

EVOLUTION OF DISTRESS CALLS IN BIRDS: STILL AN ENIGMA

by William E. Davis, Jr.

In previous *Bird Observer* articles (Davis 1987, 1988) I discussed distress calls as an avian enigma and argued that our pishing sounds mimic these calls. This article focuses on the enigma of the evolution of distress calls.

Virtually all researchers who have examined distress calls have assumed, tacitly or explicitly, that distress calls have adaptive significance. That is, they assume that some survival advantage is conferred on those birds that give them and that the calls have evolved through Darwinian natural selection. The fact that distress calls elicit a mobbing response from other birds, often leading to the calling bird's escape from the predator, and that response to distress calls seems to be most intense during the nesting and fledging period when young birds are at great risk, strongly suggest that distress calls confer a survival advantage to the calling bird.

Patterns of Response to Distress Calls. Many bird species respond to real or taped distress calls. Peep sandpipers are so attracted to the distress calls of their species that one bander who imitated them reported, "the weight of captured birds finally drags the nets to the ground" (Rohwer et al. 1976). Wrentits, Scrub Jays, Cooper's and Sharp-shinned hawks, a Great Horned Owl, and a Bewick's Wren responded to the taped distress calls of Varied Thrush and Brown Towhee (Perrone 1980). Stefanski and Falls (1972) got strong mobbing responses from Song, Swamp, and White-throated sparrows to playbacks of their own and each other's distress calls during the nesting season. The mobbing responses included diving attacks and distraction displays. They further report an instance of a Blue Jay emitting distress calls when captured by a Sharp-shinned Hawk, but escaping when other Blue Jays mobbed the hawk. Cade (1962) describes an instance when a Northern Shrike captured a House Sparrow that escaped when the shrike was mobbed by other House Sparrows and Downy Woodpeckers. Because the harsh nature of distress calls makes the caller easy to locate and because distress calls elicit a mobbing response, the evidence suggests that the caller "wants to be found."

Mobbing birds that respond to distress calls, and often secure the release of the captured bird, do so at some risk to themselves. For example, Cade (1962) reports that a Northern Shrike captured a Lapland Longspur which had been mobbing it, and that a shrike pursued a mobbing Downy Woodpecker.

How Have Distress Calls Evolved? Response patterns to distress calls do not lend themselves to simple explanation, but two alternative hypotheses have been suggested. One involves "self-interest" or "individual selection," and the other involves "kin selection."

If we consider the bird *giving* the distress call, an individual selection model for the evolution of distress calls is feasible. For example, Driver and Humphries (1969) suggest that distress calls serve to confuse and startle predators and thus allow the captured bird to escape. This suggests that the evolution of distress calls has resulted because individual birds survive due to their own efforts (distress calls). By surviving, these birds have increased their chances of reproducing and passing on this trait to succeeding generations. However, the fact that birds may continue to call long after any startle effect is lost suggests that these sounds may have a different function, such as calls for help, because distress calls often elicit a mobbing response from members of the same or different species. Thus, distress calls that elicit a mobbing response from other birds would confer survival advantages and be favored by natural selection.

The individual selection model is also supported by evidence that many juvenile birds emit distress calls more frequently than adults do. In five of twenty-one species studied, juvenile birds called significantly more often than adult birds (Inglis et al. 1982), and Boudreau (1968) states that juvenile House Sparrows almost always give distress calls, while only four percent of adults do. Juvenile Cedar Waxwings and House Finches called significantly more often than adults (Perrone 1980). The studies suggest that distress calls may have evolved by individual selection in juvenile birds. Juveniles that call for and receive help from their parents would, on average, have a higher probability of survival and of passing on the character to succeeding generations. But if the parents did not respond to the young bird's distress calls, the character would confer no advantage and would not be selected for.

Why Do Birds Respond to Distress Calls by Mobbing the Predator?

When we turn our attention away from the bird giving the distress call and focus on the bird *responding* to the call, another evolutionary pattern is suggested. Mobbing birds are at some risk which suggests that they are behaving in an "altruistic" manner (altruism is defined specifically as helping another at some risk to oneself). Altruistic birds, since they are at risk and gain no obvious advantages (for example, when the Downy Woodpecker mobbed a Northern Shrike holding a captured House Sparrow), should be selected against and thus the hereditary tendency toward altruistic behavior should disappear. Even if the risk is very slight, as long as the risk outweighs the advantage, altruism should be selected against.

What is the advantage that outweighs the risk? The widely suggested answer (Rohwer et al. 1976) to this seeming paradox is that the mobbing response evolved by kin selection. The theory of kin selection argues that individuals should behave altruistically toward close relatives because close relatives have a similar genetic makeup or, to put it another way, carry copies of

a high percentage of the altruