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First documented case of overwater nesting by Mottled Ducks (*Anas fulvigula*)Elizabeth S. Bonczek^{1*} and Kevin M. Ringelman¹

ABSTRACT—The Mottled Duck (*Anas fulvigula*) is a range-restricted species endemic to the western Gulf Coast states and peninsular Florida. As a year-round resident, it relies on coastal marsh and nearby upland habitat during the breeding season. All previous breeding research on Mottled Ducks has observed them nesting in upland habitat such as prairie, rice fields, pastures, levees, dredge-spoil islands, or dry marsh. Here, we report on the first documented cases of overwater nesting for this species. We located 2 transmitter-marked Mottled Ducks nesting in freshwater marsh on an elevated platform constructed of cutgrass, with a water depth >10 cm surrounding the nest. Existing conservation and management plans for nesting Mottled Ducks emphasize protection of upland habitat, but our results suggest that broadening the scope of habitat types assumed to be suitable for nesting Mottled Ducks may be warranted. Received 12 July 2018. Accepted 20 October 2018.

Key words: breeding ecology, coastal marsh, Gulf Coast, Louisiana, waterfowl

Primer caso documentado de anidación sobre el agua del pato *Anas fulvigula*

RESUMEN (Spanish)—El pato *Anas fulvigula* es una especie de rango restringido, endémica a los estados occidentales de la costa del Golfo y la Florida peninsular. Como residente todo el año, depende de vegetación halófila costera y hábitats adyacentes de tierra firme durante la temporada reproductiva. Todas las investigaciones previas sobre este pato le han observado anidando en hábitats de tierra firme como praderas, arrozales, pasturas, diques, islas de sedimentos de dragados o vegetación seca de pantano. Aquí reportamos los primeros casos documentados de anidación sobre el agua en esta especie. Localizamos dos patos que portaban transmisores en vegetación halófila de agua dulce en una plataforma construida con pasto acuático, con una profundidad de agua >10 cm rodeando el nido. Los planes existentes de conservación y manejo de este pato enfatizan la protección del hábitat de tierra firme, aunque nuestros resultados sugieren que podría justificarse ampliar su enfoque a los tipos de hábitat que se estiman disponibles para la anidación de *A. fulvigula*.

Palabras clave: aves acuáticas, costa del Golfo, ecología reproductiva, Luisiana, vegetación halófila costera

The Mottled Duck (*Anas fulvigula*) is a nonmigratory species of waterfowl endemic to the southern United States and northern Mexico.

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Its native range spans the Gulf Coast, with a western population found from the Laguna Madre of Mexico through Alabama (*A. f. maculosa*), and a genetically (McCracken et al. 2001) and behaviorally (Varner et al. 2013) distinct eastern population found in peninsular Florida (*A. f. fulvigula*; Baldassarre 2014). In addition to these native populations, between 1975 and 1982 waterfowl managers translocated >1,200 Mottled Ducks from across their range to establish the species in the Ashepoo, Combahee, and Edisto Basin of South Carolina for hunting opportunity. Currently, these introduced birds breed across coastal South Carolina and Altamaha Wildlife Management Area in Georgia (Weng 2006).

Aerial breeding population surveys have shown that the eastern population of Florida Mottled Ducks may be increasing slightly (Florida Fish and Wildlife Conservation Commission 2011). However, there is some concern this increase may be the result of increasing number of feral Mallards and hybrids of the 2 species rather than any actual increase in Mottled Ducks (R. Bielefeld, pers. comm.). Western Gulf Coast Mottled Duck populations have declined over the past 40 yr (Wilson 2007), and the 2018 Louisiana breeding survey was the lowest on record (Louisiana Department of Wildlife and Fisheries, 2018, unpubl. data). Johnson (2009) estimated the population growth rate for Western Gulf Coast Mottled Ducks using band-recovery data and found that the growth rate was <1 for both sexes, indicating a downward trend in population numbers consistent with the range-wide breeding survey. The underlying cause of the decline is unknown; however, survival rates for the western population generally mirror those of the eastern population, suggesting that the decline in Western Gulf Coast Mottled Ducks is related to recruitment (Wilson 2007). By understanding the type of habitat that Mottled Ducks prefer during the nesting season and how habitat influences recruitment, managers may be able to more effectively

target conservation actions to benefit declining Mottled Duck populations.

