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FEEDING ECOLOGY OF BLACK OYSTERCATCHERS ON SOUTH FARALLON ISLAND, CALIFORNIA

STEPHEN H. MORRELL, HARRIET R. HUBER, T. JAMES LEWIS, AND DAVID G. AINLEY[1]

ABSTRACT.—South Farallon Island, 45 km west of San Francisco and 38 hectares in size, has approximately 5.4 km of rocky coastline and supports a population of about 55 Black Oystercatchers, *Haematopus bachmani*. The diet of this species on South Farallon has been studied for the past 6 years (1971–76) by collecting and identifying the remains of food brought to nest sites for chicks (20 nests at 12 different sites), by observation of birds at occupied nests, and by observation of birds feeding in the littoral zone and on a 5-ha marine terrace 10 m above the littoral.

The oystercatchers defended territories that included the area within 20 m of nest sites and mussel beds or sections of mussel beds within sight of the nest but sometimes as far as 60 m away. These feeding territories were defended year-round but least intensely during winter. When hatching year oystercatchers reach independence they may still forage occasionally in their parents' territory. However, the adults often chase them away. During fall and winter, 20 to 30 or more oystercatchers congregate at a gently sloping mussel bed and adjacent supralittoral marine terrace on the southwest side of the island. Most of these birds are probably nonbreeders, including hatching year birds, since other areas of the island we are able to see are essentially occupied continuously by the birds that breed there.

Diet is apparently determined by prey availability within the defended territory, and to a lesser extent by distinct preferences for certain prey at certain times. Based on analysis of invertebrate remains for pairs at specific nest sites for several years, at least part of the diet appears to remain constant from one year to the next. Prey availability is in turn determined by topography of the shoreline–sloping shoreline supports beds of the California mussel, *Mytilus californianus*, while steep shoreline lacks mussel beds. Both types of shoreline support limpet populations, mainly *Collisella scabra*, *C. pelta*, *C. digitalis*, and *Lottia gigantia*. At nests where mussels comprise 40% or more of the prey remains (14 of 20 nests), the diet, as indicated by prey remains identified, is more varied (9 of the 14 nests had 5 or more other prey species) than at nests where mussels comprise 30% or less of the diet (6 of 20 nests; 2 of the 6 had 5 or more other prey species). This probably reflects the diversity of prey available in mussel beds. For example, the crab *Oedignathus inermis* is usually found sublittorally. However, when in the littoral zone, *Oedignathus* is found in association with mussels. *Oedignathus inermis* was not found at any of the 6 nests with 30% or less mussels, but it was found at 8 of the 14 nests with 40% or more mussels. On the other hand, mussels, when available, are taken in preference to limpets as food for chicks. The reason for this may be that if larger mussels are brought back, fewer trips have to be made.

Continuous dawn-to-dark watches were conducted on 8 days during the 1976 breeding season, one of three different nests being watched each day. Chicks were 1 to 40 days of age. Prey that would not be detected as remains at the nest site (nemertean and polychaete worms and tenebrionid beetle larvae) comprised up to 57% (by number) of the food items brought to chicks. The beetle larvae represented 30% of the chicks' diet on three of the eight days. Those larvae are captured in the soil of the marine terrace, where their availability apparently fluctuates with soil moisture, the larvae burrowing deeper into the soil as the surface becomes dry.

Four additional continuous watches of chicks old enough (67–100 days) to forage with their parents in the littoral zone revealed that limpets were the major prey item (60–85%), whether fed to a chick by a parent or captured by the chick itself. Mussels, all of which were opened by a parent, were a distant second (16% or less), and nemertean and polychaete worms comprised less than 3% of the diet. During these four watches, 5–24% of the prey items could not be identified.

The diet of newly independent chicks is mainly limpets, littoral worms, and supralittoral beetle larvae. The skill required to open mussels is apparently not sufficiently developed when the chicks first become independent. They thus do not forage heavily on those bivalves at first. Attempts are now being made to determine the age at which this aspect of feeding becomes possible.

Observations made on oystercatchers over a period of 13 months revealed that the phase of the

[1] Point Reyes Bird Observatory, 4990 State Route 1, Stinson Beach, California 94970.

tidal cycle greatly affects their activity in the littoral zone. Feeding comprises 35% of all activity during the low half of the cycle and only 9% during the high half of the cycle. Considering feeding activity alone, 70–95% is done during the low half of the cycle, depending on swell height and exposure of different areas to swells. The feeding activity observed on the high half of the tide cycle occurs mostly in late summer when adults are feeding large, rapidly growing chicks and in fall when fledglings require more time to feed themselves as they perfect their foraging skills.