

of differences between the two distributions was evaluated after normalizing weight data with a log-transformation, using the Student's *t*-test (Sokal and Rohlf 1969: 220).

Both the Chilean Eagles and Red-backed Buzzards preyed mainly on rodents, lagomorphs being second in numerical importance (Table 1). The staple prey of the two species seemed to be the diurnal rodent *Octodon degus*, which accounted for similar fractions in their diets (57.7% and 57.6%, respectively). Consumption of rabbits (*Oryctolagus cuniculus*) was higher by eagles than by buzzards, but both took mostly juveniles (4 adults were found in eagle pellets). Food-niche breadths were very similar (2.626 for Chilean Eagles, 2.684 for Red-backed Buzzards), and food-niche overlap extensive (0.951). The species differed significantly ($P < 0.001$), however, in the mean weight of mammalian prey taken [308.2 g \pm 17.1 (SE) for eagles, 213.0 g \pm 5.6 for buzzards]. This was associated with the lesser importance of small rodent prey and the higher consumption of rabbits (including adult-sized individuals) in the diet of the large Chilean Eagles. Probably the Red-backed Buzzards, by being smaller, hunted mainly the smallest rodents and were unable to kill or handle prey as large as an adult rabbit.

In sum, the species' composition and their relative abundance in the diet were extremely similar between Chilean Eagles and Red-backed Buzzards at La Dehesa, thus producing a very high overlap of their food-niches. Prey-size selection, however, would permit a certain degree of differential utilization of food resources.

We are grateful to Harry W. Greene for critically reading the manuscript.

LITERATURE CITED

- GLANZ, W. 1977. Small mammals. Pp. 232-237 in Chile-California mediterranean scrub atlas: a comparative analysis (N. J. W. Thrower and D. E. Bradbury, Eds). Stroudsburg, Pennsylvania, Dowden, Hutchinson and Ross.
- JOHNSON, A. W. 1965. The birds of Chile and adjacent regions of Argentina, Bolivia and Peru. Buenos Aires, Argentina, Platt Establecimientos Gráficos.
- LEVINS, R. 1968. Evolution in changing environments: some theoretical explorations. Monographs in population biology No. 2, Princeton, New Jersey, Princeton Univ. Press.
- PIANKA, E. R. 1974. Niche overlap and diffuse competition. Proc. Natl. Acad. Sci. USA 71: 2141-2145.
- SOKAL, R. R., & F. J. ROHLF. 1969. Biometry. San Francisco, California, W. H. Freeman.

Received 28 March 1980, accepted 29 May 1980.

Stones: an Important Incubation Stimulus for Gulls and Terns

MALCOLM C. COULTER

Department of Ornithology, The American Museum of Natural History,
Central Park West at 79th Street, New York, New York 10024 USA

Species of *Larus* gulls and *Sterna* terns (Family Laridae) differ from most birds in having three brood patches for incubation instead of a single large brood patch. Gulls usually lay 3 eggs, occasionally 2 or 1 egg, and very rarely more than 3 eggs (for a literature review see Coulter 1973, unpublished M.Sc. Thesis, Oxford, England, Oxford University). The most common clutch size for temperate terns varies from year to year and from place to place, but is usually 3 or 2 eggs (Lack 1968, Ecological adaptations for breeding in birds, London, Methuen & Co., Ltd.), although some tropical terns, such as Sooty Terns (*Sterna fuscata*) lay only 1 egg. An examination of the incubation behavior of the Black-headed Gull (*Larus ridibundus*) (Beer 1961, Behavior 18: 62) and the Black-billed Gull (*Larus bulleri*) (Beer 1965, Auk 82: 1) suggested that gulls incubating three eggs sat for longer periods of time and resettled less frequently than birds on either fewer or more eggs. Baerends et al. (1972, Behavior Suppl. 17: 134) have shown that Herring Gulls (*Larus argentatus*) did the least resettling, preening, and nest building when incubating three eggs. I have found that Western Gulls (*Larus occidentalis*) on the Farallon Islands, California are typical in having three brood patches (Coulter unpubl. obs.) and usually lay three eggs (Coulter 1973). Furthermore, birds sitting on three eggs sit for longer periods of time with less frequent

TABLE 1. Numbers of stones in nests of Common Terns according to clutch size.

