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## STATUS AND DISTRIBUTION OF EGYPTIAN GEESE (*Alopochen aegyptiaca*) IN SOUTHEASTERN FLORIDA

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**Abstract.**—The Egyptian Goose (*Alopochen aegyptiaca*), a native of Africa, is popular in aviculture. Egyptian Geese were first reported in Florida in the 1960s and recently have become widespread and numerous along the southern Atlantic coast. More than 1,200 geese were tallied at 181 sites from Martin County south through Miami-Dade County during 2012–2013, and the total population probably is several times larger. The species breeds readily outside of captivity, and we compiled 70 reports of reproduction in the state since the mid-1980s, with most of these recent. Six of seven nests described in Florida have been built on the ground, usually at the base of a tree or shrub, with one other nest being built on the roof of a house. Habitats used in Florida consist of a mix of open grassy areas and shallow freshwater wetlands; upscale residential developments, suburban parks, and golf courses are used most frequently. To date, there are few reports of geese occurring in large conservation areas. Egyptian Geese can be classified as fairly common to very common residents in the southeastern peninsula, and rare in widely scattered areas elsewhere in the state, primarily in urbanized counties. Egyptian Geese may deserve recognition by the Florida Ornithological Society Records Committee as an established exotic.

The Egyptian Goose (*Alopochen aegyptiaca*; Fig. 1) is native to sub-Saharan Africa and the Nile River drainage (del Hoyo et al. 1992). It is an attractive species that is common in aviculture, which explains its presence in Florida. Egyptian Geese form monogamous pair bonds and breed readily in and out of captivity. Nests are built on



**Figure 1. Egyptian Goose pair with brood of four goslings. Crandon Park, Miami-Dade County, 10 February 2008. Photograph by Bill Pranty.**

the ground, in burrows, on cliffs, or in trees, sometimes in used nests of other birds (Todd 1979). Clutches contain 6–12 (average 7) eggs that are incubated by the female for 28–30 days (Todd 1979, Tattan 2004). Both sexes aggressively defend the nest and young. Goslings leave the nest shortly after hatching and fledge after 70 days (Tattan 2004). Sexes are indistinguishable by plumage but females are smaller than males. Juveniles resemble adults but have duller plumage that lacks the dark brown breast spot and eye patches (Mullarney et al. 1999). Egyptian Geese are primarily herbivores, grazing on grasslands at times considerable distances from water. They also feed on aquatic vegetation and animal prey such as worms, insects, and frogs (Tattan 2004).

Exotic populations of Egyptian Geese are widespread in Europe, with recent estimates of 8,800–9,900 pairs (Kampe-Persson 2010) and 26,000 pairs, with 11,420 of these pairs in the Netherlands (Gyimesi and Lensink 2012). In North America, populations are found primarily in Florida, with smaller numbers in California and Texas (Pranty and Garrett 2011, eBird 2013). Several authors (e.g., Robertson and Woolfenden 1992, Stevenson and Anderson 1994, Braun 2004, Pranty 2005, and Greenlaw et al. 2014) have detailed

the basic status of Egyptian Geese in Florida, but their abundance and extensive distribution had escaped prior attention. In this paper, we present information on the status and distribution of Egyptian Geese in southeastern Florida, and offer evidence that the population is large, expanding, and seems to meet the standard definition of establishment.

#### METHODS

We compiled sightings of Egyptian Geese in Florida along the Atlantic coast from Brevard County southward; this region alone contains a large population. To ensure that all locations were current, we used only observations during January 2012–December 2013. (Out of necessity, we presume that no geese traveled between sites and were double-counted). We referenced numerous data sources: eBird (2013), the Early Detection and Distribution Mapping System for monitoring exotic species (EDDMapS 2013), Christmas Bird Counts (CBC; National Audubon Society 2013), the second Florida Breeding Bird Atlas (BBA) project (U. S. Geological Survey 2013), sightings posted to the Miami Bird Board (Tropical Audubon Society 2013), three books on the state's avifauna (Robertson and Woolfenden 1992, Stevenson and Anderson 1994, and Greenlaw et al. 2014), the Florida Ornithological Society Field Observations Committee (FOC) seasonal reports, and Pranty's personal photographic and file archive (BPA). We also used personal observations and reports that we received via a request for information posted to the Miami Bird Board in October 2013. Data for most exotic species, including Egyptian Geese, were deleted from Florida CBCs prior to December 2001 (when Pranty became Florida CBC editor), but we used all data from the 2001–2002 season onward to determine population persistence and trends.

