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SEXUAL MATURITY AND REPRODUCTIVE PERFORMANCE OF FEMALE HOODED SEALS AT NEWFOUNDLAND

by

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Information on the sexual maturity and reproductive performance of female hooded seals was obtained in the Denmark Strait and the Greenland Sea in 1956-1960 (Øritsland 1964). Data are now available from the analysis of pairs of ovaries and age determinations from 48 breeding female hooded seals sampled off Newfoundland-Labrador in 1967-1971 and 119 breeding females sampled in 1972. This report deals with information on sexual maturity and reproductive performance from these samples.

Using the same methods as in the earlier study of hooded seals (Øritsland 1964) and also for harp seals at Newfoundland (Øritsland 1971), the age of sexual maturity (first ovulation) was determined for individual females. Accumulated maturity frequencies were calculated from the distribution on age at maturity of all 3 to 13 years old females which had reached maturity within the last three years before they were killed. Separate graphs showing the accumulated maturity frequencies of the combined 1967-1971 samples and the sample collected in 1972 together with frequencies from the Denmark Strait 1956-1960, are shown in Figure 1. The fairly close fit of the three graphs suggests that this method may be relied upon

to give consistent results, even for quite small samples. It should be noted though, that the original frequencies reported from the Denmark Strait were based on animals which had reached maturity within the last two years before capture. These frequencies corresponded nearly too well to the 1972 Newfoundland data. The Denmark Strait frequencies shown in Figure 1 have been recalculated from the age distribution of animals matured within three years before capture, and therefore are directly comparable to the frequencies from breeding seals at Newfoundland.

The distribution on age at capture, age at maturity or first ovulation and calculated maturity frequencies for the combined Newfoundland samples collected from 1967 to 1972, are presented in Table 1. The table also indicates how frequencies were calculated. In total the combined samples comprise data from 167 seals. All these seals were captured during the lactation period, i.e. after parturition, but before the new ovulation, so the age at last ovulation was one year less than the age at capture for all of them. Among these a total of 155 seals were from 3 to 13 years old at capture (no 2 years old seals were captured), and 114 of the latter had reached maturity within the last three years before capture. The accumulated maturity frequencies in the bottom line of Table 1 are illustrated by graph A) in Figure 2.

Having no access to random samples of females of all age-groups, a method was developed for estimates of the maximum reproductive performance of harp seals at Newfoundland from samples of breeding females (Øritsland 1971). Briefly it was assumed that female seals have a regular one-year reproductive cycle, and that the two ovaries alternate so that each of them is active every second year. It was further assumed that only one ovum is released and only one corpus luteum is formed every year, and that corpora lutea persist as scar tissue or corpora albicantia in the ovaries for at least three years after they are formed. For hooded seals it has been fairly

well documented that these assumptions are valid (Øritsland 1964). An estimate of missed pregnancies can then be obtained by recording the number of corpora missing in the normal sequence for each animal. For newly matured animals which have only one or two corpora and which are older than the youngest maturing age-groups it obviously is impossible to decide whether they have missed the first couple of opportunities. Therefore the frequency of missed ovulations measured by this method is a minimum estimate, and the complementary parameter, the rate of pregnancies, must be used as a maximum estimate of reproductive success.

Such data from the combined Newfoundland samples of breeding hooded seals give maximum pregnancy rates of 0.969 for age-groups 3-10 years and 0.988 for 11 years old and older seals, without any indication of a decreasing rate for the oldest seals.

Even taken as maximum estimates, these rates are very high for a phocid seal. However, they are comparable to more direct estimates for hooded seals in the Denmark Strait where rates increasing from 0.778 at 3 years to 1.000 at 6 years were recorded, and an average rate of 0.982 was found for six years old and older seals (Øritsland 1964). It therefore may be assumed that the reproductive performance of female hooded seals at Newfoundland really is very high.

Taking 0.96 as a tentative estimate of the pregnancy rate for age-groups 3-10 and 0.98 as an estimate for 11 years old and older seals, the following cumulative frequencies of productive maturity may be calculated from the sexual maturity frequencies in Table 1:

3	years:	11.8	per	cent
4	" :	55.6	"	"
5	" :	71.6	"	"
6	" :	82.6	"	"
7	" :	93.5	"	"

8 years:	94.4	per	cent
9 " :	94.4 (!)"		"
10 " :	96.0	"	"
11+ " :	98.0	"	"

These estimates of age specific production rates are illustrated by graph B) in Figure 2. The graph indicates that 50 per cent production is reached at an age of 3.8 years.

References:

Øritsland, T. 1964. Klappmysshunnens forplantningsbiologi [The breeding biology of the female hooded seal]. Fiskets Gang, 50: 5-19. [English summary.]

