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Cover: Adult Sooty Tern from Raccoon Island Nest One, June 2009; see Raynor et al.

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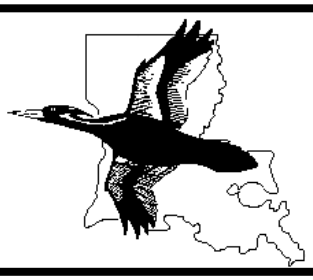

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SOOTY TERNS BREEDING ON THE ISLES DERNIERES BARRIER ISLAND CHAIN, TERREBONNE PARISH, LOUISIANA

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ABSTRACT.—Sooty Terns (*Onychoprion fuscata*) are classified as critically imperiled in Louisiana because of extreme rarity. We report the breeding of Sooty Terns in the state after an apparent 6 year absence of confirmed breeding in the state, and we report the first breeding Sooty Terns on the Isles Dernieres barrier island chain, Terrebonne Parish, Louisiana. We evaluated reproductive success of this species for the first time in Louisiana and observed a 22 year old adult incubating at a nest. Nest success for the three nests monitored was 67% and one chick fledged. This observation demonstrates that Louisiana's barrier islands continue to offer nesting habitat for waterbird species of conservation concern.

Key Words: barrier islands, northern Gulf of Mexico, reproductive success, species of conservation concern, and Sooty Tern.

The Sooty Tern (*Onychoprion fuscata*) is a widely distributed seabird throughout the sub- tropical and tropical zones of the Pacific, Atlantic, and Indian Oceans. The northern Gulf of Mexico is the northernmost extent of its breeding range in the western Atlantic Ocean (Schreiber et al. 2002). Coastal Louisiana, where Sooty Terns are classified as critically imperiled by the Louisiana Natural Heritage Program (LNHP 2008) because of extreme rarity (five or fewer known extant populations), is considered part of the breeding range. There are few published reports of Sooty Terns breeding in Louisiana, and only for the Chandeleur barrier island chain in St. Bernard Parish (Oberholser 1938, Stewart 1964, Purrington 1970, 1988).

The first Sooty Tern nest found in Louisiana was on Curlew Island in the Chandeleur barrier island chain on 5 June 1933 (Oberholser 1938). Subsequent sightings in Louisiana were often assumed to be storm-driven individuals (Imhoff 1962) until breeding was documented again on Curlew Island on 10 June 1964 (Stewart 1964). A small breeding population of Sooty Terns persisted on the Chandeleur Islands through the 1970's (Purrington 1970, Portnoy 1977), the largest of which was 30 nests on Curlew Island in 1979 (Purrington 1988). In 1987, Sooty Tern chicks were banded on Errol Island, indicating that the terns were still breeding on the Chandeleurs (USGS Bird Banding Lab unpubl. data). Although there are few confirmed reports of breeding

Sooty Terns since then, the Louisiana Department Wildlife and Fisheries (LDWF) did count 20 pairs nesting at Curlew Island in 1998 (LDWF–LNHP unpubl. data) and chicks were observed on South Gosier Island in 2002 (D.L. Dittmann and S.W. Cardiff pers. comm.).

We document the breeding of Sooty Terns in Louisiana after an apparent 6 year absence of confirmed breeding (D.L. Dittmann and S.W. Cardiff pers. comm.) and present the first reproductive success data for Sooty Terns in Louisiana. Our research also establishes the earliest breeding record for the state and documents breeding in a new locality, the Isles Dernieres barrier island chain, Terrebonne Parish, Louisiana.

METHODS

Study area.—We studied Sooty Terns nesting at the Isles Dernieres barrier island chain, Terrebonne Parish, Louisiana (29º 03′N, 90º 57′W to 29º 05′N, 90º 36′W, Fig. 1A). The Isles Dernieres barrier island chain is located in the Gulf Coast Prairies and Marshes Ecoregion, 21 km south of Cocodrie, Louisiana. The island chain is approximately 33 km long, and it comprises the Isles Denieres Barrier Islands Refuge, managed by LDWF. In 2009 the refuge consisted of four distinct islands from east to west: Wine, Trinity, Whiskey, and Raccoon. The refuge has experienced a gulf-side erosion rate of -11.1 m/yr between 1887 and 1988 (McBride et al. 1992). In response to this degradation, significant restoration efforts have occurred at the refuge over the last two decades (Penland et al. 2003).

*Nest searching and monitorin*g.—From April – July 2009, we conducted a breeding study of waterbirds using Stienkamp et al.'s (2003) protocol. We determined that adults were initiating nesting when swarming behavior was observed above a potential nest site (Dinsmore 1972). Eggs were floated in freshwater to predict hatching dates (Hays and LeCroy 1971, Alberico 1995). We used 30 days as the incubation period for back-dating egg laying dates (Dinsmore 1972). Nests were checked every 1.5 weeks to assess nest success. We classified a nest as successful when a chick was observed in or near a scrape or as failed when a clutch disappeared and adults were not present before the predicted hatch date. Nest success was estimated using the Apparent Method for nests on islands (the number of monitored nests that hatch at least one egg divided by the number of total monitored nests) (Johnson and Shaffer 1990). Chicks were monitored every 1.5 weeks until seven weeks old to assess fledging success. We assumed a chick fledged if it was present at the nest within a week of the eight-week old fledging stage (Ashmole 1963, Dinsmore 1972, Brown 1976). We classified overall productivity as the proportion of nests that produced a fledgling.

RESULTS

We observed swarming behavior of two Sooty Tern adults at Raccoon Island on 30 April 2009. Sooty Terns nested in association with large mixed-colonies of Laughing Gulls (*Leucophaeus atricilla*), Sandwich Terns (*Thalasseus sandvicensis*) and Royal Terns (*Thalasseus sandvicensis*) on Wine and Raccoon Islands. We found Sooty Tern nests during incubation on Raccoon Island (N=2) and on Wine Island (N=1). The nests on Raccoon Island were approximately 15 m apart. All pairs initiated nests within the first two weeks of May, and each nest contained one egg. We found the first nest, Raccoon Island Nest One (29º 05′ 700″ N, 90º 36′ 716″ W), on 7 May 2009 and estimated an approximate laying date of 3 May. The estimated laying dates for Raccoon Island Nest Two (29º 03′ 221″ N, 90º 56′ 73″ W) and Wine Island Nest One (29º 05′ 700″ N, 90º 36′ 716″ W) were 2 May and 8 May, respectively.

Nests were underneath moderately-dense vegetation ranging from 0.25 - 0.5 m in height. Raccoon Island Nest One was under a Camphorweed bush (*Heterotheca subaxillaris*) and Nest Two was under Crested Saltbush (*Atriplex cristata*). Wine Island Nest One was under a tuft of Marshhay Cordgrass (*Spartina patens*).

