The First Mangrove Swallow recorded in the United States

Paul W. Sykes, Jr.

USGS Patuxent Wildlife Research Center

Warnell School of Forest Resources

The University of Georgia

Athens, Georgia 30602-2152

(email: paul_sykes@usgs.gov)

Lyn S. Atherton

1100 Pinellas Bayway, I-3

Tierra Verde, Florida 33715

(email: bonniedabird@earthlink.net)

Murray Gardler

9400 Merriweather Drive

Brooksville, Florida 34613

(email: pumkin@atlantic.net)

John H. Hintermister, V

2522 NW 156th Avenue

Gainesville, Florida 32609

(email: jhhv2bird@aol.com)

INTRODUCTION

The Space Coast Birding and Wildlife Festival was held at Titusville, Brevard County, Florida on 13–17 November 2002. During the birding competition on the last day of the festival, the Canadian Team reported seeing several distant swallows at Brevard County's South Central Regional Wastewater Treatment Facility known as Viera Wetlands. They thought these were either Cliff (*Petrochelidon pyrrhonota*) or Cave (*P. fulva*) Swallows.

Following his participation at the festival, Gardler looked for the swallows on 18 November. The man-made Viera Wetlands are well known for waders, waterfowl, raptors, shorebirds, and open-country passerines. The facility is located in southern Brevard County (28º 17' N, 80º 46' W) at the west end of Wickham Road (County Road 509), and about 6.4 km north of Lake Washington in the formerly extensive freshwater marsh system of the St. Johns River. This wetland is surrounded by pastures, sod farms, citrus groves, and row-crops. Five impoundments (cells), surrounded by a low dike system with a one-lane unsurfaced road on top, make up the wetland part of the facility (Figures 1 and 2). The impoundments comprise a total of 57 hectares (140 acres), are kept flooded much of the time, and present an open expanse of shallow water in an otherwise xeric landscape. Patches of emergent freshwater vegetation form mosaics across open water within each impoundment and in the shallows along the dikes. A few trees and aquatic shrubs are scattered across these wetlands.

At about 0830 EST on the 18th, Gardler stopped on the southmost dike of Cell 1 (Figure 2) to observe swallows foraging low over the water and flying into the strong north-to-northwest wind. The group consisted of Tree (*Tachycineta bicolor*), Northern Rough-winged (*Stelgidopteryx serripennis*), and Cave Swallows. Among this collection of swallows was one with a white rump patch, dark upperparts with a greenish cast, and whitish underparts. It did not have the facial pattern or white flank patches of a Violet-green Swallow (*T. thalassina*). Reference materials at the site were limited, and obser-

Figure 1. Typical habitat at Viera Wetlands, Brevard County, Florida. *Photograph by Brooks H. Atherton.*

vations were terminated about 1000 EST. Several members of the Florida birding community were immediately contacted, and the news quickly spread.

By 19 November, most observers had concluded that the bird was probably a Mangrove Swallow (*Tachycineta albilinea*), but its identification was not certain. The Mangrove Swallow of Middle America, White-winged Swallow (*T. albiventer*) of northern and central South America, Tumbes Swallow (*T. stolzmanni*) of the northwestern coast of South America (a split from the Mangrove Swallow based upon differences in plumage color and pattern, morphometrics, nest construction, vocalizations, and distribution [Robbins et al. 1997] and treated as a full species in recent literature [Clements 2000, Ridgely and Greenfield 2001, Clements and Shany 2001, Dickinson 2003]), White-rumped Swallow (*T. leucorrhoa*) of southeastern South America, Chilean Swallow (*T. leucopyga*) of southern South America, and the widespread Common House-Martin (*Delichon urbica*) of the Old World are similar in appearance, all having prominent white rump patches (Turner and Rose 1989; see ranges in Figure 3). We were quickly able to eliminate four of the six species based on color of the upperparts and/or lack of white supraloral streak, leaving only the Mangrove and the White-rumped in contention.

The Viera Wetlands bird, an adult in fresh plumage (hatch year [HY] birds have drab gray-brown upperparts rather than the glossy green of the adults), was present through 25 November, during which time it was seen by many observers. How long the bird had actually been present is unknown. Photographs of the swallow were taken on 18 and 20 November. From 19 November onward, a number of photographs were posted on websites and attached to emails accompanied by much discussion as to the correct identity of this swallow.

