

Nesting habits of Hooded Mergansers *Mergus cucullatus* in northeastern Ontario



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We studied the nesting habits of Hooded Mergansers in northeastern Ontario. Twelve females exhibited vigorous nest defence from early incubation onwards; seven incubating females spent 85.3% of their day on the nest, taking an average of 4.7 recesses each day, each with an average duration of 60 minutes. They lost up to 16% body mass during incubation. Our results confirm earlier studies which suggested that interspecific nest parasitism is a common feature of Hooded Mergansers nesting biology.

The nesting behaviour and nesting characteristics of most major North American waterfowl species have been examined (reviewed in Afton & Paulus 1992). However, relatively little is known about the nesting habits of the Hooded Merganser *Mergus cucullatus*, a shy and wary cavity-nesting duck (Bellrose 1980). Most information on this species has been collected incidentally in studies conducted outside its principal breeding range (e.g., Morse *et al.* 1969, but see Zicus 1990). In this paper, we report on incubation, nest defence and nest parasitism of Hooded Mergansers breeding in northeastern Ontario, Canada.

Methods

Information on Hooded Mergansers was collected between 1975 and 1990 on females using established nest boxes in three areas of northeastern Ontario: Temagami (47.5°N 80°W), Elk Lake (47.5°N 80.2° W) and Sudbury (46.5°N, 80.5° W). Other ducks using these boxes were Common Goldeneye *Bucephala clangula*, Common Merganser *Mergus merganser*, and Wood Duck *Aix sponsa* (Mallory *et al.* 1993, Lumsden unpubl.). During visits to the nest, we recorded when the female initiated nests, clutch size, occurrence of eggs of other species, female mass (if she was captured for ringing), and her behaviour on our approach to the nest box.

Incubation rhythm

We measured time spent on and off the nest by female Hooded Mergansers using remote, electronic, load cell monitoring systems (Mallory & Weatherhead 1992). These systems were usually installed prior to the initiation of incubation, some during the first week of incubation. We defined a "recess" as a period of time off the nest. For each continuous, one-day recording of behaviour on the nest, we calculated the total amount of time the female spent off the nest, the number of trips off the nest ("recess frequency"), and the mean length of each trip ("recess duration"). "Nest attentiveness" was defined as the amount of time spent on the nest daily, expressed as a percentage of 24 h. To examine the relationships between nest attentiveness and stage of incubation, we restricted analyses to the period from day three to day 27. After day 27, female behaviour may be influenced by sounds from chicks in the eggs (Morse *et al.* 1969).

Nest defence

Hooded Mergansers are cavity-nesting ducks that probably have one annual nesting attempt (Bellrose 1980). During nest box checks in 1989 and 1990, we observed the behaviour of incubating mergansers as we approached the box. We recorded our distance from the nest box when the female

flushed, the distance she flew before landing, any vocalizations given in flight, and whether the female subsequently performed any distraction displays. We grouped these responses into seven categories of increasing nest defence. A score of 1 was given if a female flushed while we were greater than 10 m away and she flew out of sight. The highest score of 7 was given if a female did not flush until we were climbing the nest tree, and then she exhibited distraction displays on the water. This scoring system is identical to one used for Common Goldeneyes (Mallory & Weatherhead 1993a).

All means are reported $\pm$ SE. Spearman rank correlations were used to compare nest

attentiveness and incubation stage, and all comparisons of means were made using nonparametric Wilcoxon tests.

Results

Incubation and weight loss

A complete record of nest attentiveness for one female Hooded Merganser is presented in Figure 1. Partial records from six other females were consistent with this pattern. All seven Hooded Mergansers incubated through the night; nest departures were recorded only during daylight hours (Fig. 1).

