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## REDDISH EGRET (*Egretta rufescens*) NESTING IN CLEARWATER HARBOR AND ST. JOSEPH SOUND, PINELLAS COUNTY, AND CRYSTAL BAY, CITRUS COUNTY, FLORIDA FROM 1991 TO 2011

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**Abstract.**—Through the 1880s, Reddish Egrets (*Egretta rufescens*) occurred throughout Florida, and commonly among coastal colonial waterbird colonies in Pinellas County north to the St. Martins Keys in Citrus County. By around 1910, plume hunting and the associated disturbance at nesting colonies extirpated Florida's breeding population of Reddish Egrets, and nesting egrets were not found again in southern Florida until 1938. The first nesting record on Florida's central Gulf coast since 1890 occurred at the Alafia Bank Bird Sanctuary in Hillsborough Bay in 1974. Egrets slowly reappeared at suitable estuarine nesting sites throughout Tampa Bay and the nearby coast, and solitary pairs or small breeding groups now nest on at least 15 colony islands stretching from Three Rooker Island State Preserve (northern Pinellas County) south to Hemp Key in Pine Island Sound (Charlotte County), with the largest nesting concentration persisting at the Alafia Bank Bird Sanctuary. In Clearwater Harbor and St. Joseph Sound, egrets nested on eight dredged spoil-material islands from 1991 to 2011 (annual colony size  $\bar{x}$  = 0.01-2.8 nests, SD = 0.4-4.5, N ≤ 21 years). The annual mean number of nests was moderately correlated with the 21-year study period ( $R^2 = 0.427$ ,  $P \leq 0.001$ ). In 2009, one brood of two recently fledged-but-dependent young were found on Bird Key I Island at the Bird Keys in Crystal Bay. This was the first nesting record of Reddish Egret in Citrus County in 129 years. Anthropomorphic disturbance of nesting egrets coupled with predation (primarily by raccoons, *Procyon lotor*) are the common causes of nest failure. We recommend expanding a collaborative colony stewardship program, and establishing appropriate distance buffers around these Gulf coast nesting sites to protect them from disturbance during the nesting season.

Through the 1880s, Reddish Egrets (*Egretta rufescens*) bred commonly among coastal colonial waterbird colonies on the Gulf coast

of Florida. In 1880, they were the most numerous heron nesting on Bird Key (27° 41' 60.00" N, 82° 41' 30.01" W), the bird colony island west of Maximo Point now designated as Indian Key in the Pinellas National Wildlife Refuge complex, and were numerous at Johns Pass (27° 47' 12.98" N, 82° 46' 25.00" W), in Boca Ciega Bay (Pinellas County) (Maynard 1881, Scott 1887, 1888, 1889, 1991). They bred north to the Anclote Keys (28° 11' 20.50" N, 82° 51' 3.50" W; Pasco County) (Scott 1888), and the St. Martins Keys (28° 47' 29.00" N, 82° 44' 18.00" W; Citrus County) (Scott 1889). Scott (1888) noted "The birds are common on the Gulf Coast of Florida as far north as the Anclote Keys. . . ." and added (Scott 1889) "I am indebted to a friend . . . for the information that this species in its dark phase still breeds in numbers at rookeries at St. Martin's Keys, about forty-five miles north of Tarpon Springs, in the Gulf." By around 1910, plume hunting and the associated disturbance at nesting colonies extirpated Florida's breeding population of Reddish Egrets (Scott 1887, Stevenson and Anderson 1994, Paul 1996). Nesting was not known again in Florida until 1938, when a single nest was found in eastern Florida Bay (Desmond 1939), followed by slow increases in the Lower Keys and Florida Bay (Baker 1944, Greene 1946, Allen 1954, Powell et al. 1989) up to Hemp Key (26° 36' 2.75" N, 82° 9' 9.14" W) in Pine Island Sound (Charlotte County) (Bancroft 1971).

