

The American Alligator as a Predator of Mottled Ducks

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Abstract - Mottled Ducks (*Anas fulvigula*) are widely distributed in southeastern coastal marshes, as are American Alligators (*Alligator mississippiensis*). Although the alligator has been noted to prey upon Mottled Ducks, evidence of Mottled Duck consumption is rare in numerous studies of alligator food habits. This may be due to the season and habitat from which alligators were collected for evaluation (often autumn samples from deep water habitats preferred by adult alligators). We examined stomach contents of alligators in summer (when Mottled Duck broods and molting adults are flightless) from shallow water habitats preferred by Mottled Ducks. Mottled Duck remains were found in 20.9% of 43 alligator stomachs examined, far more than the highest frequency occurrence previously reported (1.27%). Unexpectedly, three relatively small alligators (1.51–1.70 m total length) consumed Mottled Ducks and the sixteen largest alligators did not. This study underscores the importance of season and location of collections when evaluating stomach content data.

Introduction

The Mottled Duck (*Anas fulvigula* Ridgway) is widely distributed in coastal Louisiana (Moorman and Gray 1994, Stutzenbaker 1988). Its population status is not well known due to difficulties in aerial transect methods (Chabreck and Roberts 1993), and conflicting reports indicate stable or declining populations (see references in Moorman and Gray 1994). In areas where Mottled Ducks are hunted, bag limits are usually more restrictive than those of more abundant species.

In Florida, Gray 1993, as cited in Moorman and Gray 1994, suggested predators probably consume 50% of pre-fledgling ducklings during brood rearing. The American Alligator (*Alligator mississippiensis* Daudin) has been noted as a predator of Mottled Ducks, preying upon flightless ducklings and adults during remigial molt (Moorman and Gray 1994). Stutzenbaker (1988) states “the alligator is the single most efficient predator of adult Mottled Ducks and ducklings,” although Mottled Duck egg losses due to numerous mammalian predators are also significant (Durham and Afton 2003, Moorman and Gray 1994, Stutzenbaker 1988).

However, numerous studies evaluating food habits of alligators have shown very low (if any) evidence of Mottled Duck consumption by alligators (Table 1). Kellogg (1929) found two instances (1.27%) of

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Table 1. Summary of literature on subadult/adult alligator food habits, within the range of the mottled duck.

Citation	Location	Months/year(s)	# of samples	Mottled ducks recovered	Alligator size (m)	Remarks
Kellogg (1929)	146 Louisiana; 8 Florida; 3 Georgia	April–October	157	2 (1.27%)	0.61–2.95	
Arthur (1931)	Rainey Refuge, Louisiana	June–July 1925	22	None	0.91–2.13	
Arthur (1931)	Louisiana	March 1926	44	None	Up to 3.35	Unid. ducks
McIlhenny (1934)	Avery Island	1927–1931	24	None	1.61–3.07	
O'Neil (1949)	Iberia, Cameron, Vermilion Parishes (refuges)	April–June 1941–42	375	None	Avg. 1.83	
Giles and Child (1949)	Sabine NWR	June, Sept 1946	318	None	0.91 and larger, 67% < 1.52	
Valentine et al. (1972)	Sabine NWR	April, June 1961 (25) June–Aug 1962 (79)	413	4 (0.97%)	All \geq 1.52 (1961, 1964); Only 6 \geq 1.52 (1962)	
McNease and Joanen (1977)	Cameron and Vermilion Parishes	June, July 1964 (309) Sept 1972–73	314	2 (0.64%)	Avg. 2.2	
Taylor (1986)	North/Central Louisiana (cypress lakes)	Sept 1981–82	111	None (beyond range?)	\geq 1.83 (up to 3.73)	4 Mallards 1 Wood Duck 1 unid. duck
Sloan (unpublished)	Marsh Island	March 25, 1985 to Feb 19, 1986	321	2 eggs (0.62%)	\geq 1.78	
Wolfe et al. (1987)	SE Louisiana	Sept 1984	100	None	1.5–3.0 (avg. 2.1)	1 unid. duck
Elsley et al. (1992)	Marsh Island	July 1991	108	None	1.35–1.70	
Elsley (unpubl)	Salvador WMA	July 1994	401	None	1.22–3.05	
Elsley (unpubl)	SW Louisiana (Fina 4 mile)	Sept 1994	285	1 (0.70%)	1.50–3.53	
Delany and Abercrombie (1986)	Northcentral Florida	Sept 7–Oct 14 1981–83	350	None	1.3–3.9	1 Pintail band
Barr (1997) unpubl. Ph.D. Dissertation	Florida Everglades	October and March 1994–1996	635	None	0.34–3.17	
Delany et al. (1999)	Four peninsular Florida lakes	26 Aug–30 Sept 1985	219	None	1.09–3.89	

