

# ON THE EXISTENCE OF EGG-LAYING CYCLES IN THE DOMESTIC FOWL.

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## INTRODUCTION.

THE object of this paper is to present a series of preliminary data on the existence of definite egg-laying cycles in the domestic fowl. The results were obtained in the course of investigations, still incomplete, of the genetics of egg-laying capacity. The experiments are unique in one respect, in that they were carried out in a tropical country (Trinidad, British West Indies), where environmental conditions are extraordinarily uniform throughout the year, in respect of both temperature and length of day. It is surprising that previous writers on the inheritance of fecundity in poultry (Pearl, Goodale and others) have failed to take into account the fact that the huge range in temperature and length of day in the North Temperate Zone provide quite peculiar conditions, under which the genetic factors involved can hardly find full expression. In connection with Pearl's hypothesis of a winter cycle in the Barred Plymouth Rock, one may very pertinently enquire how the genes manifest themselves under a uniform temperature.

## THE EXPERIMENTAL RESULTS.

The experimental results consist of trap-nest records for varying periods of a mixed lot of fowls comprising Trinidad Natives, and  $F_1$  hybrids between these and Leghorns, Minorcas and Plymouth Rocks. The full records are presented in Tables I-X and the salient points discussed.

## NOTES ON THE TRAP-NEST RECORDS.

*Trinidad Native, No. 1.* It will be seen from this record that in the eight months there are eight cycles of laying, each followed by a broody period. The mean number of eggs per cycle is 11.7, and the mean length of the broody period is 14.3 days. The mean number of days occupied by a clutch and the subsequent broody period is 29.3 days—about a

*Egg-laying Cycles in the Domestic Fowl*

TABLE I.

*Trap-nest Record. Trinidad Native, No. 1.*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total for month	
June	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	9
July	1	1	1*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	10
August	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	12
September	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	12
October	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	11
November	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	12
December	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	15
January	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	11

\* Went broody.

TABLE II.

*Trap-nest Record. Trinidad Native, No. 2.*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total for month	
October	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	23
November	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	10
December	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	13
January	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	8

\* Went broody.

TABLE III.

*Trap-nest Record. Trinidad Native, No. 3.*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total for month	
October	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
November	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	21
December	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	15

\* Went broody.

TABLE IV.

*Trap-nest Record. Trinidad Native, No. 4.*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total for month	
October	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	18
November	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	15
December	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	10

\* Went broody.

TABLE V.

*Trap-nest Record. Trinidad Native, No. 5.*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total for month
October	1	1	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	20
November	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	10
December	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	9

\* Went broody.

TABLE VI.

*Trap-nest Record. Black Minorca x Trinidad Native, No. 6.*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total for month
April	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	17
May	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	16
June	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5
July	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	13
August	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	11
September	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	12
October	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4
November	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	19
December	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	13
January	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	17

\* Went broody.

*Egg-laying Cycles in the Domestic Fowl*

TABLE VII.  
*Trap-nest Record. White Leghorn × Trinidad Native, No. 1.*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total for month
February	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4
March	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	12
April	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14
May	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	5
June	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
July	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	10
August	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3
September	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14
October	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	19
November	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	7
December	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16
January	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	7

\* Went broody.

TABLE VIII.  
*Trap-nest Record. White Leghorn × Trinidad Native, No. 2.*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total for month
February	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	8
March	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	6
April	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	11
May	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	10
June	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	11
July	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	11
August	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4
September	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	12
October	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15
November	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14
December	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14
January	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	10

\* Went broody.

TABLE IX.  
*Trap-nest Record. Plymouth Rock × Trinidad Native.*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total for month
April	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	20
May	1	1	1	1	1	1	1	1	1	1	1	1*	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	9
June	1	1	1	1	1	1	1	1	1	1*	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	7
July	1	1	1	1	1	1	1*	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	8
August	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	9
September	1	1	1	1	1	1	1	1	1	1*	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	10
October	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	10

\* Went broody.

TABLE X.  
*Trap-nest Record. White Leghorn, Pure Bred.*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total for month
September	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	5
October	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	20
November	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	20
December	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	22
January	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	19

died

lunar month. It will be noted also that there is consequently considerable uniformity in the day of the month at which the hen went broody—viz. 31 July, 30 August, 29 September, 31 October, 29 November, 27 December, and 30 January.

*Trinidad Native, No. 2.* This bird began laying in early October after a long period of moulting. She laid 31 eggs followed by two clutches of 11 and 12 respectively. No further records were taken, as the bird was allowed to incubate. The number 31 is suggestive of a triple clutch. The mean number of eggs per clutch, 11.5, and the mean length of the broody period, 14 days, are almost exactly comparable with No. 1.

