COMMON GOLDENEYE NEST ATTENDANCE PATTERNS[1]

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Abstract. Common Goldeneye (*Bucephala clangula*) nest attendance was recorded on three Minnesota lakes, 1982–1985. Data were from 22 nests monitored 545 days. Hens increased time at nests and frequency of overnight sessions as incubation approached. Incubation recesses were diurnal; most occurred between 9:00 and 19:00 CST. Recesses were fewest and longest in early incubation, but total recess time was greatest in late incubation. Daily incubation constancy was highly variable, ranging from 36.7 to 96.3%. Lake and year effects influenced the number of daily recesses and total daily recess time. Mean recess length did not differ among lakes and years. Three females monitored in both 1984 and 1985 recessed more daily ($\bar{x}$ = 55 min) in 1984, and their yearly ranks were the same for all parameters suggesting strong hen effects. Incubation ranged from 28 to 30 days and was correlated ($r = 0.72$) with mean daily recess time. Nests incubated 29 and 30 days had mean total incubation times that differed by 13 min. While brooding young, incubation-like patterns were maintained but absences were fewer and shorter. Our results differed slightly from those reported for a recent Ontario study, but the differences may be due to analytical approaches.

Key words: Common Goldeneyes; Bucephala clangula; *incubation; time budgets; repeated measures.*

INTRODUCTION

Avian incubation varies in male–female participation, length of incubation period, proportion of each day spent incubating (i.e., constancy as in Skutch 1962), and frequency and timing of periods off the eggs (i.e., recesses as in Skutch 1962). Afton and Paulus (1992) concluded that larger species within and among taxonomic groups of waterfowl generally had greater incubation constancies than smaller species, but trends in recess length and frequency were less clear. These observations support the belief that in larger species, female capacity to store nutrients and energy reserves offsets the need for more recess time. Thus, incubation behavior should be more sensitive to environmental factors in smaller species than in larger ones (Afton 1980).

Variation in incubation behavior has been noted within a number of waterfowl (e.g., Hohman 1986, Afton and Paulus 1992). In addition to the

effects of weather (Caldwell and Cornwell 1975, Afton 1980) and food (Hohman 1986), variability has been attributed to nest site (Ringleman et al. 1982, Hohman 1986), incubation stage (Afton 1980, Brown and Fredrickson 1987), and female age, experience, and body condition (Aldrich and Raveling 1983). Depending on incubation strategies, many factors could affect overall variability. Data necessary to partition the variability of an incubation parameter within species have been difficult to gather. In particular, analytical problems associated with incompletely repeated measures on small samples have not been addressed adequately. Hence, conclusions about the importance of factors affecting incubation have been somewhat speculative, and precision of estimates of constancy and other parameters is difficult to assess.

Common Goldeneye (*Bucephala clangula*) nesting biology differs in a number of ways from other species whose incubation patterns have been studied. Female goldeneyes are holarctic cavity-nesters (Delacour 1954). Normally, they do not nest as yearlings (Palmer 1976), and renesting is rare (Zicus 1990a). Females begin nesting soon after arrival when many wetlands are still ice

covered, but foraging territories are defended vigorously during laying and early incubation (Savard 1984, Zicus and Hennes 1993). Females weigh 600–700 g during incubation, but clutch mass often exceeds female mass (Zicus, unpubl. data). Furthermore, laying rates are low compared to other similar-sized waterfowl (cf., Palmer 1976). These traits suggest that females arrive with some stored reserves, but that exogenous nutrient sources are important for clutch completion and female maintenance during incubation. Because they nest in tree cavities, incubation may not be directly influenced as much by weather as in species nesting in open sites. Thus, factors related to acquisition of food probably influence attendance most. We examined patterns of Common Goldeneye nest attendance to assess the variability associated with incubation stage, lakes used for nesting, and year of nesting. Specifically, we were interested in numbers of recesses, average recess length, and total daily recess time.

STUDY AREA AND METHODS

Three lakes with somewhat different characteristics were selected in northcentral Minnesota to examine incubation patterns across a range of environmental conditions. The first was a 16 ha pond (Refuge Pond) with an extensive adjoining sedge meadow and floating sedge mat (30 ha). Water depths were <1.5 m and stands of hardstem bulrush (*Scirpus acutus*), waterlily (*Nymphaea tuberosa*), and various pondweeds (*Potamogeton* spp.) occurred throughout. Public use was limited to bait-leech trapping by 4–6 individuals in April to June. Four to five pairs of goldeneyes defended territories yearly, and a similar number of females nested in nest boxes. Intraspecific laying (determined by egg accretion and clutch size) was infrequent. Ducklings fledged from the pond each year, but some broods also moved overland approximately 2 km to a 2,802 ha lake. The second location was a 117 ha lake (North Twin) with almost completely undeveloped wooded shorelines and virtually no emergent aquatic vegetation. This lake received low to moderate fishing pressure beginning in May. Ten to 15 goldeneye hens nested in nest boxes each year, but only 2–3 pairs defended territories on the lake. Intraspecific laying was low to moderate, and no goldeneye broods used the lake. The third location was a 1,250 ha lake (Island Lake) with moderate to heavy year-round and summer residential shoreline development.