One of the incubating adults at Raccoon Island Nest One was banded (#1323-21263) as a chick

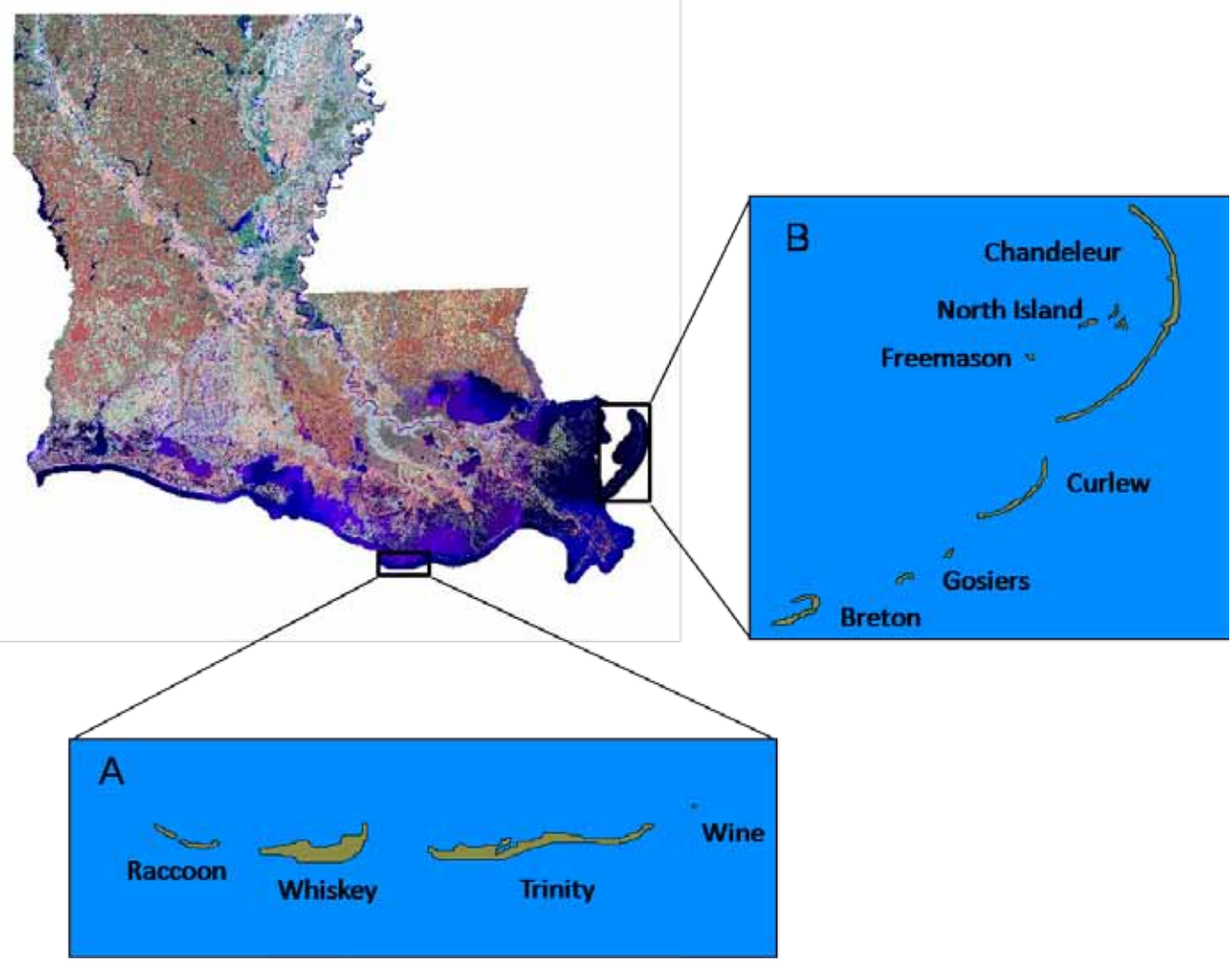

FIGURE 1. The location of the (A) Isles Dernieres island chain and the (B) Chandeleurs island chain.

on the Chandeleur Islands in 1987 (USGS Bird Banding Lab unpubl. data). We did not detect a chick at or near Raccoon Island Nest One within 1.5 weeks of its predicted hatch date of 2 June. Raccoon Island Nest Two hatched one chick on approximately 1 June 2009 and was photographed three weeks later (Fig. 2A). On 22 July 2009, at approximately 52 days old, the chick was seen near the nest with two adults (Fig. 2B). At the Wine Island Nest One, we observed a freshly hatched chick on 7 June 2009. We assume this chick died within a week of hatching because several post-hatching visits did not yield any observations of the chick or an adult. Therefore, nest success for the three nests was 67% and overall productivity was 33%.

FIGURE 2. Raccoon Island Nest Two chick, (A) 22 June 2009 and (B) 22 July 2009, Isles Dernieres island chain, Louisiana.

DISCUSSION

This is the first report of Sooty Terns breeding in Louisiana outside of the Chandeleur barrier island chain and west of the Mississippi River. The Isles Dernieres barrier island chain is approximately 155 km west of the Chandeleurs (Fig. 1). In addition, the nearest known nesting area west of the Isles Dernieres is approximately 390 km away at Bay Harbor Bar, Galveston Bay, Texas (Texas Colonial Waterbird Census unpubl. data).

We believe the colonization of Sooty Terns on the Isles Denieres barrier island chain is a recent phenomenon which may be a result of the deterioration of nearby breeding grounds on the Chandeleur Islands. Between 1996 and 2005, the Chandeleur barrier island chain's total acreage decreased by approximately 80% while the Isles Dernieres has increased in total acreage by 1% because of restoration efforts (Martinez et al. 2009). The relative stability of the Isles Dernieres barrier island chain may be due to intense restoration efforts that maintain the geological structure, which allows the islands to sustain high energy events and continue to provide nesting habitat to colonial waterbirds. In contrast, the Chandeleur barrier island chain, which has experienced little restoration efforts (Louisiana Office of Coastal Protection and Restoration 2010), is rapidly eroding primarily due to hurricane impacts (Fearnley et al. 2009) and historic tern colony sites are being abandoned (e.g. Curlew Island; Dittmann and Cardiff 2005). Furthermore, results from aerial surveys conducted in 2001 and 2008 at the Chandeleur and Isles Dernieres chains suggest that colonial waterbirds may have shifted regional nesting activity from the Chandeleur chain, where colony sites have been repeatedly damaged by hurricanes (Dittmann and Cardiff 2005), to the more intact Isles Dernieres (Michot et al. 2003, LDWF-LNHP unpubl. data). The 2001 and 2008 estimates of breeding pairs of colonial waterbirds at the Chandeleurs chain was 45,000 and 26,000, respectively, and 10,500 and 31,000, respectively, at the Isles Dernieres chain. This apparent trend of colonial waterbirds shifting from severely damaged colony sites to more stable sites in Louisiana has been suggested by Leberg et al. (2007).

