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DISCOVERY, ORIGIN, AND CURRENT DISTRIBUTION OF THE PURPLE SWAMPHEN (*PORPHYRIO PORPHYRIO*) IN FLORIDA

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Abstract.—The Purple Swamphen (*Porphyrio porphyrio*) is one of the most recently reported exotic bird species in Florida. Swamphens were noticed first at Pembroke Pines, Broward County, in December 1996. In February 1999, their population numbered at least 135 individuals, including one road-killed specimen donated to Archbold Biological Station. Breeding has been documented by numerous observations of downy chicks, and a nest with five eggs was discovered in July 1999. Swamphens are believed to be restricted to five artificial wetlands in two adjacent developments in Pembroke Pines. The origin of the birds was traced to local aviculturists who allowed their captive birds to roam freely. We present information on interactions between swamphens and other birds, and discuss the potential effects of Purple Swamphens becoming established in Florida.

Robertson and Woolfenden (1992) listed 146 species of exotic birds reported in Florida through December 1991, a number that continues to increase (e.g., 173 species listed *in* Pranty 1996). One of the most recent additions to Florida's exotic avifauna is the Purple Swamphen (Fig. 1; *Porphyrio porphyrio*), which was discovered at Pembroke Pines, Broward County, Florida in 1996 (Pranty and Schnitzius 1998).

The Purple Swamphen is a highly variable species that inhabits Europe, Africa, Asia, Australia, New Zealand, and other islands in the Pacific Ocean (Ripley 1977, del Hoyo et al. 1996, Sangster 1998).

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Figure 1. Adult Purple Swamphen at Pembroke Pines, Florida. Photographed by Bill Pranty, 9 October 1998.

Swamphens are large rallids that resemble Purple Gallinules (*Porphyrula martinica*) in shape and color (especially the races *P. p. madagascariensis*, *poliocephalus* and *viridus*). However, swamphens have body lengths about 50% larger and wingspans nearly twice as long as those of gallinules (45-50 and 90-100 cm vs. 30-36 and 50-55 cm, respectively; Beaman and Madge 1998). Purple Swamphens have large red bills and frontal shields, red irides, orange legs and toes, usually with blackish areas at the heel and toe joints, white undertail coverts, and bodies that are pale blue, brilliant blue, purplish, or blackish. Australian birds are darkest, with blackish wings and backs, Phillipine birds are the palest and have rusty backs, and African birds have greenish backs. Juvenal plumage likewise varies, but is characterized by dull plumage and a dusky bill and frontal shield (del Hoyo et al. 1996, Beaman and Madge 1998).

A survey of the Pembroke Pines area for Purple Swamphens in October 1998 indicated a sizeable breeding population. We hypothesized that the source of the birds was Miami MetroZoo, which had lost eight

swamphens following Hurricane *Andrew* in August 1992 (P. Bermudez pers. comm.). A photograph taken in October 1998 by Pranty (*in* Baicich 1999) shows three adult swamphens. Here, we more fully describe the status and current distribution of the species in Florida, and describe its origin from captive birds.

METHODS

The first Purple Swamphens observed in Pembroke Pines, Broward County, Florida were located in the SilverLakes development. Informal surveys of parts of the main lake in SilverLakes (hereafter, Lake A) were conducted by Kevin and Kim Schnitzius on 26 July and 2 August 1998. We conducted formal surveys of the Schnitzius' yard and the entire northern and eastern shorelines of Lake A on 9 October 1998, 21-22 February 1999, 25 July 1999, and 16 November 1999. The formal surveys of the northern and eastern shorelines of Lake A were about 3.0 km in length and required about 90 min to complete. During the February and July 1999 surveys, we also searched for swamphens in other areas near the original observations. Swamphens were observed as they rested or foraged in marshy areas 0-200 m from the shorelines of wetlands. Most of the swamphens were unwary and allowed approach to within 10-15 m before running or flying away. We recorded on maps the numbers and locations of all swamphens encountered. Following del Hoyo et al. (1996) and Beaman and Madge (1998), we aged swamphens by plumage characteristics. Birds with bright plumage and red bills and frontal shields were called adults. Birds with dull plumage and dusky bills and shields were called juveniles, and flightless young in black downy plumage were called chicks.

