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The Oestrous Cycle of the Mare when Maintained under Stabled Conditions with Restricted Exercise at Onderstepoort.

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OUR knowledge on the complete oestrous cycle of the mare and the many fluctuations to which it is subject under different environmental conditions is still very incomplete.

According to Flemming (1937) the mare commonly takes the horse on the ninth day after foaling, but the date may vary from the seventh to the tenth day. If she does not become pregnant the mare manifests a desire for the horse every two or four weeks from the spring until the end of summer, and the objective phenomena which announce it continue from two to four days. Williams (1943) states that the mare is commonly in oestrus at the eighth or ninth day post-partum. Thereafter if healthy and non-pregnant she is in oestrus at intervals of about 21 days during the breeding season. When highly fed and carefully handled the oestrus may remain comparatively regular throughout the year. Williams does not define the breeding season but according to Caslick (1937) the breeding season of thoroughbred mares in America is limited to four months, from 15th February to 15th June. Caslick considers that in the average thoroughbred stud about three normal oestrous periods are required to produce one pregnancy. If there is any marked derangement of the oestrous or dioestrous periods, or if the pregnant mare does not foal before the 1st of May, the breeding season will be over before these mares will have had an average opportunity to become pregnant. In a well managed stud barrenness in mares comes from three main sources: The shortness of the breeding season, genital infections, and the failure of the mare to have a normal oestrous period. The latter is regarded as causing more infertility than the other main causes combined.

Day (1939) states that while some mares continue to come into oestrus throughout the year, others go into an anoestrous condition in winter and do not come into oestrus from November to February. He also holds the view that abnormal conditions of the ovaries and irregularities of the oestrous cycle are the main factors concerned in the causation of sterility in mares.

The only study hitherto made on the sexual cycle of equines in South Africa was that carried out by Kupfer (1928) who worked on mares kept under ordinary veld conditions, and concluded from his observations that " the appearance of ovulation and other sexual manifestations (oestrum) in donkeys and horses is seasonal. In South African donkeys and horses ovulation and symptoms of oestrum occur only at certain times of the year. This season may be described as the

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' ovulation ' or ' oestral season '. For the rest of the year ovulation and symptoms of oestrum are entirely absent; it is an inactive period free from ovulation and oestrum. According to our experience the ovulation and oestral period includes the months of October, November, December, January, February and March. However, it is probable that this season will vary from year to year, inasmuch as both the beginning and the end of the active season are subject to influences determining the condition of the animals."

It is a well recognised fact that nutritional, seasonal and environmental factors may have a profound influence on the normal rhythm of the sexual cycle and on fecundity in all species of animal. The feeding value of South African pastures is notoriously poor in many respects, notably minerals and proteins.

Quinlan, Roux and van Aswegen (1939) found that disturbance of the oestrous rhythm in cattle follows prolonged droughts in South Africa. The dioestrous periods become longer, oestrus becomes less intense and as animals lose condition the psychological phenomena disappear altogether.

The animals used by Kupfer in his experiments apparently received no supplementary feeding. While the results obtained by him may, therefore, be a true indication of the oestrous cycle of mares maintained under ordinary conditions of veld grazing, it does not follow that these results will also be applicable to mares kept under more congenial conditions with regard to stabling and feeding.

Experimental Procedure.

The observations which form the basis of the present study were made at Onderstepoort from January, 1944, to June, 1946, on a number of mares that were held available for other research purposes. The mares were of the ordinary light farm type, and the majority of them were obtained from the South African Police breeding depot at Kimberley. The age of the mares varied from 18 months to $3\frac{1}{2}$ years at the commencement of the experiment.

Throughout the period under review the mares were stabled at night and ran out in a small paddock during the day. No natural grazing was available at any time and the animals were fed throughout the period. Each received approximately 10 pounds daily of a mixture consisting of oats 6 pounds, crushed maize 10 pounds and peanut meal 1 pound. Lucerne and teff hay were given *ad lib.*, and green lucerne was also supplied during the summer months, but they had no green feed of any kind during winter.

The total number of mares on which the observations were made is thirty. For obvious reasons, however, all the mares were not in the experiment at the same time and the data for the different months of the year have reference only to those animals that were actually under observation at that time. Thus mares that were pregnant were not considered during the period of pregnancy. The number of mares that were actually available in every month is indicated in the first column of Table 1.

