

## NEGATIVE EFFECTS OF PATAGIAL TAGS ON RUDDY DUCKS

ROBERT B. BRUA

*Department of Biology  
University of Dayton  
Dayton, Ohio 45469-2320 USA*

**Abstract.**—Patagial tags have been used in studies to identify waterfowl individually. I evaluated the influence of patagial tags on the behavior of male and female Ruddy Ducks (*Oxyura jamaicensis*) in Manitoba, Canada. Patagial-tagged male Ruddy Ducks decreased their courtship rate and increased the amount of time spent sleeping and preening in comparison to males with leg bands only and unmarked males. Compared with unmarked females, patagial-tagged female Ruddy Ducks increased the amount of time devoted to preening. I suggest that patagial tags not be used on Ruddy Ducks or other diving ducks.

### EFFECTO NEGATIVO EN INDIVIDUOS DE *OXYURA JAMAICENSIS* DE MARCADORES EN EL PATAGIO

**Sinopsis.**—Marcadores colocados en el patagio del ala, han sido utilizados para identificar individuos de aves acuáticas. Evalué la influencia de marcadores en el patagio, en la conducta de individuos de ambos sexos de *Oxyura jamaicensis*. El trabajo se llevó a cabo en Manitoba, Canadá. Los machos con marcadores disminuyeron su tasa de cortejo e incrementaron el periodo de tiempo de acicalarse y para dormir en comparación con individuos con anillas en las patas o sin marcar. Por su parte, las hembras incrementaron el periodo de tiempo que dedicaron a acicalarse. Sugiero que no se utilicen marcadores en el patagio en aves como la descrita y otros zambullidores donde las plumas se pueden afectar. Se deben desarrollar y poner a prueba nuevas técnicas para marcar aves acuáticas.

Often it is necessary to mark individuals to determine population dynamics, mating systems, migration routes, or habitat use of a population. Various techniques, such as leg bands, dyes or paints, neck collars, radio transmitters, nasal markers, and patagial tags (Kozlik et al. 1959, Anderson 1963, MacInnes et al. 1969, Dwyer 1972, Doty and Greenwood 1974, Korschgen et al. 1984) have been used to identify waterfowl individually. However, if the marking technique affects the behavior or survival of individuals, the reliability of the data collected is questionable.

In a study of the mating system and mate choice of Ruddy Ducks (*Oxyura jamaicensis*), I needed a permanent marker that was easy to observe but did not impair the reproductive performance of individuals. Prior marking techniques for Ruddy Ducks include imping tail feathers (Tome 1987), nasal saddles (Joyner 1975, Koob 1981), and patagial tags (Hughes 1990). However, imping is not permanent, and Joyner (1975) and Koob (1981) warned against using a nasal marker for Ruddy Ducks. The apparent success of patagial tags used by Hughes (1990) on Ruddy Ducks in Great Britain led to their use in my study. However, little information exists on the behavior of avian species carrying patagial tags. Thus, my objective was to determine the influence of patagial tags on the behavior of male and female Ruddy Ducks in comparison to leg-banded-only and unmarked individuals.

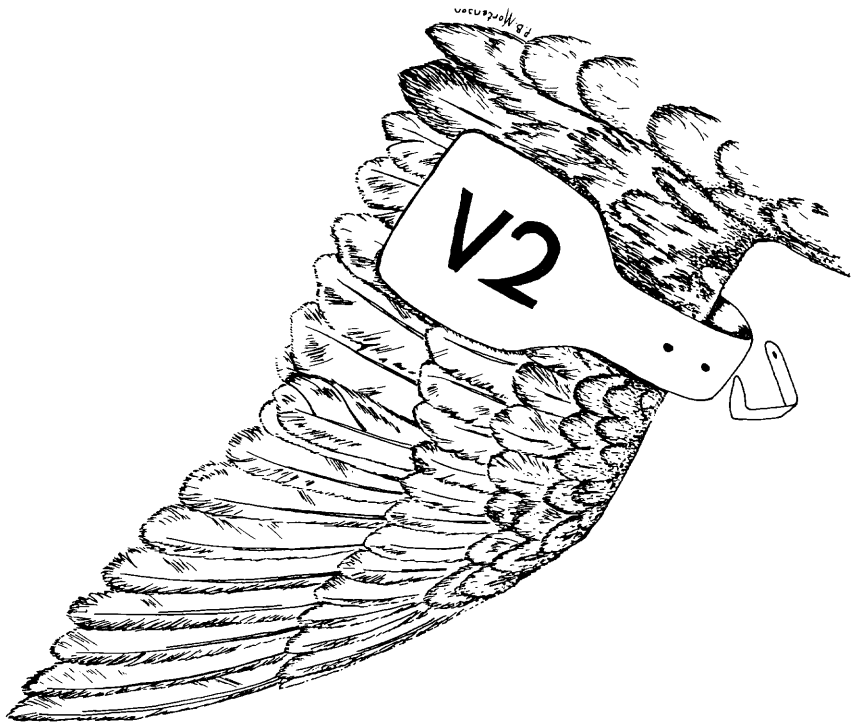


FIGURE 1. Site of patagial tag attachment on a Ruddy Duck wing. Note that the wide part of the tag normally lies over the secondary coverts, but for illustrative purposes the tag has been placed further back on the wing.