METHODS

The description we present is based upon our notes taken in the field, comments of others who also studied the swallow, and photographs of the bird taken at the site. To clarify a number of questions not available from the literature, on websites, or in published photographs and illustrations, a series of specimens was obtained on short-term loan from the American Museum of Natural History (AMNH; n=20), the Field Museum of Natural History (FMNH; n=21), the Museum of Comparative Zoology (MCZ; n=13) at Harvard, and the U.S. National Museum of Natural History (NMNH; n=8), all temporarily housed at the Georgia Museum of Natural History (GMNH) at the University of Georgia, Athens. Specimens on loan consisted of 38 Mangrove Swallows (31 adults, 7 immatures [HY]; 22 males, 16 females) and 24 White-rumped Swallows (21 adults, 3 immatures [HY]; 14 males, 10 females). The specimens examined represent a broad temporal and geographic spread for the two species. Of the specimens, 45 were collected in fall (15 August through 15 December), 23 Mangrove and 22 White-rumped (austral spring for the latter). A small sample of Tree Swallow specimens was also examined at the GMNH. Selected specimens were photographed for comparison and to show some of the range in variation of certain features within a species. Mass and selected linear measurements were taken from published sources on five species and used to develop a table for comparison. Additional linear measurements were taken from specimen material on loan. More measurements were, upon request, received from the Academy of Natural Sciences of Philadelphia (ANSP; Matt Sharp, pers. comm.), the Los Angeles County Museum (LACM; Kimball Garrett, pers. comm.), and the NMNH (Roger Clapp, pers. comm.). Sharp, Garrett, and Clapp also provided comments about plumages of specimens.

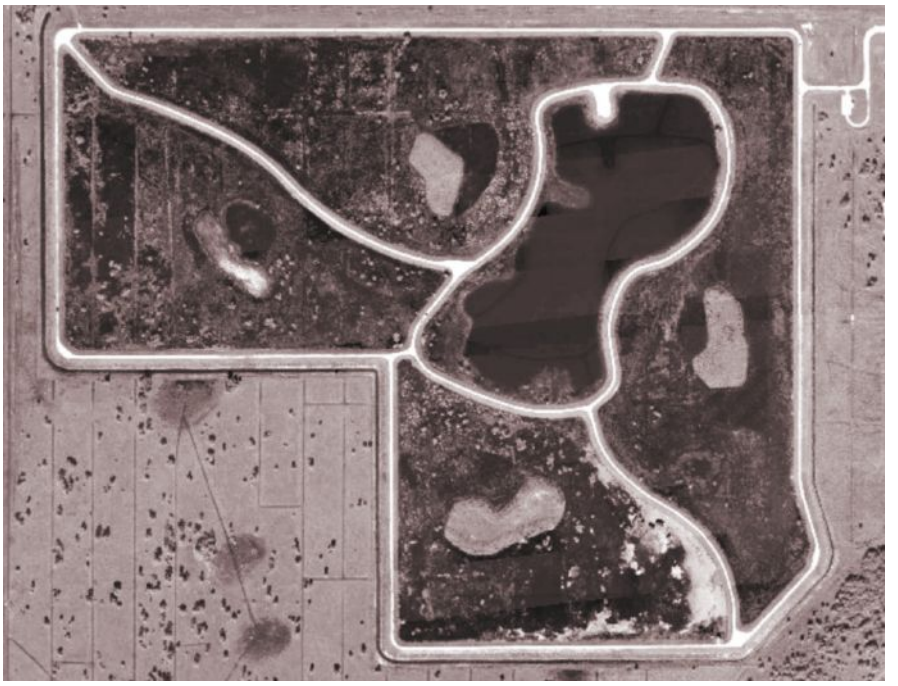

Figure 2. Aerial view of Viera Wetlands at the Brevard County South Central Regional Wastewater Treatment Facility. The Mangrove Swallow was most often seen in the southern part of Cell Numbers 1 and 2, located in the lower right and left of this map, respectively.
Photographic map courtesy of Brevard County South Central Regional Wastewater Treatment Facility.

VIEWING CONDITIONS

The Viera Wetlands swallow was generally seen in the southern portion of Cell 1 (13.7 hectares or 33.8 acres) and Cell 2, and flying over the pasture to the south of these two areas. Other swallows present in the area were 20+ Tree Swallows, one Northern Rough-winged Swallow, up to 12 Cave Swallows (with pale rumps and underparts; presumed to be one of the Mexican subspecies), and 5+ Barn Swallows (*Hirundo rustica*). The majority of the observations were of the bird in flight, although on several occasions it was perched at a distance of approximately 50 m at heights of 1 to 3 m above the water surface on dead shrubs and short dead stubs. On 20 November, the swallow was photographed perched near the top of a dead tree at a distance of approximately 60 m and at a height of 14 m. It was seen in direct comparison with Cave Swallows at least once, but most of the time it was seen in close comparison (often within a meter) with Tree Swallows, flying into the wind as the birds aerial-foraged for insects. Observations of the flying bird were made from the dikes with 10x binoculars, sometimes as close as 4 m, but generally at 10 m or greater under good lighting conditions of clear to partly cloudy skies, mild temperatures, and winds from the north-northwest of 5-18 k.p.h. The bird often foraged just above the water surface near the dike, providing unobstructed views of the entire upperparts in direct sunlight, as well as side and frontal views. In foraging, it flew upwind a distance and then circled back. These flights ranged in estimated heights above water from 15 cm to 12 m. When perched, it was studied with 20-60x zoom scopes and through the telephoto lens of cameras. The bird would disappear from view for long periods and then suddenly reappear.

