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THE ANNUAL CYCLE OF THE MATURITY STAGES OF THE ICELANDIC HERRING

by

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Until 1961 the herring fishery in Iceland has been seasonal i.e. a summer season off the North coast during June, July and August and an autumn season off the Southwest cost beginning at varying time from August to October and terminating in December.

As a result of improvement in gear technology - notably the usage of asdics and puretic power blocks - and increased knowledge of herring migrations in Icelandic waters it proved possible in 1961 to start a new herring season in January 1961, which lasted with only short interval in late February and early March till the end of May. Thus in 1961 it was possible for the first time in history to sample the herring populations in Icelandic waters throughout the year.

The following data - which were compiled on a request from the Chairman of the Herring Committee - are therefore based on the 1961 material only. Although the results from this one year probably lie near the average one must, however, be very careful in generalizing from data of this type. Throughout the paper the maturity stages I - VIII refer to those listed in the final report on the Meeting on Scale and Otolith typing and other methods in Atlanto Scandian Herring Research, page 3. (Bergen 1962)

Table 1 and better Fig. 1 a, b and c show the distribution of the maturity stages in all the material i.e. both summer and spring spawners. Considering each stage in turn, stage I is hardly represented at all in the material. Stage II on the other hand occurs in most of the months and makes up almost half of the samples in November and December. Since stage VIII (the recovering spents) corresponds to stage II its distribution will now be considered. Fig. 1 a shows that this stage is distributed throughout the year with maxima in June and October - January. This second maxima is even better defined if the distribution of stage II is considered with that of stage VIII. Fig. 1 b shows that stage III is likewise distributed throughout the year with two maxima in April - May and June - August. The picture shows further a considerable difference between the maturity of the sexes. The same features are also brought out in the distribution histograms of stages IV and V (Fig. 1 b) where the difference between the sexes is even more pronounced. Unlike the distribution of the other stages, that of stage VI (Fig. 1 c) only shows one maxima (March). Similarly the maximum frequency of stage VII is only one (April) - although this

stage occurs also in other months notably in July - August. This lack of one of the maxima-shown in the distribution of stages VIII and III - - is easily explained when it is considered that during the spawning season of one of the Icelandic herring stocks i.e. the summer spawners : no fishing took place in the spawning areas and that this stock is very poorly represented in samples until it has reached stage VIII.

Thus Fig. 1 shows that with the exception of stages VI and VII there are no sharply defined limits in the distribution of the maturity stages in the Icelandic herring populations. This is not only due to the fact that different parts of each population differ in the speed of maturation and spawning time but also because there are at least two intermixing populations. Fig. 1 c clearly shows that the height of the spawning season of one of these is during March. Fig. 2 a shows an attempt to follow the maturity cycle of this population throughout the year by comparing the frequency of the various maturity stages in each month (Fig. 1 a, b, c). The limits between the stages are fixed as near the 50% frequency level as possible; e.g. in November the frequency of females in stage III (14.4%) and IV (14.8) is approximately the same; hence the boundary between III and IV is fixed in the middle of November. Similarly in July the majority of the males are in stage III (69.4%) with a few in stage VIII (21.5%) and hence the boundary between VIII and III for the spring spawning males is fixed at approximately 5-10 July. Considering the maturation Cycle of the Icelandic spring spawning herring it must be born in mind that the recovering stage VIII are mainly based on material from the North coast where old year classes predominate whereas the later maturation stages III - V are mainly based on material from the Southwest coast where young yearclasses predominate. It is thus possible that the recovering stage VIII would cover a longer period if the whole of the stock had been sampled during summer and that stage III (females) and IV (males) are a little over represented in the scematic representation in Fig. 2 a.

Fig. 2 b shows similarly the maturity cycle of the summer spawners which is characterized on one hand by the long duration of the recovering stage VIII and the very mixed and rapid process of maturation during spring with the height of the spawning season in July. Both cycles show a very striking difference between males and females. - the prespawning stages lasting much longer in the males. The female stage V probably lasts only a few days in each individual.