RESULTS

The Purple Swamphens were discovered by Kim and Kevin Schnitzius in December 1996. SilverLakes is a 1000-ha medium-density development less than 4 km east of US Highway 27 in south-central Broward County (Fig. 2). Prior to development, the area was part of the Everglades, and was mined for limerock beginning in the late 1970s. During the development of SilverLakes, which began in 1990, shallow lakes were created onsite for wetlands mitigation. Wetlands account for 124 ha (12%) of the development (D. Neuerman pers. comm.). The shorelines of these wetlands, as well as the shorelines of small islands in the lakes, have been planted with native trees such as cypress (*Taxodium* spp.), red maple (*Acer ruber*), slash pine (*Pinus elliottii*), and cocoplum (*Chrysobalanus icaco*). The marshy areas of the lakes have been planted with native wetland forbs such as horsetail (*Equisetum* spp.), arrowhead (*Saggittaria latifolia*), pickerelweed (*Pontedaria cordata*), and water lilies (*Nymphaea* spp.). The herbicide *Rodeo* is used in the SilverLakes wetlands to control exotic vegetation (S. Mazarrela pers. comm.).

East of SilverLakes is the Pembroke Isles development, which contains at least one artificial wetland. This wetland is densely covered with forbs, including patches of cattail (*Typha* spp.), and with very little open water present. North of SilverLakes is Rolling Oaks, a low-density "semi-rural" development where residents own horses, goats,

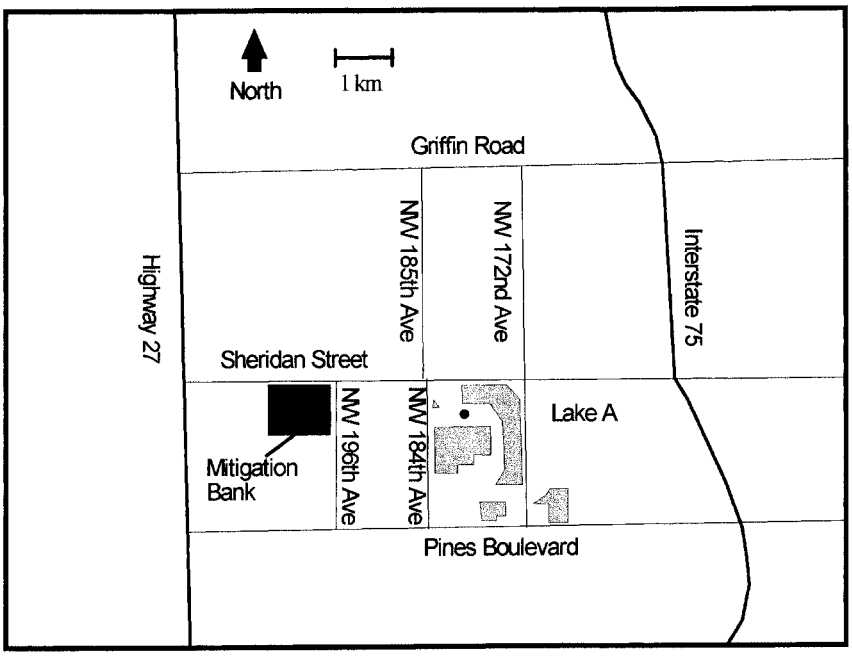

Figure 2. Map of the Pembroke Pines area. The five wetlands that contain swamphens are shown (shaded areas), as is the Pembroke Pines Mitigation Bank (solid area). SilverLakes is south of Sheridan Street between NW 196th Avenue and NW 172nd Avenue; Pembroke Isles is to the east. Rolling Oaks is bounded by Griffin Road, NW 172nd Avenue, Sheridan Street, and NW 185th Avenue. The Everglades are west of US Highway 27. The small black dot represents the location of the Schnitzius' yard.

and other animals, including several collections of exotic and native waterfowl and other birds. Acting on information from Wally George (in litt.), we searched the Rolling Oaks development for captive waterfowl collections that might have been the source of the Purple Swamphens at SilverLakes.

