THE GROWING USE OF ROOFS BY NESTING BIRDS

By Erma J. Fisk

A study of roof-nesting Least Terns (*Sterna albifrons*) in Florida led to the collection of material on roof-nesting by birds worldwide. This paper is a compilation of reports from numerous investigators, literature sources, and other references. Twenty-two species are listed from the United States, Great Britain, Europe, Africa, and the Pacific area with such details as were available on sites, roof composition and size, numbers, nests, and behavior. Data were collected through April 1977. Roof-nesting is defined here as breeding on the actual roofs of occupied buildings and not on chimney pots, platforms, or ledges. The author's concern is the adaptation that beleaguered or opportunistic birds, displaced from their normal habitats by human or avian pressures, are making for survival. Some are marginal. Others, such as Herring Gull, Least Tern, Common Nighthawk, and Killdeer have become well-adapted. Sites are largely urban, and roof composition is tar mixed with gravel or shell. Building sizes range to six stories and can cover several acres. Feeding areas can be distant. Killdeer have survived a temperature of 138°F and a descent of 50 ft. Comparative July temperatures at noon for a Least Tern colony at Fort Lauderdale, Florida, were 98°F (roof) and 106°F (beach) (Greene, pers. comm.). Known predators are American Kestrel (*Falco sparverius*), Great Black-backed Gull (*Larus marinus*), Burrowing Owl (*Speotyto cunicularia*), probably Great Horned (*Bubo virginianus*) and Tawny (*Strix aluco*) owls, Fish Crow (*Corvus ossifragus*), and Boat-tailed Grackle (*Quiscalus major*). In colonies disturbed by inexperienced observers or workmen, chicks may run off the roofs. A temporary barrier placed along edges in breeding season could prevent this. The most successful roofs have a slight pitch for drainage, some shade, safe-guarded drains and, except for Killdeer which must descend within two days and cannot surmount the obstacle, a raised edge or parapet. On flat roofs flooding causes mortality of eggs and chicks. Abnormal mortality of adult Least Terns was found at three sites in south Florida in 1975–76, suggesting polluted fishing grounds (Trafton, Willis, pers. comm.).

SPECIES ACCOUNTS

Fulmar (*Fulmarus glacialis*)

1956. A castle near Bednel on the northeast coast of Endland, 17 June (Gabrielson, pers. comm.).

1976. Holy Island, Farne Islands, Great Britain, a sloping church roof (Gaylord et al., pers. comm.).

Osprey (*Pandion haliaetus*)

1879. A sheep barn, Plum Island, N.Y. Nest destroyed by owner in 1881, rebuilt in 1885. Photo (Allen, 1892).

—— A barn at Cape May, N.J. Photo (Stone, 1937).

ca. 1960–65. Catholic church, Avalon, N.J. Nest destroyed (Glaspey, pers. comm.).

—— U.S. Coast Guard Station, Island Beach, N.J. (Jacobs, pers. comm.).

European Oystercatcher (*Haematopus ostralegus*)

1971–75. A single pair documented on a complex of medical buildings in grassy open terrain at Aberdeen, Scotland. The nest was an accumulated pile of pebbles close to a ventilator. Chicks were brooded 2–3 weeks, fledged at about a month. Also a pair on a school in the center of Aberdeen. The adults foraged on the playing field between activities (Bourne, 1975).

Wilson's Plover (*Charadrius wilsonia*)

1962–1965. Bal Harbour, Florida. Sea View Hotel, in the shadow of a ventilator. "Eggs usually under incubation by April 10 . . . the latest I remember seeing them was May 10." (McGowan, 1969a).

1976. Miami, Florida. A wing-dragging adult was seen and photographed in a Least Tern colony on Planet Ocean's flat, parapetted roof of tar and gravel. Elevation 60 ft, extent 1.9 acres (Trafton, pers. comm.).

Killdeer (*Charadrius vociferus*)

1925. Nebraska. A race track grandstand. Roof of tar and crushed stone, gently sloping, 400 × 80 ft, 50 ft above the foundation. Photo. Three clutches laid April–June, with at least two fledging from the 4 May brood and probable young from 11 June (Pickwell, 1925).