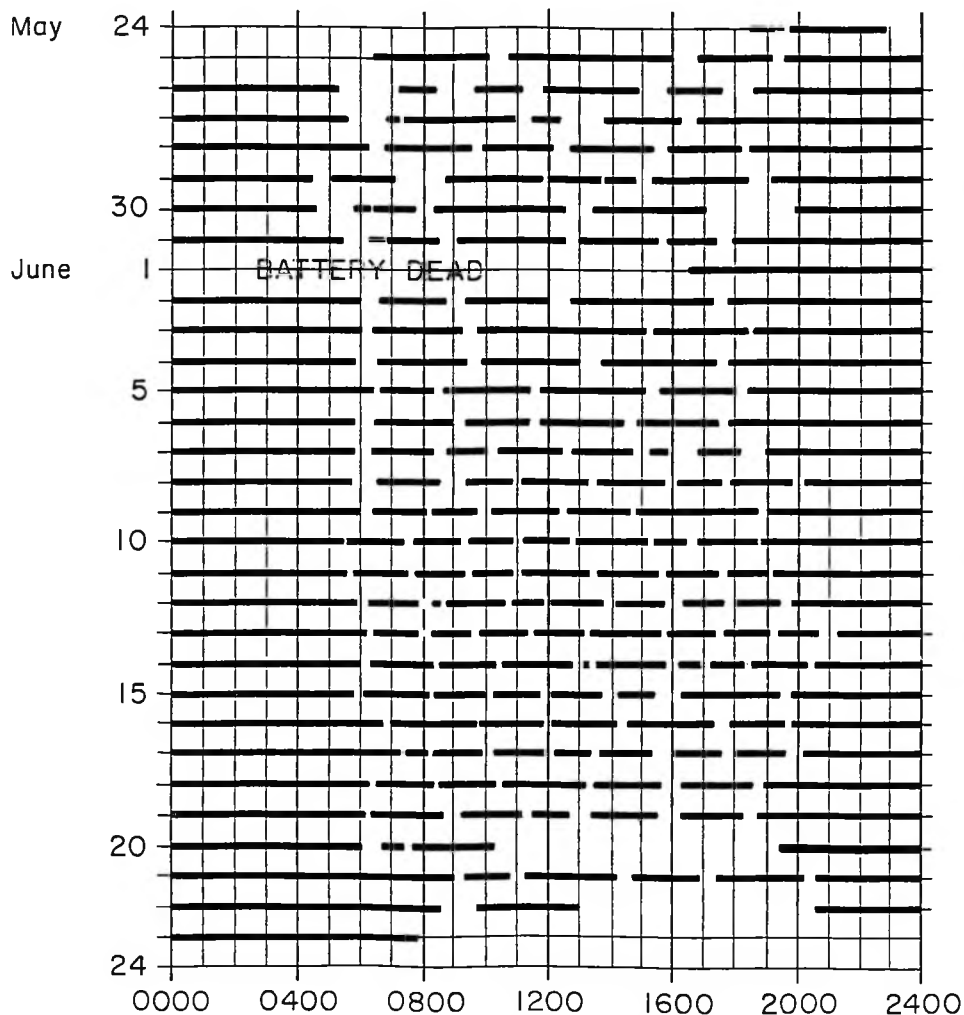


Figure 1. A complete incubation record for a female Hooded Merganser. Each horizontal line represents one 24 hour record of incubation, and breaks in a line represent time off the nest.