Just west of SilverLakes is the 180-ha Pembroke Pines Mitigation Bank, which is being restored to wetlands to mitigate current and future development in Broward County (L. Bishop pers. comm.). Nearly all other "open" lands in the area are experiencing rapid medium- and high-density development. West of US Highway 27, extensive sawgrass (*Cladium jamaicensis*) marshes are protected as Water Conservation Area 3, although areas immediately west of the highway are composed of dense forests of Australian punk trees (*Melaleuca quinquinervia*).

In 1997, one family of swamphens, consisting of two adults and three juveniles, was living in a small marshy "conservation area" that

abuts the Schnitzius' backyard in SilverLakes. The marshy area is part of Lake A. Three of these swamphens disappeared during the winter of 1997-1998, leaving two birds. The juveniles had attained adult plumage by the time the three birds disappeared, so it was not possible to determine whether the two that remained were the breeding pair from 1997.

By April 1998 only one adult swamphen was seen, but on 16 May a second adult reappeared accompanied by four chicks. By mid-July the four chicks, now juveniles, were about the size of their parents. They were feeding on their own and were beginning to develop the red bill and frontal shield of adult plumage. By 2 August 1998 only one swamphen remained in the Schnitzius' yard; we suspect the juveniles had dispersed. On 26 August a second adult again appeared in the Schnitzius' yard with another brood, this time of three chicks. We believe this indicates double-brooding for the pair in the Schnitzius' yard.

On 26 July 1998 Kevin and Kim Schnitzius informally surveyed the northern shoreline of Lake A and counted 22 swamphens (18 adults, 1 juvenile, and 3 chicks), plus the family of 6 birds in their yard. In another informal survey on 2 August, they counted 24 swamphens (21 adults and 3 chicks) along the lake's north shore, plus the family of 5 birds in their yard. On 9 October 1998 we formally surveyed the northern and eastern shorelines of Lake A. We counted 80 Purple Swamphens, 32 along the northern shore of the lake and 48 along the eastern shore. The Schnitzius' yard contained the family of four birds. Of these 84 swamphens, 59 were adults, 16 were juveniles, 1 was a large chick, and the ages of 8 birds were not determined. During subsequent informal surveys in 1998, swamphens were found elsewhere in SilverLakes and near the northeast corner of NW 172nd Avenue and Pines Boulevard in Pembroke Isles.

On 20 February 1999 we found the remains of an adult swamphen that had been run over on Sheridan Street between Lake A and Rolling Oaks. Although damaged heavily, the specimen was salvaged and was donated to Archbold Biological Station (uncatalogued, G. Woolfenden, in litt.). This represents the first specimen obtained in North America.

On 21-22 February 1999 we conducted a second formal survey of the northern and eastern shorelines of Lake A and the Schnitzius' yard, as well as all other areas where swamphens had been observed previously. We also searched other areas of SilverLakes and adjacent developments for "new" swamphens, but we did not find any. We counted 134 swamphens: 131 adults, 1 juvenile, and 2 chicks. Nearly all (n = 114; 85%) of the birds were found in areas that were surveyed on 9 October 1998. One of these swamphens was found in the canal between Rolling Oaks and Sheridan Street, and the remaining 20 birds were found in areas discovered after the October survey.