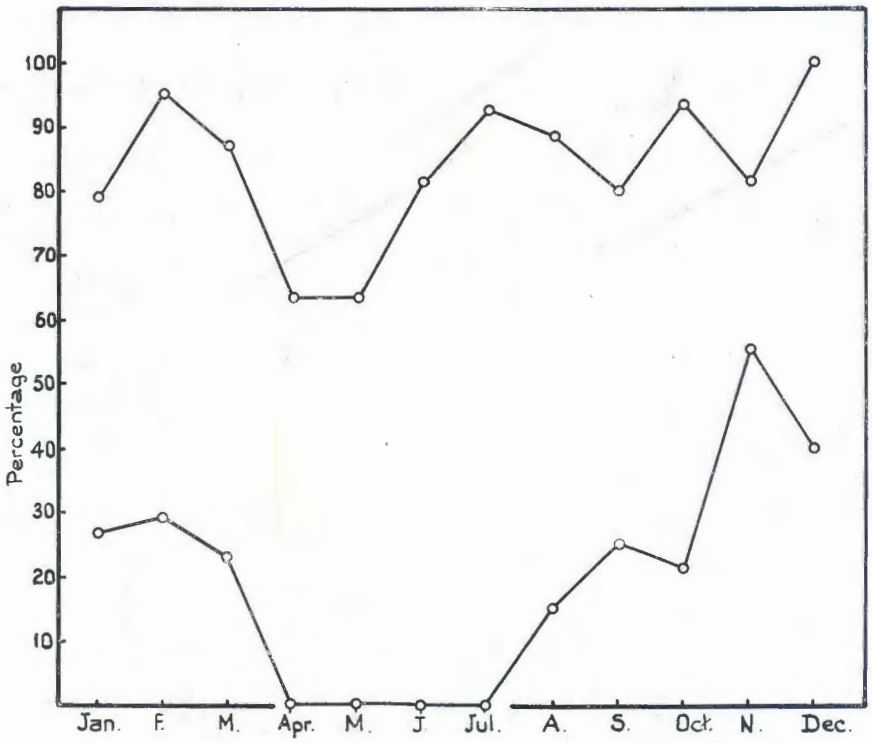
The available mares were each tested individually for oestrus every day. For this purpose she was led out of the stable in the morning and put to a teaser stallion, and any symptoms of oestrus were noted. Mares that showed oestrus were served by a stallion. Throughout the period the services were provided by two stallions namely one thoroughbred and one Percheron. Both stallions were tested for fertility and were known to be fertile before the commencement of the experiment.

TABLE 1.—*Summary of Results.*

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
No. of Mares under Observation	19	20	15	11	11	11	13	17	15	16	11	6
No. of Mares showing Oestrus..	15	19	13	13	7	9	12	15	12	15	9	6
Percentage showing Oestrus.....	78·9	95	86·7	63·6	63·6	81·7	92·2	88·2	80	93·8	81·8	100
No. of Mares Served.....	15	17	13	5	4	9	11	13	4	14	9	5
No. of Fertile Services.....	4	5	3	—	—	—	—	2	1	3	5	2
Percentage Fertile Services.....	26·7	29·4	23·1	—	—	—	—	15·4	25	21·4	55·6	40
No. of Oestrous Periods.....	17	26	21	10	7	12	21	20	21	19	13	6
Total Days of Oestrus.....	79	168	117	68	41	62	176	166	194	169	68	30
Mean duration of Oestrus in days	4·6	6·5	5·6	6·8	5·9	5·2	8·4	8·3	9·2	8·9	5·2	5·0
Mean duration of Oestrous Cycle in Days.....	29·5	37·3	44·2	28·1	43·2	28·7	34·9	21·1	22·2	24·4	23·6	24·2
Range of Oestrous Cycle in Days	16–52	19–113	6–113	11–77	32–55	8–80	7–112	12–33	9–42	13–62	21–36	19–38

It is well known that in the mare ovulation takes place towards the end of oestrus. In the average normal mare, therefore, the optimum time for service would be on the fifth or sixth day of oestrus. However, as the results will indicate, the duration of oestrus in the mare is extremely variable and may in some cases be only two or three days. Except where otherwise stated, the procedure which was therefore followed was to put the mare to the stallion on the second or third day of oestrus, and, if oestrus persisted longer, to have her served again on alternate days subsequently until she had been covered three times.

FIG. 1



Percentage of mares showing oestrus, (above), and percentage of fertile services, (below), in every month

There was no presumption of pregnancy after several services during any one oestrous period, and daily testing of such mares for oestrus was continued until pregnancy was definitely established by the Ascheim-Zondek test or by other methods.

It is of interest to note that one mare (DOB. 167) was served successfully by the stallion on 4th February 1944. Notwithstanding pregnancy she showed a normal oestrous period from the 4th to the 13th March, during which she was served three times, and again from 30th March till 4th April when she accepted the stallion twice.