In 1974, a single nest was found at the Alafia Bank Bird Sanctuary (27° 50' 55.00" N, 82° 24' 29.02" W) in Hillsborough Bay, the northeast section of Tampa Bay (Paul et al. 1975). This was the first nesting record on Florida's central Gulf coast since 1890. Reddish Egrets reappeared at estuarine nesting sites throughout Tampa Bay and the nearby coast over the next several decades, and solitary pairs or small breeding groups now nest on at least 15 colony islands stretching from Three Rooker Island State Preserve (28° 7' 4.81" N, 82° 50' 19.75" W) in northern Pinellas County south to Hemp Key, with the largest nesting concentration persisting at the Alafia Bank Bird Sanctuary (Hodgson et al. 2006, Hodgson and Paul 2010). Paul (1996) estimated a statewide population of 350-400 pairs and speculated that Florida's population was no more than 10% of the population before 1880. Green (2006) and Hodgson and Paul (2011a, unpublished data) estimated a state population of 250-350 pairs, with breeding locations extending from St. Joseph Sound on the west coast and Merritt Island National Wildlife Refuge on the east coast south to Florida Bay and the Keys.

Reddish Egrets nest generally on coastal islands in estuaries and forage for small fish, usually on nearby intertidal flats (Lowther and Paul 2002). Most nesting sites in Florida are on small (1-15 ha) islands with canopies of black mangrove (*Avicennia germinans*), white mangrove (*Laguncularia racemosa*), and red mangrove (*Rhizophora*

*mangle*) trees, or invasive exotic trees, primarily Brazilian pepper (*Schinus terebinthifolius*), separated from the mainland by deep-water channels (ABH and AFP, National Audubon Society, field notes, many dates). Reddish Egrets are secretive nesters, preferentially selecting sites behind densely foliated branches intersecting over a stream or lagoon, about 2-7 m above the water, on islands that are free of terrestrial predators (*ibid.*).

Here we describe the expansion of Reddish Egret nesting in Clearwater Harbor and St. Joseph Sound (CHSJS), Pinellas County, from 1991-2011, and report an observation of a brood of two fledged-but-dependent young 80 km north of Pinellas County at Bird Keys, Crystal Bay, Citrus County, in 2009.

