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## ROOF-NESTING TERNS, SKIMMERS, AND PLOVERS IN FLORIDA

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With increasing development and human use of beaches, roof-nesting may provide the means of survival of some beach-nesting birds. Despite problems, some of which could be alleviated, roof-nesting birds are less subject to disturbance and predation. In 1974, Louise L. Greene alerted the author to the fact that Least Terns (*Sterna albifrons*) had been nesting on roofs in Fort Lauderdale since the 1960's. A 1975 survey of all nesting Least Terns on Florida's Atlantic Coast estimated 2500 pairs in 52 colonies, 21% of these (614 pairs) were in 16 roof colonies. Since then, 43 roof-nesting sites have been documented in Florida for Least Terns, three for Black Skimmers (*Rynchops nigra*), two for Wilson's Plover (*Charadrius wilsonia*), and one enigmatic record (see comments below) for either Common (*S. hirundo*) or Roseate (*S. dougallii*) tern. Killdeers (*Charadrius vociferus*) also nest on roofs in Florida, but site details for this species have not been tabulated for this report.

### RESULTS

Listed below are such site details as are available for Least Terns (Table 1) and for Wilson's Plover, Black Skimmer, and the Common/Roseate tern (Table 2). In the tables, active denotes incubated eggs or brooded chicks, and a parapet is any sort of raised edge to a roof that prevents chicks from falling off the roof. Initials of observers are listed after each site entry and names appear in the acknowledgments. For each roof-nesting site, I have given as complete a description and history of use as the available data permit.

TABLE 1. ROOF-NESTING SITES OF LEAST TERNS IN FLORIDA.

#### Atlantic coast, north to south.

DUVAL COUNTY. JACKSONVILLE. — *Sears Roebuck & Co., Warehouse*, isolated rural area 13 mi inland. Roof, elevation 6 stories, 18 acres gravelled with excellent drainage, 2½ ft parapet. Adults feed in artificial pond 1 mi away and probably the St. John's River 2½ mi away. 1975: 25 June, 140 adults, 17 + nests, 2 chicks, 100 fledglings; 23 July, 2 nests, 69 chicks, 15 fledglings; 19 August, all birds gone, no predators observed. 1976: 1 June, 364 adults, 51 nests, 80 eggs, 170 chicks; 9 July, 2 eggs, 21 chicks; despite some failures due to heavy rain and Fish Crows, and possible grackles

and a Loggerhead Shrike, this was a successful-colony. *Florida Junior College*, inland, 4 mi from Intracoastal Waterway. Roof elevation 3 stories. Some adults fed in artificial pond, others flew in direction of ICW. 1975: 29 May, 6 adults, 8 eggs; 25 June, 2 adults, 2 downy chicks washed alive to 2nd story roof, one chick found dead on ground; 30 July, 5 fledglings still being fed by adults. 1976, one pair fledged young. *Lamb's Yatch Basin*, on Ortega River, 19 mi inland, just S of city limits. Roof, gravel, single boat dock. 1975: 20 July, 68 adults, 10 chicks, 34 fledglings; reports of many chicks washed into river during earlier storms. 1976, no nesting. A *closed motel* at 195 and SR20. 1976, about 50 adults (BSO).

BREVARD COUNTY. COCOA. — A *motel* at 195 and SR520. 1976, about 50 adults (RDB). MERRITT ISLAND. — *Cooks*, SR 520 W of Sykes Creek. 1975, birds predated by crows (LE). TITUSVILLE. — A *closed motel* at 195 and SR50, S of Titusville. 1976, about 50 adults (HWK). *Titusville Post Office*, adjacent to Intracoastal Waterway. Rural-suburban. Roof, elevation one story, high parapets. 1974-1976, several birds seen flying in and out, grackles on parapet, success doubtful. Reported by janitor. Probably an extension of an adjacent colony (ca. 30 pairs 1974-1975) in vegetated field used by fishermen and cars (EJF).