On 25 July 1999 we resurveyed all areas visited during the February 1999 survey. We counted 95 swamphens: 85 adults, 7 chicks, and 3

birds of undetermined age. One of the adults was found incubating a clutch of five eggs (Fig. 3) and another was observed carrying apparent nesting material more than 50 m through marsh vegetation. We surveyed the wetlands along the east side of the Pembroke Pines Mitigation Bank for swamphens, but otherwise did not search any other additional areas for "new" birds. On 16 November 1999 a fourth survey of the northern and eastern shorelines of Lake A was conducted, but only one other area (the lake at Pembroke Isles) was surveyed. Table 1 summarizes the results of the swamphen surveys in October 1998 and February, July, and November 1999.

All but one of the swamphens we have observed have been found in the shallow artificial wetlands in SilverLakes and Pembroke Isles. The single exception was an adult swamphen found in the canal along the north side of Sheridan Street (i.e., the southern boundary of Rolling Oaks). The banks of this canal are steep and overgrown in places with shrubs and trees. The canal is 4-8 m wide (depending on recent rainfall) and the surface is covered with algae but lacks other aquatic vegetation. We suspect the bird found here was using the canal as a corridor to move from one place to another. We doubt that the canal, or others like it, could sustain swamphens for an extended period.

The current range of the Purple Swamphen in Pembroke Pines, Florida, is apparently bounded by Sheridan Street to the north, 600 m

Figure 3. First documented Purple Swamphen nest in North America, at Pembroke Pines, Florida, 25 July 1999. Photographed by Bill Pranty.

Table 1. Results of four Purple Swamphen surveys (one incomplete) at Pembroke Pines, Florida.

Date	Schnitzius' yard	Sheridan St.[1]	NW 172nd Ave.[2]	Other[3]	Totals
9 Oct 1998	4	32	48	—	84
21-22 Feb 1999	5	29[4]	80	20	134[4]
25 Jul 1999	3	22	41	29	95
16 Nov 1999	3	14	33	9[5]	59[6]

[1]The northern shoreline of Lake A along the south side of Sheridan Street between NW 184th and NW 172nd avenues, and the canal along the north side of Sheridan Street opposite Lake A.

[2]The eastern shoreline of Lake A along the west side of NW 172nd Avenue between Sheridan and NW 9th streets.

[3]The western shoreline of Lake A, the lake along the east side of NW 184th Avenue between NW 9th and NW 17th streets, the small lake at the northeast corner of NW 184th Avenue and NW 17th Street, the western shoreline of the lake north of Pines Boulevard between NW 178th Avenue and NW 172nd Avenue, and the lake in Pembroke Isles at the northeast corner of Pines Boulevard and NW 168th Avenue.

[4]Excludes the road-killed specimen salvaged on 20 Feb 1999.

[5]16 Nov 1999 survey limited to the lake in Pembroke Isles.

[6]Incomplete survey.

to the east of NW 172nd Avenue, Pines Boulevard to the south, and NW 184th Avenue to the west. Excluding the canal between Rolling Oaks and Sheridan Street, swamphens occur currently in five wetlands in Pembroke Pines, all of them artificial.

On 22 February 1999 we located two aviculturists in Rolling Oaks who maintain or maintained captive Purple Swamphens in their collections. These collections are just 600 m north of Lake A. One aviculturist has owned up to 12 breeding pairs of swamphens since 1992, and none of his birds are pinioned (H. Sardou pers. comm.). The other aviculturist owned one breeding pair of Purple Swamphens from 1992-1998, and those birds also were not pinioned (D. Mhoon pers. comm.). We now believe that one or both of these aviculturists are the source of the birds found at SilverLakes, and we discount our earlier hypothesis (Pranty and Schnitzius 1998) that the birds originated from Miami MetroZoo.