Reproductive data for Sooty Terns in the United States is scant with the exception of the historic colony on the Dry Tortugas National Park, Florida (Robertson and Robertson 1996). Our small sample size may limit any comparisons to other studies, however, hatching success on the Isles Dernieres chain (67%) fell within the range reported elsewhere in the species range: <2–84% (Schreiber et al. 2002). Additionally, Sooty Tern productivity on the barrier island chain (33%) was also within the range reported at the Dry Tortugas (17–88%; M.J. Robertson and W.B. Robertson unpubl. data). Our reproductive data may be a small contribution to the understanding of this species'demography in the United States due to a small sample size, nonetheless, it provides information for a poorly studied Louisiana breeder.

The banded Sooty Tern observed was breeding at 21 years, 10 months old. Similar-aged Sooty Terns have been observed nesting at central Pacific, western Atlantic, and south Atlantic colonies, and the oldest known breeding Sooty Tern was 36 years old (Clapp and Sibley 1966, Schreiber and Burger 2002, Schreiber et al. 2002). That this bird bred on the Isles Dernieres, approximately 165 km from its natal origin, may indicate that some Louisiana seabirds have relocated from the highly-eroded and storm-damaged Chandeleur Islands (Farris et al 2007; Fig. 1).

Prior to this study, six species of waterbird of conservation-concern were documented as breeding on the Isles Dernieres Barrier Islands Refuge: Brown Pelican (*Pelecanus occidentalis),* Reddish Egret (*Egretta rufescens*), Roseate Spoonbill (*Platalea ajaja*), Wilson's Plover (*Charadrius wilsonia*), American Oystercatcher (*Haematopus palliates*), and Gull-billed Tern (*Gelochelidon nilotica*). Our report adds the Sooty Tern as a seventh species breeding at the refuge, strengthening the conservation need for protection and restoration of this barrier island refuge.

ACKNOWLEDGMENTS

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MONK PARAKEET *(MYIOPSITTA MONACHUS)* NESTS IN METROPOLITAN NEW ORLEANS BEFORE AND AFTER HURRICANE KATRINA

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ABSTRACT.—Four informal surveys of Monk Parakeets and their nests were performed in the New Orleans metropolitan area. Survey A took place from 20 May to 18 June 2003, Survey B from 15 November 2003 to 31 January 2004, Survey C from 15 to 27 June 2004, and Survey D from 9 November 2008 to 7 February 2009. Old nests were reused or abandoned and new ones were built, with a total of 288 nests observed. Monk Parakeets nested in palm trees (52.8% of nests) and on artificial structures (47.2% of nests). Using only nests and nest sites observed on two consecutive surveys, the number of nests decreased slightly from Survey A to Survey B. From Survey B to Survey C nests increased, more than compensating for the A to B decrease. Survey D revealed substantial decreases in nests in areas flooded by Hurricane Katrina in 2005 and substantial increases in nests on artificial substrates outside those areas. The Monk Parakeet population in the New Orleans area persisted through Hurricane Katrina and may be expanding.

Key words: hurricane effects, Hurricane Katrina, introduced species, Monk Parakeet, *Myiopsitta monachus*, nest substrate, population trend.

The Monk Parakeet (*Myiopsitta monachus*) has been widely introduced into North America from its original range in southern South America. It is a resident species in parts of Alabama, Connecticut, Delaware, Florida, Illinois, Louisiana, New Jersey, New York, Oregon, Rhode Island, Texas, and Puerto Rico (Spreyer and Bucher 1998). More recent surveys show that the largest North American population is in Florida (Avery et al. 2002, eBird 2011); additional areas with important concentrations of Monk Parakeets include the metropolitan areas of New York City, Chicago, New Orleans, and several cities in Texas (eBird 2011). In the United States the species occupies primarily urban and suburban habitat (Spreyer and Bucher 1998, Moskoff 2003). The total U.S. population is increasing rapidly (Pranty and Garrett 2003, Pruett-Jones et al. 2005, Pruett-Jones et al. 2007).

Monk Parakeets build large, distinctive nests made of sticks and twigs. They nest colonially, with most nests having from 1 to 20 chambers. Non-breeding individuals may occupy separate chambers (Spreyer and Bucher 1998). Monk Parakeets have constructed nests in the New Orleans metropolitan area since at least 1972 (Lowery 1974) and are a common sight here.

Hurricane Katrina roared through the New Orleans area at the end of August 2005. The wind and the flooding that followed levee failures devastated the city. Yaukey (2008) surveyed ten common species of birds as well as tree squirrels

FIGURE 1. Monk Parakeet nests in a power substation in the Lakeview area in New Orleans on 10 April 2011. This group of nests was substantially smaller two years earlier (Sevenair 2009).

(*Sciurus* spp.) in New Orleans both before and after the hurricane and found great population declines in all of them. The magnitudes of squirrel and bird population decreases were similar, suggesting that mortality and not dispersal from storm-damaged areas was the cause. Dobbs (2010) compared populations of resident and migrant birds before and after Hurricane Rita in a Cameron Parish coastal cheniere woodland and came to the same conclusion.

This study characterized Monk Parakeet populations in the New Orleans area. Its purposes were to: provide minimum nest counts and population sizes of Monk Parakeet in the greater New Orleans area, identify the natural and man-made substrates on which the nests were built, and compare estimates of nest numbers before and after Hurricane Katrina to evaluate the impacts of the hurricane on Monk Parakeet populations in the city.

METHODS

I conducted four informal surveys of Monk Parakeet nests and individuals in the New Orleans metropolitan area. The dates of these surveys were 20 May to 18 June 2003 (Survey A), 15 November 2003 to 31 January 2004 (Survey B), 15 to 27 June 2004 (Survey C), and 9 November 2008 to 7 February 2009 (Survey D). A tree with visible nest material was counted as one nest; separate nest structures on a single artificial support were counted as separate nests.

For Survey A, I located nests by sending a query through the LABIRD listserv (Remsen 2011) and talking with local birdwatchers. I visited each reported nest to verify its existence, spending from a few seconds to five minutes to do so (some nests in palm trees are hard to see). For each nest, I recorded the substrate supporting the nest (tree species or type of artificial structure). I also counted any Monk Parakeets present, extending most nest visits to 5 to 15 minutes for this purpose. Some palm trees with nests were located on streets with rows of palm trees on their neutral grounds (medians); I checked many trees that had no nests in them. This made it possible to identify new nests that were built between this survey and the next.