1937. Double-brooded pair on a California roof (Stoner, 1937). Since then found commonly north to Canada, east to New England, south to Miami on office buildings, schools, a National Audubon headquarters, a liquor store, an Army installation, IBM complex, filtration plant, etc. Roof composition is the usual tar and gravel, with one report of "metal" and one of "slag." Eggs are laid on the flat, or in raised nests of accumulated gravel sometimes rimmed with white pebbles or bits of shell. Prescott (1972) noted nests built against ventilators or boards, presumably as protection against wind. Eggs are often flooded out but have survived temperatures of 127°F (Demaree, 1975) and 138°F (Prescott, 1972); the latter noted one nest abandoned at 130°F. Both sexes incubate. Shells are immediately carried from the roof by the male, after hatching (Prescott, 1972; Demaree, 1975). In extreme heat the adult does not incubate, but stands, shading the eggs. Wass (1975) reported a nest moved 500 ft to the other end of an Air Force building due to re-roofing activity. Eggs survived a 6-in snowfall. Up to four broods are reported, with instances of several nests on one roof simultaneously, and in one case, territoriality (Carter *in* Wass, 1974). Chicks live on their yolk for two days,

then, at a weight of about 20 grams (Erskine *in* Wass, 1975), are coaxed by the adults to jump to the ground from whatever height. Evidently most survive and are led away to be tended for ca. 23 days. If a raised edge or parapet prevents this, the young starve. Known predators are American Kestrel and, formerly, Peregrines (*Falco peregrinus*). Locations and behavior have been well documented by Demaree (1975), Prescott (1972), and Wass (1974).

Upland Sandpiper (*Bartramia longicauda*)

1964. Schenectady, N.Y., a single record. Two eggs found in a hollow among pebbles on the flat tar and pebble roof of a one-story school in open, semi-rural country (Yunick, 1965).

Herring Gull (*Larus argentatus*)

Documented by Cramp (1971), Monaghan (1976), Monaghan and Coulson (1977).

1894. One report at a Black Sea port (Cramp, 1971).

1910. First report in the British Isles, unconfirmed, at Cornwall (Cramp, 1971).

1939. Six known sites in Great Britain. (Cramp, 1971).

1959. 28 sites (Cramp, 1971).

1969–70. 55 sites. None yet in Ireland, except on chimney pots (Monaghan, 1976).

1976. 92 sites in the British Isles, 50 of which had been colonized since 1969. An increase of 17% per annum in spite of some effort at control and the desertion of some colonies. Colonies tend to be concentrated in the central areas of towns and cities. Although the common nesting site is between chimney pots and on the ventilator shafts of sloping roofs of warehouses and large sheds, the birds are also common on flat roofs. Monaghan and Coulson suggest that the exploding increase both in the number of colonies and the size of existing ones is due to the saturation of colonies on their natural sites together with the rapid expansion of the species in Great Britain.

1956. Bremerhaven, Germany (Cramp, 1971).

1960. Bulgaria (Cramp, 1971).

1961. Boston, Massachusetts, Fish Pier (Paynter, 1963), first U.S. report. Subsequent expansion into the thousands in the environs of Boston. Heavy damage at two large industrial sites resulted not only from debris-clogged gutters but from actual holes dug through the gravel, tar and insulation (grass-pulling behavior?) (Lappin and Peterson, pers. comm.). As in England this proliferation was due to overcrowding of the coastal breeding localities and to human proliferation with its increase of seaside resorts, uncovered garbage dumps, fish factories, and other easy food sources.

Lesser Black-backed Gull (*Larus fuscus*)

1945 or 1946. First report, from South Wales (Cramp, 1971).

1969, 1970. Five colonies with a total population of 61–62 pairs, usually in association with Herring Gulls. Three out of seven sites were inland (Cramp, 1971).

By 1976 an annual increase of colonies 13%, of birds 28% (Monaghan and Coulson, 1977).

Glaucous-winged Gull (*Larus glaucescens*)

1962. Vancouver, Canada; a single nest on a dock roof (Cramp, 1971).

Dominican Gull (*Larus dominicanus*)

Auckland, New Zealand, on pier roofs and houses (Cramp, 1971).

Great Black-backed Gull (*Larus marinus*)

1970. One pair with one egg, on an ice factory at Newlyn, Cornwall, England, in association with Herring Gulls (Cramp, 1971).