It should be emphasized that all the data in this paper are compiled from one year only.

APPENDIX

Table 2 and Fig 3 show the maturity stages of Norwegian herring off the North coast of Iceland during the summer season 1961. In this population the females pass over from stage VIII to III in July and remain in that stage practically throughout the season. In the males the change-over from stage VIII to III mainly takes place in June and in August majority of the males have reached stage IV.

Table 1

Icelandic herring 1961

Monthly Distribution of Maturity Stages

Females

Maturity Stage	Jan. %	March %	April %	May %	June %	July %	Aug. %	Oct. %	Nov. %	Dec. %	%
1									1.3	0.5	0.1
2	5.0	2.2	2.4	1.0	0.2	1.7	15.3	4.4	31.9	28.8	8.0
3	4.0	10.1	7.4	42.9	0.6	34.5	63.8	23.2	14.4	6.8	24.0
4	16.1	0.7	12.3	25.0			0.3	6.5	14.8	31.5	7.8
5	5.5	12.2	1.2	9.9	2.1	1.6	0.5				2.5
6		60.4	22.0								4.7
7		0.7	35.5	6.6		1.3	2.3				4.1
8	69.4	13.7	19.2	14.6	97.1	60.9	17.8	65.9	37.6	32.4	48.8
No.	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	199	139	245	212	475	701	393	138	229	219	2950
%	6.7	4.7	8.3	7.2	16.1	23.8	13.3	4.7	7.8	7.4	50.6

Males

Maturity Stage	Jan. %	March %	April %	May %	June %	July %	Aug. %	Oct. %	Nov. %	Dec. %	1961 %
1									3.5	0.5	0.3
2	9.0	9.1	0.3	1.6	0.2	2.2	15.2	5.0	45.6	34.8	8.9
3	2.0	8.3	26.8	16.0	9.4	69.4	26.4	1.6	3.5	2.8	27.4
4	6.5	1.6	24.4	28.9		5.1	41.4	23.8	33.3	27.1	16.5
5	22.8	20.7	3.1	28.9	2.3	0.7		1.6	4.1	12.7	6.3
6		47.1	15.9								3.6
7		0.8	24.1	4.3		1.1	1.3				3.2
8	59.7	12.4	5.1	20.3	88.1	21.5	15.7	68.0	10.0	22.1	33.8
No.	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	201	121	295	187	487	726	394	122	177	181	2885
%	7.0	4.2	10.2	6.5	16.9	25.2	13.6	4.2	5.9	6.3	49.4

Table 2

Norwegian Herring 1961

Monthly Distribution of Maturity Stages

Females

Maturity Stage	June %	July %	August %	%
3	6.1	43.1	92.8	49.6
4			1.1	0.2
5		0.2		0.1
7		0.2		0.1
8	93.9	56.5	6.1	50.0
	100.0	100.0	100.0	100.0
No.	98	556	181	835
%	11.7	66.6	21.7	

Males

Maturity Stage	June %	July %	August %	%
2	1.3			
3	56.8	79.9	18.1	63.5
4		6.5	80.8	22.9
5		0.2		0.1
8	41.9	13.4	1.1	13.4
	100.0	100.0	100.0	100.0
No.	74	521	177	772
%	9.6	67.5	22.9	

