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STATUS OF BREEDING LEAST TERNS IN THE INTERIOR OF CENTRAL FLORIDA FROM 1914-1962

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Least Terns (*Sterna antillarum*) have nested in the interior of Florida (away from tidewater) since 1887 (Lake Thonotasassa, Hillsborough County; Howell 1932); most breeding colonies have been located in central and south-central Florida (Lohrer and Lohrer 1973, Stevenson and Anderson 1994, Gore 1996). Nest-sites of Least Terns in the interior may be above ground (roof-tops of buildings) or on the ground (Gore 1996). Most nest-site substrates are also man-made (Lohrer and Lohrer 1973, Maehr 1982, Gore 1996). Outside Florida, Least Terns have nested in the interior of the United States east and south of the Mississippi and Ohio rivers only in South Carolina, on beaches at two man-made (hydroelectric) lakes in the 1960s (Chamberlain 1960, Smith 1961, Post 1967, Thompson et al. 1997).

With the recent validation of *Sterna antillarum antillarum* as a distinct subspecies (Johnson et al. 1998; see also Patten and Erickson 1996), the dry lakebed of Lake Jackson, Leon County, Florida, is the only natural site in the interior of the United States where this subspecies has nested (Lohrer and Lohrer 1973, Stevenson and Anderson 1994, McNair in press). The nesting substrates for the first breeding colonies in central Florida at Lake Thonotasassa (Hillsborough County: June 1887), Lake Harney (Seminole County: June 1915), and Orlando (Orange County: May 1930) (Howell 1932, Lohrer and Lohrer 1973) are unknown. I have examined copies of field notes and journals (henceforth called journals) of D. J. and W. H. Nicholson (FOS archives at the Florida Museum of Natural History), data slips for egg sets of the Nicholson brothers at several museums [American Museum of Natural History (AMNH), Delaware Museum of Natural History (DMNH), Western Foundation of Vertebrate Zoology (WFVZ)], and literature not covered by Lohrer and Lohrer (1973) or Stevenson and Anderson (1994). These sources provide additional documentation for Least Terns breeding at Lake Harney and in Orlando as well as new information on other breeding localities in the central peninsula (Orange and Seminole counties) plus Lake Okeechobee from 1914 to the early 1960s. This paper re-assesses the breeding status of Least Terns in the interior of the central peninsula during this period.

I present documentation for each breeding locality of Least Tern in the central peninsula of Florida in chronological order.

1) Lake Harney, Seminole County. Howell (1932) stated that Least Terns nested here in June 1915. D. J. Nicholson (1938; journals) discovered this breeding site and stated that 16 pairs (14 nests with clutches of two or three eggs) nested here in one colony on a small sandy flat in June 1914. D. J. Nicholson also stated that he was away from Florida in 1915. The water at Lake Harney is brackish (DeMort 1990).

2) Lake Conway, Orange County. Lake Conway, a freshwater lake, is 8 km south of Orlando. D. J. Nicholson (1938; egg slips) discovered a small colony (12-14 birds) breeding at Lake Conway in 1927. He collected a clutch of two eggs (DMNH 1702) on the sandy shore on 23 June, and on 30 June, a clutch of two eggs (DMNH 1705) on a small sandbar in the middle of the lake. These were the only active nests on the days he collected the eggs. Nicholson saw Least Terns at Lake Conway in 1936 but did not collect any egg sets. In 1939 D. J. Nicholson (journals) found one small colony (8 pairs) on the island and one set of two eggs on 4 June. In 1962, D. J. Nicholson collected three egg sets (DMNH 1809-1811; all clutches of two eggs each) from a small colony (5-6 pairs) from

28-30 June. On 30 June four nests were active (three clutches of two eggs each, one nest with a day-old downy young). On 13 July Nicholson (journals) found another nest, with one egg hatching. The breeding site in 1962 was on a man-made substrate: sand from the lake bottom had been pumped to fill in a 1.2 ha lowland along the shore of Lake Conway beside another lake close to a road.

3) Lake Underhill and Orlando Municipal Airport field, Orange County. Lake Underhill, a freshwater lake, is 8 km from Lake Conway. I found no breeding information from May 1930 (Howell 1932). Howell (1932) collected two egg sets of two eggs each at Orlando on 9 June 1930 (AMNH 16192-16193). No data slips accompany these egg sets (R. T. Chesser, *in litt*.). Howell accompanied the Nicholson brothers at Merritt Island, Brevard County, on 8 June 1930, but the Nicholson journals contain no information on 9 June. It is likely, however, that Howell collected his egg sets at Lake Underhill, since D. J. Nicholson (1938, 1942; egg slips) collected egg sets here on 19-20 June (DMNH 1642-1646; five clutches of two eggs each). The small colony (25-30 birds) contained ten active nests, two clutches of one egg each, the other clutches with two eggs each plus one deserted nest of two eggs; two partially feathered young also were present. This colony was located along the lake shore close to the Orlando Municipal Airport field, but the nesting substrate was man-made, of sandy fill dredged from the lake and deposited on shore (D. J. Nicholson journals). Another smaller colony (12-14 birds) was 400 m away, also on the lake shore, but no active nests were present on 19-20 June.

