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AN ADDITION TO FLORIDA'S EXOTIC AVIFAUNA: SUN PARAKEETS (*Aratinga solstitialis*) IN PASCO COUNTY

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With 218 exotic bird species reported outside of captivity, and with 132 of these verifiably documented from photographic or specimen evidence (Pranty in prep.), Florida is recognized as one of the exotic-bird capitals of the world. Monitoring exotic birds is important for several reasons, including documentation of the species richness present and determination of potential impacts to native species, habitats, agriculture, animal husbandry, human health, or commerce. Here, we describe a new exotic bird for Florida, the Sun Parakeet (*Aratinga solstitialis*), a monotypic, endangered species native to savanna, dry forest, and seasonally flooded scrub forest in northeastern Brazil and southern Guyana (Silveira et al. 2005). Sun Parakeets are popular in aviculture due to their bright colors, but neither Long (1981) nor Lever (1987, 2005) knew of the presence of any exotic populations. The only potential previous report for Florida referred to two *Aratinga* that may have been Sun Parakeets observed in flight over Wilton Manors, Broward County, during 2000 (Pranty and Epps 2002).

Results

Discovery and description.—We discovered and photographed six Sun Parakeets (Fig. 1) along Old Dixie Highway, north of Hudson, Pasco County, Florida, at 0901 hrs DST on 5 July 2009. One adult was peering out of an abandoned woodpecker cavity in a wooden utility pole while the other parakeets were perched nearby. The Sun Parakeets were medium-sized parakeets with brilliant plumage. In the flock of six, three were adults, with orange heads and underparts, yellow crowns, backs, and shoulders, lime upperwing surfaces with blue primaries and yellow-tipped coverts, lime tails, and yellow undertail coverts. One of the adults was individually recognizable from several white-tipped inner primary feathers on its right wing. The other three parakeets were juveniles, similar in plumage to adults but with olive tones on the throat, breast, and nape, mottled yellow and lime on the back, shoulders,

Figure 1. Five Sun Parakeets (from the left: two juveniles retaining some juvenal plumage, two adults, and one juvenile largely in adult plumage) north of Hudson, northwestern Pasco County, Florida. These five parakeets, part of a flock of three adults and three juveniles when discovered in July 2009, furnish the first record for Florida. Photograph by Bill Pranty, 13 March 2010. Another photograph of the parakeets was published in color in Strycker (2009).

and coverts, and olive undertail coverts. Each juvenile differed in the amount of yellow versus lime on the shoulders and back. In flight, the underwing coverts of the adults showed orange and yellow, while those of the juveniles showed orange and olive. On all six parakeets, the undersides of the flight feathers were gray, the bills blackish, and the legs and feet gray. The narrow orbital rings were gray, darker on the adults. None of the parakeets was banded. The illustration in Silveira et al. (2005) and numerous photographs on avicultural websites that we examined show bold white orbital rings on adults and juveniles. Orbital rings of some non-captive parakeet species, including Nanday (Black-hooded) Parakeets (*Nandayus nenday*) in Florida, are darker than those in captivity (Pranty and Garrett 2011), evidently a result of exposure to the sun (Pranty pers. obs., P. Simdars in litt.). The adults were distinguished from the similar Jandaya Parakeet (*Aratinga jandaya*) and Sulfur-breasted Parakeet (*A. pinttoi*) by their orange underparts and wholly yellow backs and shoulders (see Silveira et al. 2005), among other features. Because Sun Parakeets are popular in captivity and sell locally for $150-200 each, we presumed that the birds escaped accidentally or were released maliciously.

The parakeets called frequently, both when perched and in flight. The primary call was a high-pitched, disyllabic screech. Other calls heard included less shrill "chattering" notes and quiet "murmuring" notes uttered when the parakeets were perched next to each other. Behaviors that we observed included flying, loafing, preening, allopreening, bill-tugging, acrobatic perching (e.g., upside-down, from one leg, solely from the bill), roosting, examining other cavities, defecating, feeding, and copulating. Twice BP video-recorded "rough play," during which one parakeet (in 2009 an adult) bit the toes, wings, breast, or uppertail coverts of a second parakeet (in 2009 two juveniles), while the second parakeet called in apparent distress. One of BP's videos is posted to <http://www.youtube.com/watch?v=XJzEAlmvrOY>.