Shoreline stands of hardstem bulrush were extensive. Fishing and boating were intensive beginning in May. Many goldeneyes defended territories throughout the lake, at least 60 females laid eggs in boxes annually, and intraspecific laying was high. In most years, 200–300 ducklings fledged from the lake. The latter two locations supported fish populations (Centrarchidae, Percidae and Esocidae) and had morphoedaphic indices (Ryder 1965) of 6.75 and 18.01, respectively (Minnesota Department of Natural Resources, Section of Fisheries, unpubl. data). These values are near optimum for highly productive fish communities (Ryder et al. 1974). Refuge Pond supported only various minnows.

Attendance data were recorded remotely (Cooper and Afton 1981) from nest boxes. Most monitors were not installed until early incubation because of uncertainty due to intraspecific egg-laying and related nest abandonment (Andersson and Eriksson 1982; Zicus, unpubl. data). However, some data were obtained during laying from nests that only one female was using. The start of incubation can be difficult to define (Afton and Paulus 1992), and females sometimes were absent for 24 hr following laying of the last egg. Therefore, we considered incubation to begin after clutch completion at 0:01 hr on the day hens began consistently taking one or more daytime recesses followed by an overnight session at the nest. Common Goldeneye ducklings were usually brooded in the nest for about 24 hr prior to departure (Zicus, unpubl. data), so we defined the end of incubation as 24:00 hr two days prior to the day ducklings departed. Because we started monitoring some nests after incubation began and the length of the incubation period varied among hens, days of incubation were numbered backwards from the departure day. Although this differs from the often used convention, we believe it is preferable because it allowed corresponding days to be compared. All nests from which we collected laying period data were successfully incubated. We used only data from days for which we had a complete (00:01–24:00 hr) record and excluded occasional records when we believed predators caused females to leave the nest. After these disturbances, we excluded data until the following midnight.

Study of nest attendance poses design problems because of the factors potentially influencing it and the possible levels of sampling (e.g., observation day, nest, individual hen, etc.). We monitored 2–9 nests each year. Although we at-
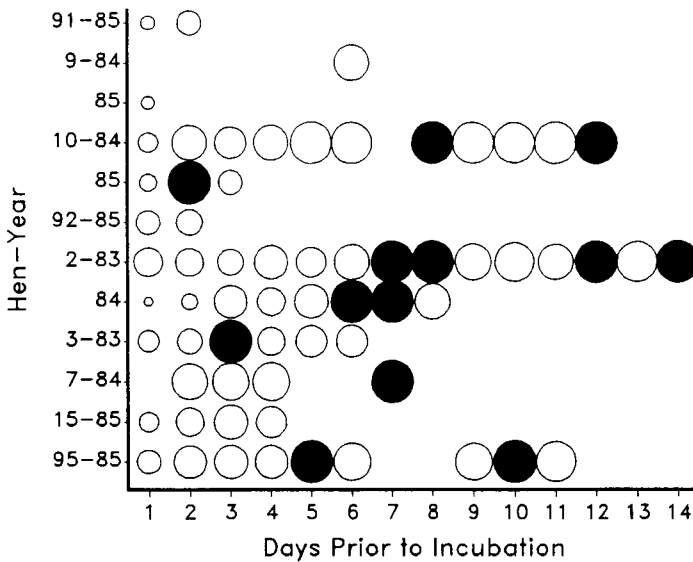
FIGURE 1. Bubble plot depicting total minutes spent off the nest by female Common Goldeneyes prior to incubation in northcentral Minnesota, 1982–1985. Solid circles denote entire days and absence of a circle indicates missing data.

tempted to obtain data for each day of laying and incubation, nest records were often incomplete because females were incubating when monitoring began, equipment sometimes failed, or predators disturbed nests. We examined incubation-day data using a generalized linear mixed model (GLMM) with maximum likelihood estimators (PROC MIXED) (SAS Institute, Inc. 1992). This approach models dependencies among repeated measures explicitly and adjusts ensuing tests for this dependence based on the underlying covariance structure (Laird and Ware 1982, Ware 1985). We determined (Jennrich and Schluchter 1986) that a first order autoregressive covariance structure was optimal for all of our models. We modeled the effect of lake, year, linear and quadratic effects of incubation day, and their interactions on three incubation parameters or response variables (number of recesses, mean recess length, and total recess time). When interactions were not significant ($\alpha = 0.05$), we used a reduced model. Simultaneous paired comparisons were made using a Bonferroni adjustment to pairwise differences in the time-adjusted means (Dobson 1990).