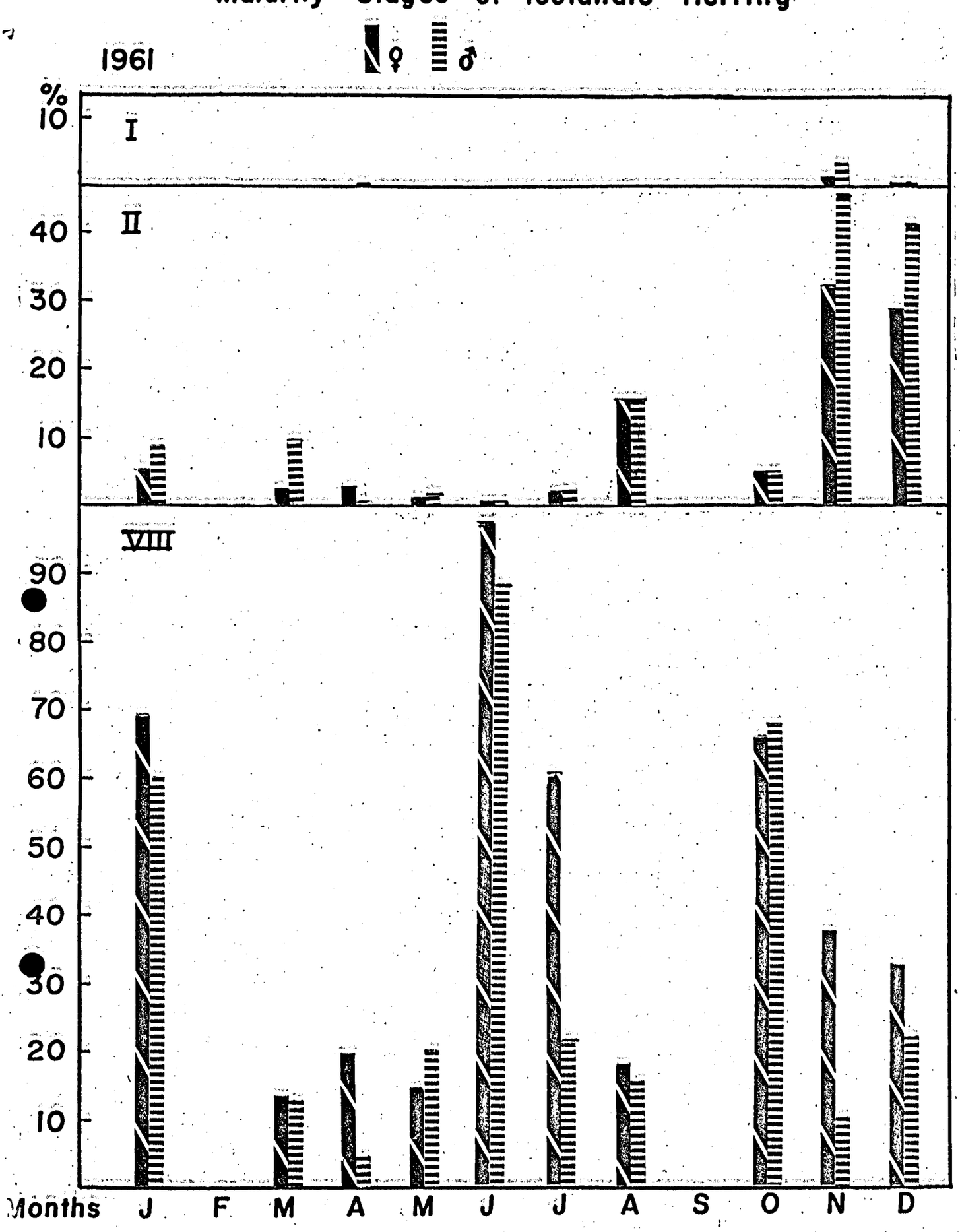

Fig. 1 a: Monthly frequency distribution of maturity stages I, II and VIII of Icelandic herring during 1961.