Mottled Duck consumption in 157 alligators examined. Of 318 alligators harvested in June and September on Sabine National Wildlife Refuge (NWR) in southwest Louisiana (Cameron Parish), Giles and Child (1949) found no Mottled Ducks in the alligator stomach contents. Another series of 413 sub-adult and adult alligators harvested in April, June, July, and August over three years on Sabine NWR documented only 4 instances (0.97%) of Mottled Ducks in alligator stomachs (Valentine et al. 1972). McNeese and Joanen (1977) examined stomachs from 314 large alligators harvested in September 1972 and 1973 on private wetlands in southwest Louisiana, and found remains of Mottled Ducks in just two stomachs (0.64%). Another large series (321) of alligator stomachs from specimens > 1.8 m in length was collected from Marsh Island Wildlife Refuge in Iberia Parish between 25 March 1985 and 19 February 1986, with collections representing spring, summer, and fall observations (Louisiana Department of Wildlife and Fisheries unpublished data). Despite collections being made when recently hatched Mottled Ducks and flightless adults might be available, no Mottled Ducks were seen in stomachs, with the exception of two eggs containing fully developed young Mottled Ducks (K. Sloan, unpublished report).

We found no Mottled Ducks in 401 stomachs from sub-adult and adult alligators harvested in July 1994 on Salvador Wildlife Management Area (WMA) in St. Charles Parish, and only one Mottled Duck in 285 alligator stomachs (0.70%) from private wetlands in SW Louisiana in September 1994 (Elsey, unpublished data).

In north-central Louisiana, Taylor (1986) examined 111 adult alligators harvested in September 1981–82. He found remains of Mallards (*Anas platyrhynchos* L.) in four alligators; a Wood Duck (*Aix sponsa* L.) in one, an unidentified waterfowl in one, and American Coot (*Fulica americana* Gmelin) remains in two stomachs. This study, however, may have been conducted beyond the normal range of the Mottled Duck.

Several other studies from a range of alligator sizes and locations have evaluated stomach contents of alligators (Table 1), with no evidence of Mottled Duck consumption, although many documented remains of other bird species. The studies in Table 1 comprise a total sample of 4197 alligator stomachs, of which only 11 (0.26%) contained Mottled Duck remains.

At least 10 of the studies cited above were conducted using alligators harvested partially or totally in autumn, when Mottled Ducks are no longer flightless, and mostly taken in deep water canals and lakes (not the preferred habitat for Mottled Ducks). Paulus (1984) found that Mottled Ducks rarely used habitats where water depth exceeded 15 cm. On April 8, 1916 in Vermilion Parish, McIlhenny (1935) observed an alligator he estimated to be not more than three and a half feet long chase, overtake, and consume eight “newly hatched” Mottled Ducks,

despite the hen's attempt to lead the ducklings away. We have on occasion observed relatively small alligators (1.52 m in length) consume Gallinules (*Gallinula chloropus* L.) and Mottled Ducks at night in spring and summer while in shallow marsh impoundments. The possibility exists that Mottled Ducks may be under-represented in prior alligator diet studies, because Mottled Ducks prefer shallow ponds and are flightless in spring and summer, while many (at least 10 of 17 reports summarized in Table 1) alligator food habit studies examined specimens collected in autumn from deep canals and lakes. Few Mottled Ducks probably occur in these deeper water habitats (Moorman and Gray 1994), and by autumn they can fly and are less likely to be taken by alligators.

This study was initiated with the following objectives: (a) to examine stomach contents from alligators collected in shallow water habitats shared by Mottled Ducks, during spring/summer when young broods and flightless adults may be available as prey for alligators, (b) to determine if larger alligators are more likely to prey upon Mottled Ducks than sub-adults, (c) to determine, if any/sufficient Mottled Ducks or parts thereof are recovered in stomachs, if adult male Mottled Ducks are less likely to be taken by predatory alligators than are hens with broods, and/or whether local ducklings are particularly susceptible as prey as compared to older ducks.

Field Site Description

This study was conducted on portions of Rockefeller Wildlife Refuge in southwestern Louisiana, in Cameron Parish. The coastal marsh refuge is approximately 32,000 hectares in size, and the boundaries and predominant vegetation have been previously described (Joanen 1969). The study was done in management units 2 and 3, which are adjacent units totaling approximately 2065 hectares.

Methods

Forty-three alligators were collected by three methods for this study, in July and August 2003. Five alligators were live-caught on a dowel line baited with beef spleen which can then be removed, and the alligator released live after the stomach contents are removed by gastric lavage (see below). The remaining alligators were live caught ($n = 18$) or shot ($n = 20$) at night, after being located by eyeshines.

Stomachs were removed the following morning from alligators that had been shot. For safety considerations, we shot the larger alligators and attempted live capture of smaller alligators. Whenever possible, if animals were to be sacrificed, we scheduled collections to coincide with multiple research projects at several universities.

Gastric lavage was performed approximately 8–12 hours after capture on alligators that were captured alive using techniques described previously (Fitzgerald 1989, Platt et al. 1990). Tap water was used to lavage stomach contents, and gentle massage of the abdomen facilitated drainage and removal of stomach contents. Stomach contents obtained were visually inspected for the presence of Mottled Duck feathers or other remains, and general notes were recorded about all contents. If Mottled Duck feathers and/or parts were found, it was assumed to represent a single duck having been consumed. Each alligator was measured (total length) to the nearest cm, tagged, a tail scute removed for identification, and the sex was recorded. Live alligators were immediately released near the refuge's laboratory facilities.

Stomach contents from one small alligator (1.51 m total length) included two feathers from a Mottled Duck. To verify the gastric lavage technique was complete, we sacrificed this animal. Upon dissection, the stomach was totally empty and completely washed clean by the lavage method. While rinsing another alligator's (1.88 m total length) stomach, we felt the rinse hose touching an object that remained in the stomach despite lavage attempts. We sacrificed this animal and found the head of a small alligator, a small insect, and a rock that did not pass by gentle lavage.

Results and Discussion

Remains of Mottled Ducks or a leg band previously placed on a Mottled Duck were recovered from nine of 43 alligator stomachs (20.9% frequency occurrence). This is far greater than any other frequency of occurrence previously reported (1.27% by Kellogg 1929). It is generally thought that alligators are opportunistic feeders (Delany 1986, McNease and Joanen 1977) and will eat whatever is present in their habitat. To our knowledge this is the first study to focus collection attempts in areas of high concentrations of Mottled Ducks, at the time of year when they are flightless, to determine if alligators are a significant predator causing duck mortality.

Of interest, the alligators that had Mottled Duck remains in their stomachs ranged from 1.51 m to 2.08 m total length. The sixteen largest alligators examined (2.11 to 3.28 m total length) had no evidence of having consumed Mottled Ducks (Fig. 1).

This was unexpected, as we predicted that larger alligators would be more likely to eat prey as large as a Mottled Duck, which can have a mass of over 1000 g (Moorman and Gray 1994). Five other studies of juvenile alligator food habits (424 stomachs combined from Mottled Duck range states of Louisiana, Florida, and Texas) showed no Mottled Ducks consumed, and only eight stomachs (1.9%) had any bird remains present (Chabreck 1971, Delany 1990, Fogarty and Albury 1967, Hayes 1992, Platt 1990). Two of the smaller alligators in our study (1.70 m and

1.87 m) which had eaten a Mottled Duck recently had stomachs filled nearly to capacity. We also presumed that if USFWS bands were retained in stomachs and not passed, older (larger) alligators might be more likely to retain bands from ducks eaten in prior years, if the bands resist digestion. We now suspect that the smaller alligators may be more agile and better able to capture a rapidly fleeing Mottled Duck. The smaller alligators may be able to tolerate the extremely low water levels (often mudflats) preferred by molting ducks and broods, whereas a large alligator could not.

As part of another study requiring necropsies, fifteen juvenile alligators (total length averaged 1.34 m, range 0.74 m–1.60 m) were caught in unit 2 on 15 September 2003. Only four of these alligators were larger than the smallest alligator in which we had documented Mottled Duck remains, thus we did not include these in our results. By mid-September nearly all Mottled Ducks are capable of flight, and are less likely to fall prey to alligators than when flightless. However, one of the four larger alligators (1.52 m) caught that night contained Mottled Duck remains, including an aluminum USFWS band placed on 8-26-03 (Table 2).

Four other USFWS bands placed on Mottled Ducks were recovered from the initial 43 alligators examined (Table 2, Fig. 2). One duck was banded on Anahuac National Wildlife Refuge (NWR) in Texas, some 161 km away from the recovery site; the others were from birds banded in the same unit in which the alligators were caught. The sex of all ducks consumed from which bands were recovered was male; due to the small sample size, this is of unknown significance. To our knowledge, this is the first report of bands from Mottled Ducks being found in alligator stomachs.

It is possible that broods of very young recently hatched Mottled Ducks may have been consumed, but were rapidly digested and eliminated completely from the stomachs due to their small mass. Newly

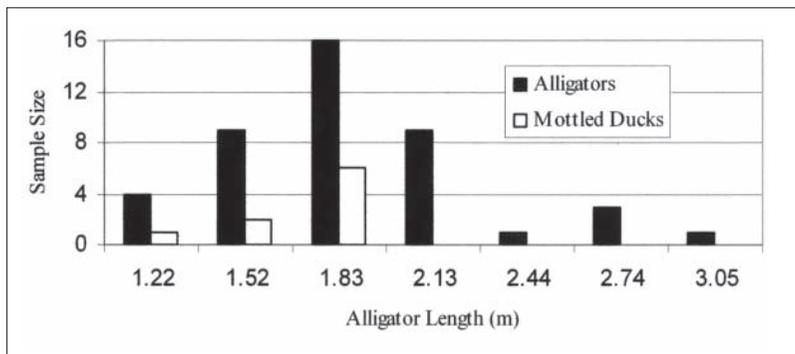


Figure 1. Size distribution of alligators from which stomach contents were examined. Note that no Mottled Ducks remains were found in the larger alligators.

hatched ducklings are more abundant in April, May, and June and our collections did not begin until late July, when molting adults were far more prevalent, which may have biased our results.

