

# SOME ASPECTS OF OESTRUM IN CATTLE, WITH REFERENCE TO FERTILITY ON ARTIFICIAL INSEMINATION. I. THE PATTERN OF OESTROUS CYCLES

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## SUMMARY.

Aspects of the incidence of oestrus, together with fertility data, have been investigated in Jersey cows in south-eastern Queensland.

For 383 cows, the mean interval between parturition and first oestrus was  $40.45 \pm 22.70$  days. The modal interval occurred at 26-30 days, and 79 per cent. of the cows exhibited first heat 11-55 days after calving. Fertility data indicated that fertility at first heat is a function of the post-partum interval rather than of any characteristic of first heat per se.

Of 441 non-service oestrous cycles, 18.4 per cent. were less than 18 days in duration. Approximately 94 per cent. of the short cycles occurred between first and second heats. Short cycles were also recorded in the case of 10.9 per cent. of 567 service-return cycles, but were not so closely associated with first heat. Fertility rates for cows artificially inseminated after short cycles were similar for first and repeat inseminations and were of the order of 57 per cent.

Non-service cycles exceeded 25 days in 11.4 per cent. of cases, whereas 33.3 per cent. of service-return cycles were of long duration. First insemination fertility (79 per cent.) after such long cycles was markedly higher than that of repeat inseminations performed after long service-return cycles (55 per cent.).

Attention is drawn to the importance of the high incidence of short oestrous cycles in the overall pattern of ovarian dysfunction in the area concerned.

## I. INTRODUCTION.

While reproductive processes in the bovine have been the subject of extensive investigation in other parts of the world, little factual information is available in respect of Australian cattle. Current husbandry practices in this country in relation to breeding are determined by recommendations derived from elsewhere. In particular, routine artificial insemination in Australia closely follows practices developed in other countries. While it is possible that such practices are optimal for fertility in Australian cattle, it is considered that the factors involved should be under constant review.

In 1955 the Queensland Department of Agriculture and Stock inaugurated a Bull Proving Project to locate dairy sires of outstanding genetic merit in Queensland studs. The programme is very similar to that being currently pursued in the United Kingdom. Initially, the Jersey breed is under consideration. Each year a team of four young bulls is placed under test, and semen from each bull is used for the artificial insemination of at least 250 cows. The cows belong to about 50 commercial dairymen in the Nambour region, approximately 70 miles north of Brisbane.

During the 1955 breeding season it was found that approximately 17 per cent. of 339 cows which failed to conceive to first insemination returned on heat within 2-17 days. This result is at considerable variance with reports from certain other sources (Asdell 1946, Erb 1955, Joubert 1955). Therefore, it was considered of value to investigate the pattern of oestrous cycles more fully in the 1956 breeding season, especially in relation to possible influences on fertility.

## II. MATERIAL AND METHODS.

In the 82-days' period from Oct. 1 to Dec. 21, 1956, 1,267 cows were presented for artificial insemination. In addition to these first inseminations, 398 repeat inseminations were performed. As each insemination was carried out, available data concerning the cow's previous reproductive performance were recorded by the inseminator. Information relating to service-return oestrous cycles was available from the artificial insemination records.

Inseminations were performed by the rectal fixation technique, approximately 1 ml. of chilled extended semen being deposited in the uterine cornua and in the cervical canal.

Fertility or breeding efficiency has been calculated on the basis of 60-90 day non-returns. Overall first insemination fertility in 1956 was of the order of 64 per cent.

## III. RESULTS.

### (1) Post-partum Interval to First Heat.

Data were available for the intervals between calving and first heat in respect of 383 cows. The distribution of the intervals is presented in Fig. 1. It was found that the mean period between parturition and first oestrus was  $40.45 \pm 22.70$  days. The modal interval occurred at 26-30 days, and 79 per cent. of the cows exhibited first heat 11-55 days after calving.