For observations of Egyptian Geese during 2012–2013, most of the data sources we referenced provided few reports, so we relied largely on the EDDMapS and especially eBird databases. Because these databases consist of often unvetted observations submitted by the public, and because some locations are non-precise (e.g., are placed at the geographic center of a city or county rather than at the actual location), we vetted the data carefully. (Fortunately, Egyptian Geese are distinctive and have few lookalike relatives, so we were not concerned about frequent confusion with other species; many reports submitted to eBird and EDDMapS were accompanied by photographs).

For sites with multiple reports during 2012–2013, we selected the report that provided the largest count of geese. For a few eBird reports that did not include the number of geese observed, we entered 1, unless comments indicated multiple birds, for which we entered 2. To the extent practical, we distinguished Egyptian Geese by ages (adults or young); geese were presumed to be adults unless indicated otherwise. To characterize habitat use, we used Google Earth to qualitatively examine the habitat at each site and then we chose one of eight general land-use categories: residential, commercial, golf course, park (typically small, recreation-based, and often containing little native vegetation; we also included botanical gardens and Zoo Miami in this category), agricultural, preserve (large and composed primarily of native vegetation, with little recreational use), spoil island, and miscellaneous park-like development (university campuses, regional medical centers, and cemeteries). Conservation areas were mapped and identified via a coverage created for Google Earth by the Florida Natural Areas Inventory (2013).

After we compiled all reports from along the southern Atlantic coast, we excluded those found north of Martin County because they were few in number and likely were geographically isolated from the large and contiguous population found farther south. All observations from Martin, Palm Beach, Broward, and Miami-Dade counties were

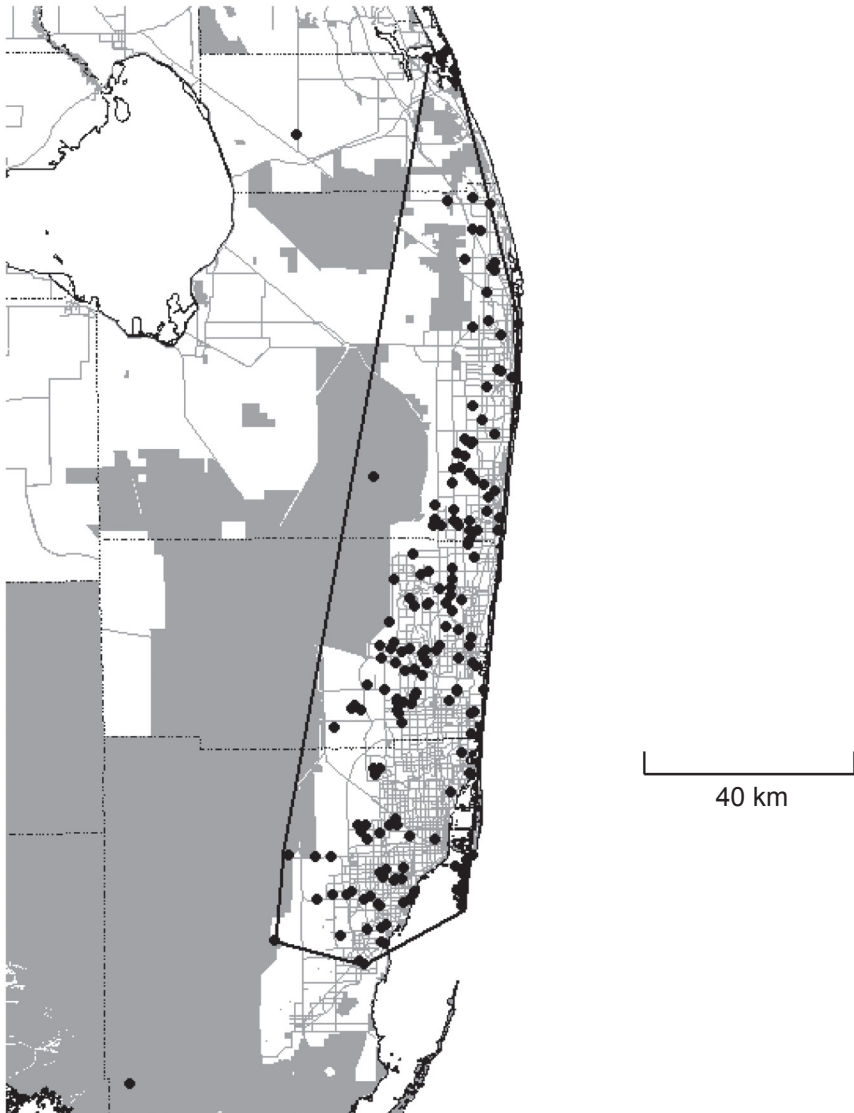
entered into a spreadsheet and numbered individually. We also entered these locations and site numbers into Google Earth and ArcView GIS (Environmental Systems Research Institute 1997) coverages. We drew a minimum convex polygon around the locations to measure the size of the currently occupied range. We excluded from the polygon two extralimital sites—near Indiantown (Martin County) and in Everglades National Park (Miami-Dade County)—to avoid inclusion of large areas of unoccupied habitats. For reproduction, we compiled all breeding reports regardless of year or region in Florida. Since goslings leave the nest shortly after hatching, we considered observations of an adult on the nest to represent a clutch where the number of eggs was unknown. Some reports of broods refer to recently-hatched chicks, while others refer to nearly full-grown juveniles that may have been as many as 10 weeks old (Tattan 2004). When compiling reports of broods observed over multiple days, we selected the earliest date observed.

