International Council for the
Exploration of the Sea

5
C.M.1966/H:30
Herring Committee

MERISTIC CHARACTERS OF HERRING WITH HIGH AND LOW FECUNDITIES IN THE PRESPAWNING CONCENTRATIONS IN THE NORTHWESTERN NORTH SEA

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Summary

Meristic and l_1 data for herring with high and low fecunditie s in the prespawning concentrations in the northwestern North Sea are compared. The Vert S and K_2 data showed no significant differences between the two fecundity groups but l_1 values for the low fecundity group were smaller than those of the high fecundity fish. From differences in the meristic characters, principally K_2 values, it was concluded that the low fecundity herring were not Downs spawners. The l_1 values obtained for low fecundity fish suggested that this group were probably spawners from the Dogger area.

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Spawning by the North Sea summer-autumn spawners takes place in three localities: northwestern (Buchan), central (Dogger) and, southern North Sea and eastern part of the English Channel (Downs). In addition to differences in growth, meristic characters, spawning time and spawning place, it has been shown that there are differences in the fecundities of these groups (Baxter 1959). These fecundity differences have been used to study the mixing rates of Downs herring in the prespawning concentrations of the northwestern North Sea (Baxter 1963 (a, b) 1964). However, while Downs spawners are characterised by low fecundities and Buchan spawners by high fecundities it has been shown that recruit spawners in the Dogger area have also low fecundities (Polder and Zijlstra 1959). In order to determine the composition of the different fecundity groups an analysis was made of meristic and l_1 characters of high and low fecundity herring sampled in the prespawning concentrations in the northwestern North Sea from 1961 to 1964. The results of this analysis are presented in this report.

The material for this investigation was collected between June and August 1961-64 and the area sampled extended from Shetland to Shields. Fecundity, Vert S, K_2, and l_1 data were obtained from fish in maturity stages III-V. The fecundity estimates for each fish were categorised as 'high' or 'low' according to the observed distributions of fecundity at length for northern and southern North Sea spawners (Baxter 1959).

Results

Meristic and l_1 data for high and low fecundity herring sampled in the prespawning concentrations between 1961 and 1964 are presented in Table 1. Since the meristic material available for low fecundity fish in 1961 and 1962 was small data from all age groups and maturity stages III-V have been combined. The Vert S and K_2 distributions and means do not show any significant differences between high and low fecundity fish in any of the years under review. The l_1 data for low fecundity fish in 1961 and 1962 are based on a small number of fish and therefore the differences which occur between high and low fecundity fish in these years can not be considered as significant, but it is important to note that the l_1 values of low fecundity herring tended to be smaller than those of high fecundity fish in 1963 and 1964.

The proportion of low fecundity fish in the samples from the prespawning concentrations increased considerably in 1963 and 1964. This increase occurred mainly among the three year old recruits of the 1960 and 1961 year classes which entered the adult stocks in 1963 and 1964. Meristic and l_1 data for high and low fecundity herring of the 1960 and 1961 year classes sampled in the prespawning concentrations are given in Table 2. Within these year classes the Vert S and K_2 data show no significant differences between high and low fecundity herring. However, the l_1 values for low fecundity fish are smaller than those for the high fecundity herring in both the 1960 and 1961 year classes.

In Table 3 mean Vert S, K_2 and l_1 data are given for Buchan, Dogger and Downs spawners. It is clear that the Vert S and particularly the K_2 means for low fecundity herring of the 1960 year class given in Table 2 are quite different from those of Downs spawners shown in Table 3. Unfortunately, at present, there are no published data available for Downs spawners of the 1961 year class but the K_2 values for the low fecundity group of this year class in

the prespawning concentrations was very similar to that of the Buchan spawners.

Therefore although the available meristic data is insufficient to provide conclusive proof. There is some evidence, particularly in regard to K_2 differences, which indicates that the low fecundity herring sampled in the prespawning concentrations of the northwestern North Sea were not Downs spawners and furthermore the l_1 values of the low fecundity group compared with those of the high fecundity fish suggests that the low fecundity herring were more likely to be spawners from the Dogger area.

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Table 1. Vert S, K_2 and l_1 distributions and means for low and high fecundity herring in the prespawning concentrations of the northwestern North Sea; June-August 1961-63.

