an egg from a small colony of 4 Royal Tern nests on Bird Island. The terns reacted strongly, one chasing the gull out of the colony and actually striking it on the back.

On 30 May, we found no viable Royal Tern eggs on Bird Island. Subcolony D on Little Bird had grown to 688 eggs and had then been abandoned. We found another subcolony (E) of 98 eggs also abandoned with many broken eggs. Through June, the Royal Terns continued nesting attempts in small groups on both islands. They laid 76 eggs in 8 small subcolonies ranging in size from 2 to 26 eggs. All these were ultimately either broken or abandoned.

During our observations on 30 May, 22 Ruddy Turnstones were on the beach, but only 1 was seen feeding on broken eggs in abandoned subcolony D. This confirmed our suspicion that the turnstones were attracted to the densely packed mass of adult Royal Terns standing in the colony, rather than to the eggs themselves. During our observation period on 22 May, we twice observed that the turnstones did not enter the colony until after the royals had returned and settled down, even though they had an opportunity to attack the eggs when undefended. Once the royals abandoned the colony, most of the turnstones ignored it. After subcolony A was abandoned, scores of intact eggs lay completely unprotected for at least 7 days. In the meantime, turnstones were stealing eggs from subcolonies B and C where adult terns were still present. By contrast, in 4 of 5 cases discussed by Parkes et al. (op. cit.), turnstones were observed taking only undefended eggs.

Three other species had nests on the Bird Islands during this period. We found no Least Tern (*Sterna albifrons*) eggs broken in 200 nests, 7 Gull-billed Tern (*Gelochelidon nilotica*) eggs broken in 180 nests (3.9%), and 14 Black Skimmer (*Rynchops nigra*) eggs broken in 816 nests (1.7%). We did not see turnstones break these eggs, but we believe that they did. Gulls were probably not responsible as they usually remove eggs from the nest, rather than break them *in situ*. Least and Gull-billed terns are more aggressive toward predators than are Royal Terns, but whether they recognize turnstones as predators is not known. Of the 4 species, the royals seemed particularly vulnerable to turnstone predation because they lacked aggression, seemingly failed to recognize turnstones as predators, and tended to desert the colony en masse when disturbed (Buckley and Buckley, op. cit.).—ROBERT W. LOFTIN, *Univ. of North Florida, Box 17074, Jacksonville, FL 32216, and* STEVE SUTTON, *4419 Silverwood Lane, Jacksonville, FL 32207.* *Accepted 19 Jan. 1978.*

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Predation of black rat snakes on a Bank Swallow colony.—The Bank Swallow, *Riparia riparia*, is well known for its gregarious breeding colonies which usually are composed of clusters of burrows in riverbanks, cliffs and the like. Studies of these colonies have recently provided data useful for tests of the theoretical benefits of coloniality (Emlen and Demong, Science 188:1029–1031, 1975; Hoogland and Sherman, Ecol. Monogr. 46:33–58, 1976), and have demonstrated the potential benefits of breeding synchrony within the colony and group defense of eggs and young from predators. The basic assumption is that fitness of Bank Swallows in colonies must ordinarily be greater than might be expected if the swallows nested individually, otherwise coloniality would not continue indefinitely. I do not dispute this assumption, but I note there appears to be little information on failure or desertion of colonies due to predation. As it is

obvious that such events sometimes occur, and because of the interest in the general benefits of coloniality, the following account of the apparent decline of a large Bank Swallow colony should be of interest.

For at least 25 years, Bank Swallows have nested on the James River near Presquile National Wildlife Refuge, Chesterfield Co., Virginia (Scott, Raven 29:122–123, 1958). Along with scattered colonies in nearby gravel pits (pers. obs.), this area represents 1 of only 3 known nesting locations for the species in Virginia (F. R. Scott, pers. comm.). Since early 1975, I have censused a large colony that has occupied the same section of riverbank for at least 8 years. This part of the James River is tidal and the riverbank containing the colony consistently erodes and falls away. Therefore, all burrows from the previous year are usually gone each spring. The section of bank occupied by the colony is about 300 m long, 3 to 5 m high and is composed of soil containing layers of sand or gravel. The swallows appear to prefer these layers for constructing their burrows. The bank is usually quite steep, but the amount of soil washing to the base of the slope varies from year to year depending upon water levels. During the study, I counted all burrows that appeared to have been completely excavated. Although I verified the existence of nests in many of these burrows, I could not reach others and made no overt attempts to do so as I wanted to avoid disturbing the colony. More than 300 individuals were banded and simple Lincoln-Peterson mark-recapture techniques (Brower and Zar, Field and Laboratory Methods for General Ecology, Wm. C. Brown, Dubuque, Iowa, 1976) were used to estimate the size of the colony each year.