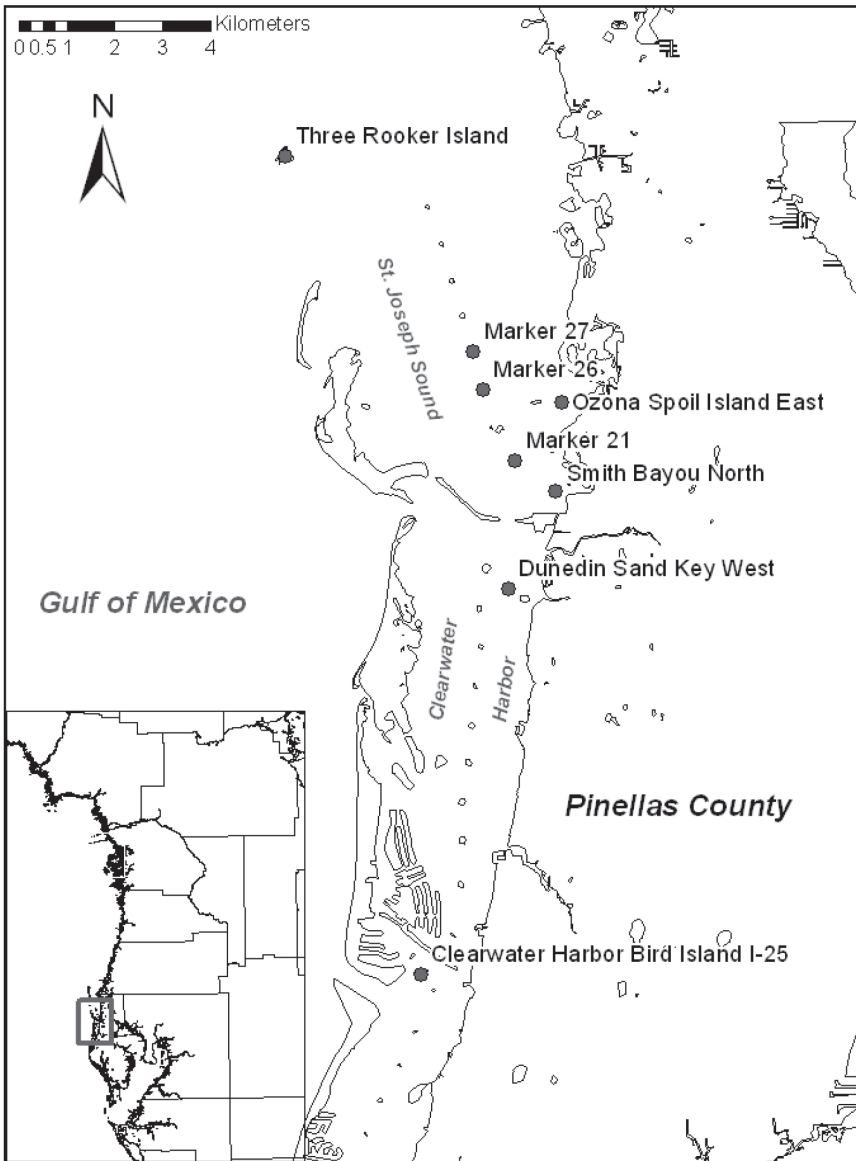
#### METHODS

*Field surveys.*—We counted Reddish Egret nesting attempts (observations of incubation or nest tending) at islands in Clearwater Harbor and St. Joseph Sound annually from 1991. Nesting birds on these small islands can be seen usually through the foliage so we could directly count nests (and eggs or chicks when visible) by circling the islands in a small motorboat from about 30 m offshore. At the few larger islands where the nests could not be seen clearly through dense foliage, we used direct counts supplemented by flight line surveys conducted usually during the guard stage of chick development (Erwin and Ogden 1980, Erwin 1981, Paul et al. 2004) and classified an adult flying in a nest exchange as a nest. We visited nesting colonies usually only once during the nesting season during the annual peak of nesting activity each spring, which we estimated based on antecedent weather conditions and our regional observations of nesting activity.

*Data analysis.*—We compiled annual survey data and examined the trend of the relationship of annual nest abundance (mean annual number of nests for all surveyed colonies in CHSJS) and years of nesting effort (21-year study period) in the study area using Microsoft Excel (Data Analysis Tools).

#### RESULTS

*Clearwater Harbor and St. Joseph Sound, Pinellas County.*—A chain of dredged spoil material islands (none are natural islands) lies along the west side of the Intracoastal Waterway (ICW) in Clearwater Harbor, and on the east side of the ICW in St. Joseph Sound (Fig. 1). Dredging intertidal flats to establish navigable channels to the shoreline created other spoil islands. These islands developed arboreal cover of mangroves, cabbage palm (*Sabal palmetto*), and Australian pine (*Casuarina* sp.), frequently bordered by Brazilian pepper, following the vegetation succession pattern for central Florida spoil islands (Lewis and Lewis 1978). Spoil islands from the Anclote Keys south through St. Joseph Sound to Clearwater Harbor were surveyed in 1986, in emulation of W. E. D. Scott's 1886 trip down the coast, but Reddish Egrets were not found nesting in this area (R. T. Paul [RTP], field notes). Audubon did not re-survey the area until 1991. The



**Figure 1. Reddish Egret nesting sites in Clearwater Harbor and St. Joseph Sound, Pinellas County, Florida.**

following chronology describes the progressive appearance of nesting Reddish Egrets at the CHSJS spoil islands from 1991 to 2011.

On 28 June 1991, one pair of Reddish Egrets was found nesting on the Marker 21 spoil island ( $28^{\circ} 3' 42.41''$  N,  $82^{\circ} 47' 35.39''$  W) in

St. Joseph Sound (RTP, field notes; Holland 1991) (Table 1). The 5-ha island had short (2.5 m) mangroves (mangroves in the Tampa Bay area were beginning to regrow after being freeze-damaged in the 1989 freeze), but the nest was about 5 m high in Brazilian pepper and had one downy-headed young about four weeks old (Fig. 1). Later that day, two pairs of Reddish Egret adults were observed, each feeding a fledged but still dependent young, at Clearwater Harbor's bird colony island I-25 (27° 57' 58.73" N, 82° 48' 52.26" W). I-25 is an 11-ha crescent-shaped island densely covered with mangroves and a few Brazilian pepper trees growing on an elevated rise on the southeastern end, fringed with scattered stands of smooth cordgrass (*Spartina alterniflora*) and an intertidal seagrass flat.

