was subsequently found nesting with a new mate in later years, but none of their original mates was observed again. The percentage of intact pairs I recovered is conservative, because I did relatively little fieldwork during 1974 and 1976, none during 1973, 1975, or after 1979, and because some pairs may have nested in subsequent years in places other than nest boxes or away from the study areas. I have one record of a Black-bellied Whistling Duck nesting about 9.2 km from its nest of the previous year. Therefore, it is possible that other pairs nested within, or perhaps beyond, this distance from the nest box where they were banded.

The reasons for mate changes by waterfowl that form long-term pair bonds are unknown. Cooke et al. (1981) reported that at least five nesting Snow Geese (*Chen caerulescens*) had changed mates although their mates from the previous year were still alive. These authors cited several studies suggesting that "divorce" among birds with long-term pair bonds is most common following a season of reduced reproductive success. Both pairs of whistling ducks, however, had successfully nested before obtaining new mates.

These observations are the only mate changes reported for whistling ducks of which I am aware. I am indebted to the Welder Wildlife Foundation for financial support, to the late Clarence Cottam for assistance with fieldwork during 1971–1972, and to Eric Bolen, Michael Conroy, Thomas Dwyer, Kenneth Reinecke, and Jim Saunders for reviewing this manuscript.

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Dump Nesting in the Wood Duck Traced by Tetracycline

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Tetracyclines have been used to mark the bones and teeth of coyotes (*Canis latrans*, Linhart and Kennelly 1967), rodents (Crier 1970), and even the scales of salmonids (Weber and Ridgway 1962). Such marking is based on the property of this group of antibiotics to chelate with calcium ions. Calcium deposits containing chelated tetracycline produce a golden-yellow fluorescence when exposed to wave ultraviolet light.

Alliston and Richmond (unpubl. research) investigated the use of tetracyclines as a possible egg-marking technique for the study of the parasitic egg-laying behavior of the Redhead (*Aythya americana*). Experiments performed with White Leghorn Chickens (*Gallus gallus*) and Mallards (domestic Mallards and Pekin Ducks, *Anas platyrhynchos*) indicated that an intraperitoneal injection of the tetracycline declomycin (demethylchlortetracycline hydrochloride) at a rate of 100 mg per kilogram of body weight would consistently mark all eggs laid by these females for up to one month and longer in many instances. Unfortunately, further tests indicated that the ability of the labeled eggs to fluoresce decreased rapidly with exposure to sunlight, thus precluding the use of this technique with ground-nesting waterfowl. The technique seemed ideal, however, for investigating the dump-nesting habit of the cavity-nesting Wood Duck (*Aix sponsa*). This paper reports the experimental use of this marking technique during a study of nesting Wood Ducks within a 250-ha green-tree impoundment at the Montezuma National Wildlife Refuge in central New York (Haramis 1975).

We induced two female Wood Ducks to desert their nests by trapping them in nest boxes during their laying period. The nests of these females were separated by 1.2 km, and each was adjacent to active as well as unused nest boxes. The two females were

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trapped, injected with declomycin, and released on 19 and 20 April 1974, respectively. The declomycin was prepared by crushing tablets with mortar and pestle and forming a suspension in distilled water at a concentration of 100 mg per cc. Because our field records indicated that female Wood Ducks averaged about 560 g in weight (Haramis 1975: 152), each was injected with 50 mg of declomycin (0.5 cc injection). We found it necessary to mix the suspension thoroughly before each injection.

Female 1's nest contained 4 eggs and female 2's contained 6 eggs when they were deserted. Because Wood Ducks are known to lay at a rate of one egg per day (Leopold 1951) and have an average clutch size of about 12 eggs (McLaughlin and Grice 1952), it was likely that each female would deposit the remainder of her clutch within a week after injection. At that time, we examined all nest boxes for the presence of marked eggs with the use of a portable ultraviolet light.

No marked eggs were found near the vicinity of female 1's nest. This was not surprising, because an abundance of naturally occurring tree-cavity nest sites was available on the area and female 1 could have dump nested there. We made no attempt, however, to locate and search tree cavities for marked eggs. In three nest boxes adjacent to female 2's nest we found a total of six marked eggs; all had been deposited in active Wood Duck nests. Five of the eggs were deposited in two nests during early incubation: the first estimated at 4 days and the second at 10 days into incubation. A single egg was deposited in a nest containing eight unincubated eggs. Vacant nest boxes were available in the immediate vicinity, but these were not used for dump nesting. Subsequent checks of nest boxes revealed neither other marked eggs nor renesting by either injected female.

The response of female 2 supports the hypothesis posed by Leopold (1951: 213) that dump nesting by Wood Ducks can be triggered by nest predation during the laying phase of the nesting cycle. The selection of active nests for dump nesting, instead of unused nest boxes, is also significant. It suggests that dump nesting is not purely a random process, but is a selective one that provides ultimately some contribution to production. Dump nesting has been observed to contribute substantially to Wood Duck production in several studies (Grice and Rogers 1965, Morse and Wight 1969, Clawson et al. 1979).

The results of our experiments indicate that tetracycline declomycin, when given intraperitoneally and at relatively low dosage, works safely and effectively to mark the eggshells of laying fowl. We suggest that 100 mg/kg may be used as a rule-of-thumb dosage with other species but recommend that dose levels be evaluated under specific conditions for each species before applying the technique in a field experiment. In general, dosage should not exceed that suggested for medical treatment, and we recommend that a veterinarian be consulted for guidelines. In addition, we do not recommend that tetracycline be given orally. Our preliminary experiments produced inconsistent results with this method, and we suspect that the tetracycline may have chelated with food or grit in the digestive tract.

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