ST. LUCIE COUNTY. FORT PIERCE. — *K-Mart*, 211 S. Federal Hwy., about 500 ft from Sears (see below). Roof, flat, gravelled, parapet, no shade. Nearest salt water 2 mi, adults feed in ditch 300 ft distant. 1976, 28 June, 100 adults, 46 chicks banded (WED, HWK). *Sears Roebuck & Co.*, urban area near Rt. 1. Roof, elevation one story, part flat, part sloping with majority of birds on slope, parapet minimal. 1976: 28 June, 160 nests, 170 young, 110 banded, some with orange tags, chicks found on ground, the 4 live chicks restored on the roof; 24 August, 14 abandoned eggs, 1 chick, 6 flying young, 9 chick carcasses (WED, HWK).

MARTIN COUNTY. STUART. — *Green Turtle Condominium*. 1975. "large numbers," successful (Stuart News). *East Ocean Mall*, 1976, June, many adults and/or young present (RLD).

PALM BEACH COUNTY. BOCA RATON. — *IBM Complex*, suburban, many acres of flat roof. 1973-1974, ca 12 adults flying from roof to feed in decorative pond. 1975, crows wiped out early nesting, a "few pairs" re-nested (RW, EJF). DEERFIELD. — *First Federal Savings Bank*. Urban. Roof elevation 2½ stories. 1974-1975, a few pairs seen flying in and out (RW, EJF). TEQUESTA. — *Lighthouse Shopping Plaza*, Grant's and adjacent store. Rural-urban. Roof, elevation 2 and 1 stories respectively, flat, tar and gravel-shell with high parapet on 2 sides (Grant's), parapet entire on other roof, ample shade. Chicks found undamaged on a lower roof of Grant's and some in the parking lot. 1973, birds present. 1974: early May, 100 pairs; mid-June, maximum of 97 nests, 75 young. 1975: Grant's only, 26 May, 150 nests with 135 young, 101 chicks banded, some with orange tags; 21 June, 41 young. 1976, 26 May, heavy rain, water on roof, 12 nests, 4 young, no eggs, no known re-nesting (RER, HWK, EJF).

BROWARD COUNTY. FORT LAUDERDALE. — *Jefferson's*, 2400 N. Federal Highway. Building constructed in 1960 on former nesting site of Least, Killdeers, and Common Nighthawks. Formerly suburban, now urban with heavy traffic. Roof, elevation 3 stories, area 187,000 ft<sup>2</sup>, tar and gravel-shell, partial parapet, shade, small grassy patch by air conditioner seepage. 1961-1962, birds present. 1963-1964, numbers increasing. 1965: active April-June; 5 May, 40 nests, 64 eggs; 12 May, 7 nestlings; 25 June, 119 young, 1 adult banded; chick mortality from starvation, drowning in clogged drain