On 1 July 1995, a Reddish Egret adult was seen flying into the colony at Marker 26 (28° 4' 32.08" N, 82° 47' 59.99" W), about 2 km north of Marker 21, during a flight-line survey of the heron and ibis colony (RTP, field notes). Marker 26 is a 3-ha spoil island dominated by a dense thicket of Brazilian pepper with a few Australian pines fringing the north and west sides, above a shoreline of rocky oyster outcrops. We believe waterbirds abandoned Marker 21, which has a wide sandy beach that attracted much recreational use in the early 1990s, and moved to Marker 26 in the 1995 nesting season.

On 21 May 2002, two nesting pairs appeared at Three Rooker Island, 2.4 km north of Marker 26 (RTP, field notes). Three Rooker Island is an undeveloped sandy barrier island vegetated with smooth- and saltmeadow cordgrass (*S. patens*), other halophytic forbs, and a coastal hammock of short mangroves, cabbage palms, and sea grapes (*Coccoloba uvifera*) on the south end of the island, where a small colony of herons and White Ibis (*Eudocimus albus*) have nested since ca. 2000.

On 17 May 2003, two unflighted dark-morph young were seen at Smith Bayou North (28° 3' 31.88" N 82° 46' 45.02" W), 1.4 km east of Marker 21 (RTP, field notes). This 1-ha island had red-, white-, and black mangroves with Brazilian pepper, halophytic forbs, and Spanish bayonet (*Yucca aloifolia*) on the crown of the island. A second nesting report was obtained on 5 April 2006 when one dark morph adult was seen here on a nest (AFP, field notes).

On 28 April 2005, one white-morph adult flew into a breeding colony in a prickly pear cactus (*Opuntia stricta*) and Brazilian pepper thicket on 0.5-ha Dunedin Sand Key West (28° 2' 17.17" N, 82° 47' 40.79" W), 0.7 km west of Dunedin (AFP, field notes). A second nesting record occurred 11 June 2010 when two large young, both white morphs, were seen in the thicket (AFP, field notes). On the other side of the island, a dark-morph adult and a dark-morph sub-adult were seen in a fringe of red- and black mangroves, but nesting was not confirmed.

Table 1. Nesting pairs of Reddish Egrets in Clearwater Harbor and St. Joseph Sound, Pinellas County, Florida, 1991-2011.

Year	3 Rooker Island			Smith Bayou			Dunedin Sand Key West			Ozona Spoil East			Clearwater Harbor I-25 Bird Island			Nests (N)		
	Marker 27	Marker 26	Marker 21	North	Bayou	North	Key West	West	East	Spoil	East	Bird Island	Occupied Sites (N)	Mean	SD	(N)	Mean	SD
1991	0	0	1	NS <sup>a</sup>	0	0	0	0	0	0	1	2	0.3	0.5	2	0.3	0.5	
1992	0	NS	0	NS	NS	NS	NS	NS	NS	NS	0	0	0.0	0.0	0	0.0	0.0	
1993	0	0	0	NS	0	0	0	0	0	0	1	1	0.1	0.4	1	0.1	0.4	
1994	0	0	0	NS	0	0	0	0	0	0	3	1	0.4	1.1	3	0.4	1.1	
1995	0	0	1	NS	0	0	0	0	0	0	4	2	0.7	1.5	5	0.7	1.5	
1996	0	0	2	NS	0	0	0	0	0	0	8	2	1.4	3.0	10	1.4	3.0	
1997	0	0	0	NS	0	0	0	0	0	0	2	1	0.3	0.8	2	0.3	0.8	
1998	0	0	6	NS	0	0	0	0	0	0	8	2	2.0	3.5	14	2.0	3.5	
1999	0	0	4	NS	0	0	0	0	0	0	4	2	1.1	2.0	8	1.1	2.0	
2000	0	0	8	NS	0	0	0	0	0	0	3	2	1.6	3.1	11	1.6	3.1	
2001	0	0	6	NS	0	0	0	0	0	0	5	2	1.6	2.7	11	1.6	2.7	
2002	2	0	8	0	0	0	0	0	0	0	7	3	2.1	3.4	17	2.1	3.4	
2003	1	0	6	1	0	0	0	0	0	0	4	4	1.5	2.3	12	1.5	2.3	
2004	2	0	10	0	0	0	0	0	0	0	10	3	2.8	4.5	22	2.8	4.5	
2005	0	1	5	0	0	0	1	0	0	0	2	4	1.1	1.7	9	1.1	1.7	
2006	1	0	2	1	0	0	NS	0	0	0	3	4	1.0	1.2	7	1.0	1.2	
2007	1	0	3	0	0	0	0	0	0	0	6	3	1.3	2.2	10	1.3	2.2	
2008	2	0	3	0	0	0	0	0	0	0	3	3	1.0	1.4	8	1.0	1.4	
2009	6	0	5	NS	0	0	NS	0	0	0	1	3	2.0	2.8	12	2.0	2.8	
2010	7	0	2	0	0	0	1	0	0	0	3	4	1.6	2.5	13	1.6	2.5	
2011	12	0	3	0	0	0	0	1	0	1	2	4	2.3	4.1	18	2.3	4.1	
Mean	1.6	0.1	3.7	0.2	0.2	0.1	0.1	0.1	0.1	0.1	3.8	2.5	9.3					
SD	3.1	0.2	3.0	0.4	0.3	0.3	0.2	0.2	0.2	0.2	2.7	1.2	5.8					