RESULTS.

The Oestrous Cycle.

The most significant feature revealed by a study of the data presented in Table 1 and the relative graph (Fig. 1) is that, contrary to the results obtained by Kupfer for South African mares maintained under ordinary veld grazing conditions, the occurrence of oestrus in the mares in this experiment was not of a seasonal nature, and it was not confined to certain months in the summer but in the majority of mares oestrus was observed throughout the year. As indicated in the table and by the graph the percentage of available mares which came into oestrus showed an appreciable decline from 86·7 in March to 63·6 in April and May, but increased again to 81·7 in June. This proved to be the only significant variation, and during the remaining ten months of the year the percentage of non-pregnant mares showing oestrus every month fluctuated between 78·9 and 100.

These results confirm the view expressed by Day (1939) of Great Britain, namely that certain mares continue the oestrous cycle throughout the year, while others go into a period of anoestrus.

Nevertheless the oestrous cycle of all mares showed remarkable fluctuations throughout the year, although these variations were more pronounced during certain seasons. This is clearly illustrated by the data in Tables 2 and 3 and by the graph in Figure 3.

The variations shown cannot be ascribed to abnormalities in the cycles of merely some of the mares, but a study of the records of the individual animals shows that not one of the thirty mares presented a regular rhythmic cycle throughout the year. The records confirm the accuracy of the statement by Crowhurst and Caslick (1939), namely that the only constant finding regarding the oestrous cycle of the mare is its irregularity.

In this work an attempt was made to ascertain whether the irregularities were of a seasonal nature or whether they occurred throughout the year. With this end in view the data for each month of the year have been determined and recorded. The method whereby the oestrous cycles were assigned to the different months was to allocate the oestrous period and cycle to the month in which the period commenced. For instance, in the longest cycle in January, one of 52 days (Table 2), the first oestrous period commenced on the 11th January and the next on March 3rd.

In Table 2 the length of each complete individual cycle is given in days under the month in which the cycle commenced. Thus ten cycles started in January and their duration varied from 16 to 52 days. In the compilation of this table only those oestrous periods are considered which were not followed by pregnancy, and the records of mares which showed oestrus in the particular month but were eliminated by death or other causes before the commencement of the subsequent oestrous period were also omitted.

Table 3 shows the number of oestrous cycles which fell within the period stated in the first column in every month of the year. According to the data supplied in this table only 60 out of the total of 130 (i.e. 46·2 per cent.) oestrous cycles fell within what can be regarded as the normal period, namely 16 to 25 days.

The very marked variations which occurred in the length of the individual oestrous cycles are shown by the range for every month in Table 2 and the graph (Figure 2) which gives the upper and lower limits of the range for every month. The month to month fluctuations in the mean duration of the complete oestrous cycle are further illustrated in the relative graph in Figure 3.

TABLE 2.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
	16	19	6	11	32	8	7	12	9	13	20	19
	16	19	17	15	40	10	11	12	10	15	20	20
	19	20	17	19	46	13	11	14	13	17	21	20
	20	20	22	23	55	16	13	15	15	21	21	38
	20	20	27	25	—	22	16	16	16	21	36	—
	26	21	27	27	—	24	17	17	19	23	—	—
	30	21	27	77	—	26	21	17	19	24	—	—
	45	23	27	—	—	34	25	19	21	24	—	—
	51	24	32	—	—	37	26	19	23	24	—	—
	52	25	41	—	—	46	29	23	23	24	—	—
	—	25	93	—	—	80	45	23	24	24	—	—
	—	30	108	—	—	—	70	23	25	26	—	—
	—	40	113	—	—	—	86	28	29	62	—	—
	—	43	—	—	—	—	112	28	30	—	—	—
	—	81	—	—	—	—	—	30	38	—	—	—
	—	90	—	—	—	—	—	31	42	—	—	—
	—	113	—	—	—	—	—	33	—	—	—	—
Total Number of Days.....	295	634	530	197	173	316	489	360	356	318	118	97
Total Number of Cycles.....	10	17	12	7	4	11	14	17	16	13	5	4
Average Length of Cycle in Days	29·5	37·3	44·2	28·1	43·2	28·7	34·9	21·2	22·2	24·5	23·6	24·2
Range.....	16–52	19–113	6–113	11–77	32–55	8–80	7–112	12–33	9–42	13–62	20–36	19–38

Total No. of Cycles..... 130
Total No. of Days..... 3,883
Average Length of Cycles.....29·9 days.

Total No. of Cycles from Aug. to Jan... 65
Total No. of Days from Aug. to Jan.... 1,544
Average Length of Cycle from Aug. to Jan. 23·8 days.