## RESULTS

*Distribution.*—For all years and throughout Florida, the eBird database (through August 2013) contained 1,372 records of Egyptian Geese and the EDDMapS database (through August 2013) contained 415 records, including many from eBird. When these two databases were edited by removing pre-2012 reports, reports from outside our study area, and all duplicate and lower-quality data, and then combined with reports from other sources, we mapped 181 sites that contained one or more Egyptian Geese along the southern Atlantic coast during 2012–2013 (Fig. 2). These sites were distributed in Martin (6), Palm Beach (53), Broward (65), and Miami-Dade (57) counties. Initially, we included reports from Brevard and Indian River counties, but we later redefined our study area because there were no reports from St. Lucie County, which lies between Indian River and Martin counties. A large majority of the sites (136; 75%) were from eBird, with 25 others from EDDMapS, 14 from personal observations or contacts, and six from the Miami Bird Board. Numbers of Egyptian Geese at these 181 sites totaled 1,204 birds: 1,023 adults and 181 young. Numbers of geese at each site ranged from 1 to 80 and averaged 6.

A minimum convex polygon drawn around all but two of the sites totaled 4,986 km<sup>2</sup> and encompassed most of the urban/suburban lands from the St. Lucie–Martin county line to the Goulds/Cutler Bay area of Miami-Dade County (Fig. 2). Virtually all sites were found within the extensively developed region between the Atlantic Ocean and the Water Conservation Areas/Everglades National Park. The length of the occupied range was about 180 km and the width ranged between 15–35 km.

*Population growth and persistence.*—Table 2 shows that the number of Egyptian Geese found on CBCs in Florida has increased greatly over the past 13 seasons, from 10 geese to 197 geese, nearly a twentyfold increase. Additionally, the numbers of CBC circles that



**Figure 2.** The range of Egyptian Geese in (from north to south) Martin, Palm Beach, Broward, and Miami-Dade counties, Florida, 2012–2013. The solid circles ( $n = 181$ ) represent goose locations, with a minimum convex polygon encompassing nearly 5,000 km<sup>2</sup> drawn around them. Two “extralimital” points were excluded from the polygon. Gray areas represent significant conservation lands in the region, ca. 1992.



contain Egyptian Geese has increased from two circles through the mid-2000s to between six and eight circles since 2011, representing an increase of 300–400% (Table 2).

*Habitats.*—Nearly all sites in Florida that contain Egyptian Geese have a combination of open grassy areas, scattered trees and shrubs, and shallow freshwater wetlands. Geese occur even in some heavily commercialized areas where retention ponds, drainage canals, or nearby recreational parks provide habitats for foraging and breeding. Our qualitative assessment of habitats that contained geese yielded the following results: 57 (31%) residential; 47 (26%) parks; 40 (21%) golf courses; 20 (11%) commercial; 10 (5%) miscellaneous; 5 (3%) preserve; 2 (1%) spoil islands, and 0 (0%) agricultural. The lack of Egyptian Geese in agricultural areas such as those north and west of Homestead (Miami-Dade County) was surprising, but might be explained by the scarcity of wetlands and grassy foraging areas. Geese also appear to avoid heavily urbanized areas, such as those along the coast (Fig. 2). The rarity of geese in preserves was expected, given the scarcity of upland grazing sites and given that Egyptian Geese in Florida seem to be a human commensal. Preserves with reports of Egyptian Geese—one recent report per site in each case—were Arthur R. Marshall Loxahatchee National Wildlife Refuge in Palm Beach County; West Miramar Water Conservation Area in Broward County; and Bird Drive Recharge Area, Everglades and Francis S. Taylor Wildlife Management Area, Everglades National Park, and Frog Pond/L31 N Transition Lands in Miami-Dade County. Most of these reports were along the eastern boundaries of the preserves, abutting urban/suburban lands (Fig. 2).