<sup>a</sup>NS = not surveyed.

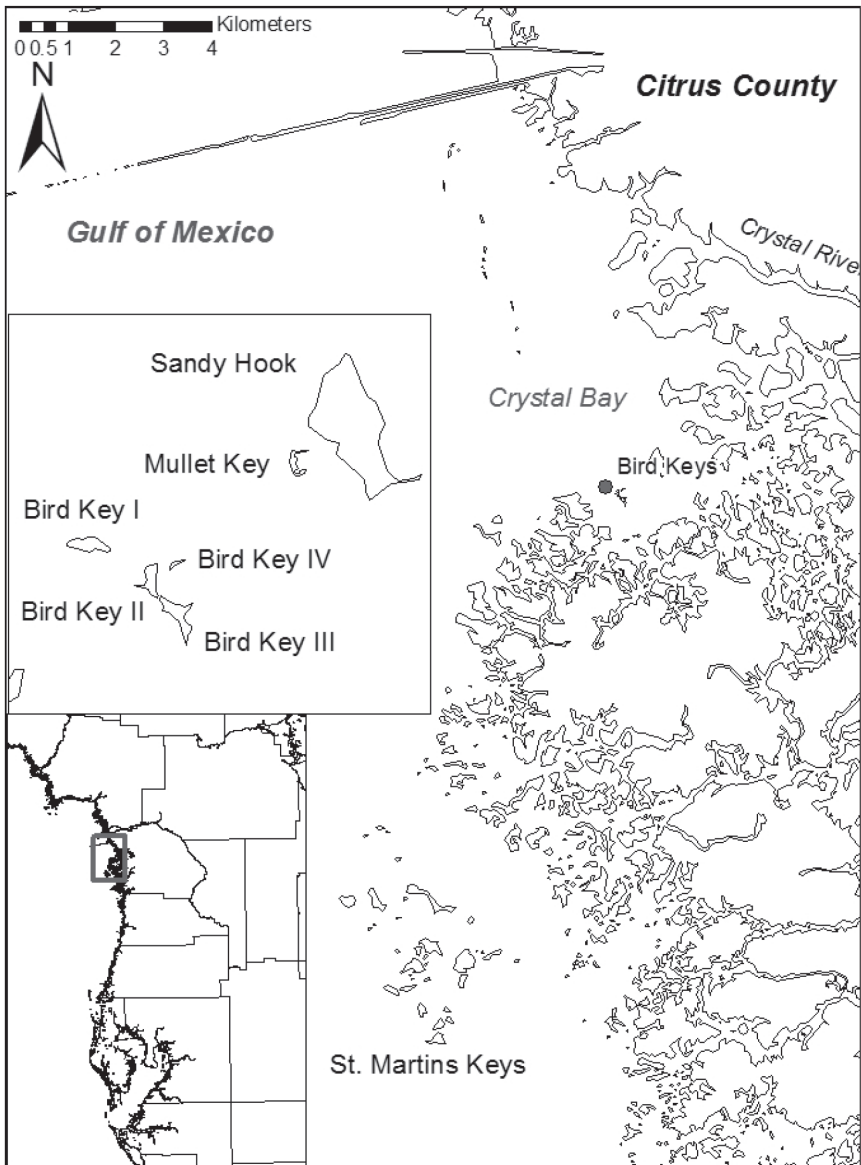
On 17 May 2011, one dark morph pair was found nesting at Ozona Spoil East (28° 4' 23.03" N, 82° 46' 59.61" W), 1.6 km east of Marker 26 (AFP, field notes). The colony is on the west end of the 0.5-ha island in a Brazilian pepper and cabbage palm thicket.