It has recently been learned that alligators have specialized facial sensory organs that can detect small disruptions on the surrounding water surface (Soares 2002). We suspect the water turbulence created by locomotion/movement of flightless Mottled Ducks in shallow water would easily be detected by, and possibly attract, nearby alligators.

Differential digestion rates of various prey items can make interpretation of crocodylian stomach contents difficult (Garnett 1985, Jackson et al. 1974). Delany and Abercrombie (1986) suggest rapidly digested fish and amphibians may be under-represented, while longer retained

Table 2. Data from alligators with USFWS bird bands from mottled ducks recovered in the alligator's stomach contents. "Same" indicates the duck was originally banded in the same management unit in which the alligator was caught. *One band was recovered from alligators caught 8-7-03, but it is uncertain precisely which alligator it was from, due to a record keeping error.

Date caught	Alligators			Date banded	Ducks		
	Unit	Length(m)	Sex		Location	Age	Sex
7-31-03	Unit 3	1.87	M	7-30-03	Same	Adult	M
7-31-03	Unit 3	1.70	M	7-30-03	Same	Juvenile	M
8-7-03	Unit 3	1.93	F	6-18-02	Same	Adult	M
8-7-03	Unit 3	U*	U*	7-24-02	Anahuac, TX	Adult	M
9-15-03	Unit 2	1.52	F	8-26-03	Same	Juvenile	M



Figure 2. Stomach contents from a 1.7-m alligator, including Mottled Duck feathers and foot with an aluminum USFWS bird band. Note that crawfish (*Procambarus clarkii* Girard) were also present.

species such as birds may be over emphasized; they found 4.4% bird remains left five days after experimental feeding in three alligators. Barr (1997) fed juvenile alligators (1.00–1.35 m total length) quail (*Colinus virginianus* L., average wet weight 92.1 g) and found 90% of the bird had exited the stomach between 48–72 hours, and less than 10% (feathers only) persisted for 10 days, when observations were discontinued. Similar data on retention time of larger waterfowl in subadult or adult alligators are lacking. Long retention time of Mottled Ducks could cause over-representation in stomach content evaluation, conversely incomplete lavage techniques could cause under-representation.

Drought conditions could increase the incidence of Mottled Ducks being consumed by alligators (Stutzenbaker 1988), as both species would concentrate where water is still available. Our study was conducted in an area of very high brood density and low water levels, which are attractive to molting birds, some 1525 Mottled Ducks were banded in the study areas from 4 June–27 August 2003. However, the alligator density in the areas studied is relatively low compared to other areas of the refuge.

The stress of capture/banding may lead to Mottled Duck mortality from alligators and other predators if the ducks are temporarily disoriented after capture and handling, though we are unaware of any detailed studies in this area. It is possible that ducks might die as a result of capture stress or fall prey to another predator, and be consumed by alligators as carrion, rather than as live prey. Conversely, ducks once captured may have a learned behavior and become more wary and avoid airboats or be less likely to move from dense cover, and remain hidden from alligators.

Although our sample size is modest, these results provide quantitative evidence that alligators can prey upon Mottled Ducks in far higher numbers than previously reported. Birds are often included in the diet of the alligator, but are rarely major items except under exceptional circumstances (see review by Wolfe et al. 1987). Migratory waterfowl generally do not arrive in coastal Louisiana marshes until autumn, when cooler temperatures lead to winter dormancy and less feeding by alligators (Delany 1986, Neill 1971). Mottled Ducks however, are year-round residents of Louisiana. Some losses due to alligators may be a factor in Mottled Duck mortality, in combination with egg losses due to mammalian predators, flooding, and other factors, such as habitat loss and saltwater intrusion. The marked difference in the results of this study and prior studies of Mottled Duck consumption by alligators underscores the importance of season and location of collections when evaluating stomach content data. Future studies are planned to evaluate a larger number of samples, and to collect stomach contents during April and May, when broods of locally hatched ducklings are more abundant,

to determine if they are particularly vulnerable to alligators. It may be that overall mortality of Mottled Ducks from alligators is not excessive, as the very shallow water and mudflat habitat preferred for brood rearing and by molting birds is generally too shallow to support large numbers of alligators.

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