### (2) Non-Service Oestrous Cycles.

Complete information concerning 441 dioestrous intervals, in the absence of service, was available for 281 cows. The data are presented in Table 1 and Fig. 2. While it is to be expected that a large proportion of the intervals should fall within the range 18-25 days, it is considered noteworthy that 18.4 per cent. of the intervals were shorter than 18 days. Further examination of the data indicates that a high proportion (93.8 per cent.) of the short cycles occurred between first and second heats. No relationship between the incidence of short cycles and other aspects of oestrus, such as the post-partum interval to oestrus, preceding cycle length and succeeding cycle length, could be established.

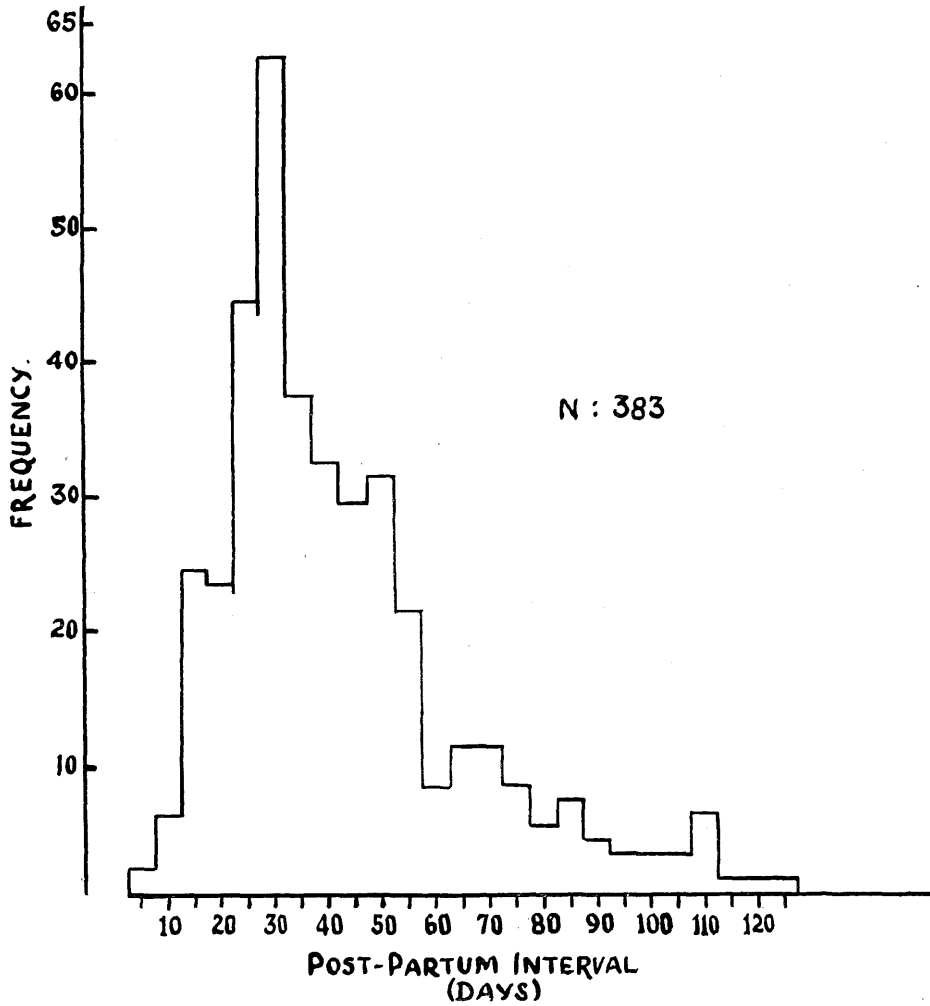


Fig. 1.  
Distribution of the Post-partum Interval to First Heat.

Table 1.  
DISTRIBUTION OF NON-SERVICE OESTROUS CYCLES.

Interval Between Respective Heats. (Days.)	Heats.								
	I.-II.		II.-III.		III.-IV.		IV.-V.	Over-all.	
	No.	%.	No.	%.	No.	%.	No.	No.	%.
0-17 .. .. .	76	27.1	3	2.6	2	4.9	..	81	18.4
18-25 .. .. .	167	59.4	103	88.8	36	87.8	3	309	70.1
26-65 .. .. .	38	13.5	10	8.6	3	7.3	..	51	11.5
Total Cycles .. .	281	..	116	..	41	..	3	441	..

