SOME VIEWS ON EXOTIC WATERFOWL

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INTRODUCTIONS of foreign species may be poor substitutes for ill-conceived or inadequate management of native game animals. Failure to meet the problems confronting endemic game populations must not be masked by furtive promise of future "successes" with exotic species.

The history of North America has fortunately not included serious attempts to establish wild populations of exotic waterfowl. Instead, gallinaceous birds were foremost in "experiments" with introductions. Now, however, the continuing enthusiasm and search for exotic sporting birds has indeed spread to waterfowl. Weller (1969) has thoughtfully reviewed the potential hazards that exotic waterfowl might bring to this continent. The spectre of direct interspecific competition between native and exotic species was among the prime considerations.

The regional focus for waterfowl introductions seems to lie mainly in the southeastern United States. This region, as much as any, is already well-stocked with an exotic biota of redoubtable proportions: nutria (*Myocastor coypus*), water hyacinth (*Eichornia crassipes*), the introduced fire ant (*Solenopsis saevissima richteri*), and, more recently, the walking catfish (*Clarias batrachus*) are compelling and instructive examples. The waterfowl taxa thought to make suitable additions include diving (Aythyini), puddling (Anatini), and perching (Cairinini) species. Within these groups are some species, most notably the perching ducks, which nest in natural tree cavities, and it is to the hole-nesting types that particular attention is drawn in this paper. Much concern has recently been expressed, for example, with the specialized habitat of the North American Wood Duck (*Aix sponsa*) by Jahn, Bellrose et al. (*in* Trefethen, 1966).

Wood Duck and Black-bellied Tree Duck.—The Wood Duck is a hole-nester naturally established in much of North America including the wooded portions of eastern Texas (Figure 1A). Recently, however, this species has been discovered nesting in southern Texas in a region broadly coincident with the northern breeding range of Black-bellied Tree Duck (*Dendrocygna autumnalis*) (Bolen and Cottam, 1967). This contact is apparently of recent origin and represents a range expansion for each species. Some measure of interspecific competition, although clearly speculative, already seems evident in this new, but natural, partial sympatry. Mixed clutches of Wood Duck and Black-bellied Tree Duck eggs have been recorded on at least two occasions in Live Oak County, Texas, (Bolen and Cain, 1968; Labuda, 1969). Male and female Black-bellied Tree Ducks alternately share incubation duties (Bolen, 1971), yet

FIG. 1. Range maps for (A) Wood Duck, (B) Black-bellied Tree Duck, and (C) Muscovy Duck. Wood Duck map adopted from Trefethen (1966), others from Delacour (1954; 1959). Arrows note direction of dispersal along the Gulf Coast; barriers are shown where there is presumably some environmental resistance to further dispersal. Note that Wood Duck range is apparently limited as it approaches semi-tropical regions whereas the Black-bellied Tree Duck range seems limited in the opposite direction by the advent of temperate areas. However, wild Muscovy Ducks introduced in the southeastern United States would instead be *approaching* favorable locales without an intervening barrier as they spread along the Gulf Coast.

the Wood Duck hens incubated the mixed clutches in both instances. One might have otherwise suspected that a Wood Duck hen, incubating alone, would have fared poorly in whatever amount of direct competition actually took place although there have been occasions when two Wood Duck hens simultaneously incubated a single set of eggs (cf. Fuller and Bolen, 1963). It is nonetheless surprising to find that Wood Duck hens dominated Black-bellied Tree Ducks at nest sites as they apparently did in the instances reported above.

Hence, there is now a biological interface in southern Texas where two native species sometimes meet and seek similar nesting sites. The contact is currently of small proportions, yet it seems that the Wood Duck may dominate a nesting site when tree ducks are also present. Presumably, the Wood Duck represents one of a variety of possible limitations to further range expansion of the Black-bellied Tree Duck into southeastern Texas. If so, this barrier is certainly a natural phenomenon and remains only of passing academic interest.

Muscovy Duck and Black-bellied Tree Duck.—We can now consider the impact that one or more additional hole-nesting species might bring to an area already served by two species with similar nesting requirements. It is well to emphasize that one of the exotic species under consideration is the Muscovy Duck (*Cairina moschata*), a tribal relative of the Wood Duck. Here again, there are limited observational data available to assess the behavior of Muscovy Ducks with Black-bellied Tree Ducks in southern Texas.

