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Novel rape avoidance in the Mallard.—Rape in the Mallard (*Anas platyrhynchos*) has been well described by Leuret (Ardea 49:97–158, 1961). Rape attempts are readily distinguishable by: (1) resistance on the part of the female in the form of struggling and/or escape behavior; and (2) absence of pre-copulatory displays characteristic of normal, non-forced pair bond copulations (see Barash, Science 197:788–789, 1977). Female Mallards use a variety of tactics to avoid rape, including hiding, diving under water, evasive flight and fighting with the rapists (Weidmann, Z. Tierpsychol. 13:208–271, 1956; Titman and Lowther, Can. J. Zool. 53:1270–1283, 1975; Barash 1977). I now present what I believe to be previously undocumented mechanism by which females avoid rape.

Mallards were observed for a total of 40 h along the Yahara River in Madison, Wisconsin, from 16 March–3 May 1976. The population consisted of approximately 100 partially tame birds occupying a 50 m stretch of river and bank where they were fed regularly by visitors. Censusing on 12 April showed a 54:45 sex ratio favoring males.

At 16:00 on 12 April a female was approached by 3 males. One male grabbed her at the nape and attempted mounting. Breaking free, the female ran and flapped along the water. She then flew up, circled and glided, landing on a horizontal tree limb 7 m above the water. The group of males congregated below her, exhibiting “grunt-whistle” displays accompanied by an occasional call, which was either a “slow” *raehb* or *räb räb* call. The female remained static on the limb except when giving a “decrescendo” call. For the rest of the day this type of rape avoidance behavior, perching in trees, was witnessed 3 more times. A different female was involved each time and at one point, 4 females were aligned on the same limb.

I had not witnessed this behavior prior to 12 April, although rape attempts were regularly seen. I did not observe this behavior again. However, my next observation was on 25 April when half the birds were gone, and nesting, presumably, had begun. Mallards nest in trees so the sight of a perched Mallard is not uncommon during the nesting season. Perching per se may not be new to these birds, but the context in which it is used might be.—VERNER P. BINGMAN, Dept. Zoology, Univ. Wisconsin, Madison, Wisconsin 53706. (Present address: Dept. Biology, SUNY Albany, Albany, New York 12222.) Accepted 29 July 1979.

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Sunbathing behavior of the Pied-billed Grebe.—In their review of sunbathing in grebes, Storer, Siegfried and Kinahan (Living Bird 14:45–57, 1975) state that, although sunbathing postures are widespread among species of Podicipediformes, sunbathing is unknown in Pied-billed Grebes (*Podilymbus podiceps*). Likewise, concentrations of dark pigments in the skin and feathers have not been reported for this species. Wetmore (Auk 37:221–247, 1920), however, briefly described a sunbathing posture in pied-bills. Our paper presents behavioral and morphological evidence of sunbathing in Pied-billed Grebes in Iowa.

We watched Pied-billed Grebes from 23 April–21 July 1977, from blinds at Smith’s Slough and Dewey’s Pasture, Clay Co., and from the shores of Hottes Lake, Dickinson Co. All are state-owned marshes in northwest Iowa. We used a 15–60× spotting scope or 7 × 35 binoculars to observe orientation and posture of individual pied-bills while they were between foraging dives or loafing. Orientation was recorded relative to both the direction of incident solar radiation and wind, and posture was designated as sunbathing or not sunbathing. Description of the postures came from field notes and photographs. Skin and feather pigmentation were determined from museum specimens and carcasses.

Pied-billed Grebes assumed sunbathing postures closely resembling those of the Least