spouts, Fish Crows, domestic cats preying on those that fell off building, and probably, lack of shade. 1966, colony failed, human disturbance. 1967, colony returned. 1974, 18 May, 20 adults, 2 nests (ADI, LLG, EJF). *Kwik Chek* (formerly Winn-Dixie), 2600 Federal Hwy. Urban. Roof elevation one story. 1961-1976, birds present. 1974, 10 adults. 1976, 10 adults (ADI, EJF, LLG). *Coral Ridge Shopping Plaza* and a *Used Furniture Store*. 1961-1975, birds irregularly observed (ADI). *Port Everglades Authority Warehouses 1, 2, 3*, along Intracoastal Waterway, industrial. Two roofs, 22,700 ft<sup>2</sup> each with a slight pitch, one 150 × 22 ft portion with 10% pitch, elevation 40 ft, tar and pea-rock, incomplete parapet. 1974: active 27 April-31 July, 200 adults; 28 May, 57 eggs, 107 chicks, highest count; 13 July, 14 broken eggs, 3 eggs being incubated; 20 July, 10 chicks, 31 July, 2 chicks, 4 eggs (LLG, RAM). 1975: active 19 May-2 August; high count on 30 May of 177 nests, 179 eggs, 183 chicks, down nearly 50% the next day after storm; 25 June, 44 chicks banded (21 color marked, orange wing tag). 1976: observations 8-27 May only, to avoid disturbing nesting Black Skimmers (see Table 2); max. of 121 nests, 162 eggs, 107 live chicks, 45 dead fresh hatched chicks, predation by Fish Crows probable (LLG). *Southport Marina*, 135 SE 16 Street, near Patterson Causeway. Urban. Roof, elevation 3 stories, area 300 ft<sup>2</sup>, tar and gravel with slight pitch, main section with parapet, 5 drainage openings each side. Perimeter roofs on E and W 2 and 3 ft lower, some shade. 1975, 31 May, 28 nests, 18 eggs, 31 chicks, Fish Crow predation. 1976, no birds (JP). *Oakland Post Office*, 1900 W. Oakland Park Blvd. Roof, area 22,700 ft<sup>2</sup>, center section 4 ft higher, allowing drainage, no parapet. 1976: active 12 May-28 June; 19 May, 42 nests, 69 chicks; 2 June, 65 chicks banded; adult mortality 30, with high of 7 plus 2 sick on 9 June; feeding grounds apparently in lakes and canals near houses (JW). **POMPANO BEACH** (Lighthouse Point). — *Zayre's*, 3772 N. Federal Hwy. Roof, elevation 1½ stories, tar and gravel-shell, uneven, little shade, no parapets, deep gutters trapping chicks. 1969, 1 June, (many incubating and well grown young)" (AFMcG). 1970-1973, birds present. 1974, late May, 80 nests, chicks from 1-7 days old, later 50 fledged young used roof as a roost for several weeks (EJF, TH). 1975, 21 May, 48 adults with chicks 1-7 days old, 11 banded, but disturbance caused young to run off roof (EJF). *Pompano Beach Fashion Square*, large mall. Unconfirmed reports of prior presence. 1975, 23 May, 8-10 adults. 1976, "about 30 adults present" (LLG).

**DADE COUNTY. MIAMI.** — *Planet Ocean*, 3979 Rickenbacker Causeway, Virginia Key, building on a former nesting site. Roof, elevation 60 ft, 1.6 acres, flat, tar and gravel, parapets. Access by cherry picker or extension ladder only. 1975, 21 June, 12 nests, 20 eggs, flying young, construction work in progress. 1976, 11 May, 35 nests, heavy losses from flooding but some success, some adult mortality (MT). **MIAMI BEACH.** — *Miami Beach Yacht Corp.*, 1928 Purdy Ave., just N of Venetian Causeway. Urban. No access, building torn down in 1975. 1951 or 1952, birds observed on roof (JKH). **NORTH MIAMI.** — *Congress Bowling Alley*, 125 St. NE & 16 Ave. Urban. Roof elevation 22 ft. 1976: active, 20 April-20 July when all but 4 young killed in a storm; 4 May, 35 nests (TP). *Diplomat Mall*, Hallandale Blvd. Urban. 1975, 100 adults, at least 50 fledglings. 1976, none present, probably moved to Yatch Harbor Apts., see below (TP, EL). *Warehouse*, 18955 NE 3 Court. Urban. 1976: active 10 April-20 July; 7 June, 175 adults, 20 nests under incubation, 100 young; 135 fledged; temp. 90-92° F (TP). *Westland Shopping Ct.*, Palmetto Expressway & 103 St. NW. Urban. Nesting suspected but not confirmed. (TP). *Yacht Harbor Apts., Inc.*, 2200 Diane Drive. Urban. Roof, elevation 4 stories, flat, gravel, 3 sides with metal parapet, drains not screened, shade. Adults evidently feed in nearby lagoon. 1976, "hundreds of birds" (TP, EL). **SOUTH MIAMI.** — *Burdine's*, Dadeland Shopping Mall, Kendall Ave. Urban. Roof, elevation 4

stories (parking garage), 1.9 acres, tar and crushed coal aggregate, parapets, shade. 1972, active, possibly earlier. 1974, 100-120 adults, estimated fledging success on first nesting, 30% renesting subjected to flooding. 1975: active 3 May-4 July; 3 May, 14 nests, 2 eggs; 25 May, 12 nests with eggs, chicks; total adult mortality 20. 1976: active mid-April, a few nesters remaining to 25 June; 27 May, 24 nests, 36 eggs, 5 chicks; 5 June, 5 nests, 7 eggs, 5 chicks; storm on 28 May caused much mortality, including adults (MT).