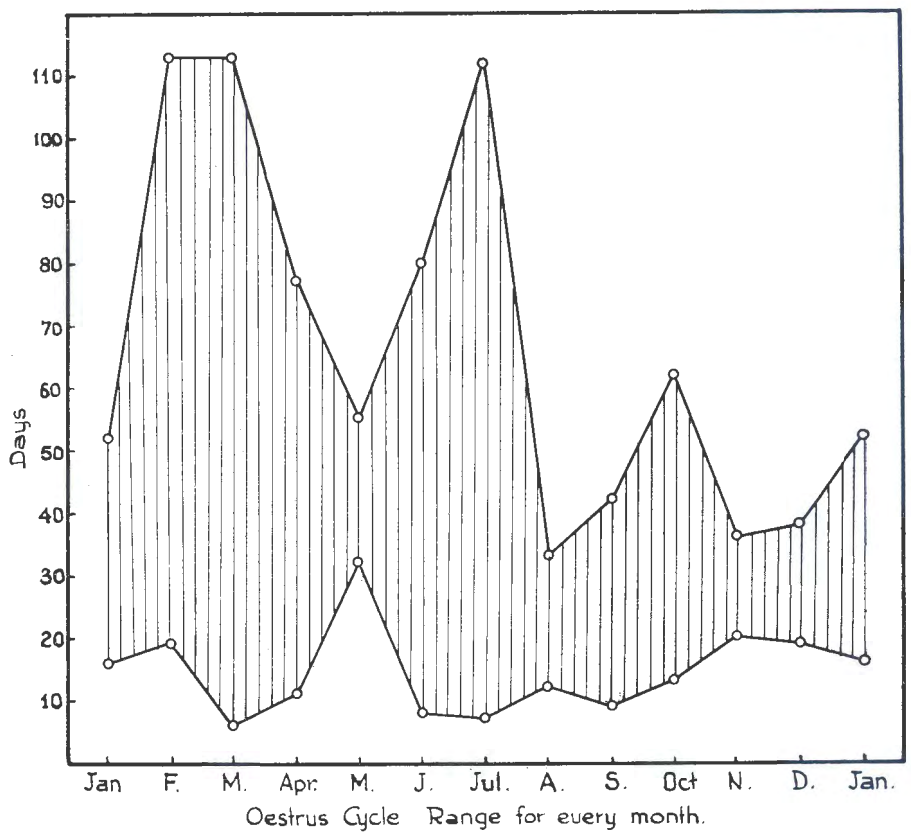
Total No. of Cycles for Feb. to July.... 65
Total No. of Days for Feb. to July 2,339
Average Length of Cycles for Feb. to July 35·9 days.

TABLE 3.

Number of Oestrous Cycles which fell within the period specified in every month.

Length of Oestrous Cycle.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Days.												
5– 15.	—	—	1	2	—	3	4	4	4	2	—	20
16– 25.	5	11	3	3	—	2	4	8	8	9	3	60
26– 35.	2	1	4	1	1	2	2	5	2	1	—	21
36– 45.	1	2	1	—	1	2	1	—	2	—	1	12
46– 55.	2	—	—	—	2	1	—	—	—	—	—	5
66– 75.	—	—	—	—	—	—	1	—	—	1	—	2
76– 85.	—	1	—	1	—	1	—	—	—	—	—	3
86– 95.	—	1	1	—	—	—	1	—	—	—	—	3
96–105.	—	—	—	—	—	—	—	—	—	—	—	—
106–115.	—	1	2	—	—	—	1	—	—	—	—	4