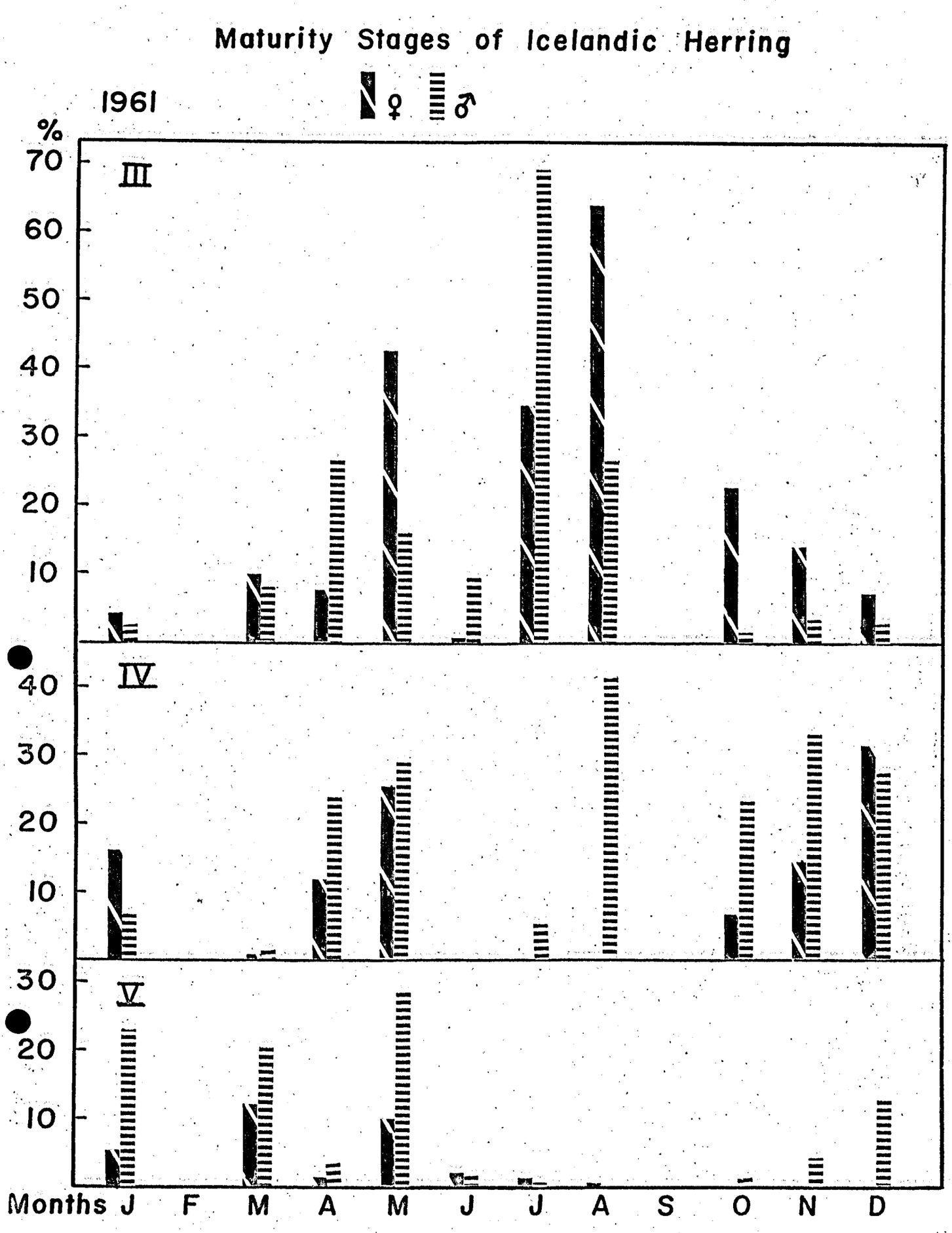

Fig. 1 b: Monthly frequency distribution of maturity stages III, IV and V of Icelandic herring during 1961.

