

THE ROYAL TERN COLONY OF LITTLE EGG ISLAND, GEORGIA¹

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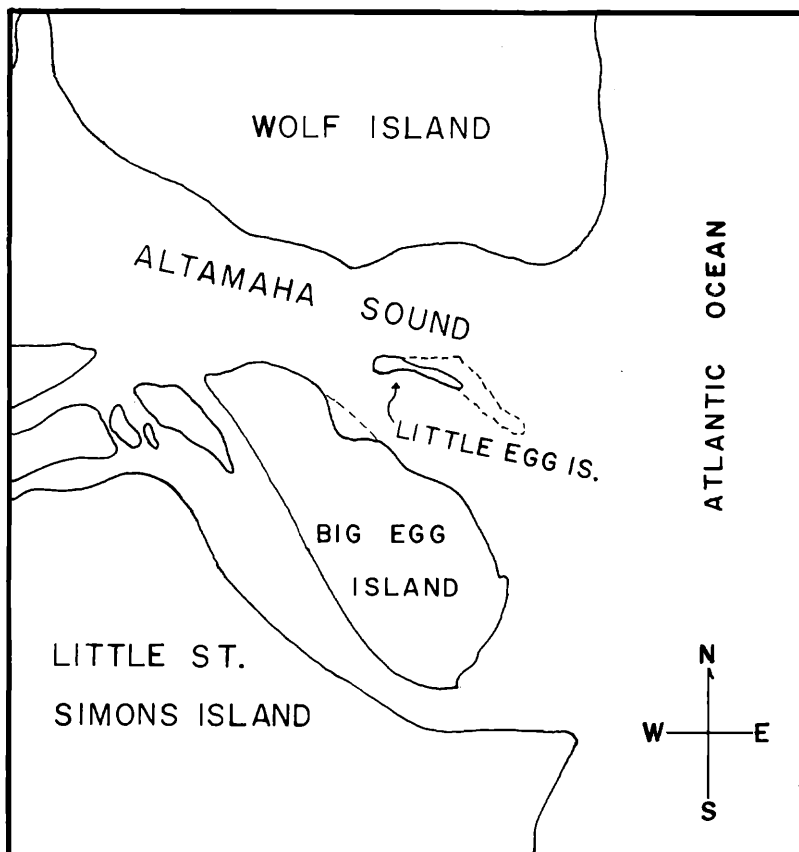
There is a gap in the breeding range of several species of estuarine-nesting birds that breed along the Atlantic and Gulf coasts of North America. For the Royal Tern (*Thalasseus maximus*) this hiatus in general occurs between Alabama on the Gulf coast and South Carolina on the Atlantic coast. According to Bent (1921) and the current A. O. U. Check-List (5th ed. 1957) the Royal Tern breeds in several isolated areas in North America, the West Indies, and western Africa. Lowery (1960) notes that in recent years it has nested on the Gulf coast east to Louisiana. Imhof (1962) records a nesting colony on the coast of Alabama in 1958. There seems to be no recent nesting account on either coast of Florida. On the South Carolina coast a few years ago it nested abundantly on "Egg Bank" in St. Helena Sound (E. B. Chamberlain, *in litt.* 1934), and an estimated 6000 nests were reported on Deveaux Bank, North Edisto River, South Carolina, on 2 June 1962 (Chamberlain, 1962). This species commonly breeds north to the Virginia coast.

The only place the Royal Tern is known to nest in Georgia is on Little Egg Island, McIntosh County—a small wind-swept and wave-washed island or sandbar located in the mouth of the Altamaha Sound (See Figure 1). Hence, this is the southern-most colony of the Royal Tern on the Atlantic coast part of its range in the United States. Burleigh (1958) mentions an account by Rice of nesting on Blackbeard Island (approximately 15 miles north of Little Egg) in 1914, and in 1933 the late Gilbert R. Rossignol collected a single egg on Oysterbed Island at the entrance to the Savannah River (Tomkins, 1934). Otherwise there are no other Georgia records.