Foraging behavior and food items taken.—We have observed swamphens foraging mostly on horsetail stalks, which are pulled up and swallowed whole, or nipped off in pieces. Occasionally, swamphens pull entire horsetail plants out of the water and consume the tubers. Birds in the Schnitzius' yard feed also on bird seed, grass blades, and various human food items offered to them (e.g., peas, melon rinds, and cooked pasta). During spring and summer 1999, we often observed swamphens feeding on worms (apparently earthworms), but have not yet observed swamphens consuming other animal prey.

Interactions with other species.—In their yard Kevin and Kim Schnitzius have observed interactions between swamphens and three other bird species. When bird seed is scattered on the ground, several species rush in to feed. On a few occasions during these "feeding frenzies," Purple Swamphens have been observed to push away and peck at Muscovy Ducks (*Cairina moschata*). On another occasion a swamphen ended a battle between two American Coots (*Fulica americana*) by striking the coots with one of its feet. And on 29 March 1999 a Great Blue Heron (*Ardea herodias*) was observed picking up a small swamphen chick and flying off with it in its bill.

Outside of the Schnitzius' yard, we have observed no interactions between swamphens and other species. Although the wetlands occupied by the swamphens are artificial, they support a diverse variety of wetland bird species. Pranty has observed 34 species of native aquatic birds in Lake A. Breeding species include the Pied-billed Grebe (*Podilymbus podiceps*), Least Bittern (*Ixobrychus exilis*), Mottled Duck (*Anas fulvigula*), Purple Gallinule, and Common Moorhen (*Gallinula chloropus*). Non-breeding species include the American Bittern (*Botaurus lentiginosus*), Wood Stork (*Mycteria americana*), White (*Eudocimus albus*) and Glossy (*Plegadis falcinellus*) ibises, Black-bellied Whistling-Duck (*Dendrocygna autumnalis*), Blue-winged Teal (*Anas discors*), Sora (*Porzana carolinus*), American Coot, Limpkin (*Aramus guarauna*), and Common Snipe (*Gallinago gallinago*).

Discussion

In recent years, between 13 and 24 races of the Purple Swamphen have been recognized, and some authors have recognized three or more allospecies (references *in* Sangster 1998). Roselaar (*in* Cramp and Simmons 1980) identified six racial groups that Sangster (1998) suggests are distinct allospecies, based on the morphometric and mitochondrial DNA data of Trewick (1996, 1997). These proposed species are the Western Swamphen (*P. porphyrio*) of the Mediterranean region, African Swamphen (*P. madagascariensis*) of Africa, Gray-headed Swamphen (*P. poliocephalus*) of Turkey and the Caspian Sea east to southern Asia, Black-backed Swamphen (*P. indicus*) of mainland Southeast Asia and Sumatra, Java, and Borneo, Philippine Swamphen (*P. pulverulentus*) of the Philippines, and Australian Swamphen (*P. melanotus*) of Australia, New Zealand, Indonesia, and the western Pacific (Sangster 1998).

On the basis of their pale heads and bluish or purplish backs, the majority of the swamphens at Pembroke Pines appear to be *P. [p.] poliocephalus*. However, a few birds appear to have heads that are bluish-purple with no indication of gray coloration (P. W. Smith pers. comm.;

pers. obs.), and these swamphens may be of another race. The breeding pair of one of the aviculturists in Rolling Oaks was composed of a gray-headed male and a blue-headed female (D. Mhoon pers. comm.). This pair produced numerous young that disappeared from the aviculturist's yard. Because the breeding female later was killed by a dog, it was presumed that all the birds that disappeared had been similarly depredated (D. Mhoon pers. comm.). However, if any of these possible "hybrid" swamphens escaped from captivity and comprise part of the feral population at SilverLakes, they might account for the apparent plumage differences present. Additional specimens from the Pembroke Pines population are needed to sort out the question of racial, or specific, identification. (The bird donated to Archbold Biological Station has not yet been prepared as a specimen, G. Woolfenden pers. comm.).