*Reproduction.*—We compiled 70 reports (of at least 77 instances) of confirmed breeding throughout Florida during 1985–2013, consisting of 10 reports of 12 clutches of eggs and 60 reports of at least 65 broods (Table 1). Dates of clutches ranged from 20 April to 27 December. Broods were observed in every month, as follows: January (3), February (10), March (3), April (14), May (5), June (8), July (3), August (4), September (1), October (4), November (2), December (3), and unknown (1). We compiled 51 reports of brood size (Table 1), which ranged from 1–10 young, and averaged 4.9 young/pair. Based on her observations at Crandon Park and Virginia Key, both in Miami-Dade County, R. Diaz (in litt.) believes that Egyptian Geese pairs in southeastern Florida raise two or three broods per year. The year-round breeding chronology in the region (Table 1) seems to support Diaz's belief.

Information on nest sites in Florida is very limited; we are aware of only seven nest sites described. One nest in Sumter County in August 2010 was built on the rooftop of a house (Pranty 2011), while the other six were built on the ground. Nests at Crandon Park in November

**Table 1. Breeding reports of Egyptian Geese in Florida, 1985–2013 ( $n = 70$ ). For observations of the same breeding pair and/or brood over multiple days or weeks, we list the date of first observation. Ages of goslings may vary from recently-hatched chicks to nearly full-grown juveniles. Abbreviations: BBA = Florida Breeding Bird Atlas, CC = Country Club, eB = eBird, ED = EDDMaps, GC = Golf Course, and RA = Restoration Area.**

County	Location	Date	Evidence	Reference
Broward	Davie: State Road 84	26 Jun 2013	1 brood of 6	anonymous (ED)
Broward	Deerfield Beach Arboretum	17 Jul 2012	1 brood (# young?)	G. Ellis (eB)
Broward	Hollywood: Orange Brook GC	2 Sep 2009	1 brood (# young?)	R. Titus (eB)
Broward	John D. Easterlin County Park	1 Nov 2013	1 active nest	G. Ellis (eB)
Broward	Lake Meadowridge	27 Apr 2013	1 brood of 10	H. Krahe (in litt.)
Broward	Margate: Carolina Club GC	26 Apr 2010	1 brood of 5	anonymous (ED)
Broward	Margate: Carolina Club GC	8 Nov 2013	19 young (# broods?)	B. Pickholtz (eB)
Broward	Pembroke Lakes GC	18 Apr 2009	1 brood of 6	anonymous (ED)
Broward	Pembroke Lakes GC	13 Jul 2011	1 brood (# young?)	K. Rosenberg (eB)
Broward	Plantation Botanical Garden	10 Apr 2013	1 brood of 8	S. Kaplan (eB)
Broward	Plantation Preserve	17 Jan 2013	1 brood of 4	T. Datien (eB)
Broward	Plantation Preserve	28 Apr 2013	1 brood of 5	S. Kaplan (eB)
Broward	Pompano Beach: NW 9th Ave. & McNab Road	19 Apr 2012	1 brood of 3	F. Pagan (ED)
Broward	Tall Cypress Natural Area	4 Jun 2013	1 brood of 6	B. Pickholtz (eB)
Broward	Tamarac, Banyan Lakes	29 Apr 2011	1 brood of 7	K. Gestring (ED)
Broward	Tamarac: Woodlands CC	27 Mar 2008	1 brood of 5	S. Field (ED)
Highlands	Sebring	12 Jun 2013	1 brood of 3	M. McMillian (BBA)
Indian River	Vero Beach: Vista Plantation GC	18 Jun 2012	1 brood of 4	W. Shields (ED)
Indian River	Vero Beach: Vista Plantation GC	15 Feb 2013	1 brood of 7	B. Latvaitis (ED)
Martin	Indian River Lagoon: Island MC2	10 Sep 2002	1 clutch of 3	Braun (2004, Fig. 1)
Martin	Hutchinson Island: Marriott GC	16 Oct 2002	1 brood of 3	Braun (2004, Fig. 2)
Martin	Hutchinson Island: St. Lucie Inlet 4	5 Jun 2012	1 brood (# young?)	N. Price (BBA)
Martin	Hutchinson Island: Sailfish Point GC	13 May 2011	1 brood of 8	B. Poppe (eB)
Miami-Dade	Aventura: Turnberry Isle Resort GC	? 2013	1 brood of 9	N. Freedman (in litt.)

