

Nest-site Fidelity in American Alligators in a Louisiana Coastal Marsh

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Abstract - Little is known about nest-site fidelity in wild *Alligator mississippiensis* (American Alligator). As part of a long-term study on multiple paternity and mate fidelity that required capture and marking of nesting female alligators, we documented several instances of nest-site reuse by individual females. In one case, the female nested at the same site seven years after initial capture, demonstrating long-term nest-site fidelity. Another female used one nest site in 2000, 2002, and 2004. Herein, we provide data on minimum nesting intervals for recaptured alligators, including three cases of females nesting in two consecutive years. Despite tremendous habitat alteration and storm surge from Hurricane Rita in 2005 and a catastrophic drought precluding nesting in 2006, we found female alligators in 2007 at nests within 20 m and 170 m of their nest sites from seven years and three years, respectively, prior to those events.

Introduction

Alligator mississippiensis Daudin (American Alligator) occurs in the southeastern United States, and its nesting ecology has been studied extensively (Carbonneau 1987, Deitz and Hines 1980, Goodwin and Marion 1978, Joanen 1969, Platt 1990, Reagan 2000). Studies have addressed spatial patterns of alligator nests (Carbonneau 1987, Jennings et al. 1987, Reagan 2000, Woodward et al. 1984) and factors affecting nest-site selection such as habitat and landscape features (Joanen 1969, Platt 1990, Reagan 2000). Although some female alligators will nest in consecutive years in captivity (Joanen and McNease 1971), limited data exist on nesting intervals in wild alligators (Reagan 2000) and little is known about nest-site fidelity by individual females. McIlhenny (1935) suggested that "old, fully-grown females will frequently use the same location year after year, building each succeeding nest on top of the old one until quite a mound accumulates;" however, this phenomenon was seen only to a limited extent by Joanen (1969). During a long-term study of multiple paternity in wild alligators (started by Davis et al. 2001), we captured and individually marked female alligators at wild nest sites over a number of years, and herein report on nest-site fidelity in several alligators recaptured up to seven years after first capture.

Materials and Methods

This study was conducted on Rockefeller Wildlife Refuge in southwest Louisiana. The refuge boundaries and predominant vegetation have been

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described previously (Davis et al. 2001, Joanen 1969). We intermittently collected female alligators in nest defense from 1997 through 2007. Catch effort varied greatly among years, due to conflicting work demands, weather, and differences in nesting effort. The study presented here includes data from 1997 when alligators were captured for a pilot study of multiple paternity (Davis et al. 2001). No attempt was made to catch alligators in 1998 or 1999. From 2000 to 2005, we caught between 17 and 29 female alligators each year in nest defense on the main study area of approximately 809 ha in the Superior System. Approximately 100 nests are constructed in this area annually (range = 55 to 119 during the years of this study). Due to a severe drought and lingering high salinities after Hurricane Rita in September 2005, no nests were constructed in the study area in 2006. In 2007, we opportunistically captured three alligators to determine if they exhibited nest-site fidelity after their potential displacement to the north during Hurricane Rita.

The sampling procedure was as described in Davis et al. (2001) with minor changes. After locating alligator nests by helicopter, nests were visited by airboat. Alligators were caught by snaring with a cable noose or by walk-in trap (Elsey and Trosclair 2004); all individuals were uniquely marked with web tags. Midway through 2002, we began mapping nests using a GPS, rather than by manually plotting the locations on an aerial photograph. Digital images were used to determine straight-line distances between nest sites used by the same female in subsequent years. Nest locations determined with a GPS were plotted while the helicopter was moving, thus reported distances can only be considered accurate to within 10–15 m. The observer that hand-plotted nest locations on maps had several years of experience and extensive knowledge of the landscape; thus we believe the locations and distance estimates were of comparable accuracy to those mapped with a GPS. We also obtained data on nesting intervals (minimum number of years between nesting events) for recaptured females, but it should not be assumed that females did not nest in years in which they were not captured.

Results

Our initial recapture was a female alligator that had been first captured at a nest site in 1997. When we recaptured her in 2000, she was approximately 230 m away from that original nest site. Although she was not located at an active nest site in 2000, she was observed with numerous hatchlings, indicating that she nested successfully the previous year (1999). All other females were caught at active nests in subsequent years and had been previously caught during the multiple paternity study (Table 1).

Of the fifteen female alligators recaptured prior to Hurricane Rita, four were caught at essentially the same location as their first capture; in one case, a female was captured at the same location after seven years (1997 R–2004 D). One female used nest sites in 2001 and 2003 that were approximately 50 m apart, and another female used nest sites approximately 70 m apart in 2001 and 2005; these distances may indicate some degree of nest-site fidelity given the limited accuracy of our maps.

