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On the antipredator advantages of coloniality: a word of caution.—The possible antipredator advantages of coloniality in many species of waterbirds are discussed in recent papers on the evolution of mixed-species colonies (Burger 1981) and the adaptive significance of coloniality (Wittenberger and Hunt 1985). Possible advantages include early warning, mobbing, and predator "swamping" via breeding synchrony. While I agree that conspecific and heterospecific signals can alert other colony members to the presence of a predator, not all species or mixed species groups give such signals. For example, there is no strong evidence that ciconiiforms mob predators. Also, based on my studies of ciconiiforms, I believe predator "swamping" via breeding synchrony may be overestimated in reducing predation. Here I present examples of coloniality affording no protection from predation.

In 1981, the Pleasant Grove colony (Hillsborough County, Florida) contained: 75 nests of Anhingas (*Anhinga anhinga*), 225 nests of Wood Storks (*Mycteria americana*), 250 nests of Cattle Egrets (*Bubulcus ibis*), and 30–40 nests of other species of herons. The colony covered ca 2.4 ha of a 9.4-ha phosphate mine impoundment dominated by willow (*Salix caroliniana*), which was the primary nesting substrate. Because of a washout of an earthen dike during heavy rains in May 1979, water at the site did not accumulate in the impoundment as in previous years. By the beginning of the breeding season in late March 1981, the water depth ranged from 15 to 30 cm. In late April, as the colony neared what would be the peak of egg hatching, the water level was low enough to expose the soft mud bottom and large numbers of fallen trees and limbs. At this time, raccoons (*Procyon lotor*) began to prey on the eggs and hatchlings of all species. By 13 May all nests were preyed upon or abandoned. No adult mortality was detected. In subsequent years (1982–1986), the water levels have reached a depth of 15–30 cm (similar to the 1981 season), but colony members have not returned to breed at the site.

Another less dramatic example of predation of Wood Stork nests occurred at the NE Mulberry colony (Polk County) in 1981. At this deep-water phosphate mine impoundment, eggs and nestlings in 24 of 131 stork nests were eaten by raccoons that crossed to three small islands via water hyacinth (*Eichhornia crassipes*).

Though it may be argued that the adults escaped predation to nest another year, the >550-nest Pleasant Grove mixed waterbird colony did not "swamp" raccoon predation. It appears that wading bird colonies of this size do not necessarily afford protection from mammalian predators in all instances (Lopinot 1951, Emlen et al. 1966, Burger 1974, Southern et al. 1985). Even avian predators can cause large scale nest loss and abandonment (Collins 1970, Hunter and Morris 1976, Burger 1977). Baker (1940) reported heavy predation by less than 40 Common Crows (*Corvus brachyrhynchos*) that destroyed a 4500-nest colony of Little Blue Herons (*Egretta caerulea*) and Snowy Egrets (*E. thula*) in less than a month.

The proposed advantages of wading birds nesting colonially are many (see review in Burger 1981, Wittenberger and Hunt 1985), and include mate location (especially in species with short-range courtship signals; Rodgers 1980); food resource information (see Krebs 1974, Burger 1981, and citations therein); defense afforded by group action (e.g., Kruuk 1964, Montevecchi 1977); and the Darling effect of stimulation of reproductive activity by the presence and activity of other colony members (Darling 1938, Gochfeld 1980, and citations therein). However, I believe colonial breeding also incurs a disadvantage, as the colony is highly obvious via auditory (calls of adults and young), olfactory (birds, guano, and dropped food items), and visual (large, often light colored species flying in and out of the site) cues to predators. Colonial breeding also can result in intraspecific and interspecific competition for nest sites (Burger 1978) and food resources (Hunt et al. 1986). In addition, the mixed-species wading bird colonies I have studied in the southeast United States appear to exhibit less total colony synchrony than is reported for other species of nesting birds (e.g., Burger 1978, Gochfeld 1980). For example, Great Blue Herons (*Ardea herodias*) and Anhingas usually begin breeding well in advance of other species of ardeids and the ultimate effect is a protracted breeding season in which the colony becomes less synchronous and any potential "swamping" effect is reduced. To compensate for the increased susceptibility to predation and still gain the advantages of coloniality, colonial nesters generally breed in inaccessible locations, such as on islands and in marsh and swamp vegetation over water (Lack 1968). But once a colony is accessed by the predator, the results may be drastic.

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JAMES A. RODGERS, JR., *Wildlife Research Laboratory, Florida Game and Fresh Water Fish Commission, 4005 S. Main St., Gainesville, Florida 32601.* *Received 22 Jan. 1986, accepted 6 Nov. 1986.*

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The foraging behavior of Gray Gulls at a sandy beach.—The Gray Gull (*Larus modestus*) is a medium-sized gull restricted to western South America, where it breeds inland at barren nitrate deserts and feeds along the coast (Johnson 1965, Howell et al. 1974). Foraging occurs in two distinct habitats: at sea, where fish and crustaceans are captured by surface seizing (Chapman 1973, Howell et al. 1974, Duffy 1983); and at sandy beaches, where foraging for the crustacean *Emerita analoga* occurs in the wave-washed zone (Murphy 1936, Johnson 1965, Howell et al. 1974). The foraging behavior of Gray Gulls at sea has been described (Duffy 1980, 1983), but nothing is reported of their foraging behavior on sandy beaches, other than the habit of running up and down in the wave-washed zone like sandpipers, probing at air bubbles left by *Emerita* (Murphy 1936, Johnson 1965, Howell et al. 1974). This study describes the foraging behavior of adult and immature Gray Gulls at a sandy beach in central Chile.

Study area and methods.—We observed Gray Gulls foraging on a fine-grained sandy beach south of Las Cruces (33°30′S, 71°38′W), central Chile, for four tidal cycles during October and November 1985. The beach supported many *Emerita analoga,* evidenced by sieved samples at low tide. Wave action was high throughout, and a moderate to strong onshore wind blew during most observation periods. Birds were aged as adult or immature on the basis of plumage characteristics (Harrison 1983).

We recorded (1) search time—the time (measured to the nearest sec) between picking or probing attempts by birds foraging in the wave-washed zone, (2) the type of feeding attempt made (see below), (3) the proportion of successful feeding attempts, (4) the fate of prey items, and (5) the handling time between prey capture and swallowing. A successful attempt was one in which a prey item was captured, although not necessarily swallowed. Two distinct foraging techniques were recognized: (1) picking prey that were on or just below the surface with the tip of the bill, and (2) probing into the sand for prey with the mandibles slightly apart. Picking was subdivided into "dry" picking, where prey were taken from wet sand or water shallower than bill length; and plunging, where prey were taken from water deeper than bill length. The sizes of prey items eaten by Gray Gulls were estimated as a proportion of bill length.

Results.—No Gray Gull was present at the beach until 90 min before low tide, and all departed within 120 min after low tide. At other times birds either went out to sea or roosted at rocky headlands. Foraging birds occurred singly or in small flocks of up to 15 individuals. Gray Gulls either ran or flew down the beach as the waves receded. Running predominated where the beach was steep and the distance from the region above the edge of the wave-washed zone to the foraging area was ≤15 m. Where the beach was broad and shallow, birds tended to wait for times when the waves receded up to 50 m, which occurred once every 5 to 10 min. The Gray Gulls would then fly out to the foraging area and capture prey,