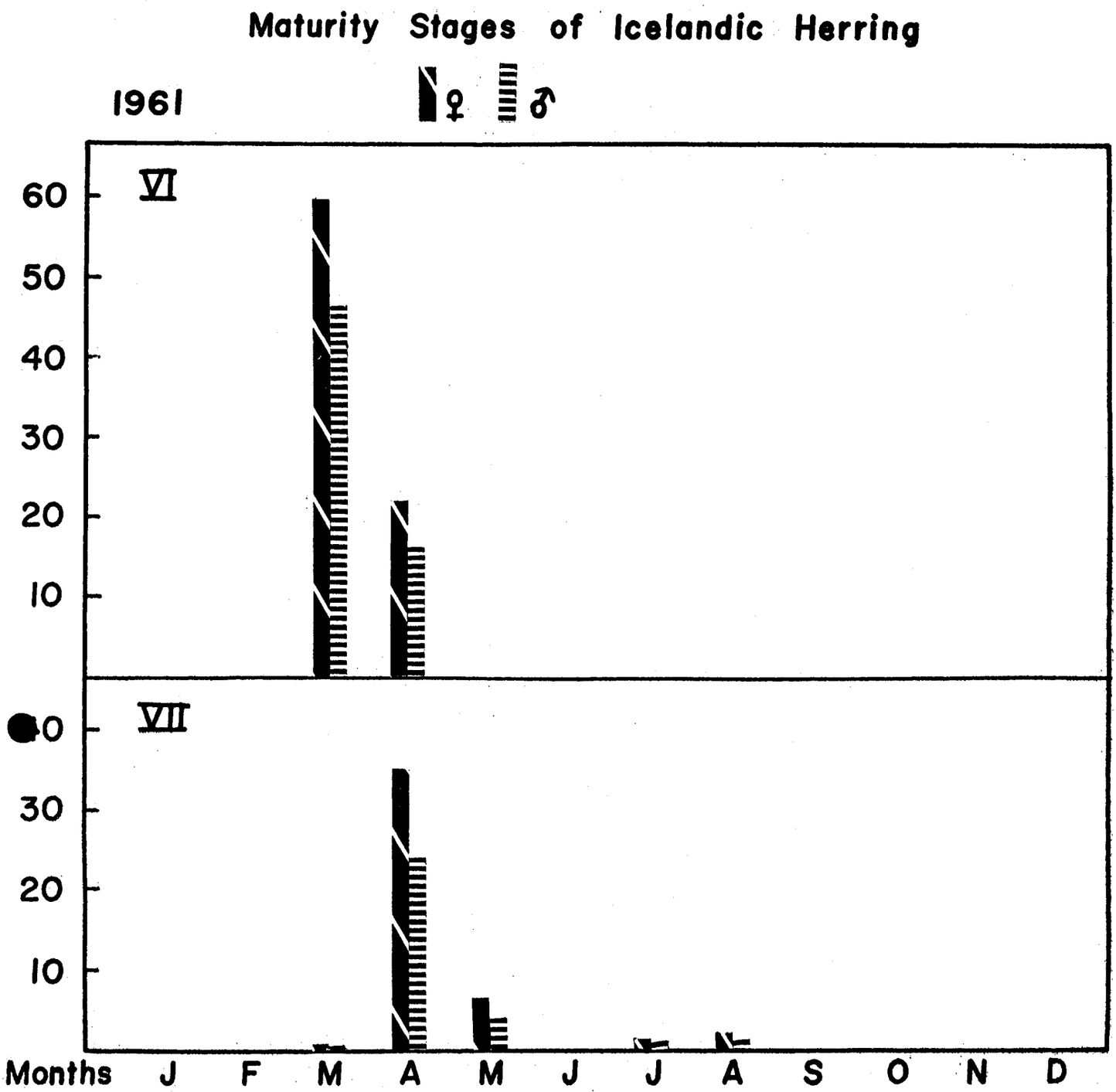

Fig. 1 c: Monthly frequency distribution of maturity stages VI and VII of Icelandic herring during 1961.