#### METHODS

This study was conducted in the prairie pothole region near Minnedosa, Manitoba, Canada ( $50^{\circ}10'N$ ,  $99^{\circ}47'W$ ) during the summer of 1995. I captured birds using decoy traps (Anderson et al. 1980) and marked males and females individually with standard United States Fish and Wildlife Service leg bands and by placing alpha-numerically labeled patagial tags, similar to those of Maddock (1989), on each wing. To attach the tag, I wrapped the narrow, upper portion of the vinyl cloth tag ( $30\text{ mm} \times 20\text{ mm}$ ) under the leading edge of each wing with the larger ( $30\text{ mm} \times 45\text{ mm}$ ) portion lying over the wing. I secured each tag with a size-3 monel metal poultry wing band (National Band and Tag, Newport, Kentucky) that pierced the patagium and locked in place. I locked the tag in place by crimping the piercing, v-shaped end of one arm over the other arm of the band, after the v-shaped end was placed through the hole on the other arm at the end of the band (Fig. 1). Each tag weighed approximately 1.2 g and measured  $60\text{ mm} \times 45\text{ mm}$  at its widest and longest points, respectively.

I observed behavior by recording continuously all courtship, aggressive, and feeding activities of focal birds during 30-min periods (Altmann 1974). Male courtship activity included Bubble displays, Flight displays, and copulations, whereas aggressive displays included Hunched Postures, Hunched Rushes, and fights (Johnsgard 1965). Female courtship included copulation and Inciting, which consists of a hunched posture with neck outstretched toward the mate and bill open (Gray 1980). Female aggression was similar to Inciting but included chasing of other birds. I recorded feeding behavior as the number of dives of focal birds. Lastly, I performed instantaneous sampling at 1-min intervals to determine the frequency of preening and sleeping during the 30-min observation period (Altmann 1974). I ended observations after the individual was out of sight for more than 5-min.

I identified leg-banded-only males using a combination of their unique cheek patch design (Koob 1981) and unique patterns cut into their tails. Patterns cut into the tails were distinguished easily and leg-banded-only males that were paired never lost a mate after receiving their treatment, nor did leg-banded-only males acquire a mate after capture and treatment. Thus, I do not believe the patterns cut into the tails of leg-banded-only males influenced their behavior. Similarly, I identified unmarked males, which were paired to patagial-tagged females, by their unique cheek patch design. I identified unmarked females, paired primarily to leg-banded-only males, by their unique cheek patch characteristics.

I obtained a total of 35.5 bird-hours of observation on 11 leg-banded-only, 16 patagial-tagged, and 11 unmarked males. The amount of observation time for leg-banded-only males was  $\bar{x} = 37.4 \pm 6.6$  (SE) min/bird; patagial-tagged males,  $\bar{x} = 70.4 \pm 10.8$  min/bird; and unmarked birds,  $\bar{x} = 54.1 \pm 12.2$  min/bird. For females, I obtained a total of 15.2 bird-hours of observation on eight patagial-tagged and nine unmarked birds. More specifically, I observed patagial-tagged females for  $\bar{x} = 76.5 \pm 15.8$  (SE) min/bird and unmarked females for  $\bar{x} = 33.4 \pm 6.4$  min/bird.

Because data were not distributed normally, I compared aspects of male behavior using a Kruskal-Wallis test. I used a Mann-Whitney *U*-test for statistical analysis of female behavior. For each sex, I originally set  $\alpha = 0.10$ , but adjusted the critical value to  $\alpha = 0.02$  for the five comparisons.

## RESULTS

I found no difference in feeding rates for the differently marked males (Table 1). However, patagial-tagged males courted less and spent more time sleeping and preening than either banded or unmarked males (Table 1). I found no difference in these behaviors between banded and unmarked males. Unmarked males performed more aggressive displays than leg-banded or patagial-tagged birds (Table 1).