At all times of the year Royal Terns are common along the Georgia coast, frequenting sandy beaches at the estuarine ends of the barrier islands, or near some inlet. The habitat band along the coast is about two miles in depth. The birds seldom follow the rivers inland, and they rarely frequent the inner salt water streams of the coastal marshlands. They are found in considerable groups during the various seasons of the year—in courtship in the spring, non-breeders in summer, and adults feeding young in the fall. There are fewer present in winter. Courtship, including "fish flights", "courtship feeding," and copulation, takes place long before the nesting site is occupied, according to the observations of Tomkins on Tybee Island, which is 40 miles from any known colony.

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Figure 1. Map of Altamaha Sound showing location of Little Egg Island, McIntosh County, Georgia (drawn from U. S. Coast and Geodetic Survey Chart No. 575).



The purpose of this paper is to describe the breeding area on Little Egg Island and to offer some suggestions as to why it is the only nesting site for the Royal Tern along the Georgia coast.

There is no record of any ornithologist visiting the island prior to 1955, yet the local usage that has named it Little Egg Island offers the inference that it has been known as a nesting place for many years. Big Egg Island, a much larger island to the southward in the same sound, may have gotten its name in the same way. At present, Big Egg Island is largely covered with marsh grass, making it unsuitable for the nesting of the terns.

Other birds nesting on Little Egg Island are: Black Skimmer (*Rynchops nigra*); Gull-billed Tern (*Gelochelidon nilotica*); Least Tern (*Sterna albifrons*); American Oystercatcher (*Haematopus*

Figure 2. Royal Tern nesting site on Little Egg Island, Altamaha Sound, Georgia, 5 June 1961.



*palliatu*s); Wilson's Plover (*Charadrius wilsonia*); Willet (*Catoptrophorus semipalmatus*); and occasionally (in the tall dune grasses) the Boat-tailed Grackle (*Cassidix mexicanus*). An associate of the Royal Tern in other breeding localities, the Sandwich or Cabot's Tern (*Thalasseus sandvicensis*) has not been found breeding here.

Little Egg Island is little more than a sandbar with a small portion above the reach of normal tides. On the east it is open to the sea for a 90 degree sector, and on the west is bounded by the tidal currents of the Altamaha Sound, which receives the waters of the extensive Oconee-Ocmulgee-Altamaha river systems. The west end rises rather abruptly from the water but the eastern shore stretches out in a long gradient toward the sea. During periods of normal high tides the above tide area is not more than three or four acres (1.3-1.7 hectares). At low tide the exposed area (indicated by dotted lines on Figure 1) reaches out perhaps 1600 feet (500 meters) or more. On the upstream end the dominant salt marsh cord-grass, *Spartina alterniflora*, has obtained a foothold in the intertidal zone, and the stems and roots have trapped some river silt, protecting against the ebb tide erosion. At a higher elevation another cord-grass, *S. patens*, and sea oats, *Uniola paniculata*, have attained some dominance. These inhibit wave and wind erosion and facilitate dune formation, perhaps four to six feet (1-2 meters) above normal high tide.

Sciple and Tomkins recorded the higher plants that were visible on 5 June 1961. All are typical of saline beaches and marshes. Using the nomenclature of Small (1933), the plants recorded, in addition to those already mentioned, were: *Panicum* sp., *Spartina cynosuroides*, *Distichlis* sp., **Sesuvium portulacastrum*, **Salicornia* sp., **Cakile harperi*, **Croton punctatus*, **Ipomoea* sp., *Iva*, sp. **Gnaphalium obtusatum*. Those starred (*) are the plants found in or near the tern nesting area.

The nesting area accepted by the Royal Terns is toward the eastern end, where the growth of vegetation has been inhibited by wave action. The photograph (Figure 2), made on 5 June 1961, shows the location of the tern colony, and particularly the "drift sedge", or the broken stems of *Spartina alterniflora* washed up by the tides. The inner edge of the broad band is at the normal high tide line. The average high tide is about seven feet (2.2 meters) above mean low water in this locality. Spring tides often go to nine feet (2.8 meters) or more, and in such an exposed location, wave action increases the height considerably. Spring tides with strong easterly winds will wash almost, if not completely, over the island. The elevation of the tern nesting site was between one and two feet (.3-.6 meter) above normal high tide.