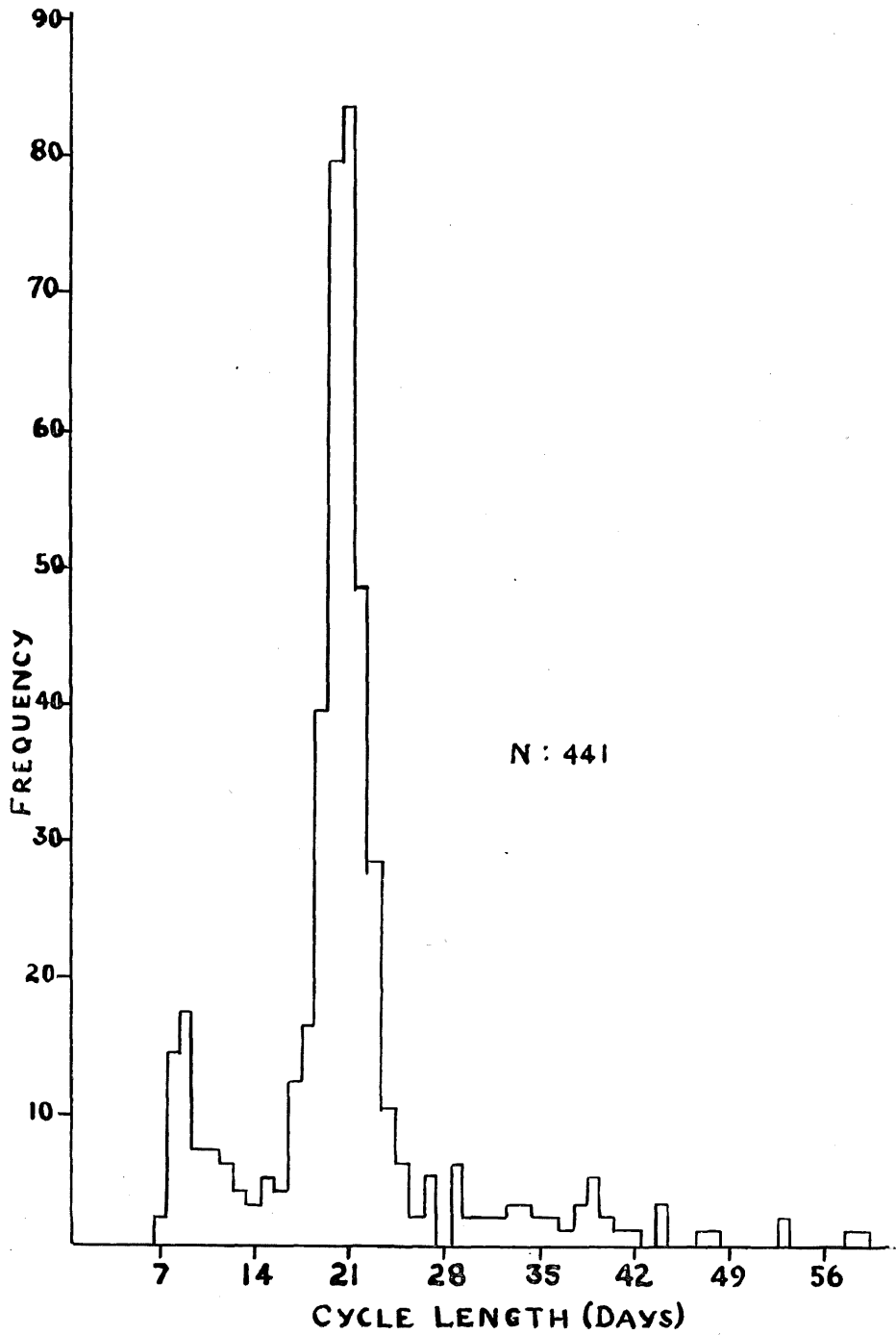


Fig. 2.

Distribution of Non-service Oestrous Cycles.