Maturity Cycle of Icelandic Herring 1961

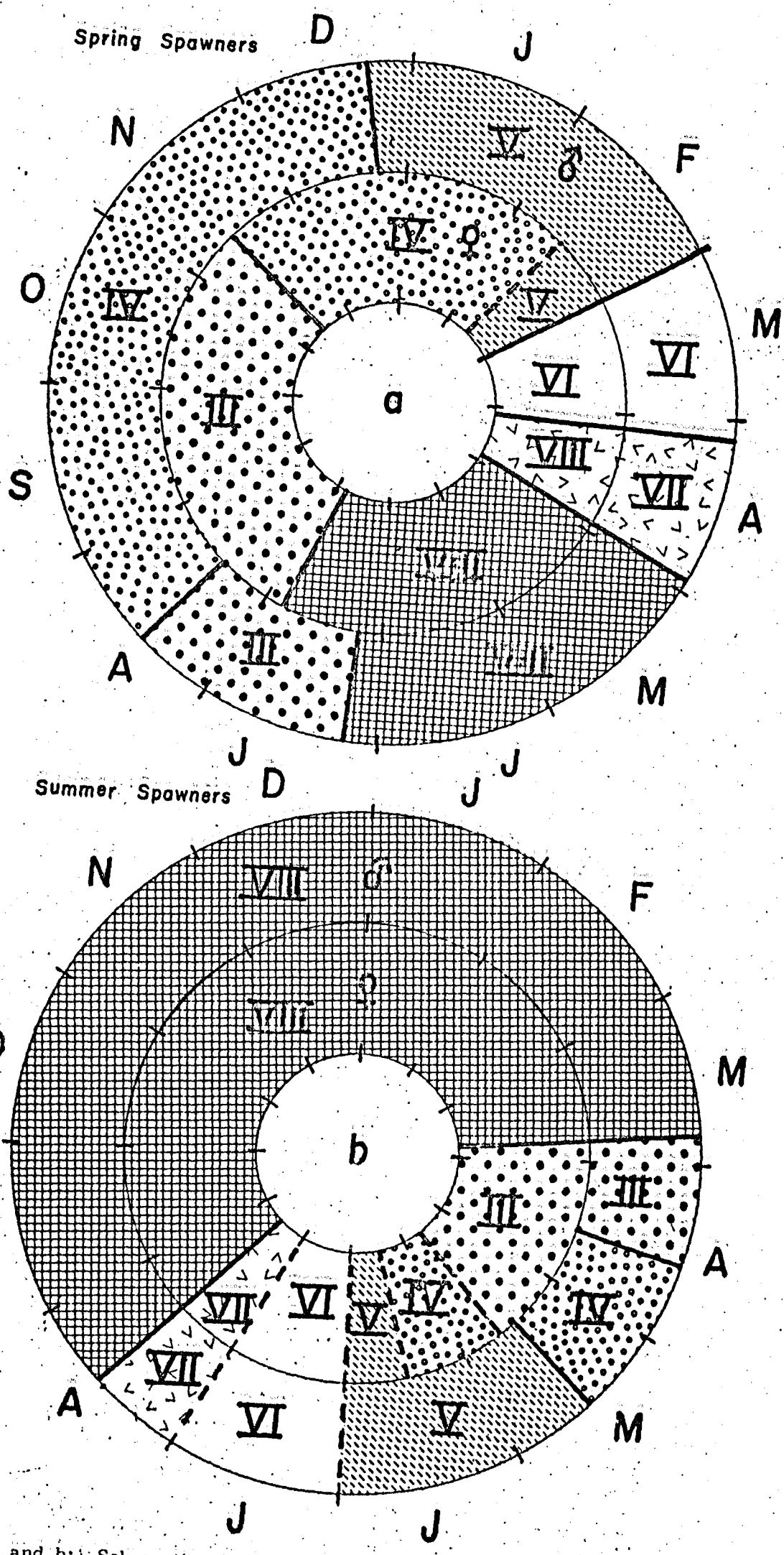

Fig. 2 a and b: Schematic representation of the maturation cycle of Icelandic herring in 1961, a) spring spawners, b) summer spawners.