Table 1. Comparison of body mass and selected linear measurements of adults of five species of swallows as a general guide to size[1]

Parameters[2]	Species (mean/sample size/range, except for total length)[2]					Sources
	Tree Swallow (*T. bicolor*)	**Mangrove Swallow** (*T. albilinea*)	White-rumped Swallow (*T. leucorrhoa*)	Violet-green Swallow (*T. thalassina*)	Cave Swallow (*Petrochelidon fulva*)	
Mass (g)[3]						
Both	20.1/82/15.6–25.4[a]	**15.0/18/14–16.5[b]**	9.0/–/17.0–21.0[a]	————————	20.4/25/18.4–22.3[a]	[a]Dunning 1984 [b]B. Stutchbury pers. comm.
Male	————————	————————	————————	14.4/16/13.0–16.3[a]		
Female	————————	————————	————————	13.9/15/12.5–15.2[a]		
Total Length cm (inches)	13 (5)	**11 (4.25)**	13 (5)	12–13 (4.75–5)	12 (4.75)	Turner & Rose 1989
Wing Length[4] (mm)						
Male	119.3/61/114–125[a]	**97.3/58/90–105[b]**	115.7/22/105–122[b]	113.9/84/–[c]	112.3/640/–[d]	[a]Robertson et al. 1992 [b]This paper; from museum skins [c]Brown et al. 1992 [d]West 1995
Female	115.3/99/110–121[a]	**95.1/36/90–100[b]**	114.4/14/108–123[b]	107.9/37/–[c]	111.9/823/—[d]	
Tail Length[5] (mm)	54.2/—/48–60[a]	**37.6/38/32–41[b]**	46.9/38/40–55[b]	49.4/–/45–55[a]	44.5/–/42–48[a]	[a]Turner & Rose 1989 [b]This paper; from museum skins
Depth of Tail[6] Fork (mm)	8.7/–/7–12[a]	**4.5/71/2–9[b]**	5.0/32/2–7[b]	8.4/–/5–10[a]	————————	[a]Turner & Rose 1989 [b]This paper; from museum skins
Width of Rump[7] Patch (mm)	————————	**17.4/47/10–23**	16.3/32/8–22	————————	————————	This paper; from museum skins
Tip of Tail to Posterior Edge of Rump Patch (mm)	————————	**28.9/40/23–36**	35.7/32/28–42	————————	————————	This paper; from museum skins

[1]Treatment is at the species level and some samples presented may consist of one or more subspecies.

[2]Sample sizes were not given for some parameters in sources used.

[3]Body mass has been shown to be the single most accurate univariate measure of size in birds (Rising and Somers 1989), including structural framework and nutrient reserves (Clark 1979, Piersma and Davidson 1991).

[4]Flattened wing chord.

[5]Measured from emergence of the shafts to the tip of the longest pair of rectrices.

[6]Measured from apex of the fork as a perpendicular to a straight line connecting the tips of the longest two rectrices.

[7]A very imprecise measurement; taken at midpoint of the rump patch and measured from the distal to the proximal edges.

DESCRIPTION OF THE SWALLOW AT VIERA WETLANDS

• **Age.** Adult (AHY).

• **Sex.** Unknown.

• **Size.** Direct comparison in flight showed the Viera Wetlands swallow to be noticeably smaller than Tree and Cave Swallows. It had a smaller body, shorter overall length, shorter broader wings, and shorter tail than the Tree Swallows, and the body appeared chunky or barrel-chested, similar to that of Cave and Cliff Swallows. The smaller size of the Mangrove Swallow in comparison with four other species corresponds with measurement data (Table 1) and can be seen in the photographs of specimens (Figures 4 and 5). As previously mentioned, the wings of the Viera Wetland bird were shorter than those of the Tree and Cave Swallows. We were able to make this wing-length comparison repeatedly over the period the bird was present in the area, and this short wing length was also noted by many others. The mean wing length (Table 1) for the Mangrove Swallow is 18% shorter than that of the Tree Swallow, 16.5% shorter than that of the White-rumped Swallow, and 14% shorter than that of the Cave Swallow. Thus, the differences can be detected under field conditions when the Mangrove and Tree Swallows are observed together at relatively close range, as was the case at Viera Wetlands. Wing lengths of migratory birds in general tend to be longer and more pointed than those of birds that are nonmigratory (Gill 1990). Of the five species listed in Table 1, only the Mangrove Swallow tends to be nonmigratory, with the exception of some postbreeding movements (Howell and Webb 1995, Stiles and Skutch 1989, Turner and Rose 1989). Figure 4 clearly shows the difference in wing length between Mangrove and Tree and White-rumped Swallows.