The Lake Underhill colony was probably active in 1929, when D. J. Nicholson saw Least Terns at the site, but he did not search for nests. This colony remained active every year through at least 1945 (Nicholson 1938, 1942, journals; egg slips; actual years for egg set data: 1930, 1937-1940). By 1937 the colony had shifted several hundred meters, from the shore of Lake Underhill to the edge of the airfield where about 50 pairs nested (Nicholson 1938). Fifty to sixty pairs also nested at this site from 1938-1940 (the five clutches collected from 15 May to July were of two eggs each, DMNH 1651-1652, 1665-1667). [Least Terns also nested at the Orlando Municipal Airport field in 1972 (Lohrer and Lohrer 1973; B. A. Anderson, *in litt*.)].

4) Puzzle Lake, Seminole County. Stevenson and Anderson (1994) cited Puzzle Lake as a breeding locality but gave no further details. Mason (1937) stated that 50 nests of Least Terns were reported here in 1932. The water at Puzzle Lake is brackish (DeMort 1990).

5) Lake Monroe, Seminole County. Stevenson and Anderson (1994) cited Lake Monroe, a freshwater lake (DeMort 1990), as a breeding locality but gave no further details. Mason (1937) stated that a colony of 100 pairs of Least Terns nested on man-made habitat (spoil bank) in Lake Monroe at Sanford in 1935.

6) Lake Okeechobee, Glades County. Nicholson (1948; journals) stated that Least Terns nested among a large colony of Gull-billed Terns (*Sterna nilotica*) at Lake Okeechobee, a freshwater lake, in 1943. Smith and Gore (1996) implied they interpreted the description (Nicholson 1948) of "small grassy islands bordered with a narrow fringe of sandy beach" to refer to natural habitat but the islands were man-made: both sandy and rocky islands were created by dredged-material (D. J. Nicholson, journals). Three pairs of Least Terns nested on the narrow beach of one or two small sandy islands, where D. J. Nicholson (journals) collected three egg sets (two sets of two eggs each, the other of three eggs) on 3 (not 7) June 1943. The breeding site was located at the end of a chain of islands which extended into the lake for 11-14 km, directly opposite Lakeport (Glades County) to the west. On 15 April and 22 May 1951 D. J. Nicholson (journals) again saw Least Terns on these islands.

7) A freshwater lake, probably Lake Sherwood about 12 km west of Orlando and about 2.5 km east of Minorville, Orange County. D. J. Nicholson discovered a colony of 20-25 pairs breeding along the sandy shore of a lake bisected by state highway 50. He collected a clutch of two eggs and another clutch of three eggs (DMNH 1781-1782) on 21

June 1948. He also found three other clutches (two of two eggs each, the other of one egg) on this date. On 6 and 22 June, W. H. Nicholson collected three egg sets of two eggs each (DMNH 1775, 1780; WFVZ 34289) on the sandy shore of a lake. He stated this colony was about 16 km west of Orlando, and contained about 50 pairs of Least Terns. Despite the discrepancies between their two accounts, a conservative interpretation is that the Nicholson brothers probably collected egg sets at the same colony. On 18 June 1962 D. J. Nicholson collected one clutch of two eggs (DMNH 1808) along highway 50 at the bottom of a 5 m grade near the lake shore. This colony contained four adult birds. Nicholson (journals) also found a larger colony (10-12 pairs) of Least Terns nesting at this site around 1956.

8) Turkey Lake, 10 km west-southwest of Orlando, Orange County. D. J. Nicholson (egg slips, journals) stated that Least Terns nested at Turkey Lake, a freshwater lake, but I have been unable to find any material documentation for this breeding site.

9) Mullet Lake, Seminole County. Davidson (1951) found three nests of Least Tern, each with one egg, in May 1951. The eggs had disappeared by 8 June. The habitat at Mullet Lake was a tongue of flat sandy shore close to the St. Johns River. The water at Mullet Lake is brackish (DeMort 1990).

W. H. Nicholson discovered 35 Least Terns at Lake Holden, Orlando, on 28 June 1933, which included one pair courtship feeding on a small grassy island. However, he stated the birds were not breeding. The Nicholson brothers (journals) also observed small numbers (≤ 5 birds) of Least Terns at other lakes in Orange County (also Flat Lake, Lake County) over the years (1928-1953) but never documented breeding at these localities.

