CHANGE IN BODY WEIGHT ASSOCIATED WITH ONSET OF OVARIAN RECRUDESCENCE AND OVIPOSITION IN PHEASANTS

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A review of experimental investigations concerning the seasonal cycle in birds (Burger, 1949) indicates that it is controlled, at least in part, by a hypophyseal cycle which is environmentally regulated. In all truly wild temperate-zone species studied, the evidence suggests that change in daily photoperiod is the primary external factor to which the annual cycle is attuned, although other factors are assuredly superimposed on this basic control.

It is known in several species that an experimental elevation in ambient or environmental temperature will increase the rate of gonadal development (Farner and Mewaldt, 1953; Mitchell and Kosin, 1954; Engels and Jenner, 1956). Psychic factors may be important for the complete development of the female reproductive cycle in some species (Burger, 1949).

During an investigation of the dynamics of a wild population of Ring-necked Pheasants (*Phasianus colchicus*) in southeastern Washington, it was desirable to establish the approximate time for the onset of ovarian activity that results from natural photoperiodic stimulation of gonadotropic secretion. Information relative to gross development of the ovary and ovulation as well as associated changes in body weight are reported herein.

METHODS

Female pheasants were obtained in Whitman County, Washington, in the early morning as either field collected specimens or fresh, highway mortalities; only those road-killed birds estimated to have been killed within 24 hours of finding were used. Body and ovarian weights were taken upon return to the laboratory, and ovaries were either examined immediately for follicular development or placed in a 4 per cent solution of formaldehyde and examined at a later date. Ovarian recrudescence was determined by detecting changes in weight of the gonad and diameter of the largest non-ovulated follicle. Enumeration of post-ovulatory follicles during April and May was used to ascertain the number of ova ovulated (Meyer, Kabat, and Buss, 1947), and the date for onset of oviposition was estimated as suggested by Buss, Meyer, and Kabat (1951).

All birds that were collected in April and May possessed stimulated ovaries. In a few instances (6 per cent), females had not laid prior to collection. However, by comparing the size of non-ovulated follicles from ovaries of these hens with those of laying females, the time when laying would have begun was estimated by assuming a linear relationship to exist.

RESULTS AND DISCUSSION

Examination of the change in average weight of ovaries from January to April (fig. 1) reveals a curve that is exponential in form. A noticeable increase is evident in the last week of February, and this weight change is followed by continued ovarian growth subsequent to mid-March. Hiatt and Fisher (1947) report similar findings among pheasants in central Montana. Ovarian weight increased 77 fold from the first week of March to mid-April. The size of the largest non-ovulated follicle exhibited a similar trend. A correlation coefficient of 0.88 for the regression of follicle diameter on ovarian weight was calculated.

It is readily apparent that seasonal change in body weight parallels the pattern of growth manifested by the ovary (fig. 1). This phenomenon of increased body weight during spring among female galliform birds is well documented (Kirkpatrick, 1944;

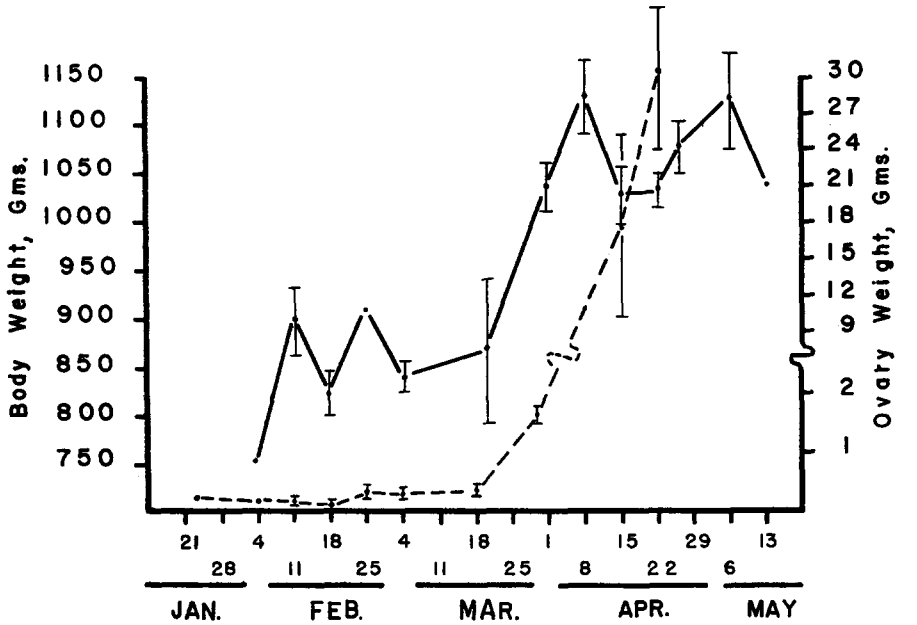

Fig. 1. Seasonal change in average body and ovarian weights of pheasants. Standard error is depicted as a vertical line when more than one specimen is on a given point.

McCabe in Stokes, 1954; Kabat, *et al.*, 1956; Bendell, 1955; Genelly, 1955). Breitenbach, Meyer, and Nagra (MS) have shown that depot fat stores are maximum in the hen pheasant at this time. Conceivably this fattening could result from the lipogenic action of estrogen, the secretion of which is increased in spring. Marked hyperphagia is known to occur during this period (Breitenbach, Meyer, and Nagra, MS).

In addition to the vernal change indicated by the ovary and body weight, a concomitant increase has been reported to occur in weight of the thyroid and adrenal as well as that of the liver, pancreas, gizzard, intestine, kidney, and spleen (Kirkpatrick, 1944; Breitenbach, Meyer, and Nagra, MS). Those organs concerned with digestion and assimilation of food may have hypertrophied as a result of the increased caloric intake. Hyperphagia and the indicated hypothyroid condition would also contribute to the accumulation of fat reserves.

Table 1

Dates for Onset of Laying as Determined by Enumeration of Post-ovulatory Follicles

Year	Sample size	Median date for first egg	Variation (days) Range	Quartile deviation
1950	31	April 11	26	5
1954	32	April 14	40	7
1955	23	April 17	21	4
1956	30	April 12	24	4
Pooled data	116	April 13	46	5

Onset of laying recurs with unvarying regularity between years (table 1). Because age, individual physiological condition, heredity, and other factors (Romanoff and Romanoff, 1949) may cause laying to be initiated in some birds either before or after an appreciable segment of the population is active, it was not surprising to find a consider-

able range between first-egg dates within a given year. However, the spread of the middle and most significant part of the data on first-egg laying is better than the extremes as an index to onset of laying within a population, since this segment of data will not be affected by the chance fluctuations of the extreme values (Freund, 1951). The middle 50 per cent of the females had laid their first egg within 4 to 7 days of the median dates. Seventy-five per cent of the laying hens that were collected had laid at least one egg by April 18. Initiation of laying was also first noted in mid-April among wild pheasants in central Montana (Hiatt and Fisher, 1947); the data of Buss, Meyer, and Kabat (1951) indicate April 23 to be the median date for laying the first egg among wild hens in southern Wisconsin.

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