• **Flight.** The flight was different from that of Tree Swallows in that it seemed to be "labored," with more rapid shallow wingbeats, and less gliding under identical conditions (flying in same direction into the wind). Tyler (1942) and Robertson et al. (1992) state that the Tree Swallow tends to glide more than many other species of swallow.

• **Bill.** Small, short, and dark.

• **Eye.** Dark; located well within the dark plumage on side of the head.

• **Head.** The crown and nape were iridescent (glossy) green, and the auricular region was black. It should be noted that all green areas of the plumage on this bird, both on the head and dorsally, had a bluish component but were dominated by green. The lores were black. A very thin white line extended from the top of the eye forward to the small white patch on the forehead at the base of the bill. This supraloral streak became wider as it joined the forehead patch. Only the Mangrove and White-rumped Swallows have this distinctive white configuration on the head (see Turner and Rose 1989). However, some specimens of both Mangrove and White-rumped Swallows that we examined did not have the white patch extending across the base of the forehead. This character showed no correlation with sex or age and appears to be attributable to individual variation. A white nuchal stripe or incomplete collar extended part way up the base of the neck. These features are shown in Figures 6, 7, 8, 9, and 10.

• **Back region.** The middle and upper back were iridescent green, as seen in Figures 6, 7, 8, 11, and 12. The upperparts of the Mangrove Swallow are iridescent green, while those of the White-rumped Swallow are iridescent blue. The most obvious feature of the swallow at Viera Wetlands was its large white rump patch contrasting with the dark upperparts and dark tail. The patch was rather long, extending from the trailing edge of the extended wings distally to, and including, some of the uppertail coverts. There was no dark dividing midline on the patch as in the Violet-green Swallow. In the field, the patch appeared to be entirely white. Most museum specimens showed a number of very narrow, pale grayish or dusky central shaft streaks within the white patch, but these cannot be readily seen on a flying bird under field conditions. Figures 13 and 14 of museum specimens show that these shaft streaks are not readily visible even at close range and were much less obvious on some individuals. The distal and proximal edges of the rump patch on the specimens were slightly irregular (not

Figure 3. The range of the Mangrove Swallow is shown in dark gray shading (Panama northward), and its accidental occurrence on the east-central coast of Florida by a black star. The range of Tumbes Swallow is shown in black shading, the White-winged Swallow in light gray shading, the White-rumped Swallow by horizontal lines, and the Chilean Swallow by vertical lines. Range of the Mangrove Swallow is derived from Howell and Webb (1995), Ridgely and Gwynne (1989), and Stiles and Skutch (1989); Tumbes Swallow from Ridgely and Tudor (1989) and Ridgely and Greenfield (2001); and White-rumped, White-winged, and Chilean Swallows from Ridgely and Tudor (1989). *Map by Virginia Maynard.*

straight lines). This was produced on the proximal edge by the extension of the tips of a few dark back feathers into the patch (Figures 13 and 14). With the distal edge, some of the white uppertail coverts in a number of the specimens we examined had iridescent green or brown subterminal spots that produced a lace-like pattern (Figure 16a). About 60% of the adult specimens had such spots, but when present, the prominence of the spots varied widely among individuals. This character is also present on some juveniles. These spots can barely be seen in Figures 6 and 15 of the Viera Wetlands bird and are shown in detail on specimens in Figures 14 and 16a. Such spots are very difficult to see in the field except at close range with good light angle. Some White-rumped Swallows have brownish "blurred smudges" scattered across the rump patch (Figure 16b) that have a completely different appearance from the prominent spots of Mangrove Swallow.

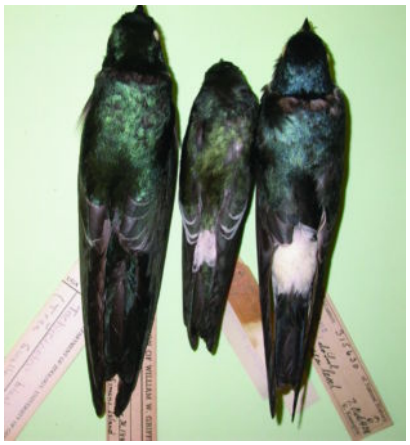

Figure 4. From left to right: comparison of specimens of fall adult Tree, Mangrove, and White-rumped Swallows. Note the differences in body and wing lengths, coloration of the upperparts, white borders to the tertials, and white rumps of the Mangrove and White-rumped Swallows. While the length and shape of the specimens may vary depending upon how well they have been prepared, the specimens were selected to reflect true relative sizes of the three species. *Photograph by Lyn S. Atherton.*

Figure 5. Specimens, left to right by pairs: Tree, Mangrove, and White-rumped Swallows. The juveniles are on the left of each pair and adults on the right. The juvenile Mangrove Swallow has a trace of green iridescence on the back. The way the specimens were prepared accounts for the apparent differences in length and shape of the Mangrove pair. *Photograph by Lyn S. Atherton.*