Table 1 summarizes the survey effort. It gives the number of nests, the number of future nest sites, and (for Surveys B, C, and D) the number of nests seen earlier that disappeared in various portions of metropolitan New Orleans. Survey A covered parts of the city where birders live and work.

In subsequent surveys the main focus was to revisit all trees, artificial structures, and streets with multiple nest substrates found to have nests during any earlier survey. Birdwatchers continued to provide information, but this was no longer the primary search mode. In addition I expanded my search to include streets and highways in areas that the LABIRD respondents hadn't reported on, checking palm trees and artificial structures for nests. All individual nests and former nest sites were visited at least once during each survey. I visited some large nest aggregations on artificial structures and nests located along streets with multiple nests two or more times, from 5 to 15 minutes each, to estimate parakeet numbers.

For the 2008-09 survey, the most extensive, I searched for Monk Parakeet nests throughout the area bordered by the Mississippi River, the Industrial Canal (the Inner Harbor Navigation Canal), Lake Pontchartrain, and the border between Jefferson and St. Charles parishes that runs between the river and the lake. I also made less extensive searches for nests in New Orleans East, near the river downstream from the Industrial Canal, and across the river on the West Bank (Table 1).

For the purpose of making minimum population estimates, I recorded the number of birds observed in association with each nest on each visit. Monk Parakeets inside their nests are impossible to detect by simple visual examination. For example, I visited a power substation with seven nests on it several times with no more than one bird seen. Then, during a later visit, I saw over two dozen birds fly out of these nests. Most sites were not visited as often as that one, so these bird counts must greatly underestimate the actual population size. For nests visited more than once, I used

TABLE 1. Number of nest and nest site observations for each survey by area.

Survey	A	B	C	D
Orleans Parish west [a]				
Existing nests	43	83	95	62
Former or future nest sites	10	27	21	73
Central Orleans Parish [b]				
Existing nests	5	7	10	27
Former or future nest sites	1	2	5	7
Jefferson Parish East Bank [c]				
Existing nests	14	19	38	89
Former or future nest sites	2	12	3	16
Other [d]				
Existing nests	0	5	5	8
Former or future nest sites	0	0	0	6
Total	75	155	177	288

[a] zip codes 70115, 70118, 70122, and 70124.
[b] between the Mississippi River, the Industrial Canal, and Lake Pontchartrain, and the zip codes in (a).
[c] between the Mississippi River and Lake Pontchartrain.
[d] Orleans Parish east of the Industrial Canal, Orleans and Jefferson west of the Mississippi River, and St. Bernard Parish just outside Orleans Parish.

the visit with the greatest number of birds in computing the total for a survey. The bird counts recorded here are far below the actual population.

RESULTS

The total numbers of nests and individuals counted during each survey were: Survey A, 66 nests, 122 individuals; Survey B, 117 nests, 227 individuals; Survey C, 148 nests, 199 individuals; and Survey D, 186 nests, 276 individuals. Monk Parakeets nested in palm trees (52.8%) and on artificial structures (47.2%); the total number of nests from the four surveys was 288 (Table 2).

The results of repeat visits for the four surveys are given in Table 3. For the pre-Katrina surveys, they show a slight decrease in nests between Survey A (20 May - 18 June 2003) in the late spring, near the end of nesting, and Survey B (15 November 2003 – 31 January 2004), in early winter. It seems likely that some birds died, some colonies were abandoned, and almost no new colonies were established during this period. This pattern occurred for all three substrate classes: date

TABLE 2. Total number of Monk Parakeet nests counted during the entire survey period.

Nesting Substrate	Number of Nests
Trees containing nests (n = 152)	
Canary Island Date Palm (*Phoenix canariensis*)	118
Cabbage Palm (*Sabal palmetto*)	34
Nests on artificial structures (n = 136)	
Cell phone towers	58
Power substations	17
Power line towers	14
Light towers in parks and stadiums	42
Telephone and streetlight poles	4
Building (a church)	1
Total	**288**

palms (almost exclusively *Phoenix canariensis*), cabbage palms (*Sabal palmetto*), and artificial structures.

The number of nests substantially increased between Survey B and Survey C (15–27 June 2004), again for all three substrate classes (Table 2). Later surveys covered more trees and structures than earlier ones, but only nests seen in both surveys are counted in a comparison column. New nests constructed for the Spring 2004 breeding season more than made up for the decrease following Spring 2003.

I conducted Survey D (9 November 2008 – 7 February 2009) more than three years after Hurricane Katrina, but the changes between Surveys C and D, shown in Table 3, reflect effects of the storm on the Monk Parakeet population and its nests. For nests for which data were collected both pre- and post-Katrina, the post-Katrina count of date palms containing nests was 45% of the pre-Katrina number. Most of these trees survived the flooding, but more than half of the nests were gone. For cabbage palms the Katrina effect was more pronounced. Of the trees that contained nests before Katrina, most were gone, and all but one of the surviving trees had no nest remaining. For artificial structures I observed the opposite effect. There were 33% more nests on artificial structures after Katrina than there were before it. Parakeets built additional nests on previously occupied structures (a 27% increase) and colonized structures that were previously unoccupied.

DISCUSSION

These casual surveys of parakeets and their nests provide minimum Monk Parakeet population estimates for the New Orleans area. They demonstrate the existence of an established population that survived Hurricane Katrina. Monk Parakeets nesting in the New Orleans area used palm trees (Fig. 1) and artificial structures (Fig. 2) with roughly equal frequencies (Table 2). In Florida, Monk Parakeets most often use power substations as nest substrates followed by Canary Island date palms (Pranty 2009). Other artificial structures and Coconut Palms (*Cocos nucifera*) were also important nest substrates in Florida.

FIGURE 2. A Monk Parakeet and a nest in a Canary Island date palm in the Gentilly area in New Orleans, taken 9 April 2011.

Most palm trees occupied before Katrina were in parts of the city that flooded; most of the artificial structures surveyed were outside the flooded zone, and many were in Jefferson Parish, which was not surveyed by Yaukey (2008) and which was farther from the eye of the storm. While Katrina probably caused substantial parakeet mortality, some birds may have relocated nearby rather than fly substantial distances over foodless terrain to forage. It is also possible that the parakeets had high mortality followed by population recovery through breeding. The Monk Parakeet has a relatively short life span and high breeding capacity for a parrot (Navarro et al. 1992, Spreyer and Bucher 1998). In Argentina, clutch sizes range from 5.1–6.1 eggs (Navarro et al. 1992) to 4.3–5.6 eggs (Eberhard 1998). The average life span in captivity is reported to be 12 to 15 years (Spreyer and Bucher 1998); life spans in the wild are likely to be shorter.