Surface conditions change rapidly when subjected to the action of wind and tides. By 1961, the site of the 1958 colony had developed into low irregular dunes, the tops of which were covered with short vegetation. The 1961 colony site was located approximately 300 feet (100 meters) east of this region on a bed of more recently deposited sand.

On 4 July 1955, when Tomkins, E. P. Odum and party visited Little Egg Island, and on 9 June 1956 when Tomkins and the Sciples stopped there, no signs of nesting Royal Terns were found. No nests were found until Kale and Teal (1958) observed them in 1958. On 5 June they counted three nests containing one egg each. On 28 June three groups, totalling 39 nests, were found, two within ten feet (3 meters) of each other and the other about sixty feet (15 meters) away. Only eight eggs in one site were observed on 11 July, and on 24 July only one egg and one immature tern were found.

In 1959 and 1960, no colonies were observed on the island, although one fledgling was banded there on 28 June 1959 by Kale. High spring tides on 22 June 1959 destroyed numerous nests of the other breeding species, and on 8 and 9 June 1960, an extremely high spring tide wiped out all of their nests. In 1961 Sciple and Tomkins found an estimated 300 pairs of Royal Terns nesting on 5 June. Kale visited the island on 18 June and counted 296 nests (290 nests contained one egg each, and six nests contained two eggs each). He returned on 3 July and found the entire colony deserted, the eggs gone or destroyed, although numerous nearby skimmer nests were still present. All three of us visited the island on 23 June 1962, and found several groups of tern nests, a total of 38 in all (36 nests with one egg each, two nests with two eggs each). There was some evidence of destruction, probably by high tides, in parts of the colony. Twenty-eight abandoned eggs were counted; some of these

had been destroyed by bill-puncturing. An extremely high spring tide on 29 June undoubtedly inundated the nesting area, for on 5 August no nesting terns or fledglings were found by J. E. Smith and Kale. Visits by Kale, L. Gardner, and T. Marples on 7 June, and by Marples, Gardiner and party on 22 July and 10 August, 1963, revealed no Royal Terns nesting on the island that year.

The nesting colony of the Royal Terns is very compact. This is shown by the photograph (Figure 2) and is also indicated in the accounts and photographs in Bent (1921) and the photographs of Bowdish (1910). Figure 2 also shows that the terrain could accommodate many more breeding birds than found on the island in 1961. Both in 1961 and 1962 the distance between nests within a group varied from 17 to 24 inches (42-62 centimeters) center to center. Bent (*loc. cit.*) counted one hundred nests in an area four yards square in a Louisiana colony.

Why do the Royal Terns nest only on Little Egg Island, when there exists numerous barren sand stretches along the coast of Georgia and as far north as St. Helena Sound in South Carolina? The answer appears to be that Little Egg is an isolated island, while the other sand beaches are all either flooded at normal high water or are connected to a larger island with its dunes and woodlands. All references found in the literature available indicate that this species nests on sandbars, isolated from the land or from any large island. But why is a small, isolated island so desirable? Perhaps the most important consideration is because it is free from mammalian predators such as the raccoon and mink which are common, wide-ranging carnivores of the coast marshes and beaches. One of us (Tomkins) offers another theory: that the terns prefer a site where there is little wind turbulence. He has seen the terns loafing on Tybee Island and other islands in the daytime, and seen them leave at dusk and move toward some isolated sandbar for the night. When resting on the beach, they move down toward the water as the tide recedes even when a gale is blowing, thus avoiding the wind turbulence found near the dune line.

Food could scarcely be a determining factor, by limiting the breeding in certain areas, or the non-breeding terns would need to go elsewhere. They seem to find abundant food all the year along our coastline. Climate, or temperature, could not be limiting for there are breeding colonies of Royal Terns in the Gulf of Mexico and the West Indies to the south, and as far as Virginia to the north.