**(3) Fertility at First Heat.**

To effect a more complete appraisal of fertility at first heat, the effect on fertility of the post-partum interval before service, *per se*, was examined. It is apparent (Table 2) that fertility levels improved as the interval between calving and insemination increased. It was noted above that a large proportion of cows exhibited first heat 11-55 days after calving. The fertility of cows inseminated when first heat occurred in the "normal" range (52 per cent.) was markedly lower (Table 3) than that of cows inseminated when first heat occurred after a longer interval (62 per cent.). The indications are, therefore, that fertility at first heat is related more to the length of the post-partum interval than to any characteristic of first heat, *per se*.

**Table 2.**  
INFLUENCE ON FERTILITY OF THE POST-PARTUM  
INTERVAL TO SERVICE.

Interval Between Calving and 1st Insemination. (Days.)	No. of Cows Inseminated.	Fertility. (%)
1-40 .. .. .	114	57
41-55 .. .. .	180	59
56-100 .. .. .	547	66
101-150 .. .. .	124	71
Total .. .. .	965	64

**Table 3.**  
FERTILITY AT FIRST HEAT.

Post-partum Interval to 1st Heat. (Days.)	No. of Cows Inseminated.	Fertility. (%)
11-55 .. .. .	54	52
56-130 .. .. .	53	62
Total .. .. .	107	57

**(4) Influence of Dioestrous Interval on Fertility.**

A wide range in the length of the dioestrous interval has been noted above. Since most of the short cycles occur before second heat, when service is often performed, the influence that such variations in intervals might exert on fertility was examined. It was found (Table 4) that fertility is depressed after short dioestrous intervals, but may be quite high after long intervals.

**(5) Service-Return Oestrous Cycles.**

Data were available for 567 oestrous cycles following unsuccessful insemination. An analysis of the distribution of those cycles, as compared with the distribution of non-service cycles (Table 5), indicates a tendency for

**Table 4.**

## INFLUENCE OF THE DIOESTROUS INTERVAL ON FERTILITY.

Length of Previous Dioestrous Interval. (Days.)	Fertility Results.					Fertility. (%)
	Heat II.	Heat III.	Heat IV.	Heat V.	Total.	
0—17 .. .. .	29 (16)	3 (2)	2 (1)	— (-)	34 (19)	56
18—25 .. .. .	98 (61)	64 (38)	33 (21)	3 (3)	198 (123)	62
26—65 .. .. .	28 (21)	11 (9)	3 (3)	— (-)	42 (33)	79
Total .. .. .	155 (98)	78 (49)	38 (25)	3 (3)	274 (175)	..
Fertility (%) .. .. .	63	63	66	..	64	..

\*Numbers in brackets refer to 60-90-day non-returns.

**Table 5.**

## PATTERN OF OESTROUS CYCLES.

Length of Cycle. (Days.)	Non-Service Cycles.		Service-Return Cycles.	
	No.	%.	No.	%.
0—17 .. .. .	81	18.4	62	10.9
18—25 .. .. .	309	70.1	305	53.8
26— .. .. .	51	11.5	200	35.3
No. of Cycles .. .. .	441	..	567	..

**Table 6.**

## DISTRIBUTION OF SERVICE-RETURN OESTROUS CYCLES AFTER FIRST AND REPEAT INSEMINATIONS.

Length of Service-Return Oestrous Cycle. (Days.)	1st Insemination Returns.		2nd Insemination Returns.		3rd Insemination Returns.	
	No.	%.	No.	%.	No.	%.
0—17 .. .. .	47	11.0	8	8.1	7	18.0
18—25 .. .. .	226	52.6	58	58.6	21	53.8
26— .. .. .	156	36.4	33	33.3	11	28.2
No. of Cycles	429	..	99	..	39	..

service-return cycles to be longer than non-service cycles. The data have been further analysed in Table 6 to present the distribution of service-return cycles after first and repeat inseminations. It is apparent that a similar trend occurred in each instance.

**(6) Service-Return Oestrous Cycles after Respective Heats.**

Although more than 90 per cent. of short non-service oestrous cycles occurred between first and second heats, it was found that short service-return cycles were not so closely associated with first heat (Table 7).

