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EFFECTS OF NASAL DISCS ON NESTING BY MALLARDS

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Abstract.—Nasal markers (saddles and discs) are used commonly to identify individuals in studies of waterfowl ecology. The potential effects that these markers have on the study animals has been poorly tested for free-ranging birds. We examined the effects of nasal discs on several indices of nesting effort for wild Mallards in the prairie pothole region of south-central Canada. Nasal discs did not significantly influence the proportion of birds that remained on the study area, the proportion of birds that nested, the number of nests initiated per bird, the total number of days a given bird devoted to laying or incubating eggs, or the proportion of birds that successfully hatched a nest. Compared to unmarked birds, however, nasal-marked birds did significantly delay their first nest by 2–6 days. Investigators should carefully examine study objectives before deciding to nasal-mark individuals.

EFECTO DE DISCOS NASALES EN EL ANIDAMIENTO DE *ANAS PLATYRHYNCHOS*

Sinopsis.—En estudios de Anseriformes se utilizan marcadores nasales para identificar a los individuos. Los efectos potenciales de estos marcadores en las aves han sido pobremente estudiados en animales silvestres. Examinamos el efecto de discos nasales en varios índices del esfuerzo de anidamiento de individuos silvestres del pato *Anas platyrhynchos*. El estudio se llevó a cabo en la parte surcentral de Canada. Los discos nasales no tuvieron efecto en la proporción de aves que permaneción en el área de estudio, la proporción de aves que anidaron, el número de nidos iniciados por las aves, o la proporción de aves que empollaron sus huevos exitosamente. En comparación con aves que no fueron marcadas, los discos nasales causaron una dilación de 2–6 días en la primera anidada. Los investigadores deben examinar detalladamente sus objetivos previo a decidir utilizar marcadores nasales en este grupo de aves.

Although nasal markers (saddles and discs) have been used commonly to identify individual birds in studies of waterfowl ecology (e.g., Bartonek and Dane 1964, Derrikson 1978, Greenwood 1977, Lokemoen and Sharp 1985, Mauser et al. 1994, Pietz et al. 1993, Rotella and Ratti 1992, Serie et al. 1992), their impacts have not been fully evaluated. Early studies indicated that nasal markers did not affect the behavior of the species being studied (Bartonek and Dane 1964, Sugden and Poston 1968). These studies, however, were performed in captivity and the information collected was mostly anecdotal. Byers and Montgomery (1981) detected no signs of increased stress in captive Mallards (*Anas platyrhynchos*) with nasal saddles but speculated that effects may be subtle and suggested additional testing. Byers (1987) noticed that in unusually severe winter weather nasal saddles could be subject to icing and inferred that increased mortality could result. Greenwood and Bair (1974) also documented icing of nasal saddles in extreme weather. Few attempts have been made to quantify the effects of nasal markers on productivity of wild, free-ranging ducks, although Koob (1981) reported that wild male Ruddy Ducks (*Oxyura jamaicensis*) with nasal saddles spent more time in maintenance activities and were less successful acquiring mates than unmarked males. Most reported problems with nasal discs have involved entanglement (Erskine [in Bartonek and Dane 1964], Evrard 1986, Calvo and Furness 1992), which can cause damage to the birds nares or death. Thus, impacts of nasal discs on productivity of wild birds are untested or poorly tested. We designed this study to compare various measures of nesting effort for female Mallards with and without nasal discs.

STUDY AREAS AND METHODS

This study was conducted at two study areas in the Parkland Ecoregion (Poston et al. 1990) of the prairie pothole region of central Canada. One area was located in the Touchwood Upland subregion near the town of Punnichy in southcentral Saskatchewan (51°20′N, 104°17′W). The Punnichy study area was 54 km^2 in size and had an average of 38 wetlands/km^2. The second area was located in the Newdale Plain subregion near the town of Hamiota in southwestern Manitoba (50°15′N, 100°40′W). The Hamiota study area was 78 km^2 in size and had an average of 25 wetlands/km^2. Intensive agriculture, primarily cereal-grain farming and cattle production have largely replaced the native aspen (*Populus tremuloides*) parkland at both study areas.