#### Gulf Coast, north to south.

PINELLAS COUNTY. ST. PETERSBURG. — *Milton Roy Co.*, 5000 Park St. 1969, colony established. 1976, colony still present, no details (DP).

SARASOTA COUNTY. SARASOTA. — *Longboat Key Apartment Building*, on Gulf and pass to Bay. Roof, elevation 3 stories, area 65,000 ft<sup>2</sup>, flat, tar and gravel, drains covered. 1974, previous beach colony moved to roof. 1975, birds present. 1976: total of 350 active nests calculated from 7-10 nests in a 1250 ft<sup>2</sup> area; successful; dead chicks found in parking lot, predation by crows and gulls (FCP). *Kane's Furniture Store*, along Hwy 41, S edge of city. Urban. Roof, parapet, drains screened, shade. Waterway and pond adjacent. Predation by Fish Crows and Laughing Gulls. 1975, 90-100 adults. 1976, 12 June, 12 nests, 18 eggs. (FCP, MMS). *Darby Buick Agency*, flat roof, ½ mi from bay, freshwater pond near by. 1975, "very active colony" (FCP). *Warehouse Roof*, E of Sarasota. 1976, birds present (FCP). *Stinnett Pontiac*, Rt 41. 1976, birds present (SS).

#### Panhandle.

ESCAMBIA COUNTY. PENSACOLA. — *Municipal Auditorium*, on the end of pier extending into the bay. Roof, 50 ft elevation, wide, slightly sloping, tar and asphalt. 1957: 8 July, 10 nests, 11 dead chicks, 3 live chicks; 16 July, 6 nests, some dead chicks. 2 live ones. (Goodnight 1957). 1963, colony still active (Sprunt 1963). 1974-1976, reports of colony still active. *Sears Roebuck & Co.* 1976, birds present (RD).

#### Inland.

ORANGE COUNTY. MAITLAND. — *Rose's Dept. Store*. Market Square Shopping Ctr., Rt 436. Birds feed in Lakes Howell and Ann. 1975, 17 July, colony present, no access. 1976, colony present, young birds seen in area (RJD). ORLANDO. — *Pepsi Cola Bldg.* 1700 Director's Row, Rt. 441, S of city. Roof, elevation 30 ft, area 6000 ft<sup>2</sup>, flat, tar and gravel. 1976, late May, 10-12 adults carrying food (RJD).

TABLE 2. ROOF-NESTING SITES OF WILSON'S PLOVER, COMMON/ROSEATE TERN, AND BLACK SKIMMER. See Table 1 for locality details.

#### Wilson's Plover.

DADE COUNTY. BAL HARBOUR. — *Beau Rivage Hotel*. 1961-1962 to 1964-1965. "in the shadow of a ventilator. Eggs were usually under incubation by April 10th. The latest I remember seeing them was May 10th." (McGowan 1969). MIAMI. — *Planet Ocean*. 1976, wing-dragging display photographed (MT).

#### Common/Roseate tern.

BROWARD COUNTY. POMPANO BEACH. — *Zayre's*. 1969, 12 adults with feathered young (McGowan 1969). These nesting terns might have been Roseates, as Common Terns are not known to breed on this portion of the Atlantic Coast, while Roseates regularly nest about 100 miles to the southwest in Key West.

#### Black Skimmer.

BROWARD COUNTY. FORT LAUDERDALE. — *Port Everglades Authority*

*Warehouses*. 1974, seen briefly at roof. 1975: 12 July, 45 adults, 8 nests, 12 eggs; all eggs subsequently vanished, Fish Crow predation suspected. 1976: nesting unsuccessful, monitored at a distance to avoid disturbance; 21 July, 47 adults, about 12 incubating; 27 July, eggs seen scattered about roof; 10 August, one small chick which had vanished by 14 August (LLG).