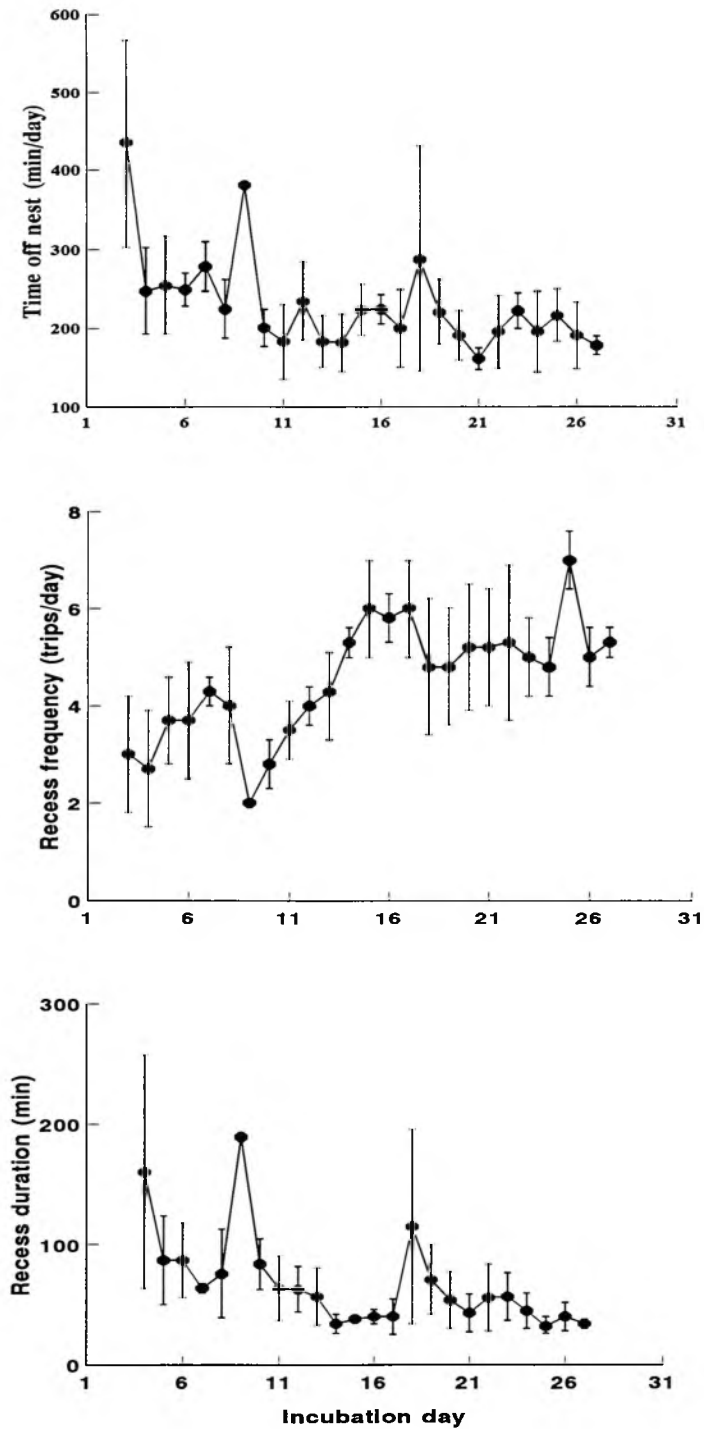


Figure 2. The relationships between time spent off the nest by incubating Hooded Mergansers, recess frequency and recess duration with incubation date. Each point represents data from a minimum of three females and a maximum of five females except for day 9 which has data for only one female.

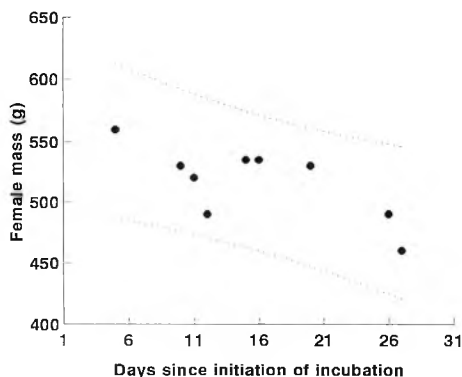


Figure 3. Masses of nine female Hooded Mergansers weighed at different stages of incubation. The relationship is described by the equation $Mass = 564.5 - 3.03(day)$ ($r = -0.73$, $P = 0.03$). Dotted lines represent 95% confidence intervals.

The female for which there was a full record took her first recess consistently around 06:00 DST (daylight savings time), and returned from her last recess by 20:00 DST. Sunrise occurs at approximately 06:30 DST and sunset at 20:00 DST during May and June in this area. For seven females monitored for a total of 89 days, incubating hens spent an average of 212 ± 8 min off the nest (i.e., nest attentiveness = $85.3 \pm 3.2\%$; range between females: 81.2–89.0%), and females spent more time on the nest as incubation proceeded ($r = 0.28$, $N = 89$, $P < 0.01$; Fig. 2). The mean recess frequency was 4.7 ± 0.2 trips per day (range between females: 3.3–6.3), but the number of recesses increased through incubation ($r = 0.39$, $N = 89$, $P < 0.001$; Fig. 2). The mean recess duration was 60 ± 6 min (range between females: 27.1–128.2), becoming shorter as incubation proceeded ($r = -0.34$, $N = 89$, $P < 0.01$, Fig. 2). When more trips were taken daily, each trip tended to be shorter ($r = -0.61$, $N = 89$, $P < 0.01$).

Females mergansers lost weight during incubation ($r = -0.73$, $N = 9$, $P = 0.03$, Fig. 3). If most females began incubation with similar masses, these results suggest an estimated weight loss of 16%, although the variability on this estimate is high (Fig. 3).

Nest defence

The mean nest defence score for female Hooded Mergansers ($= 4.9 \pm 0.6$, $N = 10$) was significantly higher than the mean score for Common Goldeneyes at the same stage of incubation ($= 3.4 \pm 0.3$, $N = 29$, $P = 0.02$; Mallory & Weatherhead 1993a). As incubation proceeded, nest defence did not increase ($r_s = 0.25$, $N = 10$, $P = 0.2$). Female mergansers often remained on their eggs until we opened the door of the nest box, and one female remained on the nest as we removed her eggs from beneath her for candling.

Nest parasitism

Hooded Merganser nests were parasitized by both Common Goldeneyes and Common Mergansers (Table 1), while Hooded Mergansers also parasitized both of these species. A greater proportion of Hooded Merganser nests were parasitized by goldeneyes than goldeneye nests were parasitized by mergansers (Table 1). However, in relation to the number of nests initiated by each species, Hooded Mergansers parasitized other species more often. Nests of other species parasitized by Hooded Mergansers represented 16.3% of all nests in which Hooded Merganser eggs were found (Table 1). In contrast, only 6.3% of all nests in which Common Goldeneye eggs were found represented cases of interspecific parasitism by goldeneyes (Table 1).