We also used bubble plots (SAS Institute, Inc. 1988:343) to display relationships among response variables and individual hen, year, lake, and incubation day. Individual daily measurements were represented as circles having diameters proportional to their values. This allows the data to be inspected directly for variation among hens and over time and for lake and year effects. Lack of a pattern in size distributions of the bubbles indicates absence of an effect. We believe this approach is a useful adjunct to the mixed model analyses which might be influenced if data are missing nonrandomly.

We ignored possible effect variables and summarized laying period data by observation days because few data were available. Data for the penultimate and departure days were analyzed using two-way ANOVAs (PROC GLM) (SAS Institute, Inc. 1991).

RESULTS

A total of 545 complete nest-days was monitored from 1982 to 1985. Scratch marks and hair on nest boxes suggested raccoons (*Procyon lotor*) flushed females from nests on 18 occasions. These occurred between 21:00 and 04:00 CST and represented approximately 1% of all departures monitored. When flushed at night, females remained away until daylight.

LAYING PERIOD

Sixty-five daily records were obtained from 12 nests started by 9 females (median = 5 days/nest, range = 1–14). Females sometimes were absent from nests for an entire day and in some instances two consecutive days (Fig. 1). Nests were visited only once per day during laying, and fe-
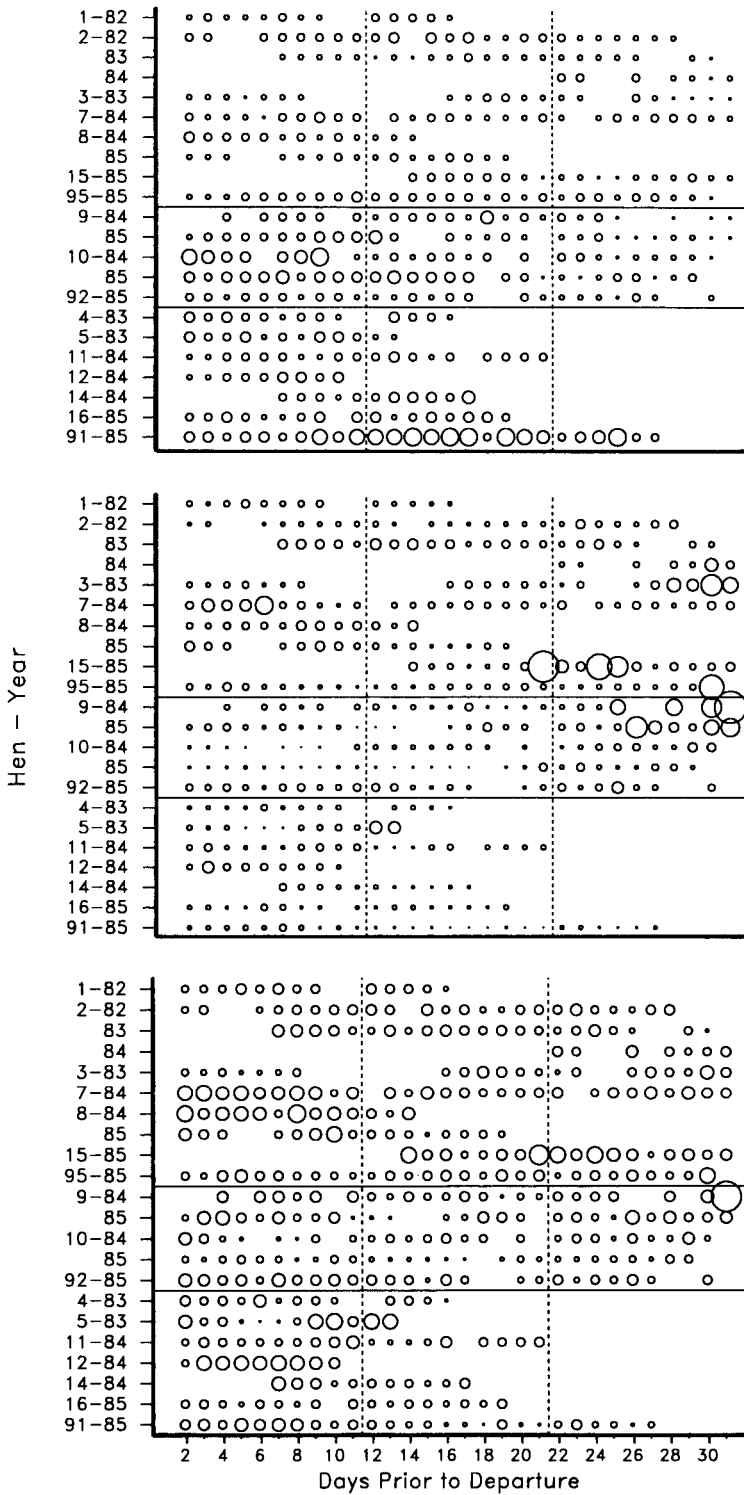
FIGURE 2.   Bubble plots depicting the daily number of recesses (top), mean recess length (middle), and total daily recess time (bottom) during incubation for Common Goldeneyes in northcentral Minnesota, 1982–1985. Absence of a circle indicates missing data. Panels from left to right in each plot depict data from late, mid, and