**Table 7.****SERVICE-RETURN OESTROUS CYCLES AFTER FIRST INSEMINATION AT RESPECTIVE HEATS.**

Length of Service-Return Oestrous Cycle. (Days.)	Cows Returning after Insemination.								
	Heat I.		Heat II.		Heat III.		Heat IV.	Over-all.	
	No.	%.	No.	%.	No.	%.	No.	No.	%.
0—17 .. .. .	9	20.9	6	10.5	..	..	..	15	10.6
18—25 .. .. .	19	44.2	38	66.7	19	65.5	9	85	60.3
26— .. .. .	15	34.9	13	22.8	10	34.5	3	41	29.1
No. of Cycles ..	43	..	57	..	29	..	12	141	..

**(7) Influence of Length of Preceding Service-Return Cycle on Fertility of Repeat Inseminations.**

Although an overall depression in fertility (57 per cent.) occurred in repeat inseminations performed after short service-return cycles (Table 8), quite high fertility was obtained in second inseminations performed after such cycles. It is of interest to note that the fertility of repeat inseminations performed after long cycles (55 per cent.) is markedly lower than that of first inseminations carried out after long cycles (79 per cent.) (see Table 4).

**Table 8.****INFLUENCE OF SERVICE-RETURN CYCLE ON FERTILITY OF REPEAT INSEMINATIONS.**

Length of Preceding Service-Return Oestrous Cycle. (Days.)	2nd Insemination.	3rd Insemination.	4th Insemination.	Total No.	Fertility. (%)
0—17 .. .. .	36 (25)	8 (1)	3 (1)	47 (27)	57
18—25 .. .. .	202 (139)	49 (21)	11 (10)	262 (170)	65
26— .. .. .	73 (41)	11 (5)	— (—)	84 (46)	55
Total ..	311 (205)	68 (27)	14 (11)	393 (243)	..
Fertility (%) ..	66	40	..	62	..

#### IV. DISCUSSION.

Dairy cows in the Nambour region are subject to enzootic anoestrus (McTackett 1956a). However, because of the restricted period during which artificial inseminations are performed in the present work, a large number of cows affected with anoestrus were not offered for service. Only 3.1 per cent. of the 383 cows considered here exhibited intervals in excess of 100 days between calving and first heat. Nevertheless, the group was useful in that it has been possible to determine what may be the "normal" interval to post-partum heat in the area.

It has been adequately demonstrated by other workers that the fertility of cows is low immediately after calving, and for this reason it is recommended that cows should not be serviced until at least 60 days after calving and then at second or later heat (Patrick and Herman 1953). However, in the present work it has been noted that first heat, *per se*, is not necessarily of low fertility, and that the post-partum interval is of more significance in this regard.

In a study of the dioestrous interval, Trimberger (1956) reported that 16.34 per cent. of 584 oestrous cycles were shorter than 18 days. However, when cases of cystic ovaries were deleted, only 2.2 per cent. of 500 cycles were of short duration. It was not possible to carry out extensive and detailed ovarian examinations in the present study, but, as noted above, 18.4 per cent. of 441 cycles were of short duration. A further point of interest was the observation that most (93.8 per cent.) of the short cycles occurred between first and second heats. However, short cycles following unsuccessful insemination were not so closely associated with first heat. No tendency for short cycles to recur in individual cows was apparent. It was observed that service-return cycles tended to be longer than non-service cycles, as reported elsewhere (Chapman and Casida 1934, Olds and Seath 1951, Erb 1955, McTackett 1956b).

Considerable evidence has been presented to indicate that the fertility of cows tends to be low immediately after short dioestrous intervals (VanDemark and Moeller 1950, Moeller and VanDemark 1951, Bonfert and Fromm 1953, Bonfert 1956, Trimberger 1956). In the present study a similar trend occurred and the importance of the first dioestrous interval has been demonstrated.

It was observed that the fertility of repeat inseminations performed after long service-return cycles was markedly lower than that of first inseminations carried out after long non-service cycles. It is considered that this difference is due mainly to pathological changes in the reproductive tract associated with early post-conception failure (Tanabe and Casida 1949).

The observations reported here are considered of importance in relation to the overall pattern of infertility in the area concerned, with particular reference to ovarian dysfunction, which hitherto has been regarded as being characterised mainly by anoestrus.



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