Table 1. Incidence of interspecific nest parasitism in cavity-nesting ducks using nest boxes near Temagami, Ontario. We could not determine the resident female for 50 mixed clutches of Common Goldeneye (CG) and Hooded Merganser (HM) eggs; these data are excluded from the table. Use of nest boxes by Common Mergansers (CM) was probably limited by the size of the entrance hole. Wood Ducks (WD) rarely used the boxes.

	Resident species in nest box			
	CG	HM	CM	WD
Total number of clutches	384	141	9	12
Clutches parasitized by CG	-	22	2	2
Clutches parasitized by HM	25	-	2	-
Clutches parasitized by CM	1	1	-	-

Discussion

Female Hooded Mergansers breeding in northeastern Ontario demonstrated unexpected nesting habits in comparison to known nesting biology for other North American species (Afton & Paulus 1992). Hooded Mergansers exhibited vigorous nest defence that did not increase during incubation, unlike the competitor Common Goldeneye (Mallory & Weatherhead 1993a) and the general pattern of nest defence in birds (Montgomerie & Weatherhead 1988). Despite their small body size, all female Hooded Mergansers incubated with high nest attentiveness, taking numerous short breaks each day. This differs from the general pattern observed in incubating waterfowl in which smaller species usually incubate with lower nest attentiveness (Afton 1980), presumably because they cannot store enough metabolic reserves to sustain their requirements during incubation. The mean recess frequency for Hooded Mergansers (4.7 trips per day) we observed is the highest reported for the Tribe Mergini and among the highest reported for North American waterfowl (Afton & Paulus 1992). Morse *et al.* (1969) found that female mergansers left the nest at sunrise and returned from their last recess by dusk. Our results were consistent with this result, in that females left the nest as early as 30 min before sunrise and returned by sunset. Our data suggest that Hooded Mergansers may lose up to 16% of their body mass during incubation. Kennamer *et al.* (1988) found that two female Hooded Mergansers nesting in South Carolina lost 13.3 and 8.7% of their body mass during incubation, lower than our estimate but well within the 95% confidence limits derived from our sample. Differences in the nesting habitat (i.e. food availability) in these two study areas (boreal forest *v.* coastal floodplain) may account for these discrepancies.

In this study region, breeding pair surveys indicate that the breeding density of Common Goldeneyes is approximately 1.5 to twice that of Hooded Mergansers, although Hooded Mergansers generally outnumber goldeneyes elsewhere in northeastern Ontario (McNicol *et al.* 1987). The proportion of nest boxes used by each species in this re-

gion is consistent with this pattern (Table 1), suggesting that observed use of the nest boxes represents local population densities. If so, our data suggest that more Hooded Mergansers parasitize nests of other species relative to their population density than do Common Goldeneyes. Zicus (1990) also noted that Hooded Mergansers readily parasitized nests of other species, although they were the most common cavity-nesting duck in his study area in Minnesota. Frequent interspecific nest parasitism by Hooded Mergansers has also been reported in Quebec (Bouvier 1974) and North Dakota (Doty *et al.* 1984). Hooded Mergansers have an unusually strong eggshell that is thick (0.6 mm *v.* 0.4 mm for that of the Common Goldeneye; Zicus *et al.* 1988) and very round (Mallory & Weatherhead 1990). These characteristics are typical of eggs of species that are obligate parasites (Spaw & Rohwer 1987). Hooded Mergansers appear to discriminate Common Goldeneye eggs and move them to the outside of their nest (Mallory & Weatherhead 1993b). Moreover, Hooded Mergansers are dominated in competitive interactions by the larger, more aggressive Common Goldeneyes and Common Mergansers that compete for limited nest sites (Savard 1984, Mallory 1991). Collectively, the characteristics of this species' eggs, its propensity towards nest parasitism (at least in nest box studies), its response to parasitic eggs and its behaviour in competitive situations with other ducks suggest that nest parasitism may be an important component of its reproductive output in natural situations. We presently lack data on the frequency of interspecific nest parasitism in natural situations to test this hypothesis.

Bellrose (1980:440) noted that Hooded Mergansers possess "...extreme inherent wariness...", and this fact has probably contributed to our lack of knowledge of this species' breeding biology, habitat preferences, diet, and interaction with competitor species over much of its range. At present, the adaptive value of its relatively high nest attentiveness yet frequent, short recesses and propensity towards nest parasitism is unclear. Reliable interpretation of these results requires detailed studies of the biology of Hooded Mergansers in natural conditions.

We thank D. McNicol and P. Weatherhead for logistic support, and many field assistants over the duration of this study. Financial support was provided by the Natural Sciences and Engineering Research Council, Carleton University, the LRTAP Program of Environment Canada, and the Ontario Ministry of Natural Resources.

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