• **Wings.** The primaries and secondaries were dull black. The upperwing secondary coverts were iridescent green and the upper primary coverts black. The leading edge of the wings showed some fine, irregular white-and-dark mottling (Figure 9). The underwing linings were white (Figure 17). The tertials were dark with green iridescence and had very prominent white margins on both sides (Figures 6, 8, 11, and 15). In the fall specimens of Mangrove Swallow, this white margin extends up both sides 30 to 50% of the individual feather length from the tip. The white margin tended to be wider and hence more obvious on the outer webs (Figure 13). There were some white edgings to several secondaries outboard of the tertials (Figure 15). In the austral spring specimens of the White-rumped Swallow, the white on the tertials is generally narrower and extends < 30% of the individual feather length from the tip (Figure 18); this also holds true for austral fall birds. On a few specimens, the white border was only at the tip or absent. Comparison of the white tertial margins of the two species is shown on specimens in Figure 12. The broader white edges to the tertials of the Mangrove Swallow are a good field mark when in fresh plumage in summer and fall and readily separate it from the White-rumped Swallow.

Figure 10. Specimens of Mangrove Swallows (left three) and White-rumped Swallows (right three) showing the variation of the white supraloral streak and the white forehead between and within species, and the white underparts of both species. *Photograph by Lyn S. Atherton.*

• **Tail.** The tail was short and black with a very shallow fork (Figures 6 and 19). Most of the time, the tail appeared square-tipped in the field. In the Mangrove Swallow, the mean tail length is 30% shorter than in the Tree Swallow and 20% shorter than in the White-rumped Swallow (Table 1).

• **Underparts.** The underparts appeared uniformly white from the chin to and including the undertail coverts (Figures 8, 17, and 20). Most Mangrove specimens show a varying degree of pale grayish wash across the breast, but

Figure 6. Adult Mangrove Swallow in flight over Cell 1 at Viera Wetlands, Brevard County, Florida, on 20 November 2002. The bird was in fresh plumage. Visible in this photograph are the white forehead, dark side of the head, incomplete white nuchal collar, green upperparts, black remiges, prominent white margins of the tertials and adjacent inner secondaries, conspicuous white rump patch, with dark spots on the proximal edge, and short black tail with a slight notch. *Photograph by Lyn S. Atherton.*

Figure 7. Adult Mangrove Swallow at Cell 1, Viera Wetlands, Brevard County, Florida, on 20 November 2002, with the white supraloral streak and white forehead patch as seen in flight. *Photograph by John Puschock.*

Figure 8. Adult Mangrove Swallow at Cell 1, Viera Wetlands, Brevard County, Florida, on 20 November 2002. The white supraloral streak, forehead, underparts, tertial borders, rump patch, and green upperparts are visible on the bird. *Photograph by Lyn S. Atherton.*

Figure 9. Adult Mangrove Swallow at Cell 1, Viera Wetlands, Brevard County, Florida, on 20 November 2002. Apparent are the mottling on the leading edge of the wings and the white forehead and underparts. *Photograph by John Puschock.*

Figure 11. Perched adult Mangrove Swallow at Cell 1, Viera Wetlands, Brevard County, Florida, on 20 November 2002. The green upperparts and white rump and underparts are shown. *Photograph by Mary C. Wheeler.*

this is not visible under field conditions. As with the white rump patch, the scattered, very fine pale gray/dusky central shaft streaks on the breast and belly are not visible in the field. To the rear of the white neck collar was an ill-defined dark wedge extending onto the sides of the breast that became somewhat diffused distally (Figure 17 and 20). This mark was much more apparent on the White-rumped Swallow specimens than on those of the Mangrove Swallow.

DISCUSSION

In summary, the combination of field marks separating the adult Mangrove Swallow from all similar species with prominent white rump patches, include: (1) small size, (2) glossy green head and back, (3) white supraloral streak, (4) black lores and auricular, (5) prominent white edges to the tertials in fresh plumage, (6) short black tail with shallow notch, and (7) white underparts. Tumbes Swallow does not have a white supraloral streak, is not known to migrate, occurs in a very arid habitat, and has a very restricted range. While the White-rumped Swallow has a white supraloral streak, it is noticeably larger (length, wings, tail, etc.; see Table 1), has glossy blue rather than green upperparts, and has much less white on the margins of the tertials throughout the year. The White-winged Swallow does not have a supraloral streak, the white edges of the tertials are much broader and more obvious than in the Mangrove Swallow, and the secondaries and secondary coverts show broad white edges, hence the English common name for the species. Both Chilean Swallow and Common House-Martin likewise lack a supraloral streak, have blue upperparts, and have longer, more deeply forked tails (Turner and Rose 1989). Violet-green Swallow (the Mangrove Swallow at Viera Wetlands was originally thought by some to be this species) sometimes appears to have a white rump (Howell and Webb 1995), but Violet-green Swallow lacks the supraloral streak, is a larger bird, has upperparts of a different color green, and has a completely different head pattern. The range of the Mangrove Swallow is much closer to Florida than any other species of swallow of similar appearance, and the weather conditions preceding the discovery were favorable for the species to reach Florida.

