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Maternal nesting behaviour by male Mallards

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Drakes of waterfowl species often accompany their mates during nest-site selection and have been observed to perform nest-building movements (McKinney, 1968). Males of *Anseranas, Cygnus atratus, Dendrocygna* and *Thalassornis* (Kear, 1970) share incubation responsibilities with their mates, but the only reported observations of Anatini males settling on nest scrapes or incomplete clutches of eggs are those noted for male Mallards *Anas platyrhynchos* and a male Blue-winged Teal *Anas discors* (Best, 1939; McKinney, 1968). Rollin (1957) reported a drake Wood Duck *Aix sponsa* sitting on his mate's deserted clutch for varying lengths of time during at least a 12-day period. To these observations we wish to add two records of male Mallard sitting on completed clutches.

Our first observation, which occurred near the Delta Waterfowl Research Station, Manitoba, involved a male, first-year, hand-reared wild Mallard *Anas p. platyrhynchos* and a female Mallard with some game farm parentage. The drake, in full nuptial plumage, had previously accompanied the female to the nest and sat alongside her. While the site was bare, the drake was not sitting in what would normally be described as a nest bowl nor had he added any down or nesting materials around him. At that time, a record of the female's behaviour on the nest was being obtained by means of a camera sequenced to take a picture every 6 minutes with the aid of a strobe light. Temperature probes were also positioned in the air space of three eggs in the nest.

The sequence of photographs and temperature changes (Figure 1) indicates that the female left the nest at 02.55 hours on 10 May 1970. The next photograph showed the drake on the nest, and in the following picture the male had settled further into the nest. He could have been influenced to sit on the eggs by the warmth radiating from the nest or could have been responding to an urge to 'incubate', brought on by the visual stimulus of the eggs, or to 'mimic' the behaviour of the hen. The temperature record shows that for the 30 minutes the male was on the nest insufficient heat was supplied to maintain egg temperature, and it dropped from 38° to 32°C. Ambient air temperature was between 4° and 6°C. When the male left the nest, the nest and egg temperature began to decline sharply and had reached 20°C when the female returned 15 minutes later. When compared with the rate of decline occurring between 00.45 hours and 01.05 hours when the female had left the nest presumably covered (Figure 1), the rate of temperature decline indicates that the male left the nest uncovered. The male was apparently gone from the nest site for almost an hour before returning to again sit in the same location alongside the female. Later that morning the female left and subsequently deserted the nest, perhaps as a result of disturbance from the camera strobe light and temperature monitoring equipment or due to possible harassment by the drake. There are no observations to support either of these suppositions.

The second observation involved a pair of Greenland Mallards *Anas p. conboschas*, C. L. Brehm held at the Northern Prairie Wildlife Research Center in North Dakota.

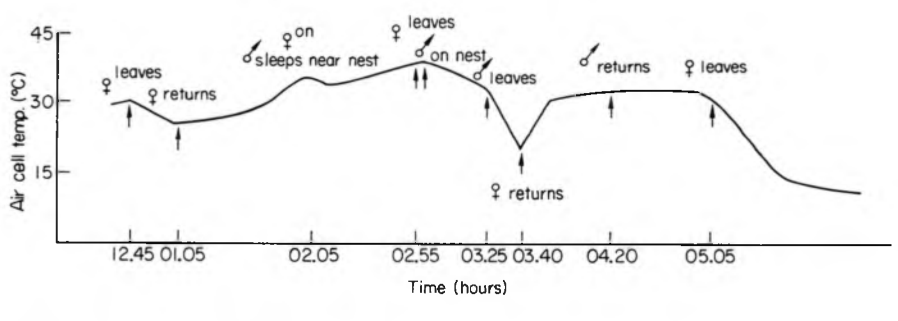

Figure 1. Egg air cell temperature correlated with nesting behavior of female and male Mallard.

On 16 June 1969 the drake was discovered sitting alongside his mate. He was in an unlined nest bowl with down, presumably from the female, around him. The female's nest was lined and covered in the normal manner, and contained five eggs which were not more than 4 days incubated. Because the male was unable to fend off a wild male Mallard that had flown into the pen, the genetic strain of the eggs was questionable, and they were destroyed.

Upon consideration of the closeness of the male to the female's nest and in an attempt to further study the nest behaviour of this Mallard pair, fifteen unincubated mallard eggs were placed in the female's nest during the afternoon of the same day that the original eggs were taken. Neither the female nor the male were within 5 m of the nest site at this time, but on the next day, the male was observed to have settled on the nest. The female chose another nest site and proceeded to lay another clutch, beginning within 7 days after the first clutch had been taken.

The male continued to occupy the nest site and on 24 June exhibited defensive behaviour whenever an observer came close to the nest. Facing the observer, the drake would extend his head forward, fluff his back and scapular feathers, raise and spread his wings slightly, and fan his tail. He would turn and exhibit this typical female nest defence posture (Middleton, 1969) when approached from any direction and would strike with his bill any object, such as a hand, placed near him.