**Table 1. (Continued) Breeding reports of Egyptian Geese in Florida, 1985-2013 ( $n = 70$ ). For observations of the same breeding pair and/or brood over multiple days or weeks, we list the date of first observation. Ages of goslings may vary from recently-hatched chicks to nearly full-grown juveniles. Abbreviations: BBA = Florida Breeding Bird Atlas, CC = Country Club, eB = eBird, ED = EDDMapS, GC = Golf Course, and RA = Restoration Area.**

County	Location	Date	Evidence	Reference
Miami-Dade	Coral Reef Park	8 Jun 2008	1 brood of 2	R. Cohen (ED)
Miami-Dade	Coral Reef Park	25 Dec 2012	1 brood of 9	C. Swenson (eB)
Miami-Dade	Costa del Sol GC	25 Oct 2013	1 brood of 1	P. Bithorn (in litt.)
Miami-Dade	Kendall Baptist Hospital	27 May 2012	1 brood of 1	T. Obrock (eB)
Miami-Dade	Kendall Baptist Hospital	27 Dec 2012	1 active nest	M. Iliff (eB)
Miami-Dade	Kendall Baptist Hospital	28 Jan 2013	1 brood of 7	M. Schall (eB)
Miami-Dade	Kendall Baptist Hospital	9 Nov 2013	1 clutch of 6	B. Ahern (in litt.)
Miami-Dade	Key Biscayne: Crandon Park	1 Oct 2000	1 brood of 4	R. Diaz (ED)
Miami-Dade	Key Biscayne: Crandon Park	14 Nov 2007	1 active nest	B. Pranty (pers. obs.)
Miami-Dade	Key Biscayne: Crandon Park	10 Feb 2008	1 brood of 4	B. Pranty (Fig. 1)
Miami-Dade	Key Biscayne: Crandon Park	15 Feb 2009	1 brood of 4	B. Pranty (pers. obs.)
Miami-Dade	Key Biscayne: Crandon Park	16 Apr 2010	1 brood of 3	D. Hueholt (eB)
Miami-Dade	Key Biscayne: Crandon Park	21 Aug 2011	1 brood of 3	D. Smyth (eB)
Miami-Dade	Key Biscayne: Crandon Park	17 Nov 2011	1 clutch of 7	R. Diaz (in litt.)
Miami-Dade	Key Biscayne: Crandon Park	20 Feb 2012	1 brood of 6	R. Diaz (eB)
Miami-Dade	Key Biscayne: Crandon Park	12 Apr 2012	2 active nests	R. Diaz (eB)
Miami-Dade	Key Biscayne: Crandon Park	17 Apr 2012	1 clutch of 2	R. Diaz (in litt.)
Miami-Dade	Key Biscayne: Crandon Park	12 Jun 2012	8 young (# broods?)	C. Berthoud (eB)
Miami-Dade	Miami Lakes: Don Shula's GC	21 Feb 2013	1 brood of 6	H. Borrero (eB)
Miami-Dade	Miami Shores GC	13 Mar 2012	1 brood of 10	A. Lamoreaux (eB)
Miami-Dade	Pinecrest: Veteran's Wayside Park	7 Nov 2013	1 active nest	B. Boeringer (eB)
Miami-Dade	Virginia Key Ecological RA	23 Feb 2010	1 brood of 10	R. Diaz (eB)
Miami-Dade	Virginia Key Ecological RA	28 Apr 2010	1 brood of 3	R. Diaz (eB)
Miami-Dade	Virginia Key Ecological RA	6 Apr 2011	1 brood of 2	R. Diaz (eB)



Table 1. (Continued) Breeding reports of Egyptian Geese in Florida, 1985–2013 ( $n = 70$ ). For observations of the same breeding pair and/or brood over multiple days or weeks, we list the date of first observation. Ages of goslings may vary from recently-hatched chicks to nearly full-grown juveniles. Abbreviations: BBA = Florida Breeding Bird Atlas, CC = Country Club, eB = eBird, ED = EDDMapS, GC = Golf Course, and RA = Restoration Area.