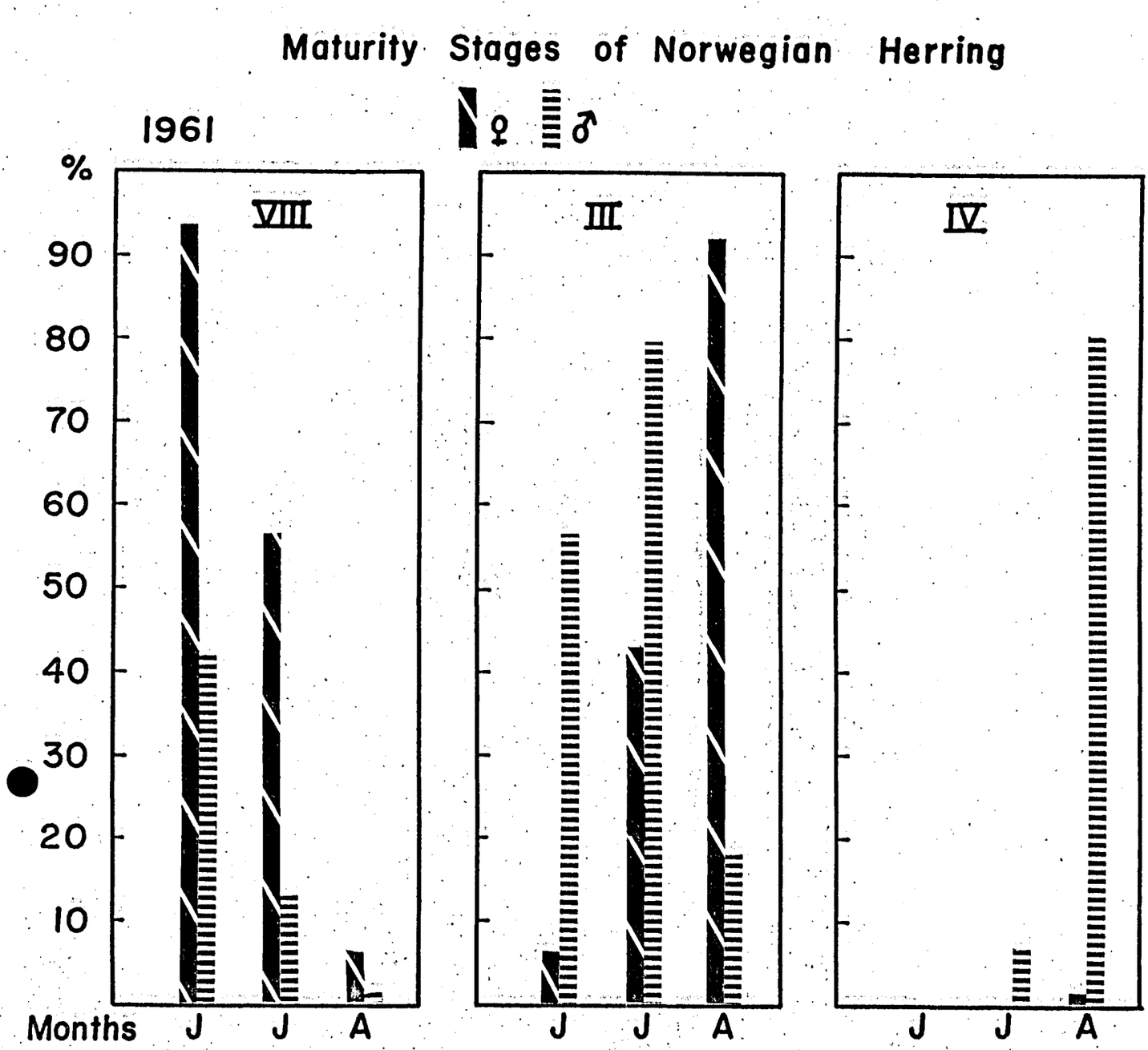

Fig. 3: Monthly frequency distribution of maturity stages of Norwegian herring off the North and East coast of Iceland in 1961.