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EXTENT AND SEVERITY OF NASAL SADDLE ICING ON MALLARDS

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Abstract.—During unusually severe winter weather in northeastern Illinois, unprecedented icing occurred on the nasal saddles of Mallards (*Anas platyrhynchos*). Icing of nasal saddles occurred on 18 of 59 d (31%). The extent of icing ranged from 1 of 52 marked Mallards (2%) to 18 of 56 (32%) and was positively correlated with increasingly severe windchill conditions. Mallards at an exposed site experienced more icing than Mallards at protected sites. Light to medium ice accumulations may occur at windchills of −18 to −29 C, whereas ⅓ of the Mallards experienced heavy icing (200 gm +) at −30 C. Heavy ice accumulations impaired Mallards' locomotor abilities. The inferred mortality of marked Mallards during this study approached 10%, the effect of ice-related mortality on other waterfowl studies using nasal saddles remains unknown. Biologists should be aware of the potential for icing of nasal saddles on Anatidae exposed to severe cold and high winds during either late fall migration or winter at more northerly latitudes, and to unfavorable public reaction to marker icing.

EXTENSIÓN Y SEVERIDAD DE CONGELAMIENTO DE MARBETES NASALES EN *ANAS PLATYRHYNCHOS*

Sinopsis.—Durante inviernos severos en el noreste de Illinois el congelamiento de marbetes nasales puede ocurrir en patos Mallards (*Anas platyrhynchos*). Durante el 1982 la congelación de estos ocurrió en 18 de 59 d de observación (31%). Se observó hielo sobre los marbetes desde 1 de 52 individuos marcados (2%) hasta 18 de 56 (32%) lo que se corelacionó positivamente con aumento en el factor de enfriamiento por la velocidad del viento. Las aves en lugares expuestos, fueron más afectadas que aquellas de lugares protegidos. La acumulación mediana de hielo puede ocurrir a temperaturas de −18 a −29 C, mientras que ⅓ parte de las aves experimentaron congelación severa (+200 gm el hielo) a temperaturas de −30 C. La acumulación severa de hielo afecta las habilidades locomotoras de los patos. La mortalidad de aves en este estudio se aproximó al 10%.

Icing on waterfowl markers has been reviewed by Greenwood and Bair (1974), who focused primarily on captive Canada Geese (*Branta canadensis*) and, to a lesser extent, on captive Mallards (*Anas platyrhynchos*). Byers and Montgomery (1981), also working with captive Mallards, reported that hens were not adversely affected by nasal saddles. In these studies, icing of nasal saddles and neck collars (Craven 1979) were not considered serious waterfowl mortality factors.

In 1982, unusually severe winter weather and reports of nasal saddle icing prompted extensive field observations of Mallards on the Fox River in northeastern Illinois by personnel of the Max McGraw Wildlife Foundation. Behavioral observations of Mallards fitted with nasal saddles and inferences to differential mortality of birds subjected to icing during severe climatic conditions are presented. Subsequent to these field investigations, significant mortality of migrant Canada Geese from neck collar icing (Zicus et al. 1983) further underscores the seriousness of marker icing. One consequence of nasal saddle icing incidents was the negative reaction of the public to the use of waterfowl markers.

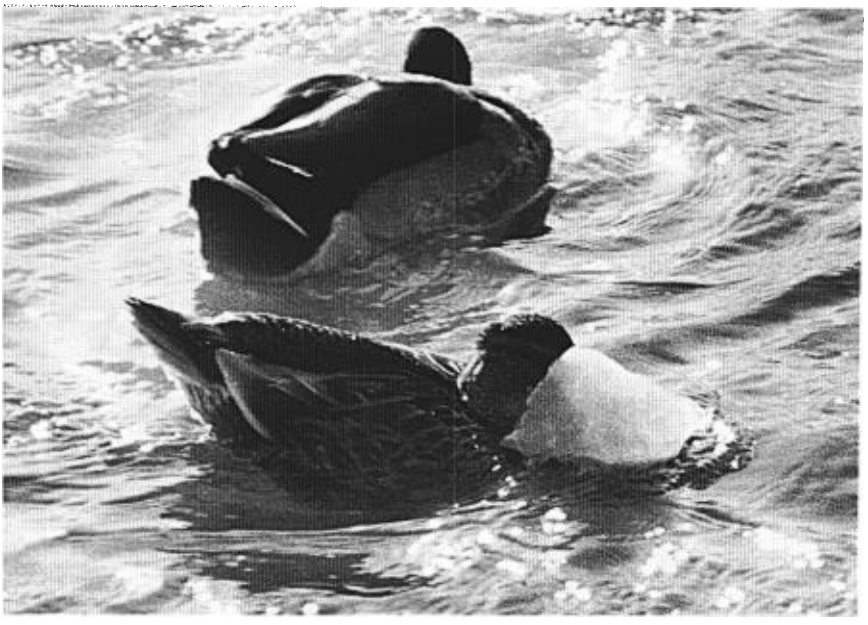

FIGURE 1. An extreme example of "heavy" nasal saddle icing. This photograph is courtesy of the Elgin Daily Courier News (Elgin, Illinois). It was printed on the front page (8 Jan. 1982) with the subtitle, "Ice Peaks on Beaks—Winter Woe Saddles Ducks."