Pre-laying female Mallards were decoy-trapped (Sharp and Lokemoen 1987) during April 1993. Females were implanted with 22-g radio transmitters (Korschgen et al. 1984, Olsen et al. 1992, Rotella et al. 1993). Every second female was also fitted with a unique set of nylon nasal discs (Juno Tool and Plastic Corp., 106 Donovan Drive, Alexandria, Minnesota) as described by Lokemoen and Sharp (1985). Nasal discs were attached using a 1.6-mm diameter stainless-steel pin inserted through the discs and nares. Stainless steel washers (Size 0, Small Parts, Inc. 13980 N.W. 58th Court, P.O. Box 4650, Miami Lakes, Florida) were placed on the pins outside the discs and the ends of the pins were flattened. Disc shapes were square, triangle, circle, oval, rectangle, and wishbone. Colors were red, ochre, orange, yellow, violet, green, and blue. We attached CWS/USFWS leg bands to all females and measured their mass (nearest 10 g) and flattened wing chord (nearest 1 mm). Females were held for 1 h following marking to allow them to recover from the anesthesia before being released back onto the wetland on which they were trapped.

After marking, females were located twice daily by triangulation when they were most likely to be on their nests (between 0600–1300 h; Gloutney et al. 1993). Triangulation was conducted using vehicle-mounted null-array receiving systems. When a female was found in the same location for 3 consecutive days she was located by a person on foot using a hand-held antenna and, if in nesting habitat, flushed to locate the nest. Each nesting female was radio-located once daily. However, if the nest was destroyed or abandoned, the female was again located twice daily to identify renesting attempts.

Mass, wing chord, and a condition index (mass/wing chord) were compared for nasal-marked females and unmarked females using *F*-tests (PROC GLM, SAS Inst. 1990). Study area was treated as a blocking factor. A categorical model was used to compare the proportions of nasal-marked and unmarked females that initiated ≥1 nest (PROC CATMOD, SAS Inst. 1990). Friedman's tests (Ipe 1987) were used to compare the nasal-marked and unmarked treatment groups with respect to (1) the number of nests initiated by each female, and (2) the date of first nest initiation. An *F*-test was used to compare the total number of days females in each group devoted to egg-laying and incubation.

Birds were excluded from analysis if they were not located by telemetry for ≥5 consecutive days at any point from the time they were trapped in April until 19 June (the last date at either study area on which a nest was known to be initiated) with two exceptions. If a bird was tracked continuously (i.e., no gaps of ≥5 d in telemetry data collection) from the time it was trapped until 1 June (the last date on which a bird was known to have initiated her first nest of the season) and was never known to have nested, we assumed the bird did not nest and included her in all analyses except for initiation dates. All birds that were tracked continuously until they initiated their first nest were included for the comparison of initiation dates of first nests regardless of our subsequent tracking success.

RESULTS

We obtained complete nesting histories for similar ($\chi^2 = 0.40$; $P > 0.52$) numbers of nasal-marked (13 and 19) and unmarked birds (13 and 26) at the Hamiota and Punnichy study areas, respectively. Nasal-marked birds did not differ from unmarked birds in mass ($F_{1,67} = 0.65$, $P > 0.42$), wing chord ($F_{1,67} = 0.16$, $P > 0.68$), or condition index ($F_{1,67} = 0.63$, $P > 0.43$) indicating that birds in both treatment groups were at a similar nutritional state (Table 1).

A similar ($P > 0.72$) proportion of nasal-marked and unmarked birds nested, and birds from both groups nested a similar ($P > 0.81$) number of times (Table 2). The total number of days devoted by birds to egg-laying and/or incubation during the nesting season did not differ ($P > 0.80$, Table 2) between those with nasal discs and those without. A similar ($\chi^2 = 0.19$; $P > 0.65$) number of nasal-marked and unmarked birds successfully hatched a nest.

Nasal-marked birds initiated their first nest later ($P < 0.04$) than un-

TABLE 1. Morphometric data for nasal-marked and unmarked Mallard females at Hamiota, Manitoba and Punnichy, Saskatchewan, 1993.