Clutch size	1978 Number of stones			1979 Number of stones			1978 and 1979 Number of stones			Total	Per- cent with stones
	0	1	2	0	1	2	0	1	2		
1	26	5	0	5	1	0	31	6	0	37	16.2
2	88	19	1	51	13	0	139	32	1	172	19.2
3	47	1	0	161	4	0	208	5	0	213	2.3
Total	187			235			422				

resettling than birds on either fewer or more eggs, and in addition the incubation period is shortest and hatching success greatest in three-egg clutches (Coulter 1973). Beer (1961) has suggested that the stimulus of the eggs in the brood patches influences incubation behavior and that gulls seem particularly adapted behaviorally to three-egg clutches (Beer 1965) and less so to either smaller or larger clutches. It is noteworthy that, although clutches of other than three eggs were extremely rare for the Western Gull, among the smaller clutches I often found stones about the size of eggs. Presumably, parents with clutches smaller than three eggs were stimulated to roll rocks into their nests. Because gulls are highly adapted for three-egg clutches, these stones may provide an important stimulus for incubation behavior in clutches smaller than three eggs.

Terns are closely related to gulls, and one might expect terns to show similar adaptations. My studies of Common Terns (*Sterna hirundo*) on Great Gull Island, Long Island Sound, New York suggested that these birds are adapted to three-egg clutches in ways similar to gulls. Common Terns have 3 brood patches (Coulter unpubl. obs.) and usually lay 3 or 2 eggs (Hays pers. com.). A series of observations suggested that Common Terns with fewer than three eggs may roll stones into their nests. First, I noticed that clutches of one or two eggs frequently also had stones. Second, occasionally when an egg was missing from a three-egg clutch (either because it had rolled out of the nest or it had hatched), I found that the nest had two eggs and a stone. Finally, I observed what appeared to be the rolling of a stone into a nest. Two nests were close together; each contained three eggs. For behavior observations I moved an egg from one nest into the other nest, thus creating one 2- and one 4-egg clutch. During my observations the bird on two eggs seemed particularly restless, and, when I returned to the nest after 1.5 h to replace the egg in its proper nest, I found that the nest with two eggs had in addition a stone about the size of an egg. These observations suggested that the terns may have rolled a stone into their nest.

In June 1978 and June 1979, I examined 422 Common Tern nests and noted the number of eggs and whether the nests also contained stones (Table 1). Between 15% and 20% of clutches with 1 or 2 eggs had stones, whereas less than 2.5% of clutches with 3 eggs contained stones. The relationship was highly significant ($\chi^2 = 30.06$, $P < 0.001$, $n = 422$). I suggest, therefore, that among certain terns and gulls, parents with clutches of fewer than three eggs may be stimulated to roll stones into their nests and that the increased clutch of eggs and stones may act as a stimulus affecting incubation behavior just like a similar-sized clutch of eggs. This phenomenon may be overlooked frequently and is sure to vary among species, being less common among those species, such as marsh-nesting birds, for which stones are not readily available.

I am grateful to the Frank M. Chapman Memorial Fund for a fellowship that provided support during this study. Helen Hays generously provided facilities and gave permission to work on Great Gull Island. The Long Point Bird Observatory kindly provided a place to write. J. DiCostanzo, E. H. Dunn, J. Farrand, Jr., H. Hays, and M. LeCroy made helpful comments on the manuscript. This is contribution number 57 of the Great Gull Island Project. Received 22 February 1980, Accepted 19 May 1980.