Two females were caught three times; one was caught in 2000, 2002, and 2004 and in all three cases she nested in essentially the same location on a small pocket of marsh near a levee. One other female was caught three times (in 1997, 2002, and 2005). The 2002 nest was located 340 m from the 1997 nest site; the 2005 nest site was approximately 1190 m from the 1997 nest site (Table 1).

Due to a severe drought in 2006 and persistent adverse habitat conditions from Hurricane Rita in late September 2005, we found no alligator nests in the area in summer 2006. Due to storm surge associated with the hurricane, many alligators marked for research purposes on Rockefeller Refuge moved or were pushed north (R.M. Elsey et al., unpubl. data). In 2007, we documented two marked females at active nests. One female nested only 20 m from where she nested in 2000. In 2007, the other female nested approximately 170 m from where she had nested in 2004; this was comparable to distances between nest sites for females recaptured before Hurricane Rita (Table 1). In 2007, we also collected eggs (to obtain blood from the hatchlings) from a nest site that was used in 2003; we were able to determine in this case that the nest was constructed by a different female.

In two cases from Rockefeller, we documented wild female alligators nesting in two sequential years (2003 Q–2004 R; and 2004 A–2005 S). In the first case, the female nested within 10 m of her prior nest, whereas the other female moved about 150 m to construct the second year's nest.

Table 1. Nesting intervals and distances between nests for American Alligators on Rockefeller Wildlife Refuge, LA. Nests were given letter codes by year, which corresponded to the order in which they were discovered. Distances between nests were accurate to within approximately 10–15 m. * = hatchlings caught in 2000.

Initial nest year	Recapture nest year	Estimated distance (m)	Years between captures
1997 V	1999*	230	2
1997 C	2002 D	120	5
1997 B	2002 M	340	5
2000 S	2002 C	10	2
1997 D	2003 J	250	6
2001 M	2003 F	50	2
1997 R	2004 D	10	7
2000 S	2002 C	10	2
	2004 F	same location	2
2001 F	2004 G	410	3
2002 A	2004 N	10	2
2003 Q	2004 R	10	1
1997 P	2004 T	150	7
2001 BB	2004 Z	150	3
2001 R	2005 B	380	4
2001 W	2005 R	70	4
2004 A	2005 S	150	1
1997 B	2002 M	340	5
	2005 AA	1190	7
2000 U	Y69 in 2007	20	7
2004 W	GPS 081 in 2007	170	3

We incidentally recovered seven marked female alligators that were taken by trappers in nearby canals on the refuge during experimental/nuisance harvests. The estimated minimum distance from the initial nest site to the harvest site was 20 m for a female taken in the same year she nested. Four females were harvested the year following when they were caught at a nest, and had moved minimum distances of 20 m, 90 m, 120 m, and 260 m. One female was trapped four years after we caught her at a nest some 920 m distant; she may have nested in the intervening years unknown to us. The last recaptured alligator was trapped in 2007, at a distance of 2930 m from her 2005 nest site. While catching live alligators for another research project, we inadvertently recaptured one of our marked females 490 m from her nest site. She was caught defending her nest on 5 July 2001, and caught the following year on 16 May.

Additionally, four female alligators marked on our main study site were harvested by trappers on adjacent private wetlands during annual autumn alligator harvests. Estimated minimum distances between initial capture at the nest site and where the alligator was trapped in a September harvest were 500 m (June 26, 2003 to September 9, 2006), 650 m (between July 25 and September 5 of 2001), 2800 m, and 4500 m (July 7, 2005 to September 9, 2006). The female trapped 2800 m away from the nest site was the female caught three times, having nested in 1997, 2002, and 2005 (Table 1).