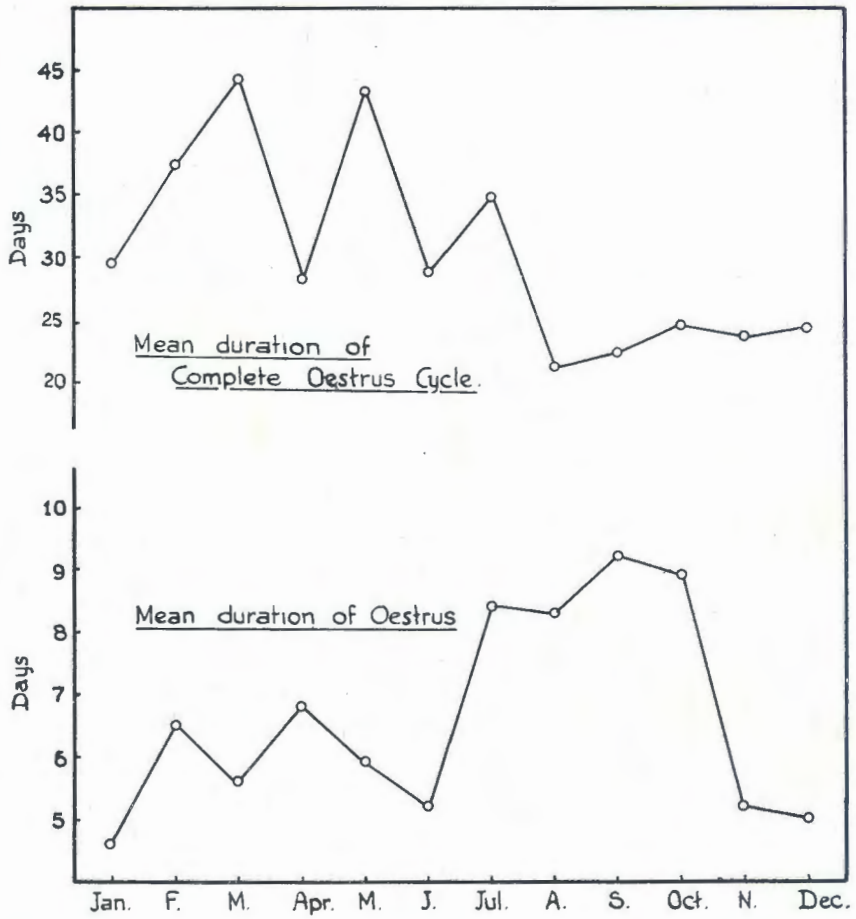
FIG. 2



The shortest cycle observed was one of 6 days and the longest 113 days. Incidentally both of these extremes were recorded in March.

The abovementioned tables and graphs indicate the marked irregularities which occur in the cycle throughout the year. It is apparent, however, that these variations were more pronounced in certain months of the year. In fact, two distinct periods can be recognised, namely, one extending from February to July and another from August to January. The former includes autumn and winter while the latter covers spring and summer. By mere coincidence exactly half of the 130 oestrous cycles noted occurred in each of these two periods.

FIG. 3



The greatest variations both as regards the range and the length of the oestrous cycle were observed during the February-July period. The average length of the oestrous cycle for these six months was 35·9 days as against 23·8 days for the August-January period. The long cycles during the autumn-winter season were responsible for raising the average length of the oestrous cycle for the whole year to 29·9 days, which is 8 days above what is generally regarded as the normal cycle.

According to the data in Table 3 only 23 (35·4 per cent.) of the 65 cycles in the February-July period fell within the normal range of 16 to 25 days and it is noteworthy that 11 of these 23 cycles started in February. The corresponding

figures for the August-January period are 37 (56·9 per cent.) Further 11 out of the 65 cycles in the former period exceeded 65 days duration as against nil during the spring-summer period. In the latter season only one cycle exceeded 60 days. That was shown by mare No. DOB. 378 which showed very great irregularity throughout the whole period. Though mated repeatedly she never conceived and must, therefore, be regarded as having a pathological condition of the genitalia.

An analysis of the data justifies a division of the oestrous cycle on a seasonal basis and for purposes of differentiation these can be classified as—

(*a*) the off season characterised by marked irregularity of the cycle and extending from February to July;

(*b*) the breeding season from August to January during which the cycles, although still showing some irregularity, run a more rhythmic and smoother course.

This is obviously intended by nature to be the optimum period for breeding.

This is but an arbitrary division and it is not suggested that an off season should be regarded as a non-breeding season. As will be shown later a certain percentage of mares did conceive during the months of February and March.

Anoestrus.

As previously indicated there is a tendency among mares to go into a period of anoestrus during certain seasons. An analysis of the data with a view to obtaining further information on anoestrus is, however, rendered very difficult by the inability to clearly differentiate between delayed oestrus and anoestrus. The question which obviously presents itself is what latitude must be allowed for the normal oestrous cycle which is notoriously irregular. Up to what stage can one regard the cycle as falling within normal limits? Intermissions are frequent, and it is doubtful whether the omission of one oestrous cycle should be regarded as a case of anoestrus. In this work it is, therefore, considered that any prolongation of the cycle from the normal average of 21 days till the following oestrous period should be regarded as delayed oestrus but that any extension beyond that should be classed as anoestrus. Forty-five days are accordingly accepted as the line of demarcation between delayed oestrus and anoestrus. This is apparently the criterion which is also accepted by Caslick. On this basis the number of mares which passed into a period of anoestrus during the different months is:—