The Mangrove Swallow is primarily coastal and is resident along both coasts of Mexico, from central Sonora and southern Tamaulipas, south to southern Panama (Figure 3). It is found from sea level to 600 m in Mexico and up to 1000 m elevation in Costa Rica (Howell and Webb 1985, Stiles and Skutch 1989, Turner and Rose 1989). While the Mangrove Swallow is considered resident, some seasonal movements have been reported (Howell and Webb 1995, Turner and Rose 1989). It is considered to be common to fairly common within much of its range and is usually found in association with water at coastal lagoons, estuaries, salinas, sloughs, fresh and brackish marshes, wet pastures, river courses, lakes, and, as its common name implies, in mangrove areas. This swallow usually forages close to the water surface or low over marshes and fields (Howell and Webb 1995, Stiles and Skutch 1989, Turner and Rose 1989).

Tumbes Swallow occurs on the northwestern coast of Peru and adjacent Ecuador, circa 1300 km south of the nearest known breeding population of Mangrove Swallow in southern Panama (Robbins et al. 1997). White-rumped Swallow is found in southern South America (Figure 3) and is migratory in the southern part of its range. We could find no records north of central Brazil, well south of the Amazon River. It is considered fairly common to common near water in semi-open habitats (Ridgely and Tudor 1989, Turner and Rose 1989). The distribution of the White-winged Swallow (Figure 3) is the northern two-thirds of South America east of the Andes Mountains (except in northern Colombia and northwestern

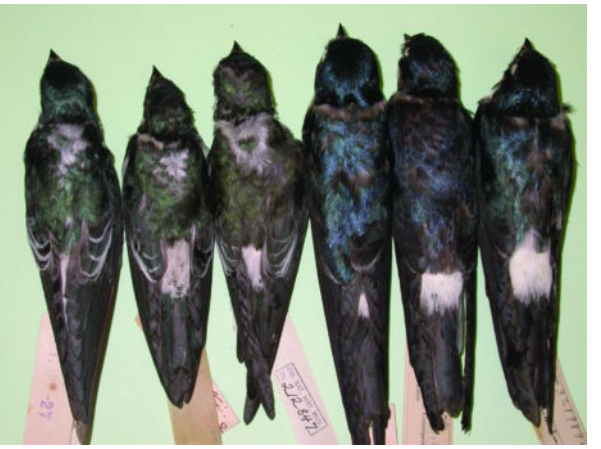

Figure 12. Fall specimens showing the green upperparts and prominent white tertial margins of Mangrove Swallows (left three), and blue upperparts and white tertial tips of White-rumped Swallows (right three). *Photograph by Lyn S. Atherton.*

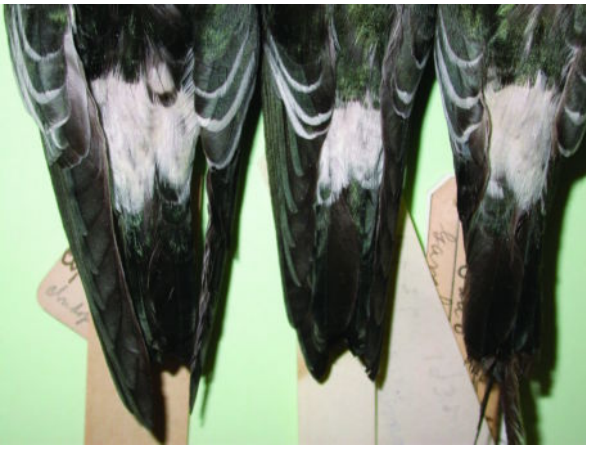

Figure 13. Prominent white tertial margins, dusky central shaft streaks on some of the white rump patch feathers, and subterminal spots on some of the white upper tail coverts of the Mangrove Swallow specimens. *Photograph by Lyn S. Atherton.*

Figure 14. Variation in amount of white tertial margins and subterminal spots on white upper tail coverts in Mangrove Swallow specimens. Note the dusky central shaft streaks in white rump patch of bird at left. *Photograph by Lyn S. Atherton.*

Venezuela) south into northern Argentina and southern Brazil. It is a fairly common to common and is migratory in the extreme southern part of its range. It has a strong association with rivers and lakes (Ridgely and Tudor 1989, Turner and Rose 1989).

The Mangrove Swallow was among those species predicted to occur in the southwestern United States (Jones 1998) and in Texas (Lasley and Lockwood 1999), but not in Florida (Pranty 1999). We predict that this species has a high probability of occurring infrequently anywhere along the United States/Mexico border and around the northern rim of the Gulf of Mexico.