			Mass (g)		Wing chord (mm)		CI[a]	
Study area	Treatment	n[b]	$\bar{x}$	SE	$\bar{x}$	SE	$\bar{x}$	SE
Hamiota	Nasal-marked	13	1128	23.3	273	1.9	4.13	0.07
	Unmarked	13	1133	25.5	275	1.8	4.11	0.11
Punnichy	Nasal-marked	19	1112	19.7	273	1.3	4.08	0.06
	Unmarked	26	1073	15.5	269	1.0	3.98	0.05

[a] CI = Condition Index (mass/wing chord).
[b] Number of females for which we collected complete nesting histories.

marked females. First nests were delayed for nasal-marked females by 6 d at the Hamiota study area and 2 d at the Punnichy study area (Table 2).

DISCUSSION

Despite common use of nasal discs in studies of waterfowl ecology, few attempts have been made to test empirically whether nasal discs have sublethal effects on the behavior or reproduction of wild, free-ranging ducks. We compared five measures of reproductive effort and found a significant effect of discs for initiation date only. Delays in nest initiation for nasal-marked females was only 2–6 d but may be important because clutch sizes generally decrease as the nesting season progresses (Rohwer 1992). Also, several studies have shown that duckling survival is lower for late-hatched broods (Orthmeyer and Ball 1990, Rotella and Ratti 1992). A possible advantage of nesting later, however, is that nests initiated to-

TABLE 2. Nesting data for nasal-marked and unmarked Mallard females at Hamiota, Manitoba and Punnichy, Saskatchewan, 1993.

			Number nested[b]		Nests per hen[c]		Days devoted[d]		Initiation[e]		Number hatched[g]	
Study area	Treatment	n[a]	No.	%	$\bar{x}$	SE	$\bar{x}$	SE	Median	IQR[f]	No.	%
Hamiota	Nasal-marked	13	13	100	2.2	0.4	27.1	3.6	126	7	5	38
	Unmarked	13	12	92	1.9	0.3	27.1	3.4	120	10	5	38
Punnichy	Nasal-marked	19	16	84	1.6	0.3	21.2	3.5	129	26	1	5
	Unmarked	26	22	85	1.5	0.2	24.8	3.4	127	13	4	15

[a] Number of females for which we collected complete nesting histories.
[b] Number of females that initiated at least one nest.
[c] Average number of nests laid by each female Mallard.
[d] Average number of days spent laying or incubating eggs.
[e] Median date first nest was initiated (Hamiota: nasal-marked $n = 21$, unmarked $n = 18$; Punnichy: nasal-marked $n = 27$, unmarked $n = 37$).
[f] IQR = Interquartile range Q1–Q3 (25–75%).
[g] Number of females that hatched eggs.

ward the end of the breeding season may tend to hatch at higher rates (Greenwood et al. 1995, Rohwer 1992).

Delays in nesting may result from an increase in preening directed toward the nasal discs, which may reduce feeding and other reproductive activities. Koob (1981) found that nasal-marked male Ruddy Ducks often interrupted other activities to scratch at their nasal saddles. McKinney and Derrickson (1979) also documented an increase in preening for nasal-marked Green-winged Teal (*A. crecca*) and speculated that nasal saddles made removing leeches from their nares more difficult.

Delays in nesting also may have occurred because of negative behavioral responses to the brightly-colored nasal discs by mates. Koob (1981) reported that a high proportion of nasal-marked male Ruddy Ducks lost their mates shortly after being marked. Male Mallards may respond negatively to colored nasal discs on typically drab females.

Several of our statistical tests failed to reject the null hypothesis of no difference between nasal-marked and unmarked birds. Power analyses revealed that the statistical power of our tests was low (<0.2). Therefore, the probability that we committed Type II error(s) is high. However, power analyses typically use the observed standardized difference between the samples as the effect size, regardless of biological significance. Thus, despite the fact that power (based on the standardized differences we observed) for our tests was low, the power for our tests would have been $>$ 0.9 to detect a large difference between our samples as defined by Cohen (1988). Conversely, we would have required very large samples ($n = 850$ for each sample) to approach power = 0.8 based on our standardized observed differences. In summary, while the statistical power of our tests based on observed differences was low, we are confident that there were not large differences between our sample groups. Nevertheless, care should be taken in interpreting these results as nasal discs having no effect on nesting Mallards.

Given that we detected only small differences between our two treatment groups, we do not suggest that nasal discs be abandoned as a technique to allow identification of individual birds. We do, however, urge investigators to examine carefully the objectives of their studies to determine if the use of nasal discs is crucial to accomplishing study goals, and be aware that discs may affect timing of first nesting attempts.

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