It appears that Hurricane Katrina was a relatively minor setback for the species, and that the Monk Parakeet population has recovered and is once again expanding; it is certainly expanding in Jefferson Parish. Range expansion beyond metropolitan New Orleans may not be easy. The New Orleans area is an island of their preferred suburban habitat almost entirely surrounded by water, swamps, marshes, and agricultural lands. In Argentina, Monk Parakeets nested and bred within 2 km of the nest they were hatched in (Spreyer and Bucher 1998). However, genetic evidence suggests that this dispersal estimate may be low and that long-distance dispersal (ca. 100 km) probably occurs (Gonçalves da Silva et al. 2010). Population pressure may force some of them to disperse across the wetlands; time will tell. In support of this, reports (eBird 2011) indicate that Monk Parakeets have been seen recently as far away from their core population area as Thibodaux,

TABLE 3. Changes observed in the number of substrates and nest complexes between one survey and the next. Dates of surveys were: 20 May to 18 June 2003 (Survey A), 15 November 2003 to 31 January 2004 (Survey B), 15 to 27 June 2004 (Survey C), and 9 November 2008 to 7 February 2009 (Survey D).

	Survey Pair-wise Comparison		
Substrate	**A to B**	**B to C**	**C to D**
Date Palm			
# Nests disappeared due to tree mortality	0	0	18
# Nests disappeared from surviving tree	2	6	31
# New nests	0	12	8
# Nests present at both surveys	38	65	32
Cabbage Palm			
# Nests disappeared due to tree mortality	0	0	18
# Nests disappeared from surviving tree	4	5	7
# New nests	1	8	0
# Nests present at both surveys	12	18	1
Artificial Structure			
# Nests disappeared due to structure removal	0	0	6
# Nests disappeared from intact structures	3	2	5
# New nests on structures occupied earlier	0	1	8
# New nests on structures not occupied earlier	0	13	13
# New nests on new structures	0	0	3
# Nests present at both surveys	7	22	29

Grand Isle, Reserve up the Mississippi River, and Plaquemines Parish downstream. These reports provide no evidence of nesting, but the potential is there.

The data on which this paper is based are on file with the Louisiana Bird Records Committee. Records will be made available to researchers with a serious ornithological purpose.

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ESTIMATES OF POPULATION SIZE AND DENSITY OF MONK PARAKEET (*MYIOPSITTA MONACHUS*) IN METROPOLITAN NEW ORLEANS, LOUISIANA

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ABSTRACT.—We conducted surveys of Monk Parakeets (*Myiopsitta monachus*) in metropolitan New Orleans, Louisiana, to estimate population size and density. The detailed survey was conducted in a portion of suburban Jefferson Parish; we located nests and counted Monk Parakeets. We located 87 nests and counted 349 Monk Parakeets. This gave a density estimate of 17.9 parakeets per square mile. Additional exploration was carried out in urban and suburban portions of Orleans Parish; in Chalmette, St. Bernard Parish; up the river to Laplace, St. John the Baptist Parish, and in Jefferson Parish on the west bank of the Mississippi River for the purpose of determining the range of the Monk Parakeet in the metropolitan area. We estimated that the urban and suburban portions of the area known to host Monk Parakeets have an approximate area of 173 square miles, which gives rough estimates of 774 nests and a population of 3,097 birds.

Key words: Monk Parakeet, *Myiopsitta monachus*, population density, population estimate, nest substrate.

Monk Parakeets are unusual among psittacids in many ways. They build nests of sticks rather than nesting in cavities, nest communally, and use their nests for resting places outside the breeding season (Spreyer and Butcher 1998). They have been introduced to several parts of the world from their native range, which stretches from central Bolivia and southern Brazil to Uruguay and central Argentina. Some fear that the birds may become serious agricultural pests, though this has not happened in North America. Nests constructed on electrical utilities sometimes cause power outages and electrical fires (Pruett-Jones et al. 2007).

The largest U.S. concentration of Monk Parakeets is in Florida; Pruett-Jones et al. (2005) estimated the population there to be 18,025–32,024 birds based on Christmas Bird Count data. Other populations in the U.S. are in the New York City, Chicago, and New Orleans areas, and in several cities in Texas (eBird 2011). Monk Parakeets have occurred in metropolitan New Orleans, Louisiana, since at least 1972 (Lowery 1974). These birds are of interest as an introduced species that could have the potential to disrupt local ecosystems. We conducted surveys of Monk Parakeets to estimate the density and population size of the species in the New Orleans metropolitan area between October 2008 and February 2009.

METHODS

The detailed survey covered every street in a restricted area of Jefferson Parish. Less detailed explorations involved counts of both nests and birds and had other purposes (see Sevenair 2012). For the purposes of the current work, they were

used to determine the range of the Monk Parakeet in the New Orleans metropolitan area.

More specifically, the detailed survey covered five zip codes in suburban Jefferson Parish, Louisiana. The zip codes 70001, 70002, 70005, 70006, and 70121 comprised the target zone, with an area of 19.50 square miles. These were chosen because they were known to contain Monk Parakeet nests (Sevenair 2012), and because their areas (Census 2000 Gazetteer Files) and boundaries (zipmap.net 2012) were readily available.

The area covered by the detailed survey is as follows. The Mississippi River is the southern boundary, the border between Orleans and Jefferson Parishes north of the river is the eastern boundary, and Lake Pontchartrain is the northern boundary. The western boundary runs from Lake Pontchartrain opposite the end of Sanctuary Drive, and along the line of Sanctuary Drive to Avron Boulevard. Then it goes west to Haring Court, southeast to Longfellow Street, northeast to St. Martin Street, southeast to West Esplanade Avenue, west to Haring Road, southeast to I-10, west to Green Acres Road, southeast to W Napoleon Avenue, east to Haring Road, southeast to Airline Drive, east to Vera Road, south to the ditch south of Airline Drive, west along the ditch to another ditch that begins opposite Orlando Drive, southeast to the railroad tracks, and east to Clearview Parkway. It then follows Clearview south, following the line of the Huey P. Long Bridge to the Mississippi River.

This survey was done by bicycle along all of the roads in the study area and through most other paved areas at a speed of 6 mph. We searched palm trees, cell towers, lights on poles, power substations and poles, the backs of billboards, and other artificial structures that might serve as nesting substrates. Binoculars (10 x 42 mm) were used to check for nests in less accessible sites. This nest survey comprised 45 bicycle journeys ridden on different days, totaling approximately 146 hours and 900 miles. We counted the Monk Parakeets associated with each nest. Some nests were surveyed more than once. For these nests we used the largest count in calculating the cumulative total.