males spent 7–1,131 min/visit at the nest. On average, females spent <540 min/day at the nest until the day before incubation began. Time at the nest appeared to increase as the start of incubation approached. Females spent an average of 787 min (SD = 202, n = 10) on the nest on the day before incubation began. Overnight sessions on the nest were more frequent as the clutch neared completion. Sessions occurred on three of 10 nights and four of the 10 nights monitored two days prior to and immediately preceding the start of incubation, respectively. In contrast, females remained on the nest only three nights (days 3 and 5 prior to incubation) during the other 45 nest-days monitored. Nine of 10 overnight sessions began after 15:00 CST, and all ended by the following noon.

INCUBATION

During incubation, 425 complete days were recorded from 22 nests incubated by 17 females (median = 20 days, range = 7–29). Daily incubation parameters varied considerably within and among hens (Fig. 2). Virtually all recesses were taken during daytime with 68.2% of the first recesses in a day beginning >4 hr after sunrise (Fig. 3). When initiation time and length of all recesses were considered, females were less likely to be away from the nest before 9:00 and after 19:00 CST with the probability of being absent being similar between 10:00 and 18:00 CST (Fig. 4).

We detected no significant interactions among the main effects (lake and year) and either linear or quadratic measures of incubation day (all Ps > 0.08). However, all incubation parameters were influenced by both measures of incubation day (Table 1 and Fig. 5). Fewer recesses were taken early than in mid or late incubation. In addition, mean recess length was longer early than during later days. Lastly, total time spent in recesses was high early, declined, and increased again in late incubation.

There were significant differences related to specific lakes (Table 2). Number of daily recesses (F = 13.29; df = 2, 16; P < 0.001) and total recess time (F = 5.78; df = 2, 16; P = 0.012) were influenced by factors associated with the lake used for nesting, but we detected no differences for average daily recess length (F = 2.44; df = 2, 16; P = 0.119). Incubation constancies of females nesting on North Twin and Island Lakes were similar to each other contrasting those on Refuge Pond. Hens from Refuge Pond took fewer longer recesses resulting in more total time off the nest than those on the other two lakes.

Year also affected two incubation parameters significantly (Table 3). Number of daily recesses (F = 3.88; df = 3, 16; P = 0.029) and total recess time (F = 3.92; df = 3, 16; P = 0.028) differed among years, whereas average recess time did not (F = 1.19; df = 3, 16; P = 0.346). Fewer recesses were taken in 1983 than in other years with generally more total time spent off the nest in 1984 and 1985.

Incubation parameters for three females that were monitored in both 1984 and 1985 were also compared (Table 4). These females reused their previous nest boxes in 1985. Female 8 also occupied the same foraging territory in both years, whereas foraging territories of the other females were unknown. For these three females, each response variable had a constant rank from year to year suggesting a strong hen effect. Furthermore, each female appeared to spend more time daily ($\bar{x}$ = 55 min) in recesses in 1984 than 1985.

Total days of incubation was determined for 12 clutches that we began monitoring during laying; one clutch was incubated 28 days, five clutches for 29 days, and six for 30 days. Period length was correlated (r = 0.72, 95% confidence interval = 0.35–0.93) with mean daily recess time. Mean total incubation time for nests incubated 29 days differed by only 13 min from those that were incubated 30 days.

HATCHING AND DEPARTURE

Ducklings usually began hatching during the morning before the day the brood departed. Complete records were obtained for the penultimate and departure days from nests incubated by 17 females (Table 5). While brooding newly hatched young, females continued to maintain recess patterns established during incubation although somewhat fewer and shorter recesses were