Discussion

Female alligators have been assumed to reuse nest sites (McIlhenny 1935, Reagan 2000); however, this assumption may be largely based on casual observations. In a five-year study of 315 alligator nests, Joanen (1969) found the majority of nests “were located within 100 to 200 yards of the old nest site,” but only 1.3% were located on or immediately adjacent to the nest site of the previous year. Carbonneau (1987) found 4.1% reuse (on or within 5 m of a prior nest site). Similarly, Platt et al. (1990) found that only one of 19 (5.3%) nest sites from 1987 was used again in 1988. Because female alligators were not caught at the nests in these studies, it is unknown whether the nests were constructed and/or reused by the same individuals. Conversely, Goodwin and Marion (1978) found no nests constructed within 160 m of another nest in their study in north-central Florida. Woodward et al. (1984) stated “Herpetologists have long suspected that alligators may use virtually the same nest site for two or more years in succession (McIlhenny 1935); we too believe this is sometimes true for individual females.” However, their data showed relatively slight immediate reuse of nest sites (Woodward et al. 1984). Reagan (2000) found 3.7% nest-site reuse (within 10 m of a previous nest) at 378 alligator nests in a three-year study on Sabine National Wildlife Refuge. However, no cases of nest-site fidelity were observed; only three females nested twice in three years, and the females selected new nest sites in all cases (Reagan 2000). In our study at Rockefeller Refuge, we documented several cases of nest-site fidelity, including

two instances of long-term (seven years) fidelity. We have also occasionally noted remnants of the flagging tape used to mark nest locations within the nest mound the following year (R.M. Elsey et al., unpubl. data), suggesting nest-site reuse, although it is unknown if it was the same female nesting in the second year.

Numerous studies have used radio-telemetry to follow individual females during the nesting season, but few of these studies were conducted for more than one season (Joanen and McNease 1970, Rootes 1989, Taylor 1984). Thus, only limited data are available in these studies to determine if females exhibited nest-site fidelity. Furthermore, it is unknown if wild female alligators typically breed annually (Platt 1990). Woolard et al. (2004) suggested that a relocated adult female alligator exhibited strong site fidelity and bred annually. Although the female was not re-captured, the authors identified the animal based on distinctive scars and a missing eye. We have data (blood samples from hatchlings obtained from collected eggs) from a female alligator located in north Louisiana confirming she nested two years in a row (2004 and 2005) in the same vicinity (R.M. Elsey et al., unpubl. data).

Although some females may breed annually or with infrequent years of no reproductive activity, certainly many alligators do not breed every year, with nesting effort each year affected by water levels and habitat conditions. For example, we have seen coastal nesting rates vary from 20,000 nests in 2006 to 43,000 nests in 2007 in Louisiana (Louisiana Department of Wildlife and Fisheries, Grand Chenier, LA, unpubl. data).

Joanen and McNease's telemetry study (1970) on Rockefeller Refuge covered a single nesting season; thus, no data were available as to nest-site reuse or inter-nest interval. Taylor (1984) monitored eight female alligators for one to four years; however, no information was provided as to nest-site fidelity; he documented one instance of a female nesting two years in a row. Rootes (1989) followed 15 adult female alligators for two nesting seasons; specifics as to nesting sites were not presented. He did note that thirteen of the fifteen alligators changed den sites during the study (Rootes 1989); dens are often associated with nest sites (Joanen 1969).

It remains unknown why alligators choose a particular site (Reagan 2000), although data suggest nest sites are clustered, rather than randomly spaced (Jennings et al. 1987, Reagan 2000, Woodward et al. 1984). These nest clusters or clumped distributions were not stationary among years (Jennings et al. 1987, Reagan 2000), and none of the habitat variables evaluated were useful in predicting nest success (Jennings et al. 1987). However, availability of certain types of vegetation for nest material may be important in nest-site selection for mound-nesting crocodylians (Carbonneau 1987). Deitz and Hines (1980) found a definite preference for *Cladium mariscus* spp. *jamaicense* (Crantz) Kükenth (Sawgrass) as a nesting material for American Alligators. Another mound-nesting crocodylian (*Crocodylus porosus* Schneider [Saltwater Crocodile]) preferentially used *Ischaemum australe* var. *villosum* Roberty for nesting material in floodplains (Webb et al. 1977).

As several females marked for this study were later taken in sanctioned wild alligator harvests, it is unknown if they would have returned to former nest sites for subsequent nesting efforts. Also of note was that in some cases, we did observe alligator nests at the exact same location as in a prior year, but were unable to capture the animal to confirm the identification of these females. In some cases, genetic analyses of blood from the hatchlings obtained from those nests revealed it was not the same female that used the nest site as we previously sampled (T.C. Glenn et al., unpubl. data).

This study demonstrated occasional reuse of nest sites by females and several cases of nest-site fidelity. Nest-site fidelity may have been more common than we were able to document, due to the intensive effort needed to mark and recapture large numbers of wild alligators over an extended time period. However, our data indicate that it cannot be assumed that alligator nests used in multiple years were constructed by the same female, or that use of these nest sites in consecutive years indicates annual nesting events by individual females. Other studies examining pair bonds and mate fidelity are currently underway and may provide additional data needed for management of crocodylian species and their wetland habitats.

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