STUDY AREA

Mallards with nasal saddles were observed at three open-water sites on a 1.5 km portion of the Fox River in northeastern Kane County, Illinois. The study area included a narrow (3–5 m) greenbelt along the river bordered by residential/urban development. River banks, buildings, and vegetation provided greater protection from high winds at two protected sites than at the exposed site. The protected sites remained ice-free throughout the winter, while water at the exposed site occasionally froze after several days of severe, subzero weather.

METHODS

A total of 200 Mallards had been fitted with large nasal saddles, as described by Greenwood (1977), during the summers of 1980 and 1981 to document age-cohort survival. Mallard numbers fluctuated from 500 to 700 during the study, as did the number of nasal-saddled Mallards (30–57) present. During extended subzero weather outlying open water froze, forcing Mallards to seek open water on the study area.

Waterfowl were observed 27 times from 5 Jan. to 11 Feb. 1982, normally at 0900 h on days when weather conditions were most severe. Observations were conducted at open-water sites, adjacent river ice, and shorelines. A small number of local citizens also conducted observations

and, in some instances, reported "iced" birds. At each site, the number of Mallards with nasal saddles and the number of nasal saddle icing incidents were reported. An icing incident was defined as any Mallard with ice accumulated on the saddle. Thickness of ice on each saddle was estimated visually: "light" ranged from 1 mm to about 6 mm, "medium" from 7 to 50 mm, and "heavy" 50+ mm (Fig. 1).

Weather data were obtained from the National Oceanic and Atmospheric Administration office at O'Hare Airport (Chicago), 55 km from the study area. Windchill was calculated at four times (0000, 0300, 0600, and 0900 h) on days when field observations were conducted, and averaged to provide a better indication of weather conditions associated with nasal saddle icing.

RESULTS AND DISCUSSION

Extent and severity of icing.—Ninety-nine nasal saddle icing incidents were observed on 18 of 27 d during the study period. A realistic estimate of the proportion of days when icing occurred for January and February would be 31% (18 of 59 d), as observations were conducted primarily on days when windchills were most severe. This proportion (31%) is considerably higher than the proportion (9%, 3 of 35 d) calculated from data presented by Greenwood and Bair (1974) for captive Mallards in North Dakota. Zicus et al. (1983) observed Canada Goose neck collar icing on three occasions during two winters in southwestern Minnesota.

During the 18 d when icing occurred, the extent of icing ranged from 2% (1 of 52 Mallards) to 32% (18 of 56 Mallards). The icing rate at the exposed site ($r = -0.560$, df = 8, $P < 0.10$) and protected sites ($r = -0.395$, df = 17, $P < 0.10$) was correlated with increasingly severe windchill conditions, corroborating Greenwood and Bair (1974), who reported that windchill is a good index of conditions conducive to marker icing. Zicus et al. (1983) also reported that strong winds, temperatures below 0 C, and snow coincided with icing of neck-collared geese.

During a 5-d period with severe windchills (7–11 Jan., average windchill of -37.6 ± 11.8 C) 39 icing incidents were recorded. Heavy ice accumulations were observed on six Mallards the first day and persisted until 11 Jan., or until the birds were captured. The actual rate of accumulation of ice was not observed. However, Zicus et al. (1983) reported that ice accumulated rapidly (within three h) on Canada Geese. Ice accumulations removed from three "heavily iced" saddled Mallards weighed 302, 199, and 198 gm. These accumulations were much greater than those reported by Greenwood and Bair (1974) for saddled captive Mallards (25 gm) and saddled captive Canada Geese (100 gm). On 11 Jan., one Mallard with a heavily iced saddle and two non-saddled Mallards were found dead. With the return of more seasonable weather (average windchill of -17.6 C) on 12 Jan., icing was not observed. On two separate occasions during this period, light and heavy ice accumulations were noted on bills of Mallards not fitted with nasal saddles.

Behavioral response of Mallards to nasal saddle icing.—Heavy ice ac-

TABLE 1. Icing incidents of nasal-saddled mallards at the exposed site vs. protected sites.

