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THE OCCURRENCE OF TWIN WATERFOWL EMBRYOS

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Twin avian embryos occur rarely and little is known of the causes of this phenomenon. Passerine twins have been reported for the American Goldfinch (*Spinus tristis*) and the Song Sparrow (*Melospiza melodia*) by Berger (1953), and for the Brown Thrasher (*Toxostoma rufum*) by Cartright (1939). Olsen and Haynes (1948) found three cases of twins in 1153 eggs of the domestic fowl (*Gallus domesticus*). In anserines, Kear (1965) discovered twin embryos in a single unsuccessful Muscovy Duck (*Cairina moschata*) egg out of 833 eggs of various waterfowl species that she examined.

The purpose of this note is to record twinning in Mallard (*Anas platyrhynchos*) and in Giant Canada Goose (*Branta canadensis maxima*) embryos and to hypothesize that exposure to low temperature prior to incubation is the teratological agent.

Twin Mallard embryos were found during an experiment that examined the effect of cold on this species' eggs (Batt and Cornwell 1972). Unincubated eggs were subjected to 0, 4, or 8°C temperatures for periods of 5–10 days in an environmental chamber immediately after collecting and prior to artificial incubation. Each treatment contained 70 fresh eggs from which 10 controls were selected randomly and put directly into the incubator. The remaining eggs were then exposed to one of the three treatment temperatures. Ten eggs were selected at random and moved to the incubator after either 5, 6, 7, 8, 9, or 10 days, respectively. This procedure was repeated at all three temperatures and the entire experiment was replicated three times. Five pairs of twins occurred in the 251 treated eggs that failed to hatch, while none occurred in the 33 unhatched control eggs (table 1). Four of the pairs were "normal" twins, while one pair was joined at the head and neck region. In each case the embryos shared the same yolk sac. One of us (B.D.J.B.) has examined approximately 2000 unhatched Mallard embryos in the past few years and has never observed another set of twins.

TABLE 1. Occurrence of twin embryos in Mallard eggs.

Exposure temperature (C)	Length of exposure (days)	Age at death (days)	Type of twin	Sex[a]
0	7	12	normal	female
0	5	10	normal	—
0	6	18	joined	male
4	10	12	normal	female
4	10	22	normal	female

[a] Determined by examination of the syrinx (Beer 1963).

The twin Canada Goose embryo was found during a field study conducted by Cooper. Nest records of 3005 eggs resulted in the discovery of a single egg containing normal twins. The egg was the first of a clutch of six and was moved to an artificial incubator 92 hr after being laid. During the intervening time, this egg was exposed to air temperatures ranging from –6.1 to 13.3°C, with 25 hr below 0°C. Both embryos died at 21 days development (27 days needed for hatching in the incubator) and were also attached to a single yolk sac.

Sturkie (1946) experimentally increased the incidence of twins in White Leghorn Chickens (*Gallus domesticus*) by inducing hypothermia in laying hens and thereby affecting normal development during the early stages of cleavage. Our observations show that normal cleavage can be interrupted by low temperatures to produce twins even after oviposition.

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