*Trinidad Native, No. 3.* This was a pullet which laid her first egg on 30 October. She laid 37 eggs, up to 27 December. This is suggestive again of a triple clutch ( $3 \times 12$ ), but is of interest again in that the bird was distinctly broody on 5 December. The number of eggs laid up to that date was 25, a double clutch of  $12 \times 2$ . The triple clutch is thus built up of a double clutch and a single clutch.

*Trinidad Native, No. 4.* This bird is chiefly interesting in the dates at which broodiness occurred, 24 October, 25 November, and 25 December, providing further evidence of a monthly cycle of broodiness. The two broody periods are each 11 days, and the mean number of eggs per clutch 14.3.

*Trinidad Native, No. 5.* This bird began laying on 1 October after moulting. She laid a double (?) clutch of 20, a single clutch of 13, and a half clutch of 6. It is not improbable that the first clutch of 20 consisted of a single plus a half clutch. The mean length of the two broody periods was 16.5 days. This bird was probably two years old when bought, and it is possible that with increasing age native birds tend to produce half clutches.

*Black Minorca × Trinidad Native, No. 6.* A batch of 34 eggs is followed by clutches of 8, 16, and 15. A moulting period of 42 days is then followed by a batch of 36 eggs, and a further batch of 17. It is clear that this bird differs from those previously discussed, and the results can most easily be explained by assuming that the basic clutch number is 16, and that the eggs recorded comprise two double clutches (34 and 36), two single clutches (15, 16) and a half clutch (8). The onset of moulting (16 September) coincided with the commencement of a broody period.

*White Leghorn × Trinidad Native, No. 1.* This bird differs from the preceding ones, in that the non-broody habit of the Leghorn behaved as a partial dominant. Signs of broodiness were exhibited on many

occasions, but were not accompanied by any pronounced tendency to sit. During the months of May, June, July and August the bird was in poor health, and suffered a good deal from colds. There is a single clutch of 14 eggs ending with a short broody period on 20 March, followed by a half clutch of 6. The rest period between 7 and 16 April was not accompanied by any broody symptoms. Another single clutch of 14 was laid between 17 April, and 14 May, but by this time the bird was obviously affected by respiratory trouble and her behaviour to 28 August must be regarded as abnormal. A single clutch of 13 begins on 29 August, and this is followed by a double (?) clutch of 23, a half clutch of 7, and another double (?) clutch of 23. In the latter clutch slight signs of broodiness were apparent with the 10th egg on 19 December.

*White Leghorn* × *Trinidad Native*, No. 2. The types of clutch in serial order are: single clutch (14), double clutch (21), single clutch (11), half clutch (4), double clutch (20), single clutch (15), single clutch (14), single clutch (13), single clutch (13). Leghorn influence was apparent in the less pronounced signs of broodiness.

*Plymouth Rock* × *Trinidad Native*. This bird began with a double clutch (28), and followed with a half clutch (6), half clutch (8), single clutch (11), and double clutch (20). She was then allowed to incubate.

*White Leghorn*, *Pure Bred*. No cycles are apparently visible.

#### DISCUSSION AND SUMMARY.

Even with the somewhat meagre series of results presented in this paper the following points are brought out:

1. There is a basal clutch number which is most commonly about 12.
2. The basal clutch number appears in one case to be 16.
3. A bird may lay a series of single clutches, or may lay multiples or sub-multiples of the basal clutch number.
4. When beginning to lay (*a*) for the first time, (*b*) after bringing up a flock of chickens, or (*c*) after moulting, it is most usual to lay some multiple of the basal clutch number. In general, multiples of the basal clutch number occur after a long rest period.
5. The clutch habit is absent in pure-bred poultry of American or European descent. This conclusion has been arrived at by an examination of the trap-nest records at the Trinidad Government Farm, where flocks of White Leghorn, Rhode Island Red, and Barred Plymouth Rock have been trap-nested for several years.
6. In four cases the clutch habit behaves as a dominant, in crosses of Native by Leghorn, Minorca or Plymouth Rock.

7. The time occupied by a single clutch and the subsequent broody period is about a lunar month.

These results are not without significance for breeders of poultry in temperate climates. It may not be too bold a speculation to suggest that the evolution of the domestic fowl in regard to the number of eggs laid per annum has taken place by a series of mutations which have resulted in the partial or complete elimination of the rest periods between clutches or in the production of higher multiples of the single clutch.

The writer is at present engaged on the genetic analysis of the clutch habit in crosses of Leghorn by Native, and interesting results are awaited.