Throughout much of Central and South America the Black-bellied Tree Duck is sympatric with the Muscovy. There is little to suggest that interspecific competition in this extensive range is anything else but minimal. One may assume a priori that niche segregation in these species is well defined where they have long co-existed. Haverschmidt (1947), for example, noted Muscovy Ducks perched with Black-bellied Tree Ducks (here, the southern race *D. a. discolor*, however) in Surinam although this, in itself, is not evidence that competition has been entirely precluded in the tropical regions of sympatry. However, at the periphery (in Texas, the northern edge) of the tree duck's range (Figure 1B), one might reasonably assume that (a) environmental stresses on the tree ducks are greater than elsewhere and (b) that in the usual absence of other cavity-nesting waterfowl, the Black-bellied Tree Duck might adequately fill this niche without difficulty.

The evidence already presented, although scant, suggests that the Black-bellied Tree Duck is seemingly a poor competitor with the Wood Duck. However, the Wood Duck is a species of temperate environments and only infrequently meets with the tropically-adapted Black-bellied Tree Duck. A projection of these events with Muscovy Ducks, however, is markedly dissimilar. In this case, Muscovy Ducks introduced in the southeastern United States may well move south into the breeding area of the tree duck and would

not be confronted with climatic adversity. Rather, Muscovy Ducks following the Gulf Coast southward would be moving directly into environmental conditions presumably of steadily increasing favorability (i.e. towards their native range, Figure 1C).

How then might we expect the northern Black-bellied Tree Duck population to fare if they should meet transplanted Muscovy Ducks on a common breeding ground in southern Texas? (One could well ask the same question regarding Wood Ducks and Muscovy Ducks in eastern Texas!). The observations now at hand suggest that Muscovy Ducks would dominate nest sites where tree ducks also attempt to nest. My records stem from Live Oak and San Patricio Counties, Texas, where feral Muscovy Ducks sometimes roam lake shores with Black-bellied Tree Ducks. The following nest histories, although necessarily abbreviated here, seem pertinent when considering potential interspecific competition:

1. A nest containing eight Black-bellied Tree Duck and four Muscovy eggs was incubated solely by the Muscovy hen.
2. A compound or "dump" nest containing the eggs of both species was intentionally robbed of, first, two Muscovy eggs and then eight additional Muscovy eggs, and finally, another six Muscovy eggs. Despite these "setbacks," a Muscovy hen assumed incubation of the entire clutch.
3. In still another nest, a Muscovy hen unsuccessfully incubated a clutch that contained tree duck eggs.
4. Finally, a Muscovy hen successfully invaded and broke up a Black-bellied Tree Duck nest already under incubation by tree ducks.

It seems clear that contact with Muscovy Ducks is not to the advantage of the Black-bellied Tree Ducks nesting in southern Texas. One can only speculate with distress as to the circumstances that might occur if Muscovy Ducks and other cavity-nesting exotics are placed into the environment now marking the northern periphery of the Black-bellied Tree Duck's range in the United States. The words of Delacour (1959:130) seem fully appropriate: "Wild Muscovy Ducks do well on pond and lakes, but the males are dangerous to other birds, mating with nearly all species and killing weaker birds. They should be isolated." Ornithologist and wildfowler alike should take ample heed of the potential problems posed by introductions of exotic waterfowl.

ACKNOWLEDGMENTS

Early drafts of this paper benefited from the reviews of Clarence Cottam, Harvey Nelson, Frank Bellrose, Malcolm Coulter, Forest Lee, Howard Mendall, Raymond Owen, Fred Gilbert, Sanford Schemnitz, and Kent Rylander. I am indebted to all for their helpful comments.

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CORRIGENDA

Volume 83

Page 5, line 14 should read, "—96° 60′ W, lat. 17° 20′ E. . . . ."
Page 7, Figure 1. The figure designations are transposed.
Page 10, Table 2. The % B.A. of *Quercus laurina* should read 0.7.