We attempted to flush the parakeets out of their nests and count them as they flew out. This was done whether or not any bird sounds came from a nest, as the birds often sit in a nest, tree, or structure without making a sound. Sometimes riding to or from a nest on a bicycle was sufficient disturbance to flush the birds. Pishing under a nest was reasonably successful for short palm trees, but for tall trees, tall light poles, and cell towers, the best it would usually do was to bring one or two of them to the nest entrances. Rapping on the bottom of an accessible tall hollow steel light pole with a rock was successful in flushing parakeets from nests mounted on these structures. Cell towers are behind locked gates, so the rapping technique could not be applied to them.

We monitored a subset of nests to obtain better estimates of parakeet numbers. Each nest or group of nests was checked five more times at sunrise and twice at sunset during February of 2009.

Broader, less detailed surveys were conducted during the same time period through most of the rest of the metropolitan area. We then extrapolated the results from the detailed survey to the area identified as occupied by nesting Monk Parakeets by the broader survey.

To estimate the population density for the detailed survey area, zip code areas were obtained (Census 2000 Gazetteer Files). The number of parakeets counted in the detailed survey was divided by the area of those zip codes to give the population density in parakeets per square mile. This density was multiplied by the area of the Monk Parakeet's range as determined in the exploratory phase to give an overall population estimate.

RESULTS AND DISCUSSION

We located a total of 87 nests and 349 Monk Parakeets during the detailed survey. Nest substrates used in Florida (Pranty 2009) were similar to those used in Louisiana (Table 1). The Florida surveyors found 154 Canary Island

TABLE 1. Number of nest and nest site observations for each survey by area.

Survey	A	B	C	D
Orleans Parish west [a]				
Existing nests	43	83	95	62
Former or future nest sites	10	27	21	73
Central Orleans Parish [b]				
Existing nests	5	7	10	27
Former or future nest sites	1	2	5	7
Jefferson Parish East Bank [c]				
Existing nests	14	19	38	89
Former or future nest sites	2	12	3	16
Other [d]				
Existing nests	0	5	5	8
Former or future nest sites	0	0	0	6
Total	75	155	177	288

[a] zip codes 70115, 70118, 70122, and 70124.
[b] between the Mississippi River, the Industrial Canal, and Lake Pontchartrain, and the zip codes in (a).
[c] between the Mississippi River and Lake Pontchartrain.
[d] Orleans Parish east of the Industrial Canal, Orleans and Jefferson west of the Mississippi River, and St. Bernard Parish just outside Orleans Parish.

date palms (*Phoenix canariensis*), 58 coconut palms (*Cocos nucifera*), and 14 trees of other species with nests. Artificial substrates with nests included electrical substations (251 with nests), ballfield light towers (103), utility poles (93), communication towers (49), and 35 other structures.

Dividing 349 parakeets by the detailed study area of 19.50 square miles gives a population density estimate of 17.9 parakeets per square mile. Dividing 349 parakeets by the number of nests, 87, gives an estimated average of 4.0 parakeets per nest structure, with a range of 0 to 14. These figures are most likely underestimates. The birds don't necessarily arrive or depart while the nest is under observation and, as noted above, don't necessarily make their existence known when they are present. Monk Parakeets may utilize more than one nest, so the possibility of some duplication in the count does exist.

This population density is comparable to the population density of 18.44 parakeets per square mile found in a 3.47 sq. mi. Hyde Park, Chicago, survey (Hyman and Pruett-Jones 1992) but less than half of the 37.17 parakeets per square mile found in a 38.76 sq. mi. Barcelona, Spain, survey (Domènech et al. 2001).

TABLE 2. Zip Code area adjustments used to estimate Monk Parakeet population densities.

ZIP CODE	LOCATION	PARISH	LAND AREA (SQ. MI.)	% HABITAT LAND	HABITAT AREA (SQ. MI.)
70001	Metairie	Jefferson	6.164	100.0%	6.164
70002	Metairie	Jefferson	3.228	100.0%	3.228
70003	Metairie	Jefferson	6.845	100.0%	6.845
70005	Metairie	Jefferson	4.202	100.0%	4.202
70006	Metairie	Jefferson	2.517	100.0%	2.517
70043	Chalmette	St. Bernard	10.770	65.0%	7.000
70053	Gretna	Jefferson	3.650	100.0%	3.650
70056	Terrytown	Jefferson	6.923	90.0%	6.231
70058	Harvey	Jefferson	20.110	60.0%	12.066
70062	Kenner	Jefferson	7.114	70.0%	4.980
70065	Kenner	Jefferson	8.298	100.0%	8.298
70068	LaPlace	St. John	25.446	20.0%	5.089
70072	Marrero, Estelle	Jefferson	39.492	40.0%	15.797
70094	Westwego, Avondale	Jefferson	42.376	20.0%	8.475
70112	New Orleans	Orleans	0.885	100.0%	0.885
70113	New Orleans	Orleans	1.114	100.0%	1.114
70114	Algiers	Orleans	4.835	100.0%	4.835
70115	New Orleans	Orleans	3.820	100.0%	3.820
70116	New Orleans	Orleans	1.339	100.0%	1.339
70117	New Orleans	Orleans	6.310	80.0%	5.048
70118	New Orleans	Orleans	4.671	100.0%	4.671
70119	New Orleans	Orleans	5.002	100.0%	5.002
70121	Jefferson	Jefferson	3.393	100.0%	3.393
70122	New Orleans	Orleans	7.190	100.0%	7.190
70123	Jeff., Harahan, River Ridge	Jefferson	7.831	100.0%	7.831
70124	New Orleans	Orleans	6.126	100.0%	6.126
70125	New Orleans	Orleans	2.355	100.0%	2.355
70126	East New Orleans	Orleans	14.747	80.0%	11.797
70127	East New Orleans	Orleans	6.881	85.0%	5.848
70128	East New Orleans	Orleans	4.932	95.0%	4.686
70130	New Orleans	Orleans	2.154	100.0%	2.154
TOTALS			270.721		172.638

During the more superficial, exploratory phase, conducted during the late fall and early winter of 2008–2009, we found that Monk Parakeets and their nests are common in the region of the metropolitan area between the Industrial Canal, the Mississippi River, the border between Jefferson and St. Charles parishes, and Lake Pontchartrain (see also Sevenair 2012). The total area of these zip codes including those in the detailed study area is 84.2 square miles. Multiplying the densities of nests and parakeets per square mile by the area explored gives 376 nests and 1,503 Monk Parakeets in this area. Again, we expect that this is most likely an underestimate, for the reasons given above.

The exploratory phase also included reconnaissance outside the area described in the previous paragraph. These include the Lower Ninth Ward (zip code 70117, 9 nests), Chalmette (70043, 2 nests), New Orleans East (70127 and 70128, 1 nest each), a stretch along the West Bank of the Mississippi River from Algiers through Westwego (70114 through 70094, total 25 nests), and one nest in Laplace (70068). Most of these zip codes include areas that are not typical, suburban nesting habitat, including wetlands and open water. We estimated such areas and subtracted them from the published zip code areas to compensate for this (Table 2).