1974. Four pairs at Newlyn, three at Mousehole (Monaghan and Coulson, 1977).

1975. Four pairs with Herring Gulls on the Newlyn factory (Cramp, 1971).

1976. A pair, apparently the only 1976 breeding, nesting unsuccessfully at Newlyn, renested, then preyed on the Herring Gulls. One chick fledged (King, pers. comm.).

Common Gull (*Larus canus*)

On the Finmark coast, Norway, at Goteberg, Sweden (Cramp, 1971) and one pair on a shed at Dalcross Airport, Inverness, Scotland in 1971 only (Monaghan and Coulson, 1977).

Hartlaub's (Silver Gull) (*Larus novae-hollandiae*)

1974. Cape Town, Africa, on five buildings of the City Hospital. High of 14 active nests, 13 chicks, 27–30 May, associated with pigeons. Substantial nests of straw and twigs were placed on wide vertical concrete gutters, 30 ft above ground. Success judged poor, due to heavy rains and chicks running off roofs (Broekhuysen and Elliott, 1975).

Western Gull (*Larus occidentalis*)

ca. 1920–77. San Francisco, Pier 26 Embarcadero (S. Fisk, pers. comm.).

1974. 8 May: 15 nests with 2–3 eggs each; 6 June: pipping eggs and chicks of various sizes (S. Fisk, pers. comm.).

Black-legged Kittiwake (*Rissa tridactyla*)

1928,*ff*. Present on warehouse in Norway with 130–140 pairs counted in 1963 (Nost *in* Cramp, 1971).

1935*ff*. Aalesund, Norway (Cramp, 1971).

1931. First record for Great Britain. A pair that failed in Scotland, (Cramp, 1971).

1969–1970. Seven sites, coastal or on a coastal river in Great Britain, with a population of 410 pairs (Cramp, 1971).

Common Tern (*Sterna hirundo*)

1966. Tampere, Finland, a factory roof (Hakala and Jokinen, 1971).

1971. Same. Nine pairs hatched at least 25 young. Roof 60 × 10 m, covered with coarse sand with a few isolated tufts of *Sedum acre*. Nesting began 11–13 May, food supply was a lake about 1 km distant. Production 2.8 per pair, double the usual 1.4 per pair of the Finnish archipelago. Predator was the Hooded Crow (*Corvus cornix*) (Hakala and Jokinen, 1971).

1975. Great Gull Island, Long Island Sound, N.Y. One pair in a very large colony, on a former army barracks (MacFarlane, 1977).

Roseate Tern (*Sterna dougallii*)

1969. Pompano Beach, Florida, in a colony of Least Terns. The report of "6 pair of Common Tern with feathered young" (McGowan, 1969) was probably a misidentification.

Least Tern (*Sterna albifrons*)

1951 or 1952. Miami Beach, Florida (Howard, pers. comm.).

1957 to present. Pensacola, Florida. First published report (Goodnight, 1957) of about 20 pairs on a pier roof 50 ft high.

1976. 42 sites documented with colonies numbering up to 300 nests. Florida east coast (33); Florida west coast (4); Louisiana (4); South Carolina (2) (Fisk, 1978). Undoubtedly many more, not yet reported or observed. Roofs vary from 1–6 stories high, two or more acres, with and without pitch or parapets. Composition tar and gravel or shell. Most with little shade except from ventilators or debris. All but one in urban, heavily trafficked areas. Feeding grounds up to 2.5 miles distant. Eggs are laid on the flat, some slightly raised on gravel, some rimmed with bits of white shell. Chicks have often been picked up alive from pavements below and restored to colonies. One was washed through a rainspout in a downpour and emerged safely 35 ft below (Goodnight, 1957). A study in 1975 by Obst (pers. comm.) gave success figures for roofs as 77% vs. 9% in the natural habitat of northeast Florida beaches. Known predators are Fish Crow, American Kestrel, Burrowing Owl, with Boat-tailed Grackle suspected.

Fairy Tern (*Gygis alba*)

Midway Island, Pacific Ocean. On the edges of the flat roofs of officer's quarters (Howell, pers. comm.) and on abandoned Quonset huts (Robbins, pers. comm.).

Black Skimmer (*Rynchops nigra*)

All colonies in association with Least Terns.

1975. Fort Lauderdale Port Authority Warehouse. High of 45 adults, 8 nests, 12 eggs, 13 July. Unsuccessful, human disturbance, and Fish Crow predation suspected (Greene, pers. comm.).