- 1971. The status of Norwegian studies of harp seals at Newfoundland. Redbook int. Commn NW. Atlant. Fish., 1971(3): 185-209.

Table 1. Sexual maturity of female hooded seals, combined samples collected from breeding seals off Newfoundland-Labrador 1967-1972.

Age at capt.	Age at last ov.	No.	Age at first ovulation								
			2	3	4	5	6	7	8	9	10
2		0									
3	2	2	2								
4	3	35	5	30							
5	4	26	7	12	7						
6	5	23	2	10	7	4					
7	6	19		7	5	4	3				
8	7	21	1	3	4	5	8	0			
9	8	8		3	0	2	2	1	0		
10	9	4		1	1	1	1	0	0	0	
11	10	5		1	0	1	1	2	0	0	0
12	11	6				1	0	3	0	2	0
13	12	6			1	0	1	2	1	1	0
Sum total		155	17	67	25	18	16	8	1	3	0
Sum 3 years		114	14	52	19	13	13	1	0	2	0
Per cent			12.3	45.6	16.7	11.4	11.4	0.9	0.0	1.8	0.0
Accum. per cent			12.3	57.9	74.6	86.0	97.4	98.3	98.3	100.1	

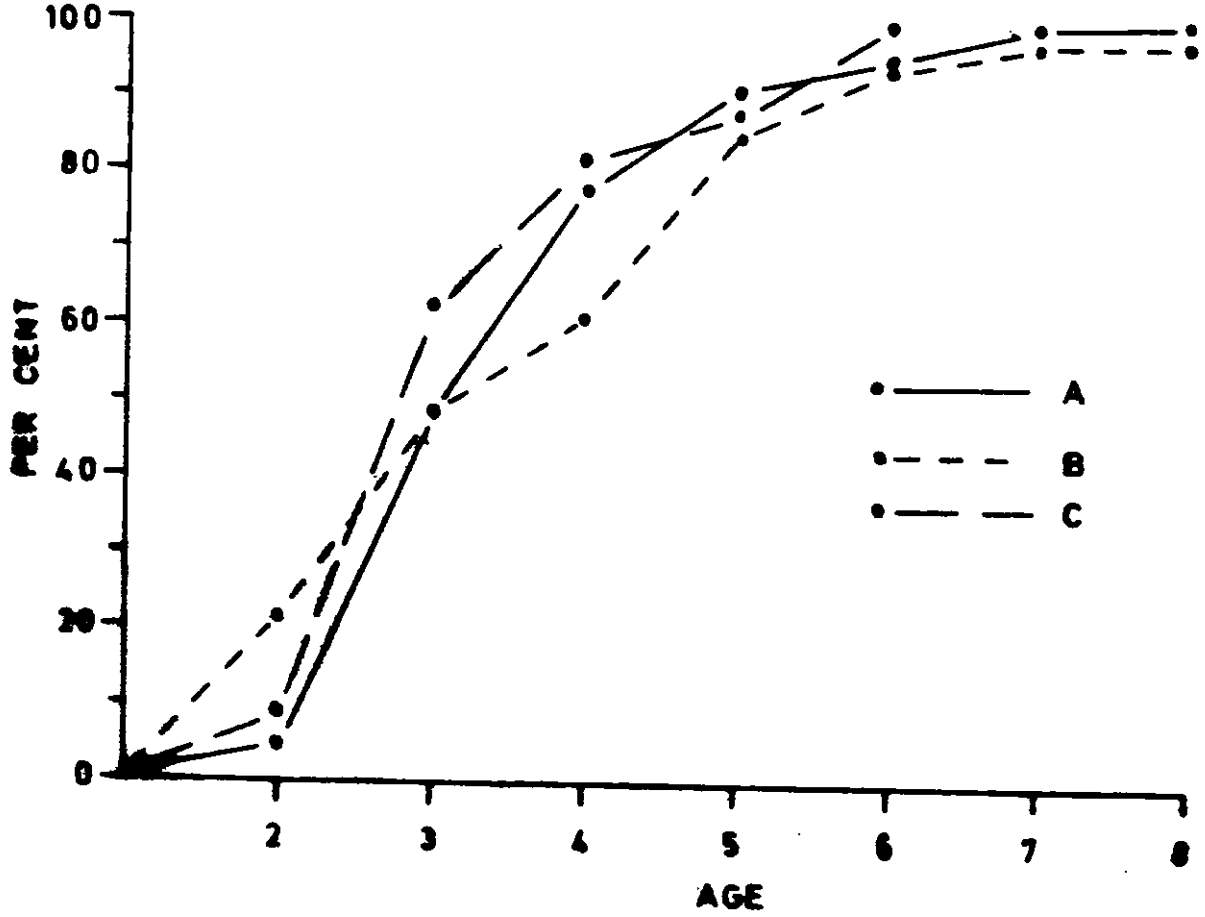

Figure 1. The sexual maturity of female hooded seals. Accumulated frequencies in samples collected at Newfoundland in 1967-1971: B) and in 1972: C) are compared to data from the Denmark Strait: A).