The total area of these zip codes is 270 square miles and their combined area of suburban habitat is 173 square miles (Table 2). Calculations yield estimates of 774 nests and 3,097 Monk Parakeets. This is based on two assumptions, one of which would lead to an underestimate (all parakeets in the detailed study area were found) and the other which would lead to an overestimate (the Monk Parakeet population is uniform over the entire area). The data on which this paper is based are on file with the Louisiana Bird Records Committee. Computer records will be made available to researchers with a serious ornithological purpose.

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BARRED OWL CONSUMES SHARP-SHINNED HAWK

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The Barred Owl (*Strix varia*) is an opportunistic predator, consuming a variety of small to medium-sized mammals, but also reptiles, amphibians, invertebrates, and often birds (Mazur and James 2000, Livezey 2007). The frequency of birds in its diet averages nearly 10% and includes at least 36 species of mostly small and medium-sized birds, ranging in size from Dark-eyed Juncos (*Junco hyemalis*) and Scarlet Tanagers (*Piranga olivaceus*) to Northern Flickers (*Colaptes aurita*) and Blue Jays (*Cyanocitta cristata*; Errington and McDonald 1937, Devereaux and Mosher 1984, Schultz 2005, Holt and Bitter 2007, Livezey 2007). Barred Owls occasionally also consume larger birds, such as American Crow (*Corvus brachyrhynchos*), Ruffed Grouse (*Bonasa unbellus*), and Eastern and Western Screech-Owl (*Megascops asio* and *M. kennicottii*; Cahn and Kemp 1930, Errington 1932, Hamer et al. 2001).

At 0900 hours CST on 19 December 2010, at Bluebonnet Swamp Nature Center, East Baton Rouge Parish, Louisiana (N 30° 22′ 12″ N, 91° 6′ 22″ W), in disturbed lowland hardwood forest adjacent to cypress–tupelo swamp, we observed a single Barred Owl perched about 4 m above the ground on a horizontal branch. Clutched in its talons was an intact, freshly dead, first-winter plumaged Sharp-shinned Hawk (*Accipiter striatus*). Thinking the owl may have extracted the hawk out of a nearby 36-mm mist-net, we checked the area for signs of struggle, but there was no evidence of feathers or disturbance in or around the net.

For the rest of the day, the owl did not move from its perch and alternated between eating the remains of the hawk, still clutched in its talons, and sleeping. It initially removed the hawk's remiges and some contour feathers. The hawk's head was consumed first, followed by parts of the body cavity (Fig. 1). After mostly sleeping from 1045–1325 hours, the owl regurgitated a pellet of feather and bone at 1321 hours before eating again at 1325 hours. It ate for another 15 min before returning to sleep. At 1615 hours, about an hour before sunset, the bird was seen eating again and much of the hawk had been consumed with mainly the legs and integument remaining (J. W. Harris and C. Foil, pers. comm.).

We have been operating 10 to 15 mist-nets bimonthly since March 2010, and although Barred Owls are common year-round and Sharp-shinned Hawks are common during the non-breeding season at our study site, neither species has ever been a known or suspected source of netted bird mortality. We did not witness how the owl captured or acquired the hawk. Barred Owls are ambush predators, and it is likely that the young, unsuspecting hawk alighted near the motionless owl, resulting in the hawk's demise. Alternatively, the owl may have surprised the hawk while it was plucking or eating prey, or roosting.

Young Sharp-shinned Hawks can suffer from low winter survival and may be particularly susceptible to predation by owls and other raptors (Roth and Lima 2005). Sharp-shinned Hawks recognize large owls as potential predators (Kerlinger and Lehrer 1982) and typically avoid hunting at dawn and dusk presumably because of increased predation risk by owls (Roth and Lima 2007). In a radio-telemetry study, of the 12

FIGURE 1. A Barred Owl at Bluebonnet Swamp Nature Center, East Baton Rouge Parish, Louisiana, consumes an immature Sharp-shinned Hawk on 19 December 2010. Photos by JEH.

Sharp-shinned Hawks killed by predators, most were thought to be from large owls, especially Great Horned Owls (*Bubo virginianus*; Roth et al. 2005). Our observation suggests that in addition to consuming a wide variety of smaller landbirds, Barred Owls occasionally opportunistically prey upon small hawks.

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FIRST RECORDED NESTING OF THE WESTERN KINGBIRD *(TYRANNUS VERTICALIS)* IN LOUISIANA'S SOUTHERN INTERIOR REGION

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Some 70 years ago in Louisiana, Oberholser (1938) considered the Western Kingbird (then known as the "Arkansas Kingbird") to be a "casual visitor" during spring and fall migration periods in eastern and southern parts of the state. Thirty-five years later, Lowery (1974) had upgraded the Western Kingbird's Louisiana status as "an uncommon spring transient, a rare breeder, a moderately common fall migrant, and a casual winter resident."

By 1999, Western Kingbird nest records were first reported from the Shreveport area (western Northern Interior region). Nesting reports from this region have continued annually through the present (P. M. Dickson unpubl. data).

Currently, the species is considered an uncommon breeder in the Shreveport area within agricultural areas of the Red River Valley, and a rare migrant. Within Louisiana's Coastal Zone, the Western Kingbird is presently characterized as a rare spring and fall migrant and casual in winter, along with one confirmed nest record from 11–23 June 1966 at the Rockefeller State Wildlife Refuge (Cameron parish; Lowery 1974).

In 2011, we discovered a pair of Western Kingbirds nesting in the Southern Interior region of Louisiana, where, it is considered a casual spring-fall migrant and casual in winter (J.V. Remsen and P.M. Dickson unpubl. data).

WESTERN KINGBIRD OBSERVATIONS

On 22 May 2011, Broussard observed an adult Western Kingbird at the intersection of D'augereaux Road and Sawmill Highway (LA 354), at the boundary of St. Martin and Lafayette parishes, ca. 0.25 km north of mile marker 107 on Interstate-10 between Breaux Bridge and Lafayette. On 5 June, Broussard again observed an adult Western Kingbird, this time on D'augereaux Road, ca. 0.5 km east of the 22 May sighting. Approximately one month later (afternoon of 04 July), he again observed a single bird at the same location as the 5 June sighting.

On 5 July, at the same location where he had seen an adult on 5 June and 4 July, Broussard observed one adult Western Kingbird catching an insect and flying toward a nest on the cross brace of a wooden utility pole located directly on the roadside of D'augereaux Road (30.1705 N, 91.5655 W). He also noted a second adult flying nearby. The adult with the insect was observed feeding young in the nest. On this same day, Broussard photographed one adult near the nest, along with the open bill of one nestling poking up from the nest.