County	Location	Date	Evidence	Reference
Miami-Dade	Virginia Key Ecological RA	18 Apr 2011	1 active nest	R. Diaz (eB)
Miami-Dade	Virginia Key Ecological RA	17 Aug 2011	1 brood of 1	R. Diaz (eB)
Miami-Dade	Virginia Key Ecological RA	17 Dec 2011	1 brood of 4	R. Diaz (eB)
Miami-Dade	Virginia Key Ecological RA	11 Jul 2012	1 brood of 7	R. Diaz (eB)
Miami-Dade	Virginia Key Ecological RA	17 Apr 2013	1 brood of 3	R. Diaz (eB)
Miami-Dade	Virginia Key Ecological RA	17 Aug 2013	1 brood of 5	R. Diaz (eB)
Miami-Dade	Virginia Key: Causeway Beach	27 May 2012	1 brood of 1	T. Obrock (eB)
Palm Beach	Boca Del Mar	15 Jan 2013	1 brood of 5	J. Jane (eB)
Palm Beach	Boca Raton: West Boca Medical Center	4 Feb 2013	1 brood of 6	S. Krantz (ED)
Palm Beach	Boca Raton: SW 9th Street	8 May 2012	1 brood of 2	T. Stermer (ED)
Palm Beach	Boca Raton: Broken Sound GC	29 Oct 2013	1 brood (# young?)	T. Baltimore (in litt.)
Palm Beach	Boca Raton: Mission Bay	8 May 2012	1 brood of 6	R. Newman (eB)
Palm Beach	Boynton Beach: Westchester GC	27 Apr 2013	1 brood of 10	S. Young (eB)
Palm Beach	Delray Beach: Tennis Lane	17 Jun 2012	12 young (# broods?)	anonymous (ED)
Palm Beach	Indian Spring GC	14 Feb 2013	1 brood of 2	S. Young (eB)
Palm Beach	Indian Spring GC	27 Apr 2013	1 brood of 5	S. Young (eB)
Palm Beach	Jupiter: Captain Kirlie Drive	9 Mar 2013	1 brood of 3	J. Bickford (ED)
Palm Beach	Palm Beach Gardens: Northlake Boulevard	2 Feb 2013	1 brood of 2	K. Whitley (ED)
Palm Beach	PGA National Golf	21 Apr 2013	1 brood (# young?)	K. Bass (eB)
Palm Beach	West Palm Beach: Bear Lakes CC	26 Dec 2012	1 brood of 1	B. Butkevich (eB)
Pinellas	Shell Key Preserve	17 May 1985	2 active nests	Paul (1985)
Sumter	The Villages	28 Feb 2010	1 brood of 2	Pranty (2010)
Sumter	The Villages	5 Aug 2010	1 active nest	Pranty (2011)

Table 2. Egyptian Geese reported on Florida Christmas Birds Counts since the 2001–2002 season. CBCs are identified by their four-letter codes: FLBC = Bay County, FLDC = Dade County, FLEM = Emerald–Sunnyhill, FLFL = Fort Lauderdale, FLJD = Jonathan Dickinson State Park, FLKD = Kendall Area, FLNA = Naples, FLSB = South Brevard County, FLST = Stuart, FLWP = West Palm Beach, and FLWR = Wekiva River. n/c = no count conducted.

Season	# Counts	# Geese	FLBC	FLDC	FLEM	FLFL	FLJD	FLKD	FLNA	FLSB	FLST	FLWP	FLWR
2001–02	2	10	0	0	0	0	0	n/c	0	0	7	0	3
2002–03	2	14	5	0	0	0	0	0	0	0	9	0	0
2003–04	2	8	0	0	6	0	0	0	0	0	2	0	0
2004–05	2	41	0	0	32	0	0	0	0	0	9	0	0
2005–06	3	14	0	0	7	0	0	0	0	0	6	0	1
2006–07	4	20	0	0	11	5	0	0	0	0	2	0	2
2007–08	5	28	2	0	13	6	0	0	0	0	5	0	2
2008–09	6	54	2	37	5	6	0	0	0	0	2	0	2
2009–10	5	44	0	7	10	21	0	3	0	0	3	0	0
2010–11	7	121	0	32	20	9	7	45	0	0	7	0	1
2011–12	8	149	0	37	7	57	13	29	1	1	4	0	0
2012–13	6	132	0	70	13	27	0	19	1	0	2	0	0
2013–14	6	197	0	78	4	44	0	48	1	0	0	22	0

2004, November 2011, and April 2012 were built on the ground at the base of shrubs or trees (BP pers. obs., R. Diaz in litt.). A nest on a spoil island in Martin County in September 2002 described by Braun (2004) appears to have been built in a similar situation. A nest at Virginia Key was built on the ground between a road and a seawall and among plastic traffic pylons (R. Diaz, photographs). One nest in a park at Pinecrest was built on a tiny island covered with forbs (B. Boeringer, photograph).

#### DISCUSSION

*Survey biases/limitations.*—We acknowledge the possibility that some individual Egyptian Geese may have been counted at more than one site over our 24-month survey period. But we feel that any double-counting that may have occurred would not have affected the totals to any great extent. At least some Egyptian Geese in Florida breed year-round, which would seem to limit movements of territorial adults. Furthermore, perusing the southeastern peninsula with Google Earth shows a vast expanse of habitats seemingly suitable for the species. Palm Beach and Broward counties in particular consist of hundreds of square kilometers of golf course and other upscale communities, with most containing freshwater wetlands. We suspect that a majority of the sites in the region that contained Egyptian Geese during 2012–2013 were not mapped because of access restrictions and a general dearth of observers birding urban and suburban areas. (As we finalized this paper, in April 2014, we reexamined the eBird map for southeastern Florida and noted that 10 new sites containing Egyptian Geese had been discovered *during the previous 30 days*, perhaps confirming that there are many geese remaining to be discovered and mapped).