1976. Port Authority, Fort Lauderdale. Unsuccessful. High of 47 adults, with about a dozen incubating on 21 July. One small chick (10 Aug.) disappeared (Greene, pers. comm.).

—South Miami store roof, 4 stories high, 12 nests, 25 June. One chick survived flooding, was abandoned due to workmen on roof (Trafton, pers. comm.).

—North Miami, warehouse roof. Four young fledged from 5 nests counted 30 June in successful Least Tern colony. High of 15 adults. This to date has been the only successful breeding doubtless because of lack of disturbance. Observation done from neighboring building. (Pafford, pers. comm.).

—Fort Pierce, Florida, store roof. Adults increasing from a few in late June to 30 on 22 July. Three eggs found abandoned, doubtless due to human disturbance. (Dowling, pers. comm.). Skimmers appeared briefly at at least two colonies the year before nesting. They are sensitive to disturbance and leave eggs and young unprotected for considerable periods. Nests are scraped through the gravel to the tar in which eggs can become imbedded on hot days (Greene, pers. comm.). Freshly damaged eggs with unconsumed contents found outside active scrapes (Trafton, pers. comm.) may be the result of a heavy bird attempting to nest on a hard, flat roof.

Pigeon Guillemot (*Cepphus columba*)

Nesting under rather than on buildings; are known to have brought off young twice from rafters beneath Fisherman's Wharf, Monterey, California 1973–74 (Ainley, pers. comm.) and from underneath a wharf at Santa Cruz, California (Remsen and Gaines, 1973).

Common Raven (*Corvus corax*)

1973–74. On the tower of Swansea Guildhall, Oxfordshire and Devon (Campbell and Turner, 1976).

Common Nighthawk (*Chordeiles minor*)

The first adaptation by a land bird, whose former, traditional nesting sites had been on burned-over rural land.

1859. On a warehouse roof in Philadelphia (Turnbull *in* Bent, 1929).

1870–71, Boston; 1876, Montreal; 1879, Cleveland. Coincidental with the introduction of mansard and flat gravelled roofs (Bent, 1929). Now a common country-wide roof-nester, perhaps attracted by insects in the night-long dusk of town and city lights.

DISCUSSION

The above species can be divided roughly into groupings of traditional cliff-nesters such as Fulmar and Kittiwake, ground-nesters such as Common Nighthawk and terns, and opportunists like gulls. In all cases the adaptation appears forced by increasing human pressure on

natural habitats of islands, beaches, and open country. Up to fledging, roofs provide a relatively undisturbed location with only the hazards of flooding and minimal predation. However most colonies are in urban locations where the young descend to city parking lots, highways with heavy traffic, cats, rats, and absence of normal feeding grounds. Gull colonies appear to be relatively site-stable, doubtless due to the species' habit of feeding at distances. Least Terns move about and renest as they do in their natural habitat, influenced by food supply and disturbances. Access to roofs for observation is often difficult, restricting study of behavior. There must be more species and many more colonies than have been presented here. With the incidence of gulls in Great Britain and on the Massachusetts coast other reports might well be expected from the U.S., but the literature and a volume of correspondence has produced no reports other than in the Boston area and the one in San Francisco. The author would welcome information on any nesting with details of site, size, access, timing, building dimensions, feeding areas as may be possible.

ACKNOWLEDGMENTS

Personal communications came from D. G. Ainley, W. E. Dowling, R. L. Downing, D. Duffy, L. Ellis, S. J. Fisk, I. N. Gabrielson, A. F. Gaylord, M. Glaspey, L. L. Greene, H. Hays, F. Herman, J. Howard, P. Howard, T. R. Howell, A. H. Inwood, J. Jacobs, H. W. Kale II, B. King, R. L. Lappin, I. C. T. Nisbet, B. S. Obst, T. Pafford, J. W. Peterson, H. Prescott, C. S. Robbins, R. E. Roberts, M. M. Simons, J. Sweel, M. Trafton Jr., M. L. Wass, and J. Willis.

LITERATURE CITED AND OTHER REFERENCES

ALLEN, C. S. 1892. Breeding habits of fish hawks on Plum Island, New York. *Auk*, **9:** 313–321.