On the afternoon of 5 July, at the D'augereaux Road site, Fontenot observed the two adult birds, both >500m from the nest and spaced widely apart on two different sets of utility lines. At 9:00 AM on 6 July, Fontenot photographed one adult bird (probably the male) defending the nest in response to his presence.

Over the next two weeks, Broussard monitored the nest, noting a second nestling on the morning of 12 July. On 14 July, he photographed two fledglings perched on a barbed-wire fence directly below the nest (Fig. 1). During trips to the same

Figure 1. Fledgling Western Kingbirds; photographed on 14 July 2011 by Gary Broussard.

general location from 23 July to 2 August, Broussard observed two juveniles, but did not see the adult birds.

Habitat in the vicinity of the nest site consists of pastures and agricultural fields. This is consistent with nesting habitat descriptions by Ohlendorf (1974), Oberholser (1974), and Gamble (1985), all noting that artificial structures such as utility poles are used as nesting sites by Western Kingbirds over much of their range. The landscape associated with D'augereaux Road nest site includes ca. 5.0 ha of close-cropped pastureland on the south side of the road, along with 2.5 ha of weedy (0.5-1.0 m in height) power line right-of-way and 2.5 ha of soybean field on the north side of the road.

CONTINENTAL RANGE EXPANSION

The breeding range for the Western Kingbird presently includes most of the western U.S. The range has gradually expanded since the late 19th century, concurrent with patterns of European settlement and agricultural development (Bent 1942, Baumgartner and Baumgartner 1992, Gamble and Bergin 1996, Sauer, et. al. 2011), particularly northward into the grasslands of southwestern Canada (Houston 1979), as well as eastward through much of Iowa, Minnesota (American Ornithologists' Union 1983), Oklahoma (Nice 1924), and Texas (Oberholser 1974). Occasional nesting records have been reported from as far east as southern Ontario (Godfrey 1986), southern Wisconsin, northern Illinois (Graber et al. 1974), Michigan (Granlund et al. 1994), western Tennessee (P.M. Dickson unpubl. data), central Arkansas, and Louisiana (American Ornithologists' Union 1983).

In Texas, the likely source of Louisiana's present-day breeding population, Oberholser (1974) mentioned a Western Kingbird breeding range expansion from the Trans Pecos region eastward to Austin/Eagle Pass in the 1950s, speculating that human-induced landscape changes were responsible. By 1974, Oberholser's range map for the Western Kingbird showed confirmed nesting farther eastward through the Navasota, Brazos, and Trinity River valleys, along a north-south line through Dallas, Corsicana (Waco area), College Station, and Houston. Honig (1992) related usage of electrical substations for nesting purposes by this species in the vicinity of Houston.

Presently, the Western Kingbird is characterized as one of relatively few Neotropical migrants nesting in North America whose population is increasing (Sauer and Droege 1992, Peterjohn and Sauer 1993, Peterjohn 1994).

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BROWN THRASHER (*TOXOSTOMA RUFUM*) WITH BILL DEFORMITY CAPTURED AT BLUEBONNET SWAMP NATURE CENTER, BATON ROUGE, LOUISIANA

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On 25 March 2012, we captured a second calendar-year, unknown sex, Brown Thrasher (*Toxostoma rufum*) with a noticeable bill deformity at the Bluebonnet Swamp Nature Center in Baton Rouge, Louisiana. The maxilla was abnormally long (31.1 mm) and slightly decurved over the normally-sized mandible (23.9 mm; Fig. 1). Relative to other Brown Thrashers captured at Bluebonnet Swamp, the mandible was extensively worn with many nicks in the keratin sheath (rhamphotheca). Interestingly, the tip of the maxilla was caked in dried mud, an indication that the bird may have been using the deformed bill to forage extensively in soil. Despite the abnormally long maxilla the thrasher appeared in good condition as indicated by clean plumage and fat scoring (furculum was 10% full). Furthermore, the individual weighed 67.5g and had a right wing-chord of 100mm; both measures are within 95% confidence intervals calculated from 28 Brown Thrashers captured at the Bluebonnet Swamp Nature Center (mass 95% CI = 98.97, 101.25; wing 95% CI = 65.81, 69.00). Photos of the thrasher, measurements and a description of the encounter were submitted to the USGS Beak Deformity Database (United States Geological Survey 2012).

Deformities in wild birds are of interest to conservationists because bill and other physiological abnormalities have been associated with disease, exposure to polychlorinated biphenyls (PCBs), and calcium deficiencies (Altman 1986, Harrison and Harrison 1986, Gilbertson et al. 1991, Ludwig et al. 1996). For example, presence of PCBs in the Great Lakes region were correlated with Double-crested Cormorant (*Phalacrocorax auritus*) bill deformities and reduced eggshell thickness (Ryckman et al. 1998). Similarly, biologists in Alaska have identified populations of Black-capped Chickadee (*Poecile atricapillus*) and Northwestern Crow (*Corvus caurinus*) that suffer from the highest rate of elongated and/or crossed-bills ever recorded in wild populations (6.9% and 16.5% of the adult population, respectively; Van Hemert and Handel 2010). High levels of bill deformity also have been documented in the United Kingdom, prompting the British Trust for Ornithology to start a citizen science monitoring project, called the Big Garden Beak Watch, which is focused on assessing the prevalence of bill abnormalities (Harrison and Handel 2011).

In the lower 48 states, the frequency of bill deformity for Brown Thrashers and other species

in the family Mimidae (Gray Catbird [*Dumetella carolinensis*], mockingbirds and thrashers) is apparently high relative to other groups of birds, although a thrasher, mockingbird or Gray Catbird encountered with an abnormal bill is still a rare event (Craves 1994). For example, between 1930 and 1993, 3 Gray Catbirds, 20 Brown Thrashers, 1 Curve-billed Thrasher (*Toxostoma curvirostre*) and 1 California Thrasher (*Toxostoma redivivum*) were documented in the United States with bill deformities (Allard 1930, Fox 1952, Prescott 1968, Steffee 1968, Goertz and Mowbray 1969, Taylor and Anderson 1972, Brown 1976, Thompson and Terkanian 1991, Craves 1994). Out of the 20 historical records of Brown Thrashers with bill deformities, only one was reported from Louisiana – the individual was captured near the town of Ruston with a deformed maxilla similar to the Brown Thrasher captured at Bluebonnet Swamp (Goertz and Mowbray 1969). We recommend that bird banders and bird watchers carefully document any encounters with birds exhibiting deformed bills to ascertain the frequency of such abnormalities in Louisiana.

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FIGURE 1. Brown Thrasher (*Toxostoma rufum*) with bill deformity captured at Bluebonnet Swamp Nature Center, Baton Rouge, Louisiana, on 25 March 2012.

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