DADE COUNTY. NORTH MIAMI. — *Warehouse*. 1976: 7 June, 16 adults; 30 June, 35 adults, 5 nests, little shade; 26 July, 4 adults, 2 young; eventually 4 young were seen leaving and returning to the roof (TP). SOUTH MIAMI. — *Burdines*. 1975, 8 July, 7 adults circled over roof and landed, not seen again. 1976: 27 May, 17 adults, 4 nests with single eggs, 3 eggs lying outside active scrapes had large ragged holes in top or end, contents fresh but not consumed; 25 June, roof flooded, 2 groupings about 150 ft apart, one with 5 nests (4 with 1 egg, 1 with 3), the other 7 nests with single eggs in water, 3 additional eggs freshly broken, unconsumed; through 17 July, 30-75 adults seen on roof; 17 July, 10 nests, 11 eggs (one nest with 3 eggs, previous 3-egg clutch gone), several fresh damaged eggs scattered away from active nests, one small chick, adults dive on observer; 23 July, after severe storm, flock absent but one pair still feeding chick until 24 July when flooding and repairmen on roof evidently caused abandonment (MT).

ST. LUCIE COUNTY. FORT PIERCE. — *K-Mart*. 1976: 23 June, a few present; 22 July, 30 adults, no nesting observed, birds left, probably due to human disturbance, but 3 eggs found abandoned in August (WED, HWK).

*Skimmer behavior*. Unlike other roof-nesters that lay their eggs on the gravel, skimmers scrape away the gravel and lay on a circle of black tar that is easily visible. Green and Kale (1976) report at least one egg stuck in tar which may cause breakage when an incubating bird tries to turn the egg. Another cause of breakage might be the weight of the bird on the flat surface, lacking the considerable nest hollow used in the sand. Trafton's (So. Miami) broken eggs were outside their scrapes, uneaten, with neighboring Least Tern eggs undamaged. Grant and Hogg (1976) found and photographed three damaged eggs outside skimmer scrapes, "evidently punctured by their knifelike bills," and Chamberlain (1959) noted eggs displaced from nests of late-nesting skimmers. When disturbed, skimmers fly off for a longer period of time than Least Terns and leave eggs and chicks exposed to sun and predation, which may explain egg disappearance at Fort Lauderdale in 1975.

## DISCUSSION

The locations and status of 43 documented roof-nesting sites for the Least Tern, Black Skimmer, Wilson's Plover, and Common/Roseate tern were reported by 21 amateur naturalists and 4 professional biologists, and includes information received to 1 April 1977. Thirty-three of the sites are from Florida's east coast (one was 13 miles inland), eight are from the Gulf coast, and two are from central Florida. The majority (ca 35) were described as urban and in areas of heavy vehicular traffic. Feeding areas, both fresh and salt water, were up to 2½ miles distant. Roofs varied in size up to many acres in extent and were from one to six stories high. Composition of the rooftop surface was pea-rock (riverstone and limerock) or shell gravel on tar. Colony size ranged from "a few" pairs to 180 pairs. Incubation dates ranged from 3 May into August.

Nesting success of Least Terns is difficult to estimate whether on roofs or on beaches. In Florida, Least Terns move often and are unpredictable in their choice of nesting sites. When disturbed they renest, either on their first site of the season or elsewhere, confusing any estimate of total numbers. While food supply, flooding, or disturbance certainly affect them, their comings and goings often remain inexplicable. On roofs of some buildings often built on former natural colony sites, they may show strong site tenacity. At Pensacola they have used the same location for 20 years. At Fort Lauderdale a few still appear on favored buildings after 12 years in spite of deterioration of the neighborhood. However, they may move across a city street, as in North Miami, or abandon a site entirely, as in South Miami. A 1975 study of Least Terns in northeast Florida estimated fledging success on roofs at 77% vs. 9% in natural colony sites (B. S. Obst, pers. comm.). A recent study of roof-nesting Common Terns in Finland gave production as 2.8 young per pair (in spite of crow predation), double the usual 1.4 young per pair for natural colony sites (Hakala and Jokinen 1971).

The advantages of roofs to nesting Least Terns include the absence of disturbance, of mammalian predators, and of the dense vegetative growth that renders many spoil islands and beaches unsuitable. Temperature appears not to be a problem. At Fort Lauderdale, Greene measured the midday air temperature at the roof surface of the Port Authority warehouse to be 98° F (37° C), and at the sand surface of a nearby beach it was 106° F (41° C).