Survey results.—We searched for the parakeets for 4,362 min (72.7 hrs) during 84 days over a 19-month period, 5 July 2009-14 January 2011. We observed the parakeets for 1,809 min (30.1 hrs) during 44 days, 5 July 2009-25 November 2010. All but a few minutes of observation time were made in the vicinity of the roost pole. Although six Sun Parakeets were originally discovered, only four of them (one adult and the three juveniles) were observed on most occasions during 2009. During 2010 however, all observations but one were of the six parakeets together. We never determined the whereabouts of the two other adults when only four parakeets were present during 2009. The parakeets were reliably found through 22 September 2009, after which their appearance around the roost pole was sporadic, indicating that they were roosting elsewhere. By our next survey, on 30 September 2009, the roost cavity was occupied by a swarm of honey bees (*Apis mellifera*). The honeycomb persisted for several months, even though the bees had disappeared by mid-November 2009. The parakeets were rediscovered at the roost pole on 21 January 2010 (D. Gagne pers. comm.), after which we resumed observations. The cavities in the roost pole were covered with sheet metal, presumably by the local electric company, by 8 April 2011, thus ending our study.

Remarkably, the Sun Parakeets were observed at four other locations, each more than 6 km from the roost pole. On 21 October 2009, Ken Tracey (in litt.) observed six and photographed four parakeets in flight over Werner-Boyce Salt Springs State Park, Bayonet Point, Pasco County. On 27 June 2010, Pranty observed from his yard at Bayonet Point a flock of vocal parakeets about 200 m away that he identified as Sun Parakeets based on their call notes. On 28 July and 13 August 2010, Lynda Barhorst (pers. comm.), who maintains about 40 captive psittacids in outdoor cages on her property in Hudson, observed the six parakeets perched in her yard. Finally, on 15 November 2010, Al and Bev Hansen observed the six parakeets flying south over Weekiwachee Preserve, Spring Hill, in Hernando County (Pranty 2011).

Habitats and landscape.—The area that supported the Sun Parakeets was more rural than is typical of sites occupied by psittacids in Florida, despite the proximity of development (Pranty pers. obs.). Habitats within 3 km of the roost pole were heterogeneous, consisting of medium-density residential, commercial, and industrial development; a six-lane divided highway (U.S. Highway 19); slash pine (*Pinus elliottii*)/cabbage palm (*Sabal palmetto*)/red cedar (*Juniperus virginiana*) uplands; open-pit limerock mines; small patches of xeric oak scrub; and black needlerush (*Juncus roemerianus*) salt marshes interspersed with cabbage palm/red cedar hammocks. Many of the uplands and wetlands were overgrown with Brazilian pepper (*Schinus terebinthifolius*) and other exotic vegetation. Lands beyond 3 km were mostly high- and medium-density residential and commercial developments to the northeast and south, and extensive conservation lands to the north.

Because most of our observations were at the roost, only once did we observe the parakeets feeding. On 25 July 2009, in the Sea Pines development east of the roost pole, we found one adult and the three juveniles feeding on marble-sized, dark berries that they apparently had earlier stashed on the tops of wooden utility poles. The parakeets had no food items in their bills when they flew to the tops of the poles, but began picking up and feeding on the berries shortly after they landed. Outside of this event, we often saw the parakeets fly into trees near the roost pole, but foliage and distance prevented us from determining if they were feeding: five times in a live oak (*Quercus virginianus*) laden with acorns; three times in an Indian rosewood (*Dalbergia sissoo*) laden with seed pods; and twice in a lead tree (*Leucaena leucocephala*) laden with seed pods. We presumed that during 2009, the parakeets foraged mostly in the Sea Pines development, as that was almost always the direction from which they flew in to roost in the evening. We found the parakeets feeding in this development on 25 July 2009 prior to their roosting, and they flew in that direction after they left the roost cavity the morning of 8 August 2009.

We later ascertained that three weeks before we discovered the parakeet flock, Ken Tracey (pers. comm.) had spoken with a nearby resident who commented that orange and yellow parakeets had recently been visiting his bird feeder in the Rainbow Palms development to the south. Searches for the parakeets in Rainbow Palms during October 2009 were not successful. On several occasions, the parakeets flew into the pine/palm/cedar uplands west of the roost pole but we could not follow them because the property was privately owned.

