

VOCAL STIMULATION IN THE GREAT HORNED OWL

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The patterned hooting of owls, like the songs of other birds, may serve one or more of a variety of functions including repulsion of territorial invaders, attraction of potential mates, and stimulation of the mate, the latter leading to a coordination of activities such as those involved in copulation. Determination of function starts with demonstration of effects, and this is often difficult to achieve convincingly in the confusing complexity of natural environments. The observations described below provide evidence that calling by the female member of a breeding pair of Great Horned Owls may trigger prompt vocal responses in the mate.

On my arrival at the Archbold Biological Station, Lake Placid, Florida, on 22 December 1970, two Great Horned Owls (*Bubo virginianus*) were hooting in a stand of tall slash pine near our cottage. One bird, subsequently determined to be a female in acts of copulation observed on 25 December and 30 December, had a slightly higher voice and a distinctive extra note at the end of each call. The pair adopted a flimsy old Fish Crow nest about 27 December, which they attended until mid-January when it collapsed dropping the two eggs to the ground.

Indications of synchrony in the calling of the two birds were noted on 22 December and on many occasions thereafter through January, February, and March. The female generally initiated the calling sessions which lasted from 10 min to over an hour. Her stereotyped call consisted of seven notes: _____ . . . _____ . and lasted about 3.0 sec. The call interval averaged 15–20 sec at the start of a

session and gradually increased to 30–50 sec. The male's call, consisting of five notes: _____ and also lasting about 3.0 sec often followed the female's call by a few seconds, suggesting that it was a response rather than an independent call.

On several occasions when the birds were close by, I could hear the male uttering a rapid irregular series of soft short grunts between hootings. These waxed and waned in intensity until the female hooted, whereupon he promptly responded with his hoot. Apparently, the male's persistent grunting stimulated the female to hoot, which, in turn, triggered his hoot. When the female did not hoot, the male continued his soft grunting for 10–15 sec and then hooted independently. The grunting suggested increasing agitation in the male, held in abeyance until released as a full hoot by the stimulus of the female's hoot.

To check my impression that the birds were indeed responding to each other, I timed the sequence of hooting calls during a 40-min early morning session on 21 February and a 23-min evening session on 17 March. I used a stop watch to estimate the length of the calls and the sweep second hand of an electric clock to record on a grid form the start of each call in a series.

On 21 February, starting at 04:00 e.s.t., 51 of the 92 male's calls followed the female's 3-sec. calls before they were completed, and 31 fell within the ensuing 3 sec. Thus 89% of the male's calls started in one-quarter of the approximately 24-sec female call interval, the 6 sec following the start of the female's calling. The statistical probability for this occurring by chance is $P \leq 0.001$ (χ^2).

During March, several months after the nesting attempt had failed, the two birds were still frequenting the pine stand and calling during the early and late hours of the night. On 17 March a complete record was kept of all hootings from 19:25 to 19:37 e.s.t. In this 12.5-min. interval, the male called 46 times