Nesting effort was concentrated at I-25 (annual colony size  $\bar{x}$  = 3.8 nests, SD = 2.7, N = 21 years) since 1991, at Marker 26 ( $\bar{x}$  = 3.7 nests, SD = 3.0, N = 17 years) since 1995, and at Three Rooker Island ( $\bar{x}$  = 1.6 nests, SD = 3.1, N = 9 years) since 2002 (Table 1). Egrets bred only once at Marker 21 and Marker 27, and sporadically at three other islands closer to the mainland: Smith Bayou North (2003, 2006), Dunedin Sand Key West (2005, 2010), and Ozona Spoil East (2011). Annual mean nesting effort was 2.5 occupied sites (SD = 1.2, N = 21 years), and 9.3 nests (SD = 5.8, N = 21 years) in CHSJS. The annual mean number of nests was moderately correlated with the 21 year study period ( $R^2 = 0.427$ ,  $P \leq 0.001$ ). The spring 2004 nesting season preceded and was not affected by the four hurricanes that crossed west-central peninsular Florida in September 2004; however, in 2005 the number of nesting pairs was 41% of the preceding year's effort, although nesting substrate was not damaged notably in CHSJS, and remained lower for several years following the hurricanes.

*Crystal Bay, Citrus County.*—Crystal Bay, the estuary of the Crystal River, contains three groups of islands where colonial waterbirds have bred since the 1990s (Fig. 2). The Bird Keys (28° 52' 34.67" N, 82° 41' 55.59" W) are a group of four small islands on the southwest edge of Crystal Bay, within the Florida Department of Environmental Protection's St. Martins Marsh Aquatic Preserve. The low-lying keys are vegetated with 7-10 m tall black- and red mangroves, with well-developed canopies, that grew on these islands since the 1989 freeze, edged irregularly with narrow stands of smooth cordgrass, surrounded by a shallow intertidal flat with oyster shell rakes and wide expanses of shoal grass (*Halodule wrightii*) and turtlegrass (*Thalassia testudinum*). Bird Key I (0.6 ha; 28° 52' 39.63" N, 82° 42' 2.89" W) has a cove on the north side, while Bird Key II (0.7 ha; 28° 52' 35.06" N, 82° 41' 53.63" W) has three interior ponds. The two smaller islands, Bird Key III and IV, are nearby. Mullet Key (0.6 ha; 28° 52' 50.72" N, 82° 41' 31.61" W), 0.9 km northeast of the Bird Keys, is a shell ridge vegetated with mangroves. Sandy Hook (4.0 ha; 28° 52' 56.65" N, 82° 41' 22.62" W), 150 m north of Mullet Key, is a broad shelly island vegetated with black mangroves, smooth cordgrass, and black needlerush (*Juncus roemerianus*) surrounding several involuted coves.

On 19 June 1996, a small heron colony but no Reddish Egrets was found nesting in some stubby mangrove snags on Mullet Key (AFP, field notes). Audubon did not survey Crystal Bay from 1997 to 2009.





**Figure 2. Bird Keys, Mullet Key, and Sandy Hook, Crystal Bay, Citrus County, Florida.**

On 7 June 2009, a mixed wading-bird colony with 413 nesting pairs but no Reddish Egrets was found nesting on Bird Key I (AFP, field notes).

On 29 August, the colony was re-visited and two dark-morph Reddish Egret young were found standing about 1 m apart at mid-



canopy on the south side of the island, characteristic of fledglings of a single brood that are still dependent on their parents, but no adults were observed (AFP, field notes). Both young were alert, with grayish-brown feathers, exhibiting primaries of irregular lengths, dark bills and legs, and yellow irides, estimated to be 8-10 weeks old. One of the young vigorously defended its roost position in the mangroves against an interloping young Great Egret (*Ardea alba*).

On 30 August, the two young Reddish Egrets were re-sighted perched on the island, but adults were not seen (AFP, field notes).

Two days later (1 September), ABH and AFP returned and found the two young again sitting side-by-side in the same position within the canopy (Fig. 3), and observed them for more than one hour without the parents revisiting the site.

