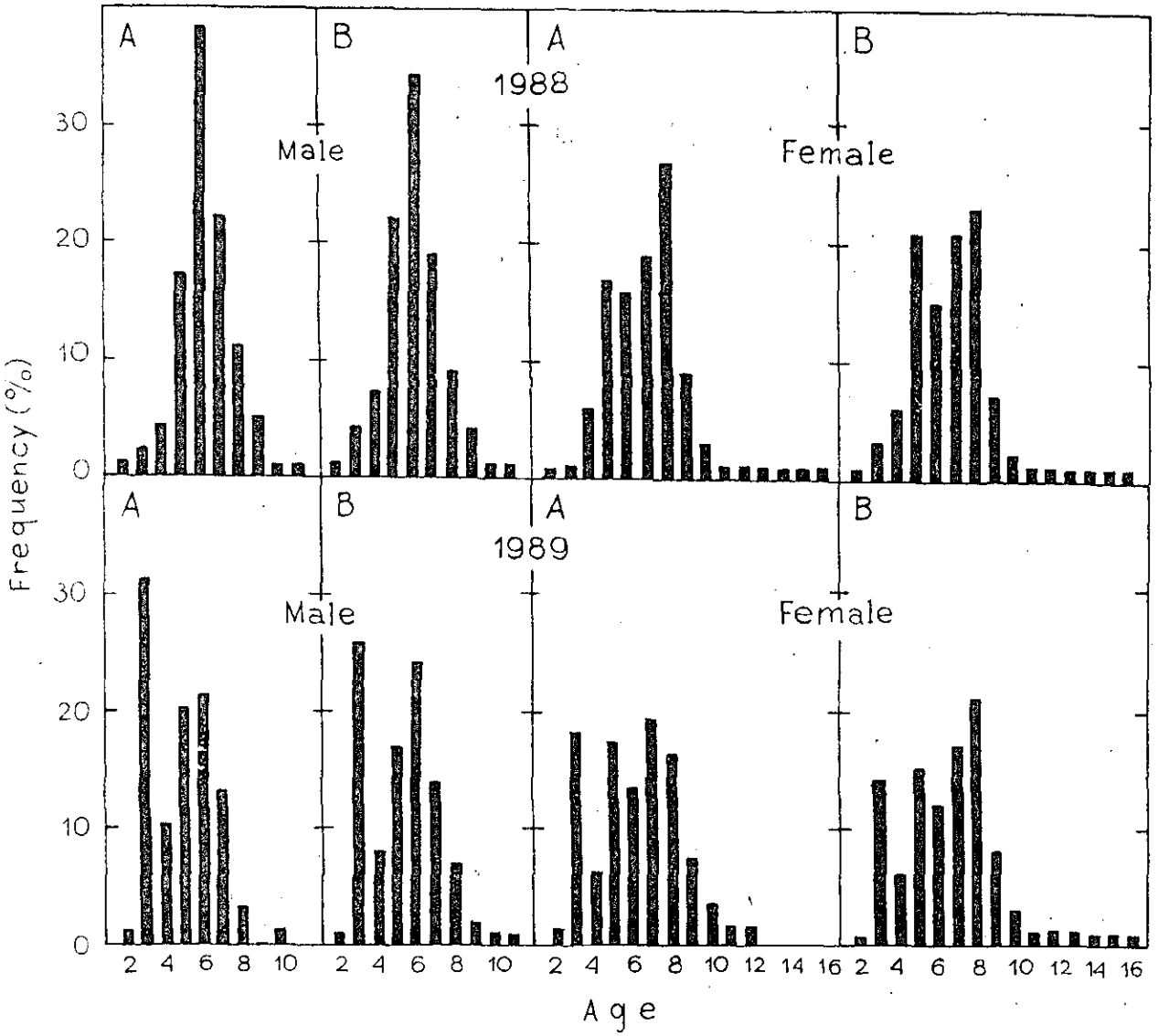

Fig.4 Age composition of the American plaice in the trawl catches in Div.3M in 1988 and 1989
(A - estimated by the Spanish length-age keys for 1988 and 1989
B - estimated by the united key)

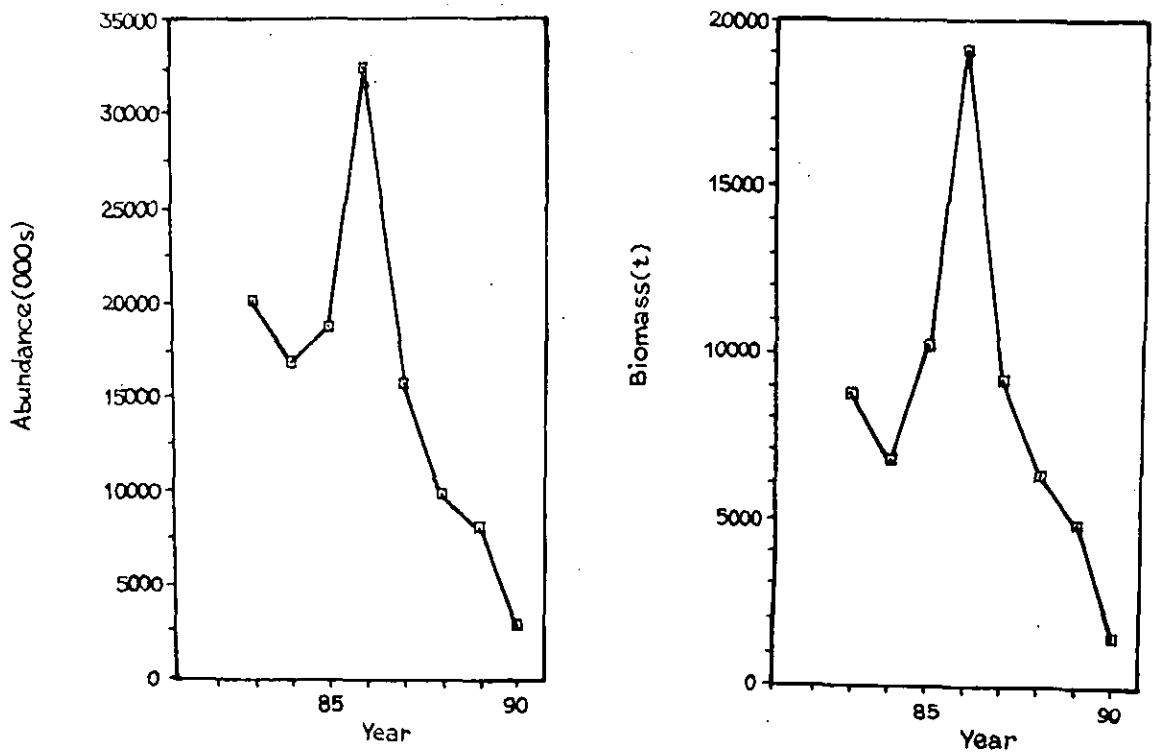

Fig.5 Fluctuation of American plaice abundance and biomass in Div.3M from 1983 to 1990 in accordance with the results from the spring-summer trawl-acoustic survey conducted by the USSR