In 1975, the colony was quite large (Table 1) and active. No predation was observed and the swallows appeared to be quite successful in producing young. River levels were fairly high that spring and the riverbank remained very steep, making access to the burrows difficult. In 1976, the colony again was large, even though an apron of slumped soil had begun to build up at the base of the riverbank. Late in that breeding season, when most burrows contained young that were near fledging, 3 black rat snakes (*Elaphe obsoleta*) were discovered in burrows. These snakes were obviously distended with swallows they had eaten and several young swallows were found dead in a burrow along with a live snake. These were apparently killed by the compression between the snake's body and the burrow wall. I removed the snakes and transported them some distance from the colony. In 1977, a considerable base had developed along the riverbank, and access to the burrows was greatly facilitated. The texture of the soil in the bank also appeared to have changed. The sand and gravel layers were nearly absent. Although the spring of 1977 was one of the warmest on record, Bank Swallows were late in nesting and the apparent size of the colony never reached 20% of former levels. Only 1 bird banded in previous years was captured, suggesting that alternate nesting areas were being used. Predation by black rat snakes was observed on 4 separate occasions. One snake captured from the colony contained 8 adult swallows. Another smaller snake contained 2 swallows, and at least 1 very large black rat snake was never captured, although it was observed in the colony and obviously had eaten several swallows. The snakes were mobbed whenever they emerged from the burrows, but there was little evidence that the mobbing was effective.

Ultimately the swallows moved the colony approximately 100 m upstream from the original site and began burrow construction. The nesting cycle was apparently interrupted as an egg was found in a burrow only a few cm deep (H. R. Laprade, pers. comm.). The second colony was subsequently abandoned in early June and to my knowledge no young were produced at this location. I suspect these birds moved to

TABLE 1

POPULATION DATA FROM A BANK SWALLOW COLONY NEAR PRESQUILE NATIONAL WILDLIFE REFUGE, CHESTERFIELD CO., VIRGINIA

Year	Number of burrows	Date of earliest activity	Number of adults	Number banded	Recaptures from previous years
1975	435	19 April	927	222	—
1976	388	24 April	875	87	15
1977	71	6 May	160	29	1

other colony sites in nearby gravel pits where they produced young, as postbreeding aggregations estimated at 1800 individuals were observed in late summer.

It is obvious that the location of Bank Swallow nests is a critical factor in the success of their reproduction. Failure of the present colony gives us evidence to apply to theories of some of the benefits of coloniality. First, I believe the desertion was largely due to the alteration of the structure and texture of the riverbank and/or subsequent increased predation by snakes. This supports the idea that coloniality is a response to localization of a critical resource, in this case appropriate nesting sites which are easily excavated and also inaccessible to most predators. It is possible that the swallows are proximately influenced by the physical nature of the cliff and fail to nest or abandon sites before intrusion by predators. The nesting attempts in 1977 may have been made by inexperienced birds born the previous season. This is supported by the lack of recovery of birds banded previously as adults. At any rate, mobbing appeared to be ineffectual in the defense of nest sites against the most common predator, the black rat snake, and only steepness of the riverbank seemed to discourage invasion by the snakes. It appeared to me that snakes were actively drawn to nest sites. Snakes may find nest sites as a result of their foraging activities along such areas, activities of the birds themselves, or olfactory attraction to snakes which previously had found the colony. If single snakes found the colony, predator-swamping would be of benefit, as individual snakes are capable of eating several swallows in a short period of time, but then would be no threat for several days. However, if the presence of a snake increases the probability of conspecifics locating the nest sites, as appears likely, this hypothesis becomes untenable.

I am indebted to H. R. Laprade and F. R. Scott for their original observations of Bank Swallows and to L. Blem and F. R. Scott for critically reading the manuscript. M. Banner, L. Blem, H. Laprade, R. Peer, and J. Steiner assisted in the field.—CHARLES R. BLEM, *Virginia Commonwealth Univ., Dept. of Biology, Academic Division, Richmond, VA 23284.* *Accepted 29 Dec. 1977.*

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Summer range and migration routes of Florida wintering Greater Sandhill Cranes.—Previously, Williams and Phillips (Auk 89:541–548, 1972) reported on sightings and recoveries of 169 Greater Sandhill Cranes (*Grus canadensis tabida*) banded and