*Distribution.*—The status and history of Egyptian Geese in Florida had received only incidental attention prior to our study. Owre (1973:497) mentioned simply that Egyptian Geese were one of numerous species seen free-flying in southeastern Florida “over the past few years.” Neither Stevenson (1976) nor James (1997) mentioned the species. Robertson and Woolfenden (1992) claimed that Egyptian Geese had been in present in Florida since the 1960s, and they wondered if the species had been released by the [present-day] Florida Fish and Wildlife Conservation Commission—a hypothesis that Cox et al. (1997:306) could “neither support nor contradict.” Two goose nests were found at Shell Key, Pinellas County, on 17 May 1985 (Paul 1985)—*not* in “Tampa Bay” as was claimed by Braun (2004:139)—and a small population at Lettuce Lake Park, Tampa, Hillsborough County, persisted from the mid-1980s to the early 1990s (Kale et al. 1992, Robertson and Woolfenden 1992, Hoffman 1995, Greenlaw et al. 2014, Pranty pers. obs.). Robertson

and Woolfenden (1992) knew of Egyptian Goose reports from only Hillsborough, Miami-Dade, Monroe, and Pinellas counties. The next report was from Pranty (1997), who noted that as many as three geese persisted at Panama City, Bay County, during 1993–1996. Observations published in the FOC reports remained spotty through the mid-2000s, with sightings only during fall 1998 and fall 2002 (Pranty 1999, 2003). Egyptian Geese have been reported annually in FOC reports since 2005 (Pranty 2006 and subsequently).

Greenlaw et al. (2014) reported Egyptian Geese in 22 counties in Florida: Bay, Brevard, Broward, Charlotte, Collier, Glades, Gulf, Holmes, Hillsborough, Indian River, Lake, Lee, Marion, Martin, Miami-Dade, Monroe, Okaloosa, Orange, Palm Beach, Pinellas, Sumter, and Wakulla, a 450% increase over the four counties reported by Robertson and Woolfenden (1992). Our examination of the eBird and EDDMapS databases adds five new counties to the list of Greenlaw et al. (2014): Duval, Highlands (photograph), Manatee, Polk (photograph), and Seminole counties. Thus, through 2013, Egyptian Geese have been reported in 27 (40%) of Florida's 67 counties. We update the status of Egyptian Geese in Florida from Greenlaw et al. (2014) as follows: A fairly common to very common, widespread resident of developed areas along the southeastern peninsula from Martin County southward to mid Miami-Dade County. Elsewhere, rare in widely scattered areas from the panhandle to the Keys, primarily in urban counties, but occasionally in outlying areas.

*Reproduction.*—It is clear that Egyptian Geese along the southern Atlantic coast are breeding widely and frequently (Table 1), and multiple broods may be produced each year. We presume that most of the recent population increase and range expansion are due to reproduction of non-captive individuals. CBC data, the only long-term dataset available in Florida for monitoring exotic birds (see Pranty 2002), did not include Egyptian Geese until 2001. As a result, we cannot ascertain when and from which areas the population expansion began. The very scattered distribution of geese in Florida (eBird 2013, Greenlaw et al. 2014) suggests that ongoing releases continue, but we presume that such releases along the lower Atlantic coast are merely augmenting the already vibrant population found there. eBird (2013) data show a huge increase in reports of Egyptian Geese in Florida in recent years, but this may simply reflect the increasing popularity of the program. The number of Egyptian Goose reports in eBird from Florida by years follows: 1971 (1), 1980 (1), 1981 (2), 2002 (1), 2006 (5), 2007 (8), 2008 (47), 2009 (100), 2010 (152), 2011 (184), 2012 (364), and 2013 (505 through August).

*Habitats.*—Southeastern Florida has undergone colossal change over the past 100+ years, with massive habitat destruction and

alteration occurring regionwide. Human residents increased from 228,000 in 1930 (Owre 1973) to 5,564,000 in 2010 (U.S. Census Bureau 2013), an increase of nearly 2500% over 80 years. Several authors (e.g., Owre 1973, Snyder et al. 1990, Cox et al. 1994, and Simberloff et al. 1997) have detailed the massive ecological changes to the region, with replacement of natural communities by urban–suburban sprawl planted with temperate and tropical plants from around the world. Marshlands have been drained, ditched, and filled, and replaced by semi-sterile lakes, ponds, and canals. As a result, southeastern Florida has become a hotbed of exotic species (Simberloff et al. 1997), including 163 species of exotic birds (Greenlaw et al. 2014). Although not restricted to the region, Egyptian Geese are widespread in Florida only along the southern Atlantic coast. Evidence to date suggests that the geese are dependent on human-altered habitats that offer a mix of shallow, open wetlands and upland grasslands for foraging and nesting. Most geese were found in upscale residential developments, city or county parks, and around golf courses. To date, few Egyptian Geese have been observed in conservation areas that offer scarce or no expanses of upland grasslands for foraging.