BEARDSLEE, C. S., AND H. S. MITCHELL. 1965. Birds of the Niagara Frontier Region. *Bull. Buffalo Soc. Nat. Sci.*, **22:** 478 p.

BENT, A. C. 1929. Life histories of North American Shore Birds. *U.S. Nat. Mus., Bull.*, **146:** 206.

———. 1964. Life histories of North American Cuckoos, Goatsuckers, Hummingbirds and their allies. *U.S. Nat. Mus., Bull.*, **176:** 211.

BOURNE, W. R. B. 1975. Oystercatchers on the roof. *Brit. Birds*, **68:** 302.

BROEKHUYSEN, G. J., AND C. C. H. ELLIOTT. 1974. Hartlaub's Gulls breeding on the roof of a building. *Bokmakierie*, **26:** 66–67.

CAMPBELL, B., AND G. E. S. TURNER. 1976. Ravens breeding on a city building. *Brit. Birds*, **69:** 229–230.

CRAMP, S. 1971. Gulls nesting on buildings in Britain and Ireland. *Brit. Birds*, **64:** 476–487.

CRAMP, S., W. R. P. BOURNE, AND D. SAUNDERS. 1974. The Seabirds of Britain and Ireland. New York, Taplinger Publ. Co.

DAVIS, E. D. 1943. A study of wild and hand-reared killdeers. *Wilson Bull.*, **55:** 223–233.

DEMAREE, S. R. 1975. Observations on roof-nesting killdeers. *Ibis*, **77:** 487–488.

FISK, E. J. 1978. Roof-nesting terns, skimmers, and plovers in Florida. *Fla. Field Nat.*, **6:** 1–8.

GOODNIGHT, L. E. 1957. Least Tern. *Fla. Nat.*, **30:** 123.

HAKALA, T., AND M. JOKINEN. 1971. A population of Common Terns nesting on the roof of a factory. *Ornis Fenn.*, **48:** 136.
HUME, R. A. 1975. Successful breeding of ravens on city buildings. *Brit. Birds*, **68:** 515–516.
MEEK, E. R. 1976. Ravens breeding on city buildings. *Brit. Birds*, **69:** 316.
MACFARLANE, A. E. 1977. Roof-nesting by Common Terns. *Wilson Bull.*, **89:** 475–476.
MCGOWAN, A. F. 1969a. Wilson's Plover nesting on roof. *Fla. Nat.*, **42:** 71.
———. 1969b. Common Terns, *Sterna hirundo*, nesting on roof in Pompano Beach. *Fla. Nat.*, **42:** 172.
MONAGHAN, P. 1976. Gulls nesting on buildings during 1976. *BTO News*, **81:** 5.
———. 1977. Gulls on the roof. *Country Life*, 6 Jan.
MONAGHAN, P., AND J. C. COULSON. 1977. Status of large gulls nesting on buildings. *Bird Study*, **24:** 89–104.
O'MEARA, M. 1975. Building-nesting Herring Gulls in County Waterford. *Irish Nat.*, **18:** 152–153.
PAYNTER, R. A., JR. 1963. North American Herring Gulls nesting on a building. *Wilson Bull.*, **75:** 88.
PETTINGILL, O. S., JR., AND D. LANCASTER. 1969. Killdeer nesting on roof. Cornell Laboratory of Ornithology Newsletter, Summer: 2.
PICKWELL, G. 1925. The nesting of the killdeer. *Auk*, **42:** 485.
PRESCOTT, H. 1972. Killdeer on the rocks. *Sunday Oregonian*, 17 Sept.
REMSEN, V., AND D. A. GAINES. 1973. Middle Pacific Coast Region. *Amer. Birds*, **27:** 915.
STONE, W. 1937. Bird Studies at Old Cape May. Vol. 1. Philadelphia, Acad. Nat. Sci.
STONER, E. A. 1937. Killdeer nests on roofs of buildings. *Condor*, **39:** 127.
WASS, W. L. 1974. Killdeers nesting on gravelled roofs. *Amer. Birds*, **28:** 983–984.
———. 1975. Killdeer camaraderie. Personal Newsletter.
YUNICK, R. P. 1965. A roof-nesting Upland Plover. *Kingbird*, **15:** 221–222.

17101 S.W. 284th Street, Homestead, FL 33030. Received 7 April 1977, accepted 29 December 1977.