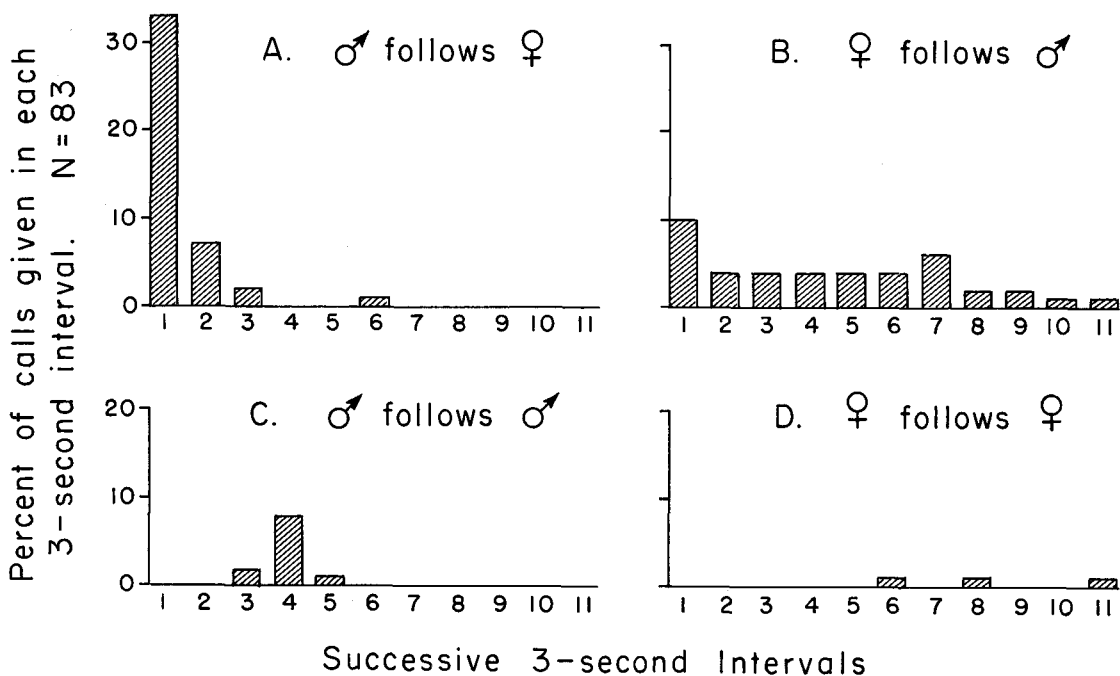


FIGURE 1. Temporal distribution of owl calls with respect to the preceding call.

at intervals ranging from 7–35 sec and averaging 16 sec. The female called 39 times at intervals of from 11–37 sec with an average of 20 sec. Thirty-three of the 46 male calls started within 6 sec after the start of a female's call, 27 of them while the female was still calling (fig. 1). The probability of this occurring by chance is $P \ll 0.001$ (χ^2). Of the remaining 13 male calls, 10 occurred when the female failed to call, all of them between 9 and 13 sec after his previous call. Unlike the male, the female called with no detectable reference to the male's calling and on only three occasions called twice in succession (fig. 1).

Temporally coordinated singing in a communicating pair of birds has been termed duetting or antiphonal singing and has been thought to function in mate recognition and behavioral coordination. This phenomenon has rarely been noted in temperate and boreal regions. It has been reported, however, in

owls (Witherby et al., The handbook of British birds, H. F. and G. Witherby Ltds., Vol. II, London, 1940) where its occurrence may be related to reduced effectiveness of visual communicatory mechanisms and increased dependence on auditory display (Thorpe, Bird song—The biology of vocal communication and expression in birds, Cambridge Univ. Press 1961). Whether or not the performances described above should be labeled duetting, they are of interest as evidence that the hooting of one member of a pair of Great Horned Owls, the female, may produce a quick and definite response in the mate. Such stimulation by a mate may well have significance for the coordination and strengthening of pair bonds.

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DIFFERENTIAL PREDATION BY SOUTH POLAR SKUAS IN AN ADÉLIE PENGUIN ROOKERY

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During the austral summer the diet of the South Polar Skua (*Catharacta maccormicki*) consists of penguin eggs (fig. 1), penguin chicks, krill lost by feeding penguins during regurgitation, and fish, often of the genus *Pleurogramma* (Young 1963), and at certain rookeries, remains of penguins killed in the water by leopard seals. Occasionally, seal droppings or afterbirths of Weddell seals (*Leptonychotes weddelli*) are taken as food. Thus, though South Polar Skuas typically nest around penguin rookeries, in the Ross Sea area Adélie Penguin (*Pygoscelis adeliae*) rookeries, the penguins are not their sole source of food. Part of a Skua population will routinely fish in the ocean (Young 1963), while many of the breeding pairs of Skua are defending peripheral sections of the adjacent penguin rookery as food territories. In the special case of the small Adélie rookery at Cape Royds, the entire rookery is divided into feeding territories of Skuas (Young 1963).

For penguins, a *colony* is defined as "a geographically continuous group of breeding birds whose territorial boundaries are contiguous" (Penney 1968). A *rookery* "contains one or more colonies of breeding birds and a landing beach or beaches the birds use to reach the nesting areas from the sea" (Penney 1968).

PROBLEM

In the Adélie Penguin rookery at Cape Crozier, South Polar Skuas nest only around the landward periphery, but not within the rookery or near the beach. They defend feeding territories along that periphery. However, Skuas prey and scavenge throughout the exten-



FIGURE 1. South Polar Skua carrying away an Adélie Penguin egg. This is done when other Skuas are competing for the egg.

sive rookery. We therefore wondered how variable the predation pressure would be in terms of the entire area of an Adélie Penguin rookery.

As a side issue, we wanted to learn more about the hunting methods of Skuas. For example, do Skuas search only for familiar items, or do they readily investigate novel objects?

METHODS

During the 1970–71 season, we carried out experiments on food-searching behavior of South Polar Skuas at Cape Crozier on Ross Island (77°27' S, 169°14' E) as part of a larger study of predation by leopard seals and Skuas and the antipredator behavior in Adélie Penguins (Müller-Schwarze and Müller-Schwarze 1970, 1971). The rookery, consisting of 150,000 breeding pairs (Penney and Lowry 1967; Emison 1968), occupies an area of about 1400 m by