Roost site and roosting behavior.—When roosting, the Sun Parakeets entered one of two cavity entrances (one facing south-southwest and the other southwest) that led to an interconnected cavity

inside the utility pole. The parakeets usually began to enter the cavity about an hour before dark. One bird, during 2009 usually a juvenile, would remain perched on top of the pole for 10-15 min after the other parakeets had entered the cavity, presumably watching for predators. Once all parakeets had entered the cavity, one adult, often joined by one or more juveniles for shorter periods, roosted with its head protruding, again evidently watching for predators, until darkness prevented continued observations. Several psittacids are known to engage in sentinel behavior (Juniper and Parr 1998, Pranty et al. 2010), but our observations appear to be the first known for Sun Parakeets (Forshaw 1977, 2006; Juniper and Parr 1998). On five occasions (22 September 2009 and 5, 6, 14 & 19 September 2010), the parakeets flew into the area and began to roost, but then the flock unexpectedly departed and did not return. The 2009 event was caused by a Peregrine Falcon (*Falco peregrinus*) that flew overhead (see below), but no cause for the September 2010 events was apparent.

Interspecific interactions.—We observed the Sun Parakeets interacting with 13 other bird species. During July-August 2009 and July-September 2010, we often observed the parakeets flushing or chasing other birds that perched near or flew by the roost pole. During 2009, the single adult usually led the chase followed by one or more juveniles; during 2010, all six parakeets often participated. When the parakeets were already inside the roost cavity, the adult often flew dozens of meters to chase the birds, and often continued the pursuit for 30 m or more. If the bird that was chased perched again, then the parakeets often flushed it again. Birds flushed or chased were one to three Mourning Doves (*Zenaida macroura*) on six occasions, one blue-morph Budgerigar (*Melopsittacus undulatus*) once, four Monk Parakeets (*Myiopsitta monachus*) twice chased for more than 120 m, single Red-bellied Woodpeckers (*Melanerpes carolinus*) twice, single Eastern Kingbirds (*Tyrannus tyrannus*) three times, two Eastern Bluebirds (*Sialia sialis*) once, one Northern Mockingbird (*Mimus polyglottos*) once, one male Summer Tanager (*Piranga rubra*) once, one or two male Boat-tailed Grackles (*Quiscalus major*) twice, and single male Red-winged Blackbirds (*Agelaius phoeniceus*) twice.

On 22 August 2009, a Pileated Woodpecker (*Dryocopus pileatus*) landed on the roost pole while four parakeets were perched nearby. The parakeets called loudly and continuously but did not leave their perches until the woodpecker flew away, after which the parakeets pursued it for a short distance before flying to the roost pole. On 22 September 2009, the parakeets had flown in to roost but departed and did not return that evening after a Peregrine Falcon flew overhead. The parakeets had clearly identified the falcon from a distance, as they flew off, calling loudly, before the falcon flew into our view. On 24 November

2010, the parakeets had begun to roost when all six flew up and circled, calling loudly, about 10 seconds before a medium-sized *Accipiter* (either a female Sharp-shinned Hawk, *A. striatus* or a male Cooper's Hawk, *A. cooperii*) flew low within 30 m of the roost pole. Within 60 seconds, the parakeets had returned to the pole and had begun to reenter the cavity. On three occasions, roosting parakeets watching from the cavity entrances looked downward as single raccoons (*Procyon lotor*) walked past the pole.

Discussion

We found no published information on the length of time that juvenal plumage is retained in Sun Parakeets (cf. Forshaw 1977, 2006; Joseph 1992; Juniper and Parr 1998). We presume that the juvenile Sun Parakeets had fledged no more than a few months prior to our discovery of the flock in July 2009 (e.g., perhaps sometime during April-June 2009). By late September 2009, the juveniles had begun to molt. One juvenile in particular had acquired much adult plumage, including loss of the olive flush on the head and breast and acquisition of mostly yellow shoulders. There seemed to be little or no further molt through early February 2010, when we resumed observations. By August 2010, two juveniles still retained some lime feathering on the shoulders and some olive tinges to the breast, but these juvenal feathers had been replaced by November 2010, when all six parakeets appeared adult-like. Thus, molt of two of the juvenile Sun Parakeets seemed to require 16-18 months to complete, with the third juvenile seemingly completing molt after only 3-5 months.

