

EFFECTS OF NECK COLLAR RADIOS ON FEMALE REDHEADS

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Abstract.—I fitted eight female Redheads (*Aythya americana*) with neck collar radios in April and May 1986 and monitored their subsequent behavior. Radio equipped birds preened during 55% of observations, repeatedly grasping the radio collar in their bills. Five birds broke the antenna off the radio collar, greatly reducing the radio's transmitting range. Four birds caught their lower mandible in the collar. This problem may have contributed to higher mortality of radio equipped birds. Two birds were killed by predators shortly after being released and no radio equipped birds returned to the study area in 1987. Only one bird nested in 1986. Lack of breeding and other abnormal behavior caused by this radio package make it inappropriate for studies of breeding Redheads.

EFFECTO DE RADIOTRANSMISORES DE COLLAR EN HEMBRAS DE *AYTHYA AMERICANA*

Resumen.—Se anillaron ocho hembras de *Aythya americana* con radiotransmisores de collar y se monitoreó su comportamiento subsiguiente. Las aves anilladas se acicalaron persistentemente, y en el 55% de las observaciones atraparon el radiotransmisor con su pico. Cinco aves rompieron las antenas del radiotransmisor, reduciendo en gran medida el alcance de la transmisión. A cuatro se le enganchó la mandíbula inferior en el collar. Este problema pudo haber contribuido a la alta mortalidad de aves equipadas con radiotransmisores. Dos aves fueron muertas por depredadores poco después de ser liberadas; ningún individuo equipado con radiotransmisor regresó al área de estudio en el 1987. Solamente un individuo anidó en el 1986. El hecho de que los animales experimentales no hayan podido reproducirse unido al comportamiento anormal de estos, causado por el equipo de radiotransmisores, hacen el equipo inapropiado para estudiar la reproducción del ave.

Attempts to develop an effective radio package for diving ducks have met with limited success. Back mounted radios cause excessive preening behavior and extreme weight loss in Canvasbacks (*Aythya valisineria*) (Perry 1981). Small radios mounted on nasal saddles have limited range and operating life and may interfere with benthic feeding and cause damage to the bill (Korschgen et al. 1984, Perry 1981). Implanted radios have less effect on behavior, but are also limited in range because they must transmit through the body of the bird (Korschgen et al. 1984). Recently, a neck collar radio was developed for Wood Ducks (*Aix sponsa*) and other waterfowl species (Montgomery 1985). I selected this package for a study of parasitic egg laying in Redheads (*Aythya americana*) because it had greater transmitting range than implanted radios (see below) and had been used successfully on Redheads (K. Kenow, U.S. Fish and Wildl. Serv., pers. comm.) In this paper, I report on some effects of neck collar radios on female Redheads.

METHODS

Female Redheads were captured in decoy traps (Anderson et al. 1980) and fitted with neck collar radios (Midwest Telemetry, 1011 W. Vine, Champaign, IL) between 25 Apr. and 11 May 1986. The radio package weighed 11 g and had a two stage transmitter and 3 V battery attached to the front of a vinyl coated fabric collar (Fig. 1, Montgomery 1985). A 22 cm twisted 3-stranded stainless steel antenna covered in shrink tubing extended backwards alongside the neck and over the back of the bird when the collar was in the proper position.

Fitting the radio involved simply slipping the collar over the bird's head and working it under the feathers at the base of the neck. The collar's conical shape (Fig. 1) was intended to prevent the radio from sliding up from this position. Each bird was also fitted with a PVC nasal saddle for visual identification (Doty and Greenwood 1974).

I located radio equipped birds using a 164 MHz scanning receiver (Telonics, Inc., Mesa, AZ) and a 4-element Yagi antenna mounted 1.5 m above the cab of a pickup truck. I stopped equipping new birds with radios as it became clear that radioed birds were not breeding, but I continued to monitor effects of the radio package. Visual observations of up to 30 min were made whenever possible during daily tracking efforts between 25 Apr. and 4 Jun. During each observation, I recorded activity (resting, feeding, or preening), social status, any abnormal behavior, and any evidence of parasitic egg laying or nesting behavior.

The study area is located near Minnedosa, Manitoba, and is characterized by a high density of small wetlands (26.3/km², Stoult 1982) and an extensive network of gravel roads. This landscape provided an opportunity to make visual observations at close range that were not possible in other studies (K. Kenow, U.S. Fish and Wildl. Serv., pers. comm.; Montgomery 1985) using this radio package.