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early incubation and those from top to bottom depict data from Refuge Pond, North Twin Lake, and Island Lake.
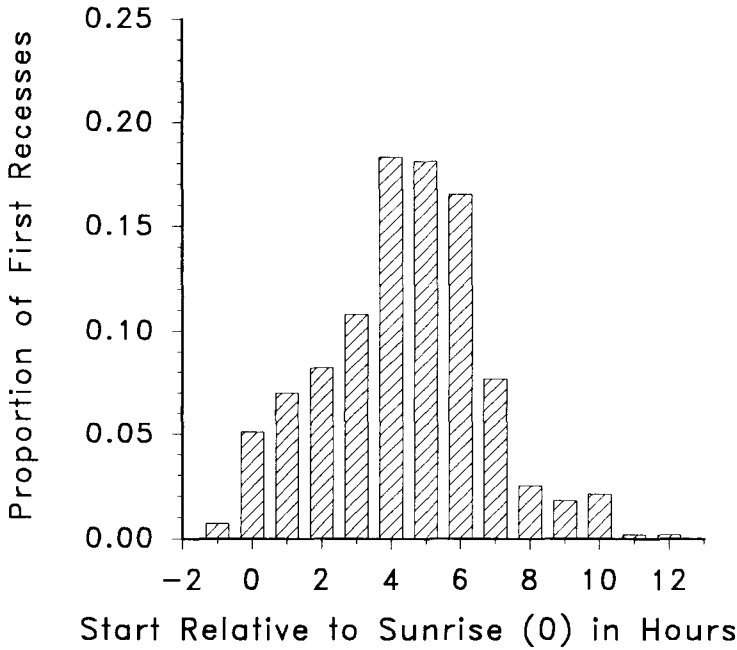
FIGURE 3. Proportion of first daily recesses started relative to sunrise by female Common Goldeneyes in northcentral Minnesota, 1982–1985.

taken. As during incubation, numbers of recesses, average recess length, and total time spent in recesses varied widely. Except for total recess time on the penultimate day, we detected no significant effect on parameters related to lake, year, or their interactions (all $Ps > 0.120$). Year had a marginally significant effect on total recess time on the penultimate day ($F = 3.71$; df $= 2, 13$; $P = 0.053$). The three females that were monitored in both 1984 and 1985 continued to show a strong hen effect and also spent an average of 30 and 9 min longer away during the penultimate and departure days, respectively, in 1984. Broods departed between 06:30 and 16:15 CST (median = 9:50) with thirteen of 18 departures occurring before noon.

DISCUSSION

Studies of incubation patterns provide insight to reproductive strategies and energy needs of nesting females. However, analysis of nest attendance data can be difficult. Our sample was larger and relatively more complete than most previous incubation studies, and a striking aspect of Common Goldeneye nest attendance and incubation patterns was the high variability within and among hens. Indeed, variability from these sources appeared nearly as great as that attributable to stage of incubation, lake, or year. Because individuals are selected (presumably at random) and followed over time, females and not individual days per hen determine whether

TABLE 1. Model-based coefficients for two measures of incubation day for three Common Goldeneye incubation parameters on three northcentral Minnesota lakes, 1982–1985.

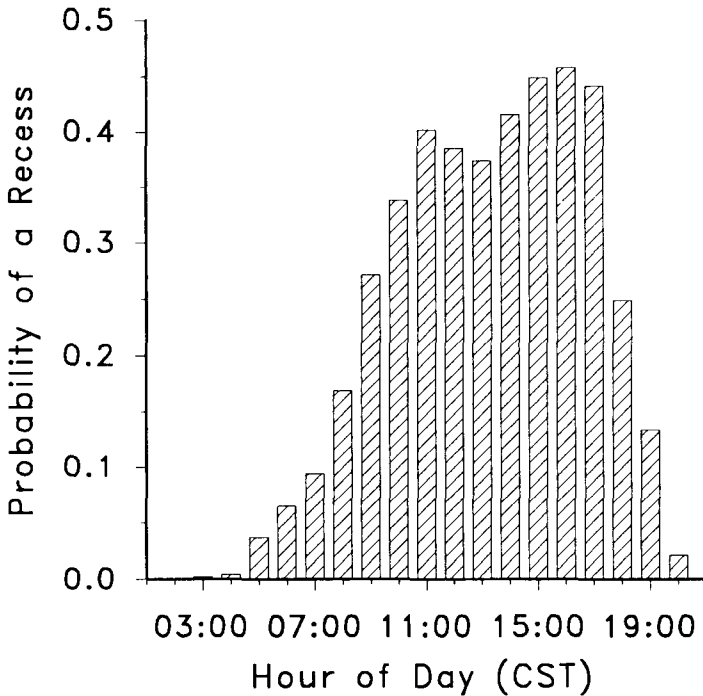| Parameter	Model coefficient			
	Day² (SE)	P	Day (SE)	P
Number recesses	−0.003 (0.001)	0.001	0.066 (0.030)	0.033
Average recess length	0.386 (0.082)	<0.001	−9.456 (2.650)	<0.001
Total recess time	0.306 (0.090)	<0.001	−10.288 (2.922)	<0.001

FIGURE 4. Hourly probability of female Common Goldeneyes to be on an incubation recess in northcentral Minnesota, 1982–1985.