Month.	*Number of Mares.*	*Length of Cycle. Days.*
January	2	(1) 51 (2) 52
February	3	(1) 81 (2) 90 (3)113
March	3	(1) 93 (2) 108 (3) 113
April	1	77
May	2	(1) 46 (2) 55
June	2	(1) 46 (2) 80
July	3	(1) 70 (2) 86 (3) 112
August	—	
September	—	
October	1	62
November	—	—
December	—	—
	—	
TOTAL	17	

With one exception all cases of anoestrus commenced during the first seven months of the year. As stated previously the one animal which started a period of anoestrus in October was apparently a pathological case. If this mare is left out of consideration the position is that all anoestrous periods commenced during the first seven months of the year. The two that started in January were of comparatively short duration. Nevertheless these, associated with the increase in the mean duration of the oestrous cycle in January, suggest that the irregularities in the functioning of the ovaries commence as early as January and that this marks the end of the optimum breeding period.

Duration of Oestrus.

According to Crowhurst and Caslick (1946) the mean duration of oestrus varies from $5\frac{1}{2}$ to 7 days with a wide range of 1 to 130 days. They also consider that oestrus lasts longer in the early part of the breeding season. Day (1939) gives the average duration of oestrus as 6 days but states that it varies from 3 to 65 days.

The individual oestrous periods as they occurred in every month are tabulated in Table 4. The figures given under each month represent the duration of the periods concerned. Thus there were 17 periods in January and these varied from 2 days to 9 days with an average of 4·6 days.

The relative data in this table indicate that the duration of oestrus is as variable as the oestrous cycle. The shortest period observed was one day and the longest 55 days. The average duration of oestrus throughout the year was 6·93 days.

The following table summarises the duration of the 193 oestrous periods concerned in this investigation:—

Duration in Days.	*Number of Oestrous Periods.*
1	9
2	15
3	25
4	24
5	16
6	20
7	21
8	13
9	8
10	14
11	5
12	8
13	3
15	3
18	2
21	1
22	2
23	1
24	1
27	1
55	1

One would naturally expect that the majority of periods would be grouped round the average (5 to 7 days). In actual fact only 57 out of the 193 (29·5 per cent.) oestrous periods had a duration of 5 to 7 days, whereas 64 (33·2 per cent.) lasted from 2 to 4 days.

TABLE 4.

Number and duration of Oestrous Periods every Month.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
	2	1	2	3	3	2	1	1	2	4	1	3
	2	1	2	4	4	2	1	2	2	5	3	3
	2	3	3	4	4	3	1	2	3	5	3	5
	3	3	3	4	4	3	1	4	4	6	4	5
	3	3	3	6	6	3	1	4	4	6	5	7
	3	3	3	6	9	4	2	5	4	7	5	7
	3	4	3	7	11	4	2	5	6	7	6	—
	4	4	3	7	—	5	2	5	7	7	6	—
	4	4	4	9	—	8	2	6	8	7	6	—
	4	5	5	18	—	8	3	7	8	7	7	—
	5	5	6	—	—	9	4	9	8	8	7	—
	6	5	6	—	—	11	4	9	9	9	7	—
	7	6	6	—	—	—	5	10	10	10	8	—
	7	6	6	—	—	—	7	10	11	10	—	—
	7	6	6	—	—	—	8	10	12	10	—	—
	8	7	6	—	—	—	10	10	12	10	—	—
	9	7	8	—	—	—	12	12	12	11	—	—
	—	7	10	—	—	—	12	15	12	13	—	—
	—	8	10	—	—	—	21	18	13	27	—	—
	—	8	10	—	—	—	22	22	23	—	—	—
	—	8	12	—	—	—	55	—	24	—	—	—
	—	10	—	—	—	—	—	—	—	—	—	—
	—	11	—	—	—	—	—	—	—	—	—	—
	—	13	—	—	—	—	—	—	—	—	—	—
	—	15	—	—	—	—	—	—	—	—	—	—
	—	15	—	—	—	—	—	—	—	—	—	—
Total No. of Oestrous Days....	79	168	117	58	41	62	175	166	194	169	48	30
Total No. of Oestrous Periods...	17	26	21	10	7	12	21	20	21	19	13	6
Mean duration of Oestrus in Days.....	4·6	6·5	5·6	6·8	5·9	5·2	8·4	8·3	9·2	8·9	5·2	5·0
Range in Days.....	2–9	1–15	2–12	3–18	3–11	2–11	1–55	1–22	2–24	4–27	1–8	3–7

Total Number of Oestrous days..... 1,338

Total Number of Oestrous periods..... 193

Average duration of oestrus from January to June 5·7 days.