RESULTS AND DISCUSSION

Seven adult Redhead females and one yearling female were fitted with neck collar radios. The adults weighed from 1015 to 1160 g and the yearling weighed 960 g. All birds flew away immediately after being released.

Transmitting range of the neck collar radios (1.0–1.5 km) was substantially better than the range of an abdominally implanted radio (0.3–0.5 km) I tested in 1985 or the range reported by Korschgen et al. (1984) for implanted radios (0.4–0.6 km).

Table 1 summarizes observations made on individual birds. During 55% of observations ($n = 40$) in which radio equipped birds could be watched for at least 1 min, the bird was observed to persistently grab at the collar and antenna with the bill. This persistent preening behavior was recorded for all five birds which were observed four or more times (Table 1) and for three birds (#449, #472, & #722) until shortly before they removed their antennas (21, 25, and 18 d respectively after being

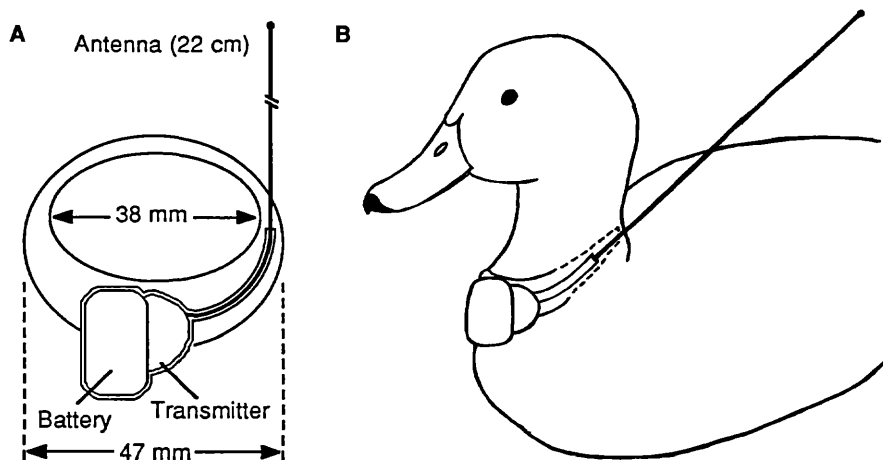


FIGURE 1. A. Schematic diagram of radio package (top-front view). B. Radio in position on bird. Most of collar is out of sight under the bird's plumage.

radioed). In other studies, Wood Ducks and Redheads with neck collar radios and Wood Ducks, Mallards (*Anas platyrhynchos*), and African Black Ducks (*A. sparsa*) with breast mounted radios also spent more time preening than birds without radios (Gilmer et al. 1974, Montgomery 1985, Siegfried et al. 1977).

I observed four birds with their lower mandible lodged in the neck collar. On four occasions I observed a bird's bill become lodged during apparent efforts to remove the collar. In each case, the bird responded by thrashing violently in the water until freeing its bill, usually within a few minutes. However, one bird (#594) had its lower mandible lodged under the collar continuously during each of three observations in a four day period. On three occasions, this bird was also observed to fly with its bill stuck in the collar. Thus, movement documented by telemetry locations is not a guarantee that a bird has adjusted to the radio and is behaving normally.

Predation risk may be greatly increased among birds preoccupied with preening or with their bill lodged in the collar. Two birds were killed by raptors within 7 d after being equipped with a radio. Neck collar radios may also cause other mortality risks. No radio equipped birds were seen on the study area in 1987, whereas at least 5 of 10 decoy trapped birds without radios returned ($G_{adj} = 5.35$, $df = 1$, $P = 0.02$). In another study, a Canvasback with its lower mandible stuck in a neck collar radio drowned (Montgomery 1985). Modifications in the height or circumference of the collar might prevent a bird from getting its bill inside the collar and might thereby reduce mortality risks. With bird in hand, the collar fit well against the base of the bird's neck but it could easily be moved from this position by pulling upwards, leaving plenty of room for the bill to become lodged inside the collar.

TABLE 1. Summary of observations made and effects of neck collar radios on Redhead females. Many visual observations were of short duration and thus unlikely to include some of the behaviors or situations listed.