Establishment of new breeding colonies can result from three factors: (1) an expanding population, (2) relocation of a disturbed colony, and (3) the creation of new terrain suitable for nesting. It is our thought that the last mentioned has taken place at Little Egg Island. The relatively flat and barren sandy sites utilized by nesting Royal Terns are formed, and sometimes maintained, by the deposition of sand and the inhibition of the growth of vegetation as a result of storm tides and wave action. These conditions are found on sand bars and spits in the mouths of rivers and sounds. When a sand bar reaches an elevation where vegetation becomes established, dunes form and an island appears. Early in its history it provides nesting

sites for the Royal Tern. Dense vegetation and dunes soon discourage breeding, but tides and storms are continually eating away at the island and depositing sand down current and down wind from the island to form a sand spit, or elsewhere to form new sandbars, and new breeding terrain.

Storms and tidal action, however, can be disastrous during the nesting season, especially in an area of extreme tidal ranges. There are references to storm destruction in the literature and it is considered that the colony on Little Egg Island is particularly susceptible to storms. The nesting success of this colony since 1958 has been almost nil, and only two nestlings have been banded. The majority of the destruction of nests, or young, has been caused by high spring tides, combined with strong easterly winds that drove in heavy swells. Still another mortality factor might be the heavy "black squalls" or thundershowers that are common all along this coast in summer. Tomkins has seen much destruction to the nesting of Least Terns and Black Skimmers from rain and wind alone. A rainfall of two to four inches in an hour will erode the sand, wash away or cover the eggs, and alter the micro-landmarks, thus disorienting the birds from their nests.

From the foregoing discussion we conclude that Little Egg Island provides the only terrain suited to the breeding of the Royal Tern along the Georgia coast and that the basic reason for lack of other suitable breeding sites is the tidal range, the highest of any region along the southeastern coast of the United States. The low nesting success of the colony is indicative of marginal habitat conditions for this species.

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SUMMARY

1. There is a hiatus in the breeding range of the Royal Tern which, in general, extends from South Carolina on the Atlantic coast to Alabama on the Gulf coast. 2. The Royal tern requires for a nesting site a barren or sparsely vegetated sand site surrounded by water some distance from the mainland or large islands. These sites are prepared by storm and tidal action prior to the breeding season. Reproductive success of the colony requires the nesting site to be relatively free of these storms and tides during the breeding period. 3. The colony which breeds sporadically on Little Egg Island, in Altamaha Sound, McIntosh County, Georgia, inhabits the only suitable habitat along the Georgia coast, however, a very low reproductive success indicates the site as marginal which is probably due to the extreme tidal range of 6 to 10 feet (2-3 meters).

LITERATURE CITED

- BENT, A. C. 1921. Life Histories of North American Gulls and Terns. U. S. Nat. Mus. Bull. 113, Washington, D. C.
- BOWDISH, B. S. 1910. Bird photographing in the Carolinas. *Auk*, **27**: 305-311.
- BURLEIGH, T. D. 1958. Georgia Birds. Univ. of Okla. Press, Norman, Okla. 746 pp.
- CHAMBERLAIN, B. R. 1962. Editor, Southern Atlantic Coast Region. *Aud. Field Notes*, **16** (5): 467.
- CHECK-LIST OF NORTH AMERICAN BIRDS, 5th Ed. 1957. A. O. U. 691 pp.
- IMHOF, T. A. 1962. Alabama Birds. Univ. of Ala. Press, Tuscaloosa, Ala. 591 pp.
- KALE, H. W. and J. M. TEAL. 1958. Royal Terns nesting on Little Egg Island. *Oriole*, **23**: 36-37.
- LOWERY, G. H., JR. 1960. Louisiana Birds, 2nd Ed., La. State Univ. Press, Baton Rouge, La. 567 pp.
- SMALL, J. K. 1933. Manual of the Southeastern Flora. Univ. of N. C. Press, Chapel Hill, N. C.
- TOMKINS, I. R. 1934. Notes from Chatham County, Georgia. *Auk*, **51**: 252-253.

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ON PLUMAGE VARIATION IN MALE
DARWIN'S FINCHES¹

RESULTS OF THE GERMAN GALAPAGOS-EXPEDITION 1962/63. V.

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CONTENTS

- A. Plumage variation and its interpretation
- B. Methods and acknowledgments
- C. New evidence on plumage variation
1. Seasonal changes in the plumages of populations
 2. Plumage color and age
 3. Plumage changes in individual birds
- D. Discussion and conclusions
- Summary
- Literature

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