Figure 15. Adult Mangrove Swallow preening at Cell 1, Viera Wetlands, Brevard County, Florida, on 20 November 2002. The green crown, white margins of the tertials, white of the inner secondaries, and large white rump patch are clearly visible. *Photograph by Lyn S. Atherton.*

Figure 17. View of the underside of adult Mangrove Swallow at Cell 1, Viera Wetlands, Brevard County, Florida, 20 November 2002. Visible are the white underparts, white wing linings, and dark diffuse wedge extending onto the side of the breast. Note the vestigial tenth primary that is typical of Hirundinidae (Turner and Rose 1989). *Photograph by John Puschock.*

Weather conditions preceding the discovery of the Mangrove Swallow at Viera Wetlands, for much of the month of November (Figure 21), could have aided the bird in its eastward movement across the Gulf of Mexico, most likely from the Yucatán region or perhaps Caribbean slope of Central America. During the period, three significant weather systems swept the Gulf Region under the influence of the El Niño—Southern Oscillation. These patterns are characterized by low-pressure cells that follow more southerly tracks than in most years. Often these southern systems are reinforced by strong polar air masses from central Canada, resulting in heavy winds and rain along the frontal boundaries. Upper-atmosphere analysis supports the surface observations, especially in the 850-millibar (mb) level at roughly 914–1523 meters (3000–5000 feet), a range often associated with bird migration but probably not with that of swallows, which are diurnal migrants that fly at much lower elevations.

On 5–6 November, a moderate low formed in central Mexico and pushed a cold front northeastward across the Gulf of Mexico on the 6th (Figure 21a). Winds ahead of this front were 25+ knots from the southwest. On 11–13 November, a strong cold front swept the Gulf Coast, with very cold high pressure penetrating deep into the southern United States (Figure 21b). Strong southerly-to-southwesterly winds developed 9–11 November, as a deep trough of the polar jet stream formed, reaching well into Texas. On 15–17 November, a moderate low-pressure area formed over the Texas-Arkansas border and tracked eastward and southward under the influence of a reinforcing cold front (Figure 21c). Converging systems brought heavy rain and strong winds to the Gulf Coast and Florida Peninsula.

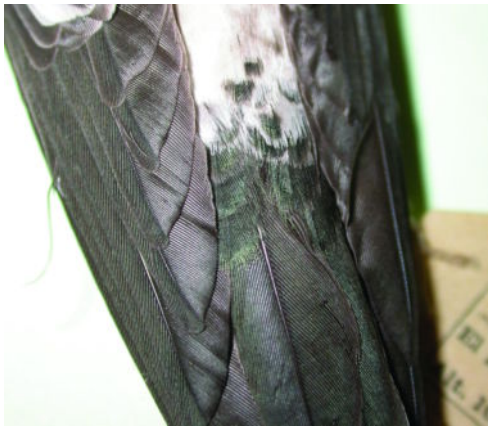

Figure 16. Detailed view of lower rump area of adult Mangrove Swallow (above) with dark subterminal spots of the white upper tail coverts, contrasted with smudge-like markings on tips of feathers of white rump area of adult White-rumped Swallow (below). *Photograph by Lyn S. Atherton.*

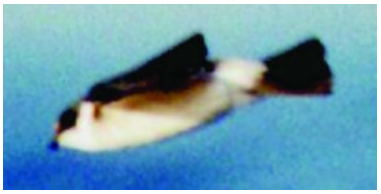

Figure 20. Adult Mangrove Swallow at Cell 1, Viera Wetlands, Brevard County, Florida, on 18 November 2002. The dark upperparts, white rump, dark side of the head, white underparts, and dark wedge-shaped streak extending onto side of the breast are visible in this photograph. *Photograph by Lyn S. Atherton.*

We believe the Mangrove Swallow, which was found on the east-central coast of Florida in the latter half of November 2002, was present in Florida as a direct result of one or more of these weather systems. Also, these systems were probably responsible for the unprecedented incursion of Cave Swallows over much of eastern North America during the same general period (Brinkley and Lehman 2003).

This is the first record of the Mangrove Swallow for Florida and the United States. It has been accepted by the Florida Ornithological Society Records Committee; vote 7/0, 18 July 2003 (Reed Bowman and Fred E. Lohrer, pers. comm.).