#### DISCUSSION

Mangroves begin to reach the upper range of their distribution on Florida's Gulf coast in northern Pinellas County, and were freeze-damaged but not killed in Clearwater Harbor and St. Joseph Sound in the 1989 freeze. As Reddish Egrets appeared in CHSJS in the 1990s, novel nesting habitat on the spoil islands was available, bridging the distance from Tampa Bay to the Anclote Keys (Hodgson and Paul 2010,



**Figure 3.** Reddish Egret young-of-the-year brood of two at Bird Key I, Crystal Bay, Citrus County, Florida on 1 September 2009 (photograph: A. B. Hodgson).

Hodgson and Paul 2011a, b). The origin of the egrets that nested in CHSJS is not known; they could have dispersed from colonies farther south on the coast, although we speculate that it is more likely that they came from some of the established colonies in Tampa Bay. The origin of the egrets that nested in Citrus County is similarly unknown. Wading-bird nesting habitat is not present along coastal Pasco County, where the coastal vegetation transitions from arboreal to herbaceous cover and there are no offshore islands above the Anclote Keys. Reddish Egrets were not found during annual surveys of waterbird colonies on Bird Key (28° 40' 23.99" N, 82° 41' 10.00" W) or Crawl Key (28° 39' 9.00" N, 82° 41' 12.98" W) in Chassahowitzka Bay in Hernando County from 2005-2011 (ABH, unpublished data). Dispersing Reddish Egret adults and young-of-the-year occur commonly after the nesting season along the upper Gulf coast and panhandle of Florida (Stevenson and Anderson 1994, National Audubon Society 2010), and it is plausible that Reddish Egrets flew over the Crystal Bay islands while dispersing from colonies farther south or while returning south from a nomadic flight.

Mangroves were killed to the ground in Citrus County in the 1989 freeze (Hebert 1993), but have re-colonized the small outer islands in the past two decades and the trees have gained some height so that the overwashed islands have developed usable nesting habitat. The nesting record on Bird Key I was plausible as the mangroves re-grew to envelop the embayments on the island and create the "branches over-arching shallow lagoons" configuration preferred as nesting habitat by Reddish Egrets.

Reddish Egret young fledge at around 6.5-7 weeks, but the parents feed the dependent young at the colony for another 2-4 weeks, so the brood of fledglings seen at Bird Key I were in a stage at which they were flying but still dependent (Paul 1996). We speculate that egg laying for these young occurred during the week of 7 June, about the same time when AFP first visited the colony, although the nest was apparently so well concealed that it was not observed.

*Management recommendations.*—Anthropogenic disturbance of wading-bird colonies is a frequent cause of nesting failure (Rodgers 1995, Carney and Sydeman 1999). All the CHSJS wading bird colonies are pressured from various recreational activities that draw visitors disruptively close to nesting birds (such as fishing the island perimeters, picnicking or sunbathing on the enticing sand beaches, or nature watching by kayak). Similarly, fishermen and recreational kayakers have been observed disturbing the Bird Key I colony (ABH and AFP, pers. obs.). Our management recommendations encompass several strategies to educate the public about the consequences of colony disturbance by humans, and solicit their participation in protecting colonial waterbird colonies during nesting:

1) enlist interested volunteers to participate in protection of these colonies and establish cooperative stewardship between the responsible state agencies using a protocol such as Audubon's Project ColonyWatch program (Paul and Paul 2004),

2) post the islands with regulatory and informational signs to educate the public about colonial waterbird nesting behavior and deter intrusion during the nesting season,

3) remove fishing line or other entangling marine debris during the fall, when birds are typically not nesting, to prevent death or injury to colonial waterbirds, and

4) implement an appropriate surrounding buffer, which may vary according to the site conditions of each island, to minimize disturbance during the nesting season.

Clearwater Harbor, St. Joseph Sound, and Crystal Bay's Bird Keys are the northernmost extension of Reddish Egret nesting on Florida's peninsular Gulf of Mexico coastline and, cumulatively, these islands support approximately 10% of the estimated state population. Protecting these nesting pairs contributes to achieving the objectives of the range-wide conservation action plan for Reddish Egrets (USFWS, unpublished report) and maintaining the population goals of Florida's statewide imperiled wading bird action plan (FWC, unpublished report), both of which are currently in public review.

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