On 26 June, the male was off the nest, but the eggs were covered with down and were warm but wet because it was raining. A visit the following morning revealed the male off the nest and the eggs cold. However, the drake was again seen on the nest that afternoon and all fifteen eggs were still in the nest although ten subsequently became broken. Having reoccupied the nest, the drake was seen on the nest daily and remained until after the estimated hatching date of 13 July. On 21 July, the five remaining eggs were replaced with five star-pipped Gadwall *Anas strepera* eggs. At this time the drake was extremely aggressive and his behaviour was filmed. The following day two Gadwall ducklings hatched successfully. Two eggs were crushed before they hatched and the third embryo died while pipping. The behaviour of the drake and the newly-hatched ducklings at the nest site was also documented on film. When one or both ducklings were placed about 2 m from the nest, the male would utter a low call and the ducklings would return. That same afternoon the male was observed on the pond with the two young Gadwall, but he appeared to have lost interest in them. The ducklings raised themselves and at 2 weeks of age were doing well.

When first observed sitting on the eggs, the drake appeared to have begun his post-nuptial moult. He had a few brown head feathers and a 'ratty' appearance on the breast due to incoming female-like feathers of the eclipse plumage. On 21 July, when the pipped Gadwall eggs were substituted, 50% of his head and back and almost all of his nuptial breast feathers had been replaced with eclipse plumage. However, a portion of the white neck ring was still visible, and his moult during the 'incubation' period may not have proceeded as rapidly as usual.

On 10 September the drake was laparotomized and the presence of testes confirmed. The left testis measured 5 × 11 mm. At that time the bird was acquiring new nuptial plumage typical of the male and 40% of his breast and most of his belly had new nuptial feathers. However, only nine primaries had completely regrown, suggesting that the nesting experience may have delayed the time of wing moult.

Discussion

The cause of the initial behaviour of two male Mallards sitting on nests may have had either a hormonal or non-hormonal basis. Males and females of other species have been induced with proper stimuli to incubate before they had constructed nests or laid eggs (Poulsen 1953; Ytreberg, 1956; Lehrman, 1961, p. 1285; Tinbergen 1953).

Progesterone or an endogenous progestagen is needed to induce incubation behaviour, although a previous priming with testosterone (Riddle and Lahr, 1944; Eisner, 1960; Lehrman, 1963; 1965; Stern and Lehrman 1969) or presumably oestrogen, prepares neural centres for full effectiveness of the progestagen in inducing incubation. There was usually a latent period between exposure to the eggs and performance of incubation behaviour (Lehrman, 1958; Stern & Lehrman, 1969).

After the start of incubation, the act of sitting on the eggs or, in some instances, the sight of eggs or an incubating mate has resulted in the release of prolactin needed for maintenance of incubation (Patel, 1936; Saeki & Tanabe, 1955; Lehrman, 1961). As long as the proper stimuli are present, birds incubate, even beyond normal incubation periods (Riddle & Lahr, 1944; Saeki & Tanabe, 1955; Kuroda, 1956). Removal of the physical or visual stimulus of eggs results in a decrease in prolactin (Saeki & Tanabe, 1955; Kuroda, 1956), which causes the cessation of incubation behaviour and, in some instances, an increase in follicle-stimulating hormone in females, followed by a renesting effort (Lehrman, 1961; Sowls, 1955).

The full nuptial-plumaged male that sat briefly on eggs in early May was probably attracted by the warmth of the eggs, or driven by a vestigial behavioural response to the sight of eggs. The behaviour of this bird might have been influenced by high testosterone levels and resultant prolactin levels (Tixier-Vidal, 1969). The Greenland Mallard male, which presumably had had enlarged testes producing testosterone capable of sensitizing the neural sites, may also have had circulating progestagens at the time he was noted sitting alongside the female. Progestagens have been shown to be present in extracted seminiferous tubule lipids following testicular metamorphosis and steatogenesis (Lofts & Marshall, 1959). Marshall & Serventy (1956) note that the appearance of lipids in testicular tubules coincides with incubation for at least some species in which the male incubates, and progestagens may occur in the tubules at some stage prior to complete collapse of the testes. Since the postnuptial moult had begun, progestagens probably were present in the two known instances of prolonged sitting by Anatinae males which do not normally incubate (i.e. the Greenland Mallard reported in this study and the Wood Duck reported by Rollin, 1957).

Lipid staining material has been noted in the peripheral cells of the seminiferous tubules of Mallards at the same time that sperm were found in the lumens of the tubules (C. W. Dane, unpublished). This is presumed to be the first recognizable stage in testicular metamorphosis, and is associated with the beginning of postnuptial moult. Therefore, it is possible that the Greenland Mallard male had begun to undergo testicular regression when first observed sitting alongside the nest. The presence of progestagens in the seminiferous tubules and blood stream of the Mallard may have been sufficient to induce incubation behaviour upon absence of the female from the nest and sight of the eggs. Continual contact with the eggs could have been sufficient to induce the production of prolactin, with the result that the male remained on the nest, even beyond the normal incubation period.

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Summary

A wild male Mallard *Anas platyrhynchos* in full nuptial plumage sat alongside his mate who was on a nest. Later when she left, he sat on the nest for 30 minutes. A penned, hand-reared Greenland Mallard *A.p. conboschas* in partial moult who had been sitting along his nesting mate, occupied her nest site for 36 days after eggs were exchanged and female apparently deserted the nest. The hormonal balance likely to induce such behaviour is discussed.

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