sources of variability have been estimated sufficiently for most statistical inferences. Responses of interest were measured repeatedly on each bird on successive days and therefore are strongly autocorrelated. Thus, daily measurements cannot be interpreted as if they came from different hens as appears to have been done in some regression and correlation analyses (e.g., Afton 1980, Ringleman et al. 1982, Hawkins 1986, Hohman 1986, Mallory and Weatherhead 1993). Hen effects likely confound most relationships with the environment and must be considered. Unfortunately, this is impossible for time series with several consecutive missing data points. Although we used a more appropriate

GLMM to analyze our data, we believe the ensuing tests and estimates must be viewed cautiously. We believe they are informative if one is mindful of the pattern of missing data and the fact that we ignored the doubly repeated (hens in successive years) nature of some of the data. The conclusions reached using the GLMM were essentially unchanged from those that we first reached through inspection of the bubble plots. With these kinds of data, descriptive analyses may be as appropriate as inferential statistical tests wherein significance levels might be meaningless or misleading (Yoccoz 1991).

Females generally spent more time during egg-laying at the nest as incubation neared. This ap-

TABLE 2. Model-based means adjusted for year and incubation day for three Common Goldeneye incubation parameters in northcentral Minnesota, 1982–1985.[a]

Location	Number of recesses		Average recess length		Total recess time	
	$\bar{x}$	(SE)	$\bar{x}$	(SE)	$\bar{x}$	(SE)
Island Lake	3.3A	(0.16)	86.9	(14.2)	241.0A	(14.5)
North Twin	2.7B	(0.16)	105.5	(14.4)	222.8A	(14.5)
Refuge Pond	2.4B	(0.10)	123.8	(9.6)	277.6B	(9.7)

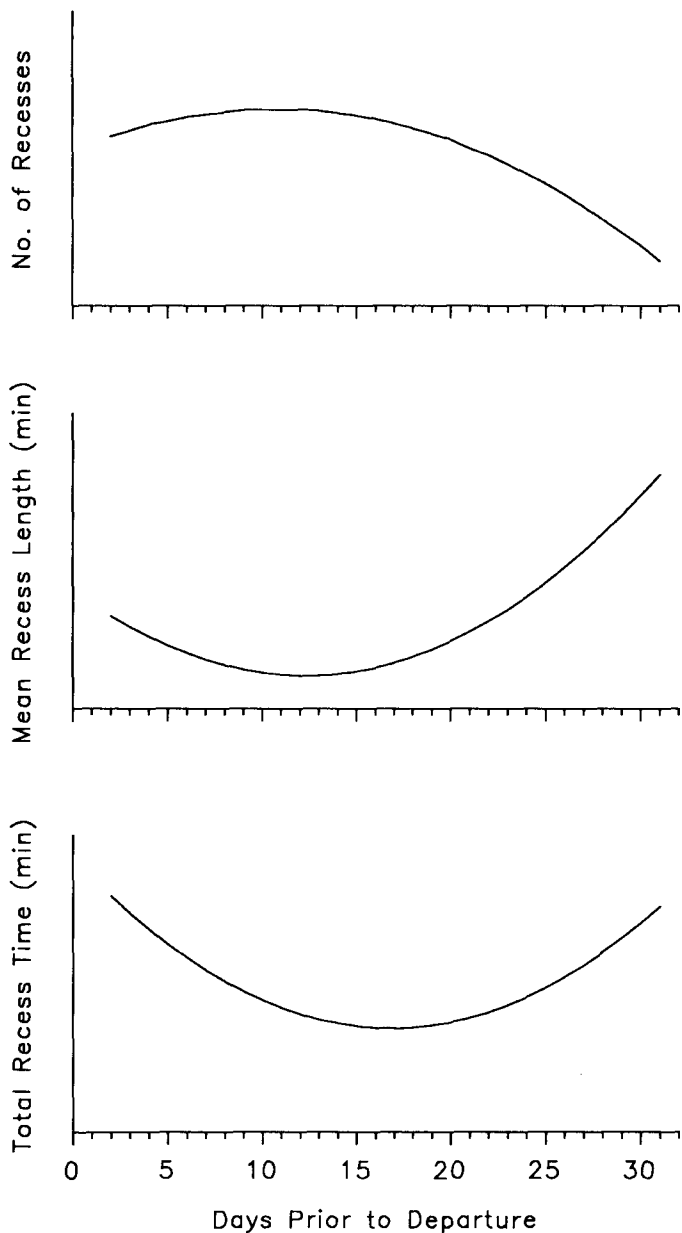[a] Means followed by the same letter are similar ($\alpha = 0.05$).

FIGURE 5. Model-based estimated change in daily number of recesses, mean recess length, and total daily recess time by incubation day for Common Goldeneyes in northcentral Minnesota, 1982–1985.

pears to be the norm among waterfowl (e.g., Caldwell and Cornwell 1975, Afton 1980, Cooper 1978). However, because of the long laying interval, Common Goldeneyes sometimes failed to visit their nests on the day after they laid an egg.