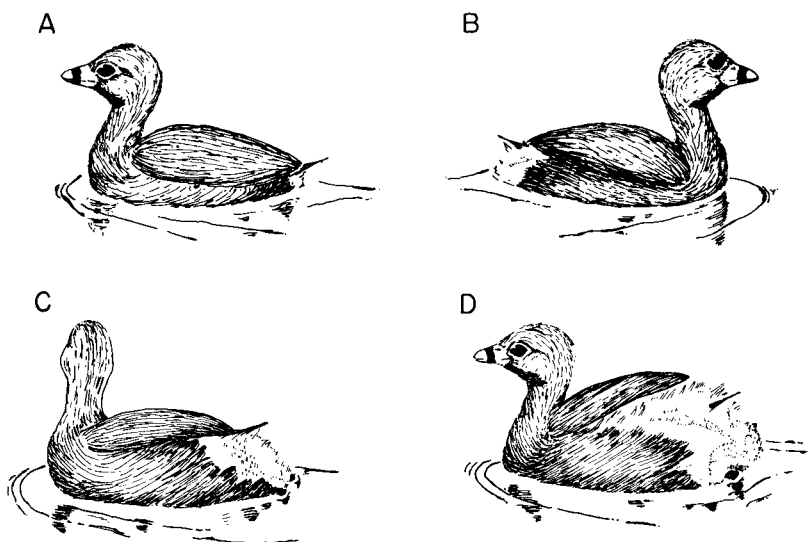


FIG. 1. A. Non-sunbathing posture of Pied-billed Grebes. B-D. Sunbathing postures of pied-bills, from least to greatest intensity.

Grebe (*Podiceps* [= *Tachybaptus*] *dominicus*) as described by Storer et al. (1975). Posturing varied in intensity and duration (Fig. 1). In the least intense display, pied-bills slightly erected their white rump feathers and undertail coverts. This behavior graded into a more intense display in which they raised the wings to a 30–45° angle above the back and exposed fluffed, silky white feathers from the axillary region along the flanks to the rump and undertail coverts. Occasionally, they would raise the backs of the legs above water level. Preening did not regularly precede or follow sunbathing.

The most intense display was maintained for several sec up to 25 min and was seen most often between foraging dives in open areas. Sunbathing bouts between dives averaged 11.1 ± 0.9 sec ($N = 21$). Storer et al. (1975) reported sunbathing bouts between foraging dives of approximately 10 sec for the Dabchick (*Tachybaptus ruficollis*). Pied-bills also sunbathe while loafing near emergent vegetation.

Adult males and females, and juveniles were seen sunbathing. Females were observed sunbathing between 103 of 107 (96%) foraging dives, but males were observed sunbathing between only 68 of 136 (50%) ($\chi^2 = 61.45$, $df = 1$, $P < 0.001$).

We obtained 231 independent observations of orientation to incident sunlight for Pied-billed Grebes displaying sunbathing postures. The birds faced away from the sun much more often than would be expected on the basis of chance ($\chi^2 = 105.28$, $df = 3$, $P < 0.001$) (Fig. 2). We also examined orientation relative to incident sunlight by pied-bills that were not in sunbathing postures, and found that their orientation was random ($\chi^2 = 5.03$, $df = 3$, $N = 182$, $P > 0.10$) (Fig. 2). Presumably, when pied-bills are in sunbathing postures they position themselves to maximize solar input.

Storer et al. (1975) found that in sunbathing Least Grebes this orientation away from the sun occurred contrary to the common avian habit of facing into the wind. We tested orien-

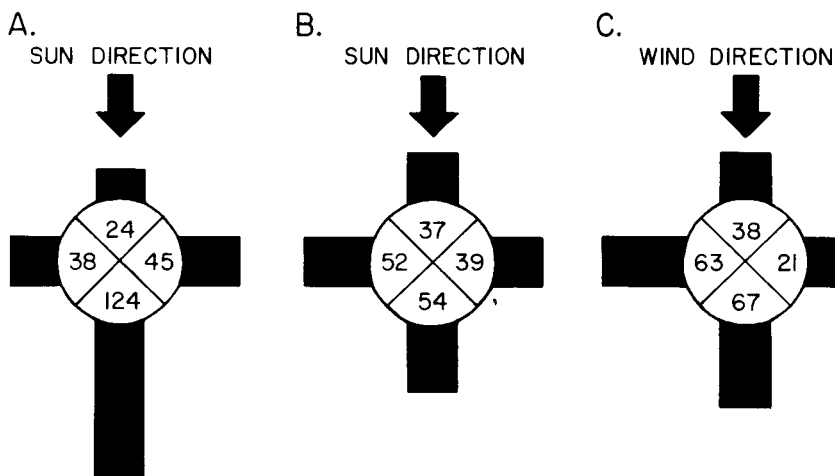


FIG. 2. Orientation frequency of Pied-billed Grebes. A. Position of sunbathing pied-bills relative to incident solar radiation. B. Position of non-sunbathing birds with respect to incident solar radiation. C. Orientation of pied-bills to wind direction. Direction of incident sunlight and wind is from the top of the circles, and the birds are facing outward from the circle.

tation of sunbathing Pied-billed Grebes to wind, and found that they faced not into the wind, but significantly away from or perpendicular to it ($\chi^2 = 29.90$, $df = 3$, $N = 184$, $P < 0.001$) (Fig. 2). The lack of random bearing relative to wind direction is probably a function of the relationship between sun and wind direction. Prevailing winds either came from the same direction as the sun or perpendicular to it, but were rarely from the opposite direction.