Disadvantages of roofs to nesting Least Terns include flooding by heavy rains and the frequent lack of parapets and shade for chicks (for remedies see below). Storms may deposit several inches of rain on a flat roof, washing eggs and chicks from nests into drains and gutters. Goodnight (1957) and Inwood (1975) both report seeing chicks washed into downspouts and emerging unharmed below, but most young are not so lucky. All observers report chicks huddling in the sparse shade of ventilators, lumber, or trash. Chicks may run off roofs or become trapped in gutters, either on their own or more commonly in response to human disturbance. Chicks are sometimes found on pavements at the mercy of traffic, heedless shoppers, or animals. Roof repair during the breeding season usually causes a colony to desert, and exposed tar areas can trap adults and chicks. Fledglings may land on streets or parking lots, especially if nearby natural areas are lacking.

Roofs also have disadvantages for researchers. Few of them are easily accessible, because of construction, insurance regulations, or the natural reluctance of busy building managers to let strangers prowl about. Even under the best conditions access is limited to two to four brief visits a season. The careful studies done at Fort Lauderdale warehouses necessitated climbing a two story vertical outside ladder. One dedicated observer reached a roof

first by cherry picker, and later only by a 60-foot extension ladder steadied by workmen. The author was admitted to two rooftops only by showing a letter from the office of the Assistant Secretary of the Interior. A researcher needs to be a missionary, diplomat, and salesman to convince some building owners of the value of their buildings to the birds, and of the promotional value to the owners that stories in the media can give. Managers of chain stores must often refer requests to monitor and protect roof colonies to their home office, so if groundwork is not done in the winter the colony may be gone before approval is granted. Both the Port Authority of Fort Lauderdale and Sears Roebuck and Co. have been most helpful in granting access to roofs.

### PROTECTION OF COLONIES

While it is important to continue documentation of colonies, the advantages to ornithology of detailed studies should be carefully weighed against the advantages to the birds of being left undisturbed. The Least Tern is officially endangered in California, under consideration for this category in New Jersey (Galli, pers. comm.) and the Mississippi race appears rare or absent (Downing, pers. comm.). In Massachusetts where all colonies are posted and patrolled, compression into fewer and fewer natural areas have made them annually more vulnerable to predators and natural disasters. While the species appears abundant in Florida, 1975 estimates of the total Atlantic coast population of the United States showed an 80% decline since the mid-1940's (Nisbet, pers. comm.). Therefore, careful consideration should be given to the goals and methods of any study. Even under the best of conditions the appearance of man on a roof causes disturbance. The chicks scatter and take shelter and fall in gutters or off the roof, and adults flying up risk exposure of eggs and young. Data on incubation and nestling periods, re-nesting efforts, and effects of wind, flooding, and repairmen are already well documented. Ambient temperature can be taken on adjacent buildings. Information about location, size, and feeding areas of roof-nesting colonies is needed, but much can be learned from ground observation or neighboring buildings. Banding studies and photography are occasionally desirable and should only be conducted by or under the close supervision of experienced workers.

Liasion with property owners and architectural firms and public tolerance of roof colonies can be stimulated by articles and photographs in the press, as well as by citizen concern. Fisk's (1975) article on roof-nesting Least Terns resulted in inquiries from California and Europe, and in an ongoing correspondence with the Department of Architecture at Notre Dame University.

Roof construction that meets requirements of sand-nesting birds is relatively simple, including a slight pitch to provide drainage, a parapet at

least three or four inches high, screened drains, and structures of some sort that provide drainage. As an environmental service, the Port Authority of Fort Lauderdale has been working with Louise L. Greene to incorporate these needs in their plans for a new building.

#### FUTURE REPORTS

The frequency of roof-nesting in Least Terns appears to be increasing, and is no longer restricted to Florida. Three records exist in Charleston, South Carolina (LeGrand 1976) and four in Louisiana (Stewart 1976). Undoubtedly many more such colonies exist in Florida. The author urges observers to be alert for roof colonies, especially at shopping malls and similar areas with vast gravel roofs. She would appreciate learning of sites with such data as the type of building and roof, size of colony, and proximity to feeding areas, and *insofar as it is possible without disturbing the colony*, any information on dates, stage of breeding cycle and estimated success.

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