Information on frequency and distance of psittacid movements in Florida is lacking, due to logistical difficulties of following flocks in suburban and urban areas, as well as the inability to distinguish the same or separate flocks. Because most psittacids in their native ranges are non-migratory, and because food and water are widespread and easily obtainable in Florida, we presume that movements of psittacids are limited to short distances (perhaps < 8 km). Based on a minimum convex polygon, the home range of the Sun Parakeet flock in northwestern Pasco County and southwestern Hernando County between July 2009 and November 2010 was 57.2 km^2. Such a home range seems surprisingly large for a single, small flock of parakeets. The only other information available on home-range size in psittacids in Florida was a home range of 74.1 km^2 for a population of 24 or more Blue-and-yellow Macaws (*Ara ararauna*) in Miami-Dade County, Florida, between January 2003 and July 2009 (Pranty et al. 2010).

Even though it seemed unlikely to us that six or more Sun Parakeets—including three juveniles—would have escaped or been

released together sometime during 2009, we observed no direct evidence of breeding outside of captivity. The juveniles were independent by the time we discovered the flock in July 2009, and during spring and summer 2010, all six parakeets were seen together and the roost cavity was never occupied during daylight hours, which would have indicated an active nest. The only suggestion that two of the parakeets were paired was on 10 July 2010, when we observed copulation. Like nearly all other psittacids, Sun Parakeets nest and roost in cavities (Forshaw 1977, Joseph 1992, Juniper and Parr 1998). In Florida, many psittacids regularly nest in former woodpecker cavities excavated in wooden utility poles (Pranty and Epps 2002, Pranty and Lovell 2011), so the Sun Parakeet's roost pole seemed an appropriate nest-site. The breeding season of Florida's psittacids is imperfectly known, but most psittacid nests have been active during spring or summer, and juveniles have been observed with adults during summer or early fall (e.g., Pranty and Epps 2002, Pranty and Garrett 2003, Pranty et al. 2010, Pranty and Lovell 2011). Thus, it seems that breeding outside of captivity during spring 2009 is the most likely explanation for our discovery of three adult and three juvenile Sun Parakeets north of Hudson, in Pasco County, Florida.

Postscript.—In June 2011, while this manuscript was in final review, Pranty was contacted by Paul Simdars, a local resident who had seen Pranty's videos of the Sun Parakeets on YouTube. In 2005, Simdars moved to the Viva Villas development in Hudson, which is 0.8 km east of Old Dixie Highway. Simdars owned a flock of about eight Sun Parakeets (a breeding pair and their progeny) that initially were kept in a large outdoor cage in his yard. After about a year, Simdars allowed the parakeet to fly freely around the area, but they returned to roost in the cage. (A video by Paul Simdars of five Sun Parakeets free-flying and then returning to his yard during summer 2006 is posted to <http://www.youtube.com/watch?v=5ndGxPl6GWQ>). At times the flock would be observed more than 1.6 km from the Simdars yard. Within another year or two, the parakeets began roosting elsewhere, but they continued to return daily to feed, during morning and evening. Over the years, the number of parakeets declined gradually, presumably from depredation or another cause of death. The final three Sun Parakeets disappeared at once sometime in spring 2011, months after we had last seen the flock. Simdars believes that the flock was captured or otherwise removed. Simdars stated that the female of his breeding pair was individually identifiable from aberrant spotting on the feathers on its right wing. This may refer to the adult parakeet that we photographed with several white-tipped inner primaries on the right wing. Simdars confirmed that during one year, his female disappeared for 28 days and then returned. Later, three juveniles began appearing

with the rest of the flock. Although anecdotal, Simdars's observations confirm that his free-flying flock of Sun Parakeets did breed outside of captivity. Simdars said that the breeder male later disappeared, which may explain why we did not find any strong evidence of nesting during 2010; the copulation we observed in July 2010 may have included one or two of the juveniles.

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