During incubation, we detected a slight in-crease and then a decrease in daily time spent on the nest with the lowest constancy occurring just prior to hatch. Typically, more recesses were taken later in incubation than at the start. Mean recess length was longest early in incubation, de-clined, and then increased prior to hatch. Our conclusions regarding patterns of chronological

TABLE 3.   Model-based means adjusted for lake and incubation day for three Common Goldeneye incubation parameters on three northcentral Minnesota lakes.[a]

Year	Number of recesses		Average recess length		Total recess time	
	$\bar{x}$	(SE)	$\bar{x}$	(SE)	$\bar{x}$	(SE)
1982	3.0A	(0.25)	82.7	(23.3)	218.6A	(23.6)
1983	2.4B	(0.18)	118.0	(16.5)	234.9A	(16.7)
1984	2.8A	(0.12)	120.9	(11.1)	286.4B	(11.3)
1985	3.1A	(0.11)	100.4	(9.8)	248.5AB	(9.9)

[a] Means followed by the same letter are similar ($\alpha = 0.05$).

change for all three incubation parameters differed from those described by Mallory and Weatherhead (1993) in their Ontario study. However, we believe these differences are due largely to their exclusion of data from the early and late portions of incubation (Mallory and Weatherhead 1993) as well as the apparent consideration of only linear models. Encouragingly, the time related changes in incubation parameters that we detected with our GLMM analyses and bubble plot inspections are also suggested when their graphical summaries of the entire incubation period are examined (Mallory and Weatherhead 1993). Changes in constancy and recess frequency associated with incubation stage also have been reported for some other waterfowl (e.g., Northern Shovelers *Anas clypeata* and White-winged Scoters *Melanitta fusca*) (Afton 1980, Brown and Fredrickson 1987), but not for others (e.g., Ring-necked Ducks [*Aythya collaris*]) (Hohman 1986).

While hatched young were present, females took fewer recesses and spent approximately one-third less time away from the nest than during incubation. However, 3 hr and 1 hr (median values) were spent away on the penultimate and departure days, respectively. Few data have been reported, but female absences during hatching appear to be short and infrequent in most species (Afton and Paulus 1992).

Of all incubation parameters, constancy may be the most useful to compare incubation strategies among species. However, meaningful contrasts can be made only after variability within a species is understood (Drent 1975). Common Goldeneye incubation constancy appears similar to other small-bodied waterfowl, but lower than that reported for Wood Ducks (*Aix sponsa*) (see review in Afton and Paulus 1992). However, factors associated with location, year, and day of incubation strongly influenced incubation parameters in our study. These factors likely op-

erate to some degree in other species and locations as well. Reported Common Goldeneye constancy has ranged from 75 to 89% (Siren 1952, Semenov-Tyan-Shanski and Bragin 1969; both cited in Hohman 1986, Mallory and Weatherhead 1993). The year, lake, and time-adjusted means for total recess time that we estimated correspond to constancies that ranged from 80 to 85%. Maximum and minimum mean individual constancies were 88.5 and 73.6%; both hens hatched normal-sized clutches (Zicus, unpubl. data). This range represents >3.5 hr/day, and the female with the lower constancy spent more than twice as much time away from the nest as the one having the higher value. This variability underscores the need to adequately sample target populations in all incubation studies.

Incubation constancy differed among years. Both constancy and recess duration have been reported to vary inversely with ambient temperature presumably because of thermal requirements (see review in Afton and Paulus 1992). Mallory and Weatherhead (1993) also suggested daily incubation constancy by goldeneyes was lower when daily temperature was higher, but it

TABLE 4.   Unadjusted arithmetic daily mean number of recesses, recess length, and total recess time during mid and late incubation for female Common Goldeneyes nesting in the same nest boxes during two consecutive years in northcentral Minnesota.

Year	Lake	Hen number	n[a]	Number recesses	Recess length (min)	Total recess time (min)
1984	Refuge Pond	8	13	2.6	138.7	359.2
	North Twin	9	15	2.9	88.8	252.6
	North Twin	10	16	3.6	65.0	206.8
1985	Refuge Pond	8	16	2.3	117.0	257.7
	North Twin	9	17	3.1	84.6	238.9
	North Twin	10	18	3.9	40.8	156.4

[a] Number of incubation days monitored (maximum possible = 19).

TABLE 5. Patterns of nest occupancy for 17 female Common Goldeneyes with hatched young on three northcentral Minnesota lakes, 1982–1985.

