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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,

TABLE 1

THE PROPORTIONS, FREQUENCIES OF SUCCESS, AND RATES OF DIFFERENT FORAGING TECHNIQUES USED BY GRAY GULLS FEEDING AT SANDY BEACHES

Foraging technique	% attempts (N)	% success	Time between attempts (sec)
Picking	47.0 (101)	50.5	16.8 ± 12.9 (101)[a]
Dry picking	37.2 (80)	53.8	13.8 ± 11.3 (80)
Plunging	9.8 (21)	38.1	28.6 ± 12.1 (21)
Probing	53.0 (114)	12.3	15.9 ± 9.2 (58)

[a] Mean ± SD (N).

either by picking them up while flying, or by landing and probing. Flying birds fed by picking significantly more frequently (88.8%, N = 80) than did walking birds (28.0%, N = 100) ($\chi^2 = 66.27$, df = 1, $P < 0.001$).

Picking was successful more frequently than was probing ($\chi^2 = 37.01$, $P < 0.001$) (Table 1), although the differences in success rate between dry picking and plunging, and between plunging and probing were not significant ($\chi^2 = 1.64$, 2.38, $P > 0.1$). Immatures did not forage by plunging (N = 82 attempts), but rather they foraged primarily by probing (95% of attempts), whereas adults foraged primarily by picking (73% of 135 attempts).

The foraging rate of adults and immatures combined, as indicated by the mean interval between foraging attempts, varied with different foraging techniques (ANOVA, $F = 16.08$, df = 2, 132, $P < 0.001$) (Table 1). The foraging rate of adults alone, however, was not different between dry picking and probing, but both were significantly higher than the rate for plunging birds (Newman-Keuls test).

All prey eaten appeared to be *Emerita,* although some of the smaller prey items may have been isopods (*Cirolana* sp.), which were abundant in the area. Prey size ranged between 0.2 and 1.0 × bill length (mean 0.52 × bill length, N = 26). The mean prey handling time of adults (1.2 ± 3.3 sec [SD], N = 57) was shorter than that of immatures (24.5 ± 22.4 sec, N = 6). Of the eight prey items caught by immatures, one was lost when it was dropped in the sea, and one was stolen by another immature Gray Gull. Two attempts at intraspecific prey robbery were observed, both involving immature gulls. No adults lost prey items or were robbed by other birds. An adult Gray Gull twice attempted unsuccessfully to rob a Sanderling (*Calidris alba*) struggling with a large *Emerita,* by flying at and chasing the Sanderling.

Assuming a mean handling time of 3.4 sec, gulls caught 1.88 prey/min when dry picking, 0.71 prey/min when plunging, and 0.38 prey/min when probing.

Discussion.—Gray Gull foraging periodicity on sandy beaches is limited by the tidal cycle, presumably as a result of the distribution of prey on the shore. Foraging while walking apparently is preferred to foraging while flying (Murphy 1936, Johnson 1965, Howell et al. 1974, this study), presumably because walking is less costly energetically than is flying. The cost of foraging by flying is at least partly offset by an increased energy intake rate as a result of a high proportion of foraging by picking, the most time efficient prey capture technique, during aerial foraging.

The limited data presented here suggest that immature Gray Gulls are less efficient foragers than are adults, as is typical of many gull species (e.g., Verbeek 1977, Searcy 1978).

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Internest displacement of White Ibis eggs.—During a study of nesting success at a White Ibis (*Eudocimus albus*) colony (Shields and Parnell 1986), I observed five cases in which an egg laid in one nest was subsequently found in another nest in the same tree or shrub. The study was conducted during the 1983 and 1984 breeding seasons at Battery Island, North Carolina (33°54′N, 78°01′W), where White Ibises nested in a maritime shrub thicket (see Shields and Parnell 1986 for a complete description of the area). I marked 694 eggs in 1983, and 1213 eggs in 1984, with unique alpha-numeric codes. I visited nests 1–3 times per week from the onset of egglaying through hatching to record fates of eggs. I ruled out the possibility that I may have accidentally placed eggs in the wrong nests after marking them. I temporarily removed eggs from a nest for marking only on the date I first observed the eggs. Internest displacement of four eggs occurred several days after they were marked, and one case involved an unmarked egg.

I detected two instances of internest displacement of eggs in 1983, one involving a marked egg and one an unmarked egg. On 16 April, nests 96 and 97 contained three eggs each. On 21 April, nest 97 held three eggs, while only two eggs were present in nest 96; the third egg was found on the ground with one side punctured in the manner characteristic of crow predation (Rearden 1951). Fish Crows (*Corvus ossifragus*) were common in the colony, and crow predation on ibis eggs was high (Shields and Parnell 1986). On 28 April, I found another egg from 96 on the ground with a hole in its side; the remaining egg, which was slightly cracked, was discovered in nest 97. All four eggs in 97 hatched between 3–10 May.

Nest 59 held two eggs on 13 April and four eggs on 16, 21, and 28 April. On 3 May, the first egg had begun hatching, and a fifth egg was present. Three days later the nest held four chicks and one of the original four eggs, which hatched between 6–10 May. Because the