Previous research on nesting Mottled Ducks has been limited, both in terms of sample size and geographic coverage, thus nesting ecology remains a high-priority information need for this species (Wilson 2007). In southwest Louisiana, Davis (2012) found that female Mottled Ducks moved into agricultural areas during the breeding season, where they preferred idle fields and permanent pasture for nesting (Durham and Afton 2003). In the Mississippi and Atchafalaya river deltas, Mottled Ducks typically nested in herbaceous vegetation on dredge spoil islands, and rarely on dry land embedded in marshy areas (Holbrook et al. 2000, Walters et al. 2001). Along coastal Texas and Louisiana in the Chenier Plain, Mottled Ducks have been shown to nest on well-drained cordgrass ridges, and no nests have been found in permanently wet areas (Baker 1983, Stutzenbaker 1998). Unlike the Western Gulf Coast Mottled Duck, Varner et al. (2013) found that the Florida Mottled Duck nested in human-dominated habitats such as neighborhoods, golf courses, parks, and commercial properties, as well as agricultural areas, prairie, and dry marsh. In South Carolina, despite searching upland areas, all Mottled Duck nests were found in managed tidal impoundments or on impoundment levees, with the majority of nests found on islands of emergent vegetation within wetlands (Shipes 2014).

Methods

We initiated a study examining the breeding ecology of Western Gulf Coast Mottled Ducks during summer 2017. We captured adult female Mottled Ducks from airboats at night by hand when the birds were molting and unable to fly. Captures took place on Rockefeller Wildlife Refuge in conjunction with annual Louisiana Department of Wildlife and Fisheries banding efforts. On 21 and 22 August 2017, we marked 65 individuals with 21 g Ecotone GPS-GSM Saker-L transmitters (federal bird banding permit 06669). We attached the transmitters in a Dwyer style configuration (Dwyer 1972) using Conrad-Jarvis ¼-inch black nylon automotive elastic with neoprene elastomer and tightened until the tip of the thumb fit under the unit. Our procedures were

approved by Louisiana State University's Institutional Animal Care and Use Committee under permit A2016-27.

Transmitters were set to log GPS coordinates every 2 h during daylight and were monitored throughout the year. Once a female logged a point in the same location for 10 consecutive days, we assumed she was nesting and searched the area on foot to locate the nest. At the initial nest visit we collected information on clutch size, incubation stage determined by candling (Weller 1956), and habitat metrics such as vegetation height, dominant vegetation composition, and Robel pole readings taken from each cardinal direction as a measure of vegetation density (Robel et al. 1970). Once the GPS data showed that the nest either hatched or failed, we returned to the nest to collect a second set of the same habitat metrics and record the final fate of the nest.

Observations

At the start of the 2018 breeding season, 35 individuals out of the original 65 marked were alive and transmitting data. Between 20 March and 10 July 2018, we observed 6 nesting attempts by marked females, including 2 nests that were constructed over water. Both of these nests were located in freshwater marsh and were built using giant cutgrass (*Zizaniopsis miliacea*). We located the first nest (Fig. 1, 2) on 11 April in a cattail (*Typha* spp.) dominated marsh also containing giant cutgrass and bull tongue (*Sagittaria lancifolia*). It was located 230 m from the nearest land, which was a levee. This nest contained 7 eggs incubated to 5 d at the time of discovery, putting the initiation date at 29 March. The nest was built within a clump of dense giant cutgrass that surrounded the nest, except for 2 openings, which the hen used to access the nest. The vegetation encompassing the nest measured 1.8 m tall on average, and canopy cover was 100%. Robel pole measurements exceeded 1.2 m in all cardinal directions. At the final visit, the nest was 10 cm above the water with the surrounding water measuring 10 cm deep. However, water depth was higher at initial discovery, as low precipitation throughout the spring caused water levels to drop. On 2 May, at least 3 eggs successfully hatched from this nest.



Figure 1. Clump of giant cutgrass (*Zizaniopsis miliacea*) located in a cattail (*Typha* spp.) dominated freshwater marsh in southwest Louisiana, USA, within which an overwater Mottled Duck (*Anas fulvigula*) nest was found on 11 April 2018.



Figure 2. Mottled Duck (*Anas fulvigula*) nest found within a giant cutgrass (*Zizaniopsis miliacea*) clump in southwest Louisiana, USA, on 11 April 2018.

We located the second nest (Fig. 3) on 25 April. It was located in a cutgrass-dominated marsh interspersed with bull tongue. It was 1,350 m from the nearest land, a levee, which was not connected to the mainland. This nest contained 11 eggs incubated to 18 d, putting initiation at 28 March. This nest was also built in a clump of giant cutgrass, with sparse vegetation completely surrounding it and one opening for hen access to the nest bowl. In contrast to the first nest, canopy cover of this nest was 0%. The vegetation surrounding the nest measured 1 m tall, and Robel pole measurements averaged 1 m. At the time of fate, the nest was 33 cm above the soil and the area surrounding the nest was dry, but water depth was >10 cm at the initial visit. From this nest, at least 7 eggs hatched on 7 May. In contrast, the Mottled Duck nests we monitored in upland habitat were not successful, likely due to mammalian predation.