Parameter	$\bar{x}$	SD	n	Median	Range
Penultimate day					
Recesses/day	2.9	1.1	19	3	1–6
Recess length (min)	75.5	27.1	55	70	35–153
Total recess time/day (min)	212.0	85.0	19	209	57–458
Departure day					
Recesses/day	1.7	1.1	18	1	0–4
Recess length (min)	43.0	24.8	31	46	0–84
Total recess time/day (min)	74.7	54.8	18	53	0–209

is unclear whether or not this influence could affect the entire incubation period. As an alternative explanation, Sayler (1985) observed more recess time taken by Redhead Ducks (*Aythya americana*) during drought years and attributed the contrast to reduced food abundance and resulting poorer body condition. Factors related to food acquisition are likely important to incubating goldeneyes considering the amount of time devoted to foraging during recesses (Zicus and Hennes 1993).

Female body condition at the onset and throughout incubation may influence nest attentiveness as well (e.g., Low 1945, Afton 1978, Aldrich and Raveling 1983, Gatti 1983, Hohman 1986). This might be true for Common Goldeneyes, however Mallory and Weatherhead (1993) found no clear support for the idea. We have no direct evidence, but body mass of three females at hatching was positively related to their constancy (Zicus, unpubl. data) suggesting the need to explore the relationship further.

Productivity, Common Goldeneye densities, frequency of intraspecific egg-laying, distances incubating females traveled to forage, and human activity varied among the lakes we studied, and we suspected incubation patterns might vary from lake to lake. Refuge Pond females appeared to take longer recesses and have a lower constancy than those on the other two lakes, suggesting food acquisition may have been most difficult for them. Many invertebrate prey that serve as Common Goldeneye food have patchy distributions (Elliot 1977, and others), and foraging territory quality may also depend on factors such as density of conspecifics, ratio of territory area to perimeter, and the spatial arrangement of territories (Einarsson 1990). To a large degree, we believe the range in incubation constancies that

we observed likely reflected varying foraging territory quality within and among lakes and years.

For most waterfowl, length of incubation varies by a few days (cf., Bellrose 1976), but reasons for this are unclear. Breckenridge (1956) believed incubation had a minimum length that could be extended by prolonged absences from the nest combined with cold temperatures. Similarly, Afton (1977) observed the extension of incubation by a Northern Shoveler for 1 day due to delayed onset of nocturnal incubation. Although Common Goldeneye females have comparatively low constancies and rely on exogenous resources during incubation, those with greater constancies spent fewer days incubating. Likewise, we suspect that females having greater body mass (perhaps better body condition) have greater constancies and thus shorter incubation periods. Total time spent incubating was nearly identical irrespective of the length of the incubation period. Whereas, predation upon nests and incubating waterfowl can be high (Sargeant et al. 1984), short incubation periods may be more adaptive than longer ones because nest and perhaps female vulnerability are minimized. The relationship among constancy, length of incubation, and body condition emphasizes the importance of habitat quality and lack of disturbance to nesting goldeneyes.

Common Goldeneye incubation recesses are taken during midday (this study, Mallory and Weatherhead 1993) which is different from that of most waterfowl. Although Ring-necked Ducks recessed at all times of the day and night (Hohman 1986:292), recesses initiated in early morning through late evening are more typical in other species. Northern Shovelers (Afton 1980:134), Canada Geese (*Branta canadensis*) (Cooper 1978: 36), and Wood Ducks (Breckenridge 1956:17) all

have early morning and late afternoon-early eve-
ning peaks in recess activity. Recesses may be
timed so as to avoid exposing eggs to extreme
temperatures (Caldwell and Cornwell 1975, Af-
ton 1980), to coincide with daily food availabil-
ity (Afton 1980), or to avoid nest detection by
predators (Afton 1980, Hohman 1986). Except
for possibly food availability, these explanations
do not seem relevant to a cavity-nester taking
midday recesses. Instead, we believe midday re-
cesses may serve to minimize intraspecific egg-
laying (Andersson and Eriksson 1982) during in-
cubation and to reduce interference by females
that are nest prospecting (Eadie and Gauthier
1985, Zicus and Hennes 1989). The normal prev-
alence of intraspecific egg-laying in cavity-nest-
ing ducks has been difficult to assess (Semel and
Sherman 1986:815). Although this behavior may
be an integral part of the breeding strategy of
some species (e.g., Hooded Merganser [*Lophod-
ytes cucullatus*]) (Zicus 1990b), its adaptive sig-
nificance is poorly understood (Eadie *et al.* 1988).
Whether or not intraspecific laying benefits in-
cubating females, eggs laid intraspecifically in a
nest that is already being incubated have little
chance of hatching. Females laying eggs intraspe-
cifically and those that are nest prospecting most
often visit nests in early morning (Zicus, pers.
observ., Zicus and Hennes 1989). Thus, delaying
recesses until midday may decrease the likeli-
hood of eggs being laid intraspecifically at an
inappropriate time and also minimize nest dis-
turbance by intruding females.

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