Two (sites 7-8) of the nine enumerated breeding sites of Least Terns in the interior of the central peninsula of Florida from 1914 to the early 1960s were heretofore unknown. For the other two sites in Orange County, Nicholson (1938) mentioned that Least Terns had nested at Lake Conway but gave no other details and the Lake Underhill site is probably the locality referred to in Howell (1932). Four of five remaining sites are from Seminole County; the other was at Lake Okeechobee. All five localities had been cited in the literature but were not cited by Lohrer and Lohrer 1973; two references (Nicholson 1948, Davidson 1951) had emphasized breeding information on Gull-billed Terns. Data slips for egg sets and journals of the Nicholson brothers contributed significant new information for most of the seven enumerated localities which had been cited before.

Least Terns that nested in the interior of central Florida from 1914 to the early 1960s demonstrated flexibility in choice of breeding location. Other than Lake Okeechobee, the eight breeding localities can be divided into two groups, lakes of the St. Johns River system (Lakes Harney and Monroe, and Mullet and Puzzle lakes) and lakes of the central sandy ridge. The large shallow lakes of the St. Johns River system vary from fresh to brackish (DeMort 1990). For Least Terns breeding at brackish sites, the designation "inland" is somewhat misleading. In both groups plus Lake Okeechobee, Least Terns nested on man-made substrates. Data slips and journals of the Nicholson brothers provided information that positively identified the man-made substrate for several of these localities (e.g., Lake Okeechobee) that appeared to be of natural origin from the original citation. I am reluctant to conclude that some other breeding localities that may be of natural origin (e.g., "sandy shore", "sandy flat") are not man-made substrates because some man-made substrates were originally described as such. It is possible that Least Terns may nest along natural sandy shorelines of lakes in central Florida, especially during drought years when water levels are low. The positive determination of natural substrate for any Least Terns nesting at an inland locality in the central peninsula of Florida would have potential implications for how their historical breeding distribution could be interpreted.

Least Terns were more abundant and widespread as breeding birds in the interior of the central peninsula of Florida from 1914 to the early 1960s than heretofore appreciated. Regardless of the possibility that some colonies during this period may have been

on natural substrates (cf., McNair in press), Least Terns responded to the availability of man-made habitats that provided suitable nesting substrates. This increase in the interior coincided with recovery of coastal populations after the turn of the 20th century, but before coastal birds were heavily disturbed (Thompson et al. 1997). Least Terns may have nested in the interior of central Florida prior to decimation of Least Tern breeding populations in the late 19th century, but the only evidence we have from this period is the undetailed report from Lake Thonotasassa in 1887 (Howell 1932).

D. J. Nicholson died in 1964 (Sprunt 1965). Afterwards, Least Terns breeding in the interior of the central peninsula of Florida continued to nest on man-made substrates, including phosphate mines beginning in the mid-1960s (Tall Timbers Research Station archives for materials of Henry M. Stevenson) and roof-tops of buildings (Orange County) beginning in 1975 (Fisk 1978, Stevenson and Anderson 1994). Some colonies at these two habitats have been as large or larger (100-200 pairs, TTRS archives; cf., Maehr 1982) than the largest colonies here prior to the mid-1960s. The Florida breeding bird atlas (1986-1991) documented breeding colonies of Least Terns in the interior in seven counties; these colonies were concentrated in the central peninsula plus Lake Okeechobee (Gore 1996), which agrees with other material since the mid-1960s (Stevenson and Anderson 1994; TTRS archives). This recent distributional pattern is highly similar to the pattern documented by the Nicholson brothers and a few other individuals about 50 years before, although Least Terns now usually nest at more inaccessible sites (e.g., roof-tops) in response to greater human disturbance. Since observer effort has significantly increased recently compared to 50 years ago, I question the conclusion Least Terns have become more numerous and widespread as breeding birds in the central peninsula of Florida over the last several decades in response to the loss of natural habitat (sandy beaches) on the coast (Fisk 1978, Robertson and Woolfenden 1992, Gore 1996). This conclusion was made without adequate consideration of Least Tern breeding information from the central peninsula of Florida from 1914 to the early 1960s.

In summary, Least Terns nested at eight localities in the interior of the central peninsula of Florida (Orange and Seminole counties) plus one site at Lake Okeechobee from 1914 to the early 1960s. Breeding at two localities in Orange County was previously unknown. Data slips for Least Tern egg sets and journals of the Nicholson brothers also provided new breeding information for most other localities. Nesting on man-made substrates was confirmed but nesting on natural substrates is not considered proven beyond a reasonable doubt. Least Terns were more abundant and widespread as breeding birds in the interior of the central peninsula of Florida from 1914 to the early 1960s than heretofore appreciated. The perception that breeding Least Terns have become more numerous and widespread over the last several decades in this region is overstated, compared to their earlier breeding status.

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