	Bird									
	449	472	572	594	621	722	746	792		
Date radio-collared	30 Apr.	29 Apr.	8 May	30 Apr.	29 Apr.	6 May	11 May	25 Apr.		
Min. no. days on study area	49	81	3	80	65	23	1	1		
No. telemetry locations	13	29	4	10	15	19	1	4		
No. visual observations	9	19	2	6	2	17	0	4		
Persistent preening ^a	1	11	1	1		6		2		
Bill caught in collar ^a		1	1	3				1		
Killed by predator ^b			3-7							<1
Removed antenna ^b	22-28	34-36		<25	<32	19-23				
Observed w/o drake ^a	1	9	2	5						
Hide in vegetation ^a	1	6	1	2						

^a Number of observations during which the behavior or situation was recorded.

^b Number of days after bird was equipped with radio when the event occurred.

Another problem in my study was that all five birds that remained alive and on the study area for ≥ 23 d broke the antenna off their collar between 20 and 36 d after being equipped with a radio. This reduced the transmitting range of the radios to 100 m or less. A collar that was retrieved from bird #621 had only the 3 cm of antenna that was attached to the collar remaining. Although a heavier gauge antenna and/or a sleeve of PVC tubing at the base of the antenna might prolong the effective life of the radio, this problem is an indication of the amount of time these birds spent pulling at the antenna and collar. Nonetheless, even after 65 d, bird #621 showed no unusual feather wear or skin irritation as has been observed with other radio packages (Greenwood and Sargeant 1973).

Redhead females are nearly always with their mate during April and May at Minnedosa (98% of sightings, $n = 679$, unpublished data), but four birds with radios were observed without drakes (23% of all observations in April and May, $n = 56$). Two of these birds were again seen with drakes after being alone for 1 d (#449) and 10 d (#472). One bird (#572) was killed after at least 2 d alone and one bird (#594) was alone for 6 d, but was not sighted again until 49 d after being radioed and was then without a drake. These same four birds were found hiding in the emergent vegetation along wetland edges when they were without a drake. One bird (#472) was hidden in the emergent vegetation on one wetland each of six times it was located during a 7 d period. I flushed this bird from emergent vegetation twice during this period after which she swam low in the water back into the emergents when I left the area. One lone female (#572) was aggressively attacked by a pair of Canvasbacks when her bill became caught in the collar.

Only one radio equipped bird (#621) nested, whereas at least 14 of 24 decoy trapped adults without radios nested ($G_{\text{adj}} = 4.27$, $df = 1$, $P = 0.04$, unpublished data from 1986 and 1987). Moreover, bird #621 initiated her nest 32 d after being equipped with a radio and only after she had removed the antenna. Another bird (#722) may have laid a parasitic egg at each of two nest sites where she was observed interacting with Canvasback females. However, this bird appeared to become more agitated by the collar as time went on and joined a post-breeding flock of male diving ducks 20 d after being equipped with a radio.

K. Kenow (U.S. Fish and Wildl. Serv., pers. comm.) also found that decoy trapped Redheads rarely nested after being fitted with neck collar radios. In that study, however, decoy trapped birds tended to be in poorer condition than randomly collected birds. There was no indication of such a trapping bias in my study. Decoy trapped females in my study weighed as much ($\bar{x} = 1088$ g, $SE = 17$, $n = 17$) as prebreeding Redhead females collected in other studies (K. Kenow, U.S. Fish and Wildl. Serv., pers. comm., $\bar{x} = 1077$ g; Noyes and Jarvis 1985, $\bar{x} = 1062$ g, $SE = 22$, $n = 15$). Neck collar radios may be accepted more readily when used on birds that are already nesting. In Kenow's study, birds trapped late in incubation continued with their nesting attempt and accompanied their broods after being equipped with a radio.

CONCLUSION

The results of this and other studies indicate that diving ducks are very sensitive to the presence of externally mounted radios. Although time budget data were not collected in this study, the behavior of radio equipped birds was dramatically and obviously altered. These birds seemed to be preoccupied with getting the collar off, spending a large amount of time preening and tugging at the collar. In addition, most radio equipped birds made no attempt at nesting. Lack of breeding, other abnormal behavior, and increased mortality caused by neck collar radios make them unsuitable for most studies of breeding Redheads.

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