Average duration of oestrus from July to December 8·03 days.

Average duration of oestrus.....6·93 days.

Reference to Table 4 will show that the large number of periods of short duration occurred mainly during the off season (February to July) when it was not unusual for a mare to show weak oestrus lasting only for a day or two.

The data in Table 4 and the graph (Figure 3) giving the mean duration of oestrus for every month show that the average for the first six months of the year was fairly regular and varied from 4·6 to 6·8 days. In July, however, there was a significant increase in the mean to 8·4 days and for the four months of July, August, September and October the mean duration of oestrus was 8·4, 8·3, 9·2 and 8·9 days respectively. In November and December it declined again to 5·2 and 5·0 days respectively. This finding lends striking support to the view expressed by Crowhurst and Caslick, namely that oestrus is longer in the early part of the breeding season.

In the strict sense July cannot be regarded as forming part of the breeding season since none of the 11 mares (Table 1) that were served during this month conceived. Yet it is obvious from Table 4 that this is a month of great ovarian activity since it showed far greater variation in the duration of oestrus than any other month, the range being 1 to 55 days. It would appear that hormonal imbalance which was probably responsible for the many fluctuations and periods of anoestrus during the previous six months now returns to a more normal rhythm in preparation for the impending breeding season. There seems to be more intense gonadotropic activity during this month than in any other.

Notwithstanding the fact that the majority of mares did not go into a period of anoestrus during the winter months, it will be observed in Table 1 that none of the mares that were mated during April, May, June and July conceived. It must, therefore, be concluded that none of the 50 oestrous periods which occurred during those months was accompanied by ovulation. This was apparently a period of anovulatory oestrus, probably resulting from a lull or inhibition in the secretion of gonadotrophic hormones during the early winter months. July probably sees a resumption or intensification of hormonal activity which is maintained at a high level during the most important part of the breeding season, and commences to decline during the last two months of the year.

Fertility.

In consideration of the oestrous cycle of the mare the obvious question which presents itself is the extent to which fertility is influenced by the marked irregularities which occur both in the cycle and in the oestrous period itself. From the breeder's aspect it is important to know which season of the year can be regarded as the optimum for breeding, whether a mare is more likely to conceive if served immediately after a long cycle or period of anoestrus or after a short cycle, and also whether service during a short oestrous period is more likely to be successful than during a long oestrus.

The percentage of mares which were successfully served every month is given in Table 1 and illustrated by a graph (Figure 1). According to these fecundity was low during the first three months of the year, varying from 23·1 to 29·4 per cent. The next four months (April to July) proved to be a season of complete infertility notwithstanding the fact that the majority of mares did not show anoestrus during this period and were served as regularly as during the remainder of the year.

Breeding recommenced in August although the percentage of mares that conceived was low (15·4). September and October showed a slight improvement to 25·0 and 21·4 per cent. respectively. By far the best results were obtained in November when 55·6 per cent of the mares that were mated conceived. The decline in fertility started in December when 40 per cent. of the mares served became pregnant.

On cursory examination the fertility rate appears to be low. This may be accounted for by the fact that these mares got very little exercise since they were stabled at night and kept in a small paddock during the day. Their only exercise consisted in walking about 300 yards daily from stable to paddock and back. Day (1939) states that the percentage fertility of different groups of horses varies considerably, and for light horses of the type used in this investigation he found it to be 52 per cent.

Nutritional factors are very probably largely responsible both for the irregularities noted in the oestrous cycle and partly for the low fertility rate. As stated previously the natural herbage in South Africa is notoriously poor in many essential food elements, chiefly minerals and proteins. This deficiency is most marked during the dry cold months of the year. With the advent of spring and green food the nutritive value of our plant foods increases and reaches its optimum value in late spring and early summer. It is considered that this season of high nutritive value of our natural feeding is very short, lasting as it does for approximately only two months (October and November), after which it declines again.

The decline in the nutritive value of the herbage is concurrent with the decrease in the fertility rate observed in these mares and also with the onset and increase of the irregularities noted in the oestrous cycle of the mares.

A puzzling feature of these results, however, is the fact that the mares in this investigation were not grazed at all but received a uniform ration throughout the year, the only exception being that the ration was supplemented by a certain amount of green lucerne during the summer months.

The question now arises whether this small amount of green food was responsible for the increased fertility or whether the latter was the result of natural adaptation which aims at regulating fertility so that the young are born at a period when the nutritive value of natural food is at its highest.