Vertebral Count (Actual numbers - all age groups) - maturity stages III-V

Year of sampling		Number of Vertebrae 54	55	56	57	58	59	Mean	Number
1961	Low fecundity	-	-	11	6	1	-	56.44	18
	High fecundity	-	22	135	158	17	-	56.51	332
1962	Low fecundity	-	2	21	15	3	-	56.46	41
	High fecundity	-	29	205	190	23	-	56.46	447
1963	Low fecundity	-	18	107	106	7	-	56.43	238
	High fecundity	1	43	411	306	35	1	56.42	797
1964	Low fecundity	-	11	86	57	7	-	56.37	161
	High fecundity	-	34	306	263	19	-	56.43	622

K_2 (Actual numbers - all age groups) - maturity stages III-V

	Number of keeled scales 12	13	14	15	16	17	18	Mean	Number
Low fecundity	-	6	6	4	-	-	-	13.88	16
High fecundity	2	43	136	108	24	2	-	14.37	315
Low fecundity	-	2	21	12	1	-	-	14.33	36
High fecundity	4	77	203	135	23	1	-	14.22	443
Low fecundity	-	25	118	79	14	-	-	14.35	236
High fecundity	1	66	429	254	38	-	-	14.33	788
Low fecundity	-	25	78	52	3	1	-	14.23	159
High fecundity	2	65	295	208	35	2	3	14.37	610

l_1 (Actual numbers - all age groups) - maturity stages III-V

		cm 8	9	10	11	12	13	14	15	16	17	18	19	20	21	Mean	Number
1961	Low fecundity	-	-	-	-	-	1	-	2	1	5		-	-	-	16.00	9
	High fecundity	-	2	9	9	16	21	30	39	39	21	18	4	3	-	14.78	211
1962	Low fecundity	-	1	-	1	-	2	3	6	5	1	1	-	1	-	15.65	21
	High fecundity	1	1	8	24	24	38	53	45	38	42	10	14	3	-	14.58	301
1963	Low fecundity	-	1	1	1	2	10	33	38	54	39	31	8	3	-	15.90	221
	High fecundity	-	1	5	11	17	51	75	107	152	143	101	52	13	2	16.00	731
1964	Low fecundity	-	1	1	7	30	20	24	34	21	7	4	5	1	-	14.22	155
	High fecundity	-	2	4	10	37	60	89	101	93	78	55	38	11	-	15.40	578

Table 2. Vert S, K_2 and l_1 distributions and means for low and high fecundity herring of the 1960 and 1961 year classes, in the prespawning concentrations of the northwestern North Sea; June-August 1963 and 1964.

Vertebral Count (Actual numbers - maturity stages III-V)

Year of sampling	Year Class		Number of Vertebrae 55	56	57	58	59	Mean	Number
1963	1960	Low fecundity	18	106	102	6	-	56.41	232
		High fecundity	37	328	224	24	1	56.39	614
1964	1960	Low fecundity	3	29	24	1	-	56.40	57
		High fecundity	18	209	153	14	-	56.41	394
	1961	Low fecundity	8	52	30	4	-	56.32	94
		High fecundity	10	59	54	1	-	56.37	124

K_2 (Actual numbers - maturity stages III-V)

Year of sampling	Year Class		Number of keeled scales 12	13	14	15	16	17	18	Mean	Number
1963	1960	Low fecundity	-	24	116	77	13	-	-	14.34	230
		High fecundity	1	55	333	196	23	-	-	14.30	608
1964	1960	Low fecundity	-	2	30	25	3	-	-	14.48	60
		High fecundity	1	31	179	143	25	1	3	14.46	383
	1961	Low fecundity	-	22	41	25	-	1	-	14.07	89
		High fecundity	1	20	66	32	4	-	-	14.15	123

l_1 (Actual numbers - Maturity stages III-V)

Year of sampling	Year Class		cm 9	10	11	12	13	14	15	16	17	18	19	20	21	Mean	Number
1963	1960	Low fecundity	1	1	-	2	10	32	38	52	39	31	7	3	-	15.91	216
		High fecundity	-	1	3	4	24	53	87	124	124	91	49	12	2	16.36	514
1964	1960	Low fecundity	-	-	2	7	5	7	14	8	5	2	5	-	-	14.96	55
		High fecundity	1	1	2	9	32	53	65	63	59	44	31	10	-	15.88	370
	1961	Low fecundity	-	1	4	22	13	15	20	11	2	1	-	1	-	13.83	90
		High fecundity	-	-	2	17	20	23	23	16	10	4	2	-	-	14.44	117

Table 3. Mean Vert S, K_2 and l_1 values for Buchan, Dogger and Downs spawners; 1960 and 1961 year classes.

Spawning Group	Year Class	Year of sampling	Mean Vert S	Mean K_2	Mean l_1	
Buchan	1960	1963	56.38	14.27	15.75	Scottish Data
	1960	1964	56.41	14.33	15.79	Maturity Stages VI and VII
	1961	1964	56.32	14.06	14.23	Scottish drift-net catches in north-western North Sea July-September 1963-64.
Dogger	1960	1963	56.46*	14.57*	15.46	
	1960	1964	56.40*	-	14.65	German Data Annales Biologiques 1963 Fish Stock Record 1964
	1961	1964	56.40*	-	13.53	Maturity Stages VI and VII September 1963 and 1964
Downs	1960	1963	56.52	15.05	14.38	Belgian Data Fish Stock Record 1963 Sandettie - maturity stages V-VII November 1963

*Mean Vert S for all age groups but 1960 and 1961 year classes formed 80-90% of age composition.