Pied-billed Grebes have skin and feather pigmentation resembling that described by Storer et al. (1975) for the Least Grebe. Two long patches of silky white feathers running from the axillary region to rump, where they converge around the legs and under the tail, are exposed and erected during sunbathing. Dark grey feathers of the dorsal tract run between these 2 patches to the tail. When not sunbathing, pied-bills cover most of the white feathers with their wings and long, dark scapular and flank feathers.

The posterior $\frac{1}{3}$ of the body, especially between and dorsal to the legs and around the tail, is the area most exposed to the sun during sunbathing. Feathers in the anterior $\frac{1}{3}$ of the 2 white patches are mostly white with the proximal $\frac{1}{4}$ – $\frac{1}{8}$ darkly pigmented (Fig. 3). Posterior to the convergence of these 2 patches the feathers are progressively darker grey. Under the tail and at the base of the legs the feathers have only the distal $\frac{1}{4}$ – $\frac{1}{8}$ white. The skin underlying the dark-based white feathers is much more darkly pigmented than the rest of the skin (Fig. 3). No patch of dark skin occurs on the nape as in the Least Grebe (Storer et al. 1975), although feathers in this area may be fluffed during sunbathing.

Mueller (*Z. Tierpsych.* 30:253–258, 1972) thought heat conservation an unlikely function of sunbathing in most birds. Based upon our observations of pied-bills, we agree with Storer et al. (1975) that heat conservation is the most important, if not the only function of sunbathing in grebes.

A larger surface-to-volume ratio and greater susceptibility to heat loss makes it more

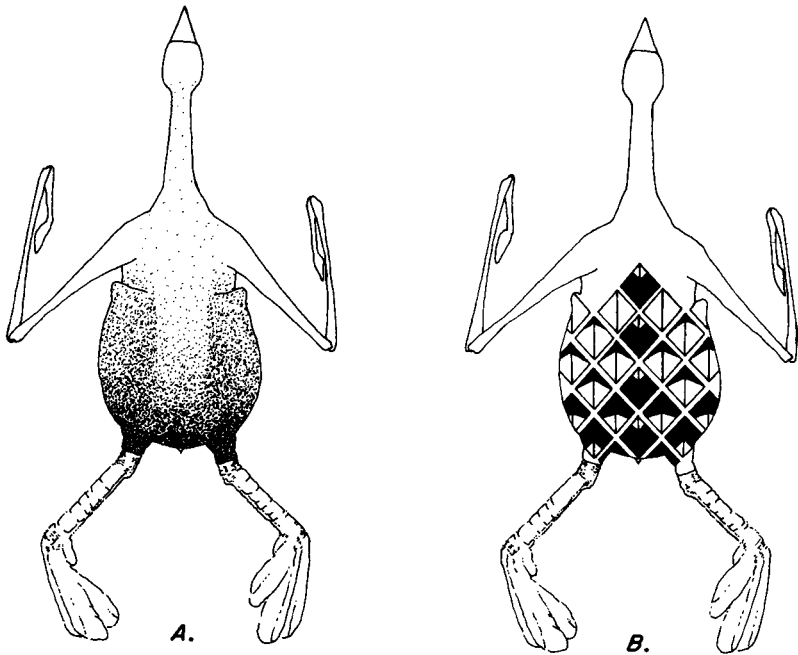


FIG. 3. Pied-billed Grebe skin (A) and feather (B) pigmentation, dorsal view. Diamonds represent individual feathers showing relative pigmentation; anterior ends of the diamonds are proximal ends of feathers. (After Storer et al. 1975.)

beneficial for a small bird to have a supplemental heat source than a large bird. Storer et al. (1975) demonstrated sunbathing in grebe species averaging less than 350 g, and in heavier montane species. Pied-billed Grebes may not need to sunbathe as much as smaller species such as the Least Grebe. This may explain why Storer et al. (1975) did not see the behavior in pied-bills when Least Grebes were sunbathing.

Storer et al. (1975) give a mean weight of 396 g for Pied-billed Grebes, but there is considerable sexual dimorphism in size in this species. Adult females range in weight between 281 and 435 g, adult males between 485 and 559 g (Handbook of North American Birds, Vol. 1, Palmer, ed., Yale Univ. Press, New Haven, Connecticut, 1962:106). This size differential may be related to the significant difference in sunbathing frequency we observed for the sexes.

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