No definite conclusions could be drawn from this investigation with regard to the effect of duration of the cycle and of oestrus on fecundity. In the 25 pregnancies which were observed the duration of the oestrus period in which the mare was successfully mated was as follows:—

Duration of Oestrus.	*Number of Pregnancies.*
3 days	5
4 days	1
5 days	2
6 days	5
7 days	5
8 days	4
22 days	1
23 days	1
26 days	1

Thirteen of the mares were served only once during the relative period; eight were served twice and four were served three times. Four of the five mares which became pregnant during a three-day oestrus were mated only once. In the case of the mare which conceived during a 23-day oestrus it is significant that only one service was given, and that was on the 19th day of the oestrus. This illustrates the futility of attempting to prescribe a definite stage during oestrus for most successful mating.

The effect of the duration of oestrus on fecundity is entirely dependent on the stage during oestrous in which ovulation takes place. It is generally accepted too that the best time for mating is a few hours before ovulation occurs, and this is usually regarded as taking place towards the end of the oestrous period. The critical question, however, is: What is the duration of oestrus in each individual case? It is evident from the above results that in 5 cases ovulation probably occurred on the second or third day of oestrus, while in another it apparently only took place on the nineteenth or twentieth day.

On the results obtained one would have to recommend serving the mare on the second or third day of oestrus, and if she continues to show oestrus to mate her on alternate days subsequently. In view of the long oestrous periods which are frequently encountered this procedure would greatly reduce the reproductive capabilities of a stallion by limiting the number of mares to a small number if he has to serve some of them repeatedly. The necessity for repeated service would be obviated if conception would terminate oestrous within a day or two after service. This probably does take place in many cases but not in all. For instance, the one mare which became pregnant during a 26-day oestrous period was served twice, on the third and tenth days. She, therefore, continued to show symptoms of oestrus for at least 16 days after successful service. Crowhurst and Caslick (1946) also state that a mare may remain in oestrum and became pregnant 15 days after service.

It is not possible to state with any degree of certainty whether a long or a short oestrous period is most favourable for conception. The results given above would, however, suggest that the 3- to 8-day periods are most fertile. It is significant that no pregnancy resulted from services given in periods lasting from 9 to 21 days. The three pregnancies that were obtained in 22-, 23- and 26-day periods must be regarded as exceptions.

Finally it must be emphasised that conception depends entirely on, firstly, whether the oestrus is accompanied by ovulation or not and, secondly, on the stage at which ovulation takes place.

Summary and Conclusions.

(1) Observations were carried out on the oestrous cycle of 30 mares from January, 1944, to June, 1946.

(2) The mares were stabled at night and ran out in a small paddock during the day. They were never let out to grazing but received a uniform ration throughout the year with the exception that green feed was given during the summer months but not during winter.

(3) They were tested for oestrus every day and mares that showed symptoms of oestrus were mated.

(4) The results revealed that the oestrous cycle in these mares was not seasonal, but that it continued throughout the year in the majority of animals.

(5) There was, however, a noteworthy decline in the percentage of mares that showed oestrus in April and May.

(6) The cycles were very irregular and varied in length from 6 days to 113 days. The irregularities occurred throughout the year, but were most pronounced during the months of February to July. The average length of the cycles for this period was 35·9 days as against 23·8 days for the remaining six months of the year. The average length of the oestrous cycles for the whole year was 29·9 days.

(7) The increase in the average length of the cycles for February to July is largely due to the fact that a number of mares went into varying periods of anoestrus during these months. This also accounts for the abnormal length of the average for the cycle throughout the year.

(8) There were 17 periods of anoestrus varying in duration from 46 to 113 days. With one exception all these occurred during the first seven months of the year.

(9) The average duration of oestrus was found to be 6·93 days. Oestrus was shorter (average of 5·7 days) in the first half of the year than in the second half when the mean was 8·03 days. In the latter it was highest during the early months of breeding (July to October).

(10) The oestrous period was found to be as variable as the oestrous cycle. The shortest period was 1 day and the longest 55 days.

(11) The months of April, May, June and July were found to be barren in so far as none of the mares that were mated then became pregnant. It is concluded that the 50 oestrous periods that were shown during these months were not accompanied by ovulation.

(12) Fecundity was low during the first three months of the year. Then ceased for four months from April to July and commenced again in August. The highest percentage of pregnancies (55·6) was obtained from service in November.

(13) Nutritional factors are considered to be responsible for irregularities in the oestrous cycle and for the low fertility.

(14) Most of the pregnancies resulted from mating during oestrous lasting from 3 to 8 days.

(15) It is doubtful whether the duration of oestrus influences fertility. The latter depends on service at the time of ovulation. This is also variable and may even occur 19 or 20 days after the commencement of oestrus.

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