Acknowledgments

We wish to thank the staff of the Brevard County South Central Regional Wastewater Treatment Facility for permitting access to the Viera Wetlands complex to the birding community. We acknowledge Roger B. Clapp (NMNH), Paul Sweet (AMNH), Jeremiah

Figure 18. Adult White-rumped Swallow specimens showing variation in the white tips of the tertials and variation in marks (or lack thereof) in the white rump patch. *Photograph by Lyn S. Atherton.*

Figure 19. Adult Mangrove Swallow preening at Cell 1, Viera Wetlands, Brevard County, Florida, on 20 November 2002. Visible are the green upper parts, white underparts and black, somewhat square-tipped tail. *Photograph by Mary C. Wheeler.*

Trimble (MCZ), and David E. Willard (FMNH) for providing *Tachycineta* swallow specimens on loan from their respective institutions and to Elizabeth M. McGhee (GMNH) for receiving, housing, and returning the specimens on loan. We particularly express our appreciation to Roger B. Clapp, Matthew Sharp, and Kimball L. Garrett (LACM) for providing measurements and salient comments on swallow specimens as well as replying to inquiries about certain characteristics of the specimens in question.

Brooks H. Atherton provided the material for the weather analysis and a photograph of habitat. Debbie Coles of the Brevard County Natural Resources Management Office; Lynda J. Garrett, Library, Patuxent Wildlife Research Center, Laurel, Maryland; Bridget J. Stutchbury, York University, Canada; Angela K. Turner, University of Nottingham, United Kingdom; and C. Wesley Biggs provided helpful information. Thanks go to all who posted comments about and images of the Viera Wetland swallow on the various websites. Appreciation is extended to John Puschock and Mary C. Wheeler for use of some of their series of photographs of the Viera Wetlands bird, and to Steve Holzman, Peter J. Lasier, and Parley V. Winger for trying so hard to improve the senior author's computer skills. This paper has benefited from the helpful comments of Steve N. G. Howell and Peter Pyle. And we thank Bonnie F. Kepler for typing the draft manuscript.

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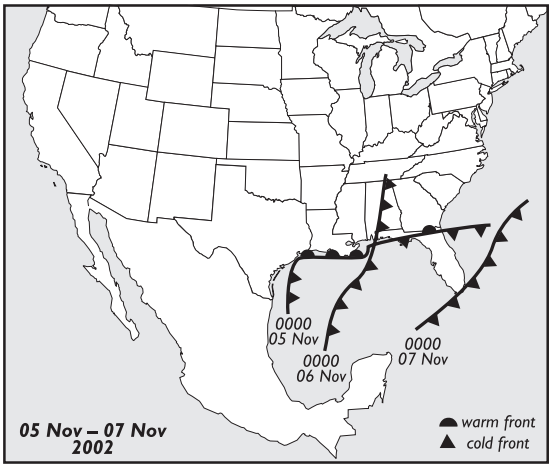

Figure 21a

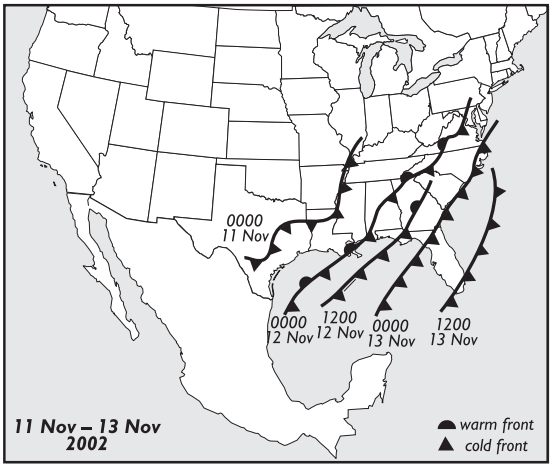

Figure 21b

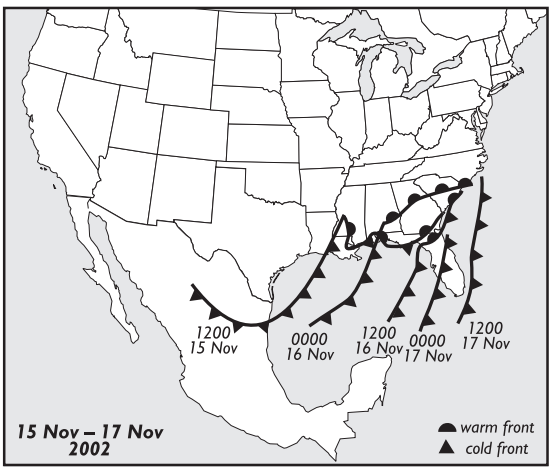

Figure 21c

Figure 21. It is likely that the appearance of the Mangrove Swallow in Florida was facilitated by one or more of three significant November 2002 weather events under the influence of the El Niño–Southern Oscillation, patterns characterized by low-pressure cells that follow more southerly tracks than in normal years. The 5–6 November front (Figure 21a) consisted of a moderate low that formed in central Mexico and crossed the Gulf of Mexico to the northeast on the 6th with southwesterly winds of 25 knots and greater. The 11–13 November front (Figure 21b) swept the Gulf Coast with very cold high pressure that penetrated deep into the southern United States and contained still stronger southwesterly winds. Finally, on 15–17 November, a moderate low formed over the Texas–Arkansas border and moved east and south (Figure 21c). *Maps by Virginia Maynard.*