Windchill	Exposed site Iced/not iced	Days observed	Protected site Iced/not iced	Days observed	X^2	
Above −17.7 C	6/128 (4.5%)	3	8/283 (2.7%)	5	0.9	NS
−17.8 – −23.3 C	9/36 (20.0%)	1	1/87 (1.1%)	2	15.2	$P < 0.001$
−23.4 – −28.9 C	23/126 (15.4%)	3	6/150 (3.8%)	4	20.1	$P < 0.001$
−29.0 – −34.4 C	18/38 (32.1%)	1	2/51 (3.8%)	1	14.6	$P < 0.001$
−34.5 – −45.6 C	10/44 (18.5%)	1	11/181 (5.7%)	4	8.8	$P < 0.005$
Below −45.7 C		0	5/46 (9.8%)	1		
Totals	66/372 (15.1%)		33/798 (4.0%)		49.1	$P < 0.001$

cumulations on nasal saddles prevented Mallards from assuming the head-under-wing posture which allows accumulated ice to melt (Greenwood and Bair 1974). Mallards with heavy ice accumulations, despite appearing unable to hold their heads erect, could fly short distances and usually avoided capture. However, local residents and I captured five birds and removed the saddles. Presumably the Mallards' locomotor abilities were too impaired, or the birds too exhausted, to escape repeated capture attempts. Only rarely were the Mallards frozen to the ice, and they escaped capture by jerking their heads back (shearing the ice off the saddle) as they attempted flight.

Light and medium amounts of ice apparently had little effect on Mallard behavior. Such "iced" Mallards were extremely wary and unapproachable, and were occasionally observed performing precopulatory and copulatory behavior. Saddled Mallards subjected to these amounts of ice could still assume the head-under-wing posture.

Factors predisposing saddled Mallards to icing.—Observations of nasal saddle icing incidents revealed a significant difference ($\chi^2 = 49.1$, df = 4, $P < 0.001$) in the icing incidents at the exposed site (15%) vs. protected sites (4%, Table 1). Further, icing increased at a greater rate at the exposed site than at protected sites with increasingly strong winds and severe windchills ($t = 17.1$, $P < 0.05$). Mallards, attracted by food handouts from the public at the exposed site, were more vulnerable to strong winds, causing a disproportionately higher incidence of saddle icing. This discrepancy in icing rates suggests that wind speed is an important component of climatic conditions that lead to marker icing. Zicus et al. (1983) noted that Canada Geese at Rochester, Minnesota, roosting on a sheltered lake, rarely experienced marker icing (and then only a thin glaze) while geese roosting in open water in southwestern Minnesota experienced ice-related mortality.

Other factors, including physical condition, predisposed saddled Mallards to icing. Two Mallards with abnormal wing posture experienced icing repeatedly. Another Mallard, to which a saddle had been improperly applied, also experienced icing.

Public reaction to nasal saddle icing.—Petko-Seus et al. (1985) documented that the public is generally tolerant of wildlife markers. However, our experience indicates that this attitude can change dramatically—literally overnight. This is particularly true when the public perceives (either real or imagined) that the animal's welfare is jeopardized.

Nasal saddle icing evoked a wide range of emotions from local residents—from expressions of outrage directed at the "perpetrators" to sympathy for the Mallard's welfare. Publicity stemmed from the opposition of a few individuals to the use of nasal saddles on Mallards. Their letters to the editor of a local newspaper, coupled with photographs (Fig. 1), served to focus additional public and media interest on nasal saddle icing.

My responses, and those of the Max McGraw Wildlife Foundation, to questions and complaints—via telephone calls, meetings, and by letters—may have allayed most of these concerns. Moderating weather conditions may have been equally important to reducing public and media interest and complaints. However, the negative public response to nasal saddle icing has persuaded the Foundation to discontinue use of nasal saddles on Mallards wintering in northeastern Illinois.

CONCLUSIONS

Researchers should be aware that nasal saddle icing may occur as windchills approach −18 C. At windchills from −18 to −29 C, light as well as medium ice accumulations may occur, but have little effect on Mallard behavior. Icing rates at these windchills varied from 15 to 20% at the exposed site, vs. 1–4% at the more protected sites. Heavy ice accumulations occurred on two d, however, when average windchills were −21 and −26 C. At the onset of extremely severe windchills (of −30 C and below), icing rates also increased (19–32% at the exposed site vs. 4–6% at protected sites). At these windchills, approximately ⅓ of the Mallards experiencing icing were subjected to heavy ice accumulations that impaired locomotor abilities.

Nasal saddle icing occurred both more frequently and with greater ice accumulations than has been previously been reported (Greenwood and Bair 1974). Also, nasal saddle icing has not been reported as a mortality factor. During this study, one saddled Mallard died, and presumably five other Mallards captured by hand might also have succumbed to icing had the saddles not been removed. This infers that mortality due to heavy icing might well have approached 10% (six of 57 saddled Mallards).

This study demonstrated the potential for nasal saddle icing mortality, particularly for Mallards and other Anatidae exposed to severe cold and high winds during late fall migration or during winter at more northerly latitudes. Further, the effect of ice-related mortality on results of waterfowl studies using nasal saddles may be important, although such losses remain unknown.

Apart from the obvious concern for the resource, advice concerning the judicious use of neck collars (Greenwood and Bair 1974, Zicus et al. 1983) so as not to imperil their continued use as a research tool, also

applies to nasal saddles. Finally, my experience with the public and the media, and their unfavorable reaction to nasal saddle icing, underscore published advice concerning judicious use of markers.

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