Discussion

Traditionally, uplands have been regarded as preferred habitat for nesting dabbling ducks (*Anas*, *Spatula*, and *Mareca* spp.; Bellrose 1976). Although anecdotally noted, researchers often assumed dabbling ducks that nested over water were aberrant, and this behavior occurred at very low frequencies (Hochbaum 1944, Bellrose 1976). That said, this line of thinking may have been caused in part by a sampling bias resulting from traditional ATV chain-drags (Klett et al. 1986) most commonly used for locating dabbling duck nests. Although ATV chain-drags are efficient for searching grassland, they preclude the discovery of nests in other habitat types such as wet marsh. Alternatively, following marked individuals may provide a more accurate representation of nest site selection, albeit at lower sample sizes. For example, Krapu et al. (1979) used radio transmitters to determine Mallard nesting habits in south-central North Dakota and found that the majority of marked Mallards nested over water. In addition to Mallards, American Black Ducks (*Anas*



Figure 3. Mottled Duck (*Anas fulvigula*) nest found in giant cutgrass (*Zizaniopsis miliacea*) dominated freshwater marsh in southwest Louisiana, USA, on 25 April 2018. Feather down in the nest bowl can be seen in the background and the vegetated ramp leading from the water to the nest bowl in the foreground.

rubripes) also nest over water (Ringelman et al. 1982), but little has been published on the frequency of this behavior. Ringelman et al. (1982) located one overwater black duck nest in south-central Maine in a stand of narrow-leaved cattail (*Typha angustifolia*). Together, these studies suggest that overwater nesting in dabbling ducks—especially Mallards and close congeners—may be a viable strategy in some contexts. However, previous studies following marked female Mottled Ducks (>100 individuals) to nest sites in Florida and South Carolina did not document any overwater nests (Dugger et al. 2010, Varner et al. 2013, Shipes 2014, Kneece 2016).

Overwater nesting may be advantageous for several reasons. For example, in early spring, wetlands may provide better access to residual cover compared to upland sites, and in general, the tall, dense cover that wetlands offer may provide the security sought after by nesting birds (Krapu et al. 1979). In addition, disturbance of residual cover in upland habitat (e.g., from haying, grazing) may

prompt alternative wetland habitats to be selected. Interestingly, nest success differs between upland and overwater nests: Arnold et al. (1993) found that Mallard nest success was higher for overwater nests (43.9%; $n = 47$) than for upland nests (12.2%; $n = 49$) in southwestern Manitoba. Overwater nests likely offer more security from terrestrial mammalian predators than nests in upland areas (Krapu et al. 1979, Arnold et al. 1993). This may be especially true for the sites selected by Mottled Ducks in this study: both marshes were composed of tall, thick vegetation, >230 m from the nearest levee, and even farther from the mainland. However, in Louisiana, the American alligator (*Alligator mississippiensis*) is also a potential predator of Mottled Duck hens and their nests, but the overwater nests we located were in shallow water which is not preferred by alligators during the nesting season (Newsom et al. 1987). We hypothesize that there is likely an optimal water depth that both minimizes alligator interaction and maximizes protection from terrestrial predators.

A big risk to overwater nests is likely flooding, and indeed, flooding was the most common cause of nest failure for Mottled Duck nests found on dredge-spoil islands in the Atchafalaya (Caillouet 2015). Because overwater nests are completely surrounded by water, they are more susceptible to adverse effects of fluctuating water levels than their upland counterparts (Bouffard et al. 1987). For example, heavy precipitation and high storm surges brought on by severe storms are prevalent throughout the year along the Gulf Coast, and particularly during hurricane season (1 Jun–1 Nov), which partially overlaps with the Mottled Duck nesting season. These storms can drastically raise water levels over a short period of time, and models predict that such storms are likely to become more intense and more frequent in the future (Michener et al. 1997, IPCC 2013). However, overwater nesting ducks may respond to rising water levels by raising the nest using nearby vegetation (Ringelman et al. 1982).

Prior studies have not identified flooded marsh as potential nesting habitat for breeding Mottled Ducks, and existing management plans for breeding Mottled Ducks focus on the importance of upland habitats (Wilson 2007, Krainyk 2016). Two out of the 6 nests we monitored were overwater nests, and they were the only ones that successfully hatched. Given the vast expanses of inaccessible marsh in southwest Louisiana, and the

apparent success of this strategy, it seems plausible that overwater nesting is more common than currently recognized. Furthermore, while the frequency of this behavior at a population level is unknown and may be low compared to ground nesting, overwater nests appear to have higher rates of success than their upland counterparts, and thus contribute meaningfully to Mottled Duck recruitment. Our results suggest that managers concerned with Mottled Duck populations consider broadening the scope of what is deemed suitable Mottled Duck nesting habitat and expand research efforts on Mottled Duck nest site selection.

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