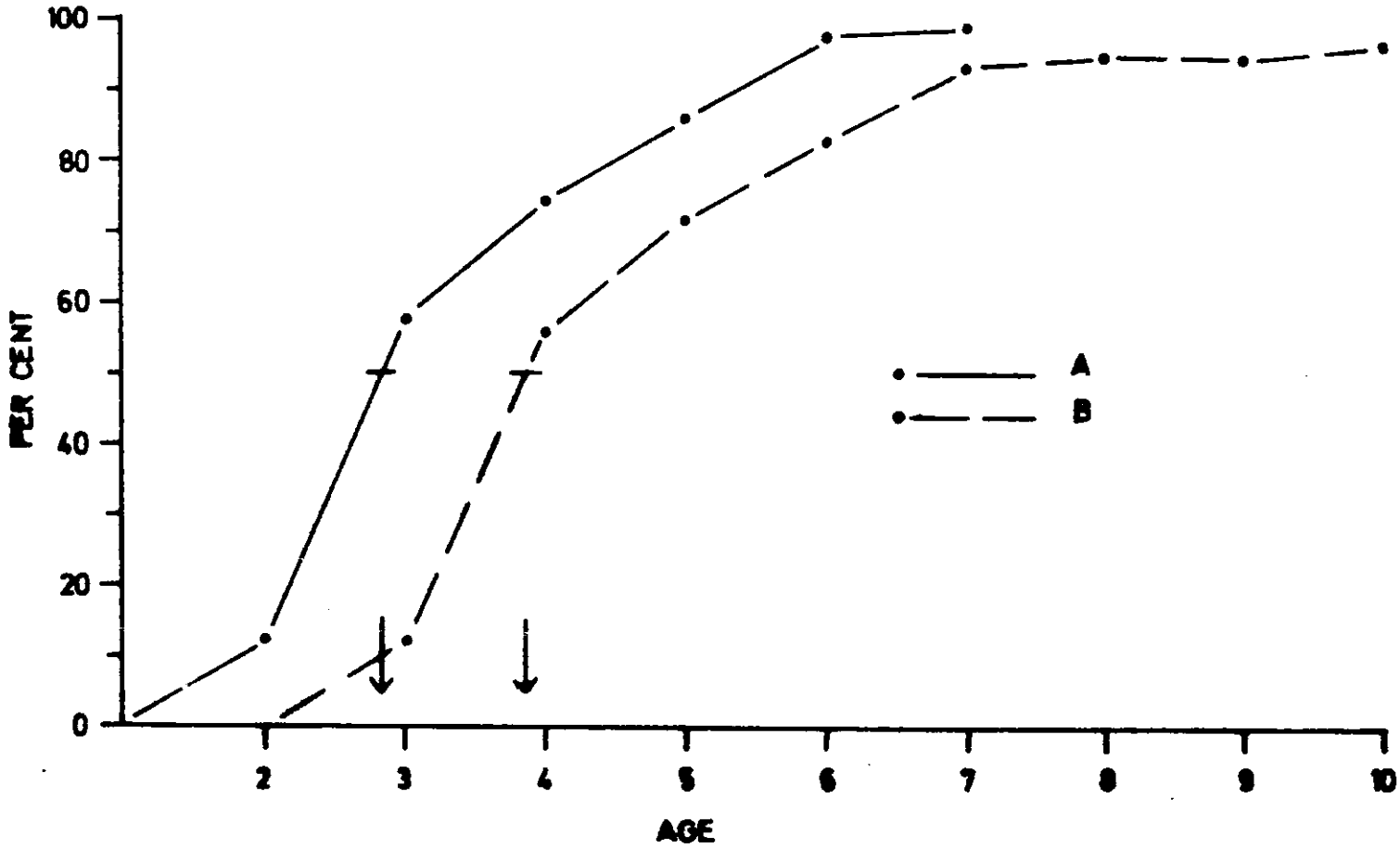

Figure 2. Sexual maturity (age at first ovulation) and reproductive maturity (age at first parturition) of female hooded seals at Newfoundland. Accumulated frequencies are based on combined samples collected 1967-1972 (Table 1).