I never found a nest on a wetland where I observed continuously a patagial-tagged female, even after searching the emergent vegetation for a nest several times. It is unknown how many unmarked or leg-banded-only females that did not nest, but I did find 125 Ruddy Duck nests on

TABLE 1. Results of Kruskal-Wallis tests comparing behaviors of patagial-tagged ( $n = 16$ ), leg-banded-only ( $n = 11$ ), and unmarked ( $n = 11$ ) male Ruddy Ducks. Values reported for each marker type are means  $\pm$  1 SE.

Behavior	Patagial tag	Leg band only	Unmarked	$\chi^2$	$P$
Courtship displays/min	0.28 $\pm$ 0.15A <sup>a</sup>	1.29 $\pm$ 0.38B	1.26 $\pm$ 0.45B	13.22	0.001
Aggressive displays/min	0.02 $\pm$ 0.02A	0.03 $\pm$ 0.01A	0.08 $\pm$ 0.01B	14.04	0.001
Feeds/min	0.41 $\pm$ 0.12A	0.75 $\pm$ 0.12A	0.36 $\pm$ 0.10A	4.58	0.101
Sleeping (%)	8.0 $\pm$ 2.0A	3.0 $\pm$ 1.0B	1.0 $\pm$ 1.0B	8.45	0.015
Preening (%)	15.0 $\pm$ 2.0A	5.0 $\pm$ 3.0B	4.0 $\pm$ 2.0B	12.83	0.002

<sup>a</sup> Chi-square value, corrected for ties. Mann-Whitney  $U$ -test used for multiple comparison ( $P < 0.05$ ). Values with different letters in the same row are significantly different.

the study area in 1995. Of these nests, I nest-trapped three females that were leg-banded-only from the previous year. Also, during weekly searches of the study area, in which all wetlands on the study area were visited, I never observed a patagial-tagged female with a brood. However, there were numerous unmarked females with ducklings.

I found no difference in courtship, aggression, or feeding rates and percent of time sleeping, between patagial-tagged and unmarked female Ruddy Ducks (Table 2). However, patagial-tagged females spent more time preening than unmarked females (Table 2).

#### DISCUSSION

Patagial tags on Ruddy Ducks cause significant changes in behavior and reproductive performance for each sex. Patagial-tagged male Ruddy Ducks decreased their courtship rate and increased their time spent sleeping and preening. Patagial-tagged females increased the amount of time spent preening. Although no data were reported, Hughes (1990) found no differences in behavior of patagial-tagged and untagged Ruddy Ducks in captivity. This result is in contrast to several other studies that have shown negative affects on waterfowl and other avian species. Tagged female Mallards (*Anas platyrhynchos*) experienced higher mortality (Szymczak and Ringelman 1986), and female Common Eiders (*Somateria mollissima*) changed their behavior (Anderson 1963). In other species, patagial-tagged birds had lower survival and reproductive output, and re-

TABLE 2. Results of Mann-Whitney  $U$ -tests comparing aspects of behavior of eight patagial-tagged and nine unmarked female Ruddy Ducks. Values reported for each marker type are means  $\pm$  1 SE.

Behavior	Patagial tag	Unmarked	$U$	$P$
Courtship displays/min	0.04 $\pm$ 0.02	0.01 $\pm$ 0.01	29	0.449
Aggressive displays/min	0.02 $\pm$ 0.01	0.01 $\pm$ 0.01	22	0.093
Feeds/min	0.65 $\pm$ 0.17	0.77 $\pm$ 0.16	29.5	0.531
Sleeping (%)	6.0 $\pm$ 3.0	3.0 $\pm$ 3.0	20	0.071
Preening (%)	9.0 $\pm$ 4.0	1.0 $\pm$ 0.4	5.5	0.002

turned later to their breeding grounds than untagged birds (Southern and Southern 1983, 1985; Saunders 1988; Kinkel 1989).

Patagial-tagged female Ruddy Ducks were presumably unable to nest, as I found no nests and observed no females with broods. Bustnes and Erikstad (1990) reported that patagial-tagged female Common Eiders delayed nesting and laid smaller eggs. They suggested that females were unable to accumulate the energy reserves necessary to initiate nests early and lay large eggs due to interference from patagial tags. This may explain the lack of nesting by patagial-tagged female Ruddy Ducks, which have one of the highest energetic costs of producing a clutch of eggs for any waterfowl (Alisauskas and Ankney 1994a,b).

Currently, it appears that any external marker used commonly for waterfowl, other than leg bands, alters Ruddy Duck behavior. With the recent report of the possible negative effects of nasal markers on female Mallards (Howerter et al. 1997), more research is needed on the influence of marking techniques on waterfowl behavior and reproduction.

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