*Population growth and persistence.*—Two sources document persistence of Egyptian Geese in Florida. Braun (2004:140) states that two geese were found east of Stuart on Hutchinson Island, Martin County, in 1993 or 1994 and that geese were “routinely” observed through 2004, including at least one successful breeding attempt. Data from eBird, the Stuart CBC, and the second BBA project confirm the continued presence of Egyptian Geese in the area through 2013 (although no geese were found on the Stuart CBC in December 2013; Table 2). Thus, we have population persistence of Egyptian Geese in northeastern Martin County for 20–21 years, with reports of breeding. Secondly, the BPA (item 1665) contains a list prepared by Valerie Cassidy (undated but provided to Robin Diaz in February 2001) of exotic waterfowl, including two Egyptian Geese, that had been released at Crandon Park, Miami-Dade County. The geese proliferated at the park, with 25 visible in one of Pranty’s photographs from 5 December 2009, and with 36 counted there, 17 November 2011 (R. Diaz). eBird data confirm the continued presence of Egyptian Geese at Crandon Park through 2013. Thus, a persistence of at least 13 years can be documented there.

We cannot document the persistence of Egyptian Geese elsewhere in Florida. eBird was not launched until 2002 and EDDMapS was begun in 2005. Although some Christmas Bird Counts in the state have been run for many decades, Egyptian Geese were deleted from Florida CBCs until the 2001–2002 season, as noted above. Given that Egyptian Geese have been reported—on an increasing basis—during

every CBC season since 2001–2002 (Table 2), it seems likely that geese had been present in some CBC circles before those years. CBC data (Table 2) confirm the recent, frequent presence (at least eight of the past 13 seasons) at Stuart, as well as at Emeralda–Sunnyhill in Lake and Sumter counties (the past 11 CBCs) and Fort Lauderdale in Broward County (the past eight CBCs), and show increasing numbers at Dade County in Miami-Dade County (the past six CBCs).

*Potential for and assessment of establishment.*—The Florida Ornithological Society Records Committee (FOSRC) maintains the official list of the birds of Florida. The FOSRC webpage <fosbirds.org/content/records-committee-rules-and-procedures> identifies and explains the criteria that define when an exotic bird may be considered established in the state and thus can be added to the Florida list. Two criteria must be met: a persistence criterion and one of three other criteria. The persistence criterion requires that at least one “. . . stable or increasing population . . . has persisted continuously in one or more areas for at least 15 years. . . .” Another criterion, 3b, requires that successful breeding is “a characteristic of one or more local populations of several hundred individuals,” that this activity is recruiting young into the population, that the population has “exhibited resilience in the face of major perturbations such as hurricanes or habitat disruptions,” and that there is “little or no evidence that ongoing releases play a significant role in population maintenance.”

Egyptian Geese have persisted for 20–21 years in the Stuart/Hutchinson Island area of Martin County, seemingly meeting the FOSRC’s 15-year persistence criterion. Additionally, the 70 reports of breeding that we have compiled (Fig. 1, Table 1) support the view that widespread breeding is occurring in the region. The population of geese found from Martin County through Miami-Dade County numbers in excess of 1,200 individuals, and the population likely exceeds this total by several hundred percent, given the scarcity of birders in the region and the fact that many upscale communities are inaccessible to non-residents. The range of Egyptian Geese along the southern Atlantic coast (e.g., Fig. 2) is already extensive enough to survive an occasional tropical storm, hurricane, or other disturbance. We are unaware of any effort by state or federal authorities to control the goose population, an effort that may well be futile if attempted. We believe that Egyptian Geese in southeastern Florida meet the FOSRC’s 15-year persistence criterion and criterion 3b for breeding, population size, and resilience to storms or other disturbance.

There is always concern among land managers and conservationists when a new exotic becomes established in southeastern Florida, where ecological concerns and challenges are great. However, evidence that Egyptian Geese will become invasive in the region presently is



lacking. Based on habitats used during our study, preserves such as the Water Conservation Areas and Everglades National Park appear to offer poor foraging habitat. Furthermore, predation of adults and young from native and exotic predators such as American alligators (*Alligator mississippiensis*) and Burmese pythons (*Python molurus*) may be considerable outside of urban/suburban areas. We suggest that populations of Egyptian Geese outside their core range in urban southeastern Florida—should any eventually form—be monitored closely.

#### DEDICATION

We dedicate this paper to the memory of Helen Violi, a close friend of BP, a former plant ecologist at Archbold Biological Station, and later a resident of Coral Gables. Helen died of cancer on 7 September 2013 at the age of 41.

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