Previous North American reports.—Although the Pembroke Pines birds are the first Purple Swamphens reported in Florida (Robertson and Woolfenden 1992, Stevenson and Anderson 1994), there is a previous report for North America. For two weeks beginning on 5 December 1990, a molting sub-adult swamphen "from one of the Middle Eastern subspecies"—apparently a gray-headed Purple Swamphen—was observed and photographed at Wilmington, Delaware. The origin of this bird was not determined (Boyle et al. 1991, AOU 1998).

Potential for establishment.—Swamphen chicks have been observed at Pembroke Pines in May, August, and October 1998, and January, February, March, April, and July 1999 (P. W. Smith pers. comm., pers. obs.). It seems likely that some of the Pembroke Pines swamphens may breed year-round. The pair in the Schnitzius' yard apparently produced two broods in 1998, and the captive birds that presumably are the source of the feral population produced two or three broods annually (D. Mhoon pers. comm., H. Sardou pers. comm.).

With their high reproductive potential and the abundance of wetlands in Florida, it seems reasonable to consider the potential negative effects of Purple Swamphens on native species or habitats if they expand their range outside of suburban Pembroke Pines. But there is no similar avian precedent available in Florida—or North America—to compare to Purple Swamphens. The only other exotic rallid that has been reported in Florida is the Gray-necked Wood-Rail (*Aramides cajanea*), which was reported to breed in Indian River and Miami-Dade counties from the 1960s to the 1970s (Stevenson and Anderson 1994) or the 1980s (Robertson and Woolfenden 1992), but then apparently died out. There is no information available about the population size of the wood-rail in Florida (Robertson and Woolfenden 1992, Stevenson and Anderson 1994), but it apparently was quite small.

Although the foraging and habitat requirements of the Purple Swamphen overlap to some extent with those of the Purple Gallinule (R.

West *in litt.*), it is our impression that swamphens prefer "grassy" shoreline vegetation rather than the emergent vegetation most preferred by gallinules. Furthermore, since all the wetlands currently occupied by swamphens are artificially maintained horsetail/arrowhead/pickerelweed marshes that lack other, much more common and widespread wetland plants (e.g., cattail and sawgrass), swamphens seem less likely to colonize native wetlands such as the Everglades. Horsetail is not listed as a dominant plant species among the various marsh habitats found in Florida (Kushlan 1990). In their native range, swamphens are often observed away from wetlands and can damage grain and vegetable crops (Ripley 1977, del Hoyo et al. 1996), so the impact of swamphens in Florida may extend beyond wetland species. Although they are primarily vegetarians, swamphens are known to prey upon mollusks, fish, lizards, frogs, snakes, bird eggs and nestlings, and other small birds (Ripley 1977, Cramp and Simmons 1980). Purple Swamphens occasionally move long distances (up to 1000 km; Grussu 1999), thus they potentially could colonize a large part of the state.

Less than half of the exotic birds reported in Florida have bred in the wild (Robertson and Woolfenden 1992, Stevenson and Anderson 1994), and of the breeding species, very few can be considered truly successful in establishing a large and increasing population. The most widespread exotic birds in Florida currently are the Muscovy Duck, Rock Dove (*Columba livia*), Eurasian Collared-Dove (*Streptopelia decaocto*), Monk Parakeet (*Myiopsitta monachus*), European Starling (*Sturnus vulgaris*), and House Sparrow (*Passer domesticus*).

Of all the exotic birds in Florida, only the European Starling often occurs in native habitats little disturbed by man. All other exotic birds in Florida appear to be dependent on one or more aspects of human development (e.g., creation of nesting sites, supplementation of food, or elimination of many potential competitors) to thrive. Extensive human development eradicates habitats for most of Florida's native breeding species, and thus may allow exotic birds to form, and in a few cases, to maintain, breeding populations. But outside of these artificial habitats, exotic birds in Florida, with the possible exception of the European Starling, have not yet shown an ability to reproduce widely. At the present time, it is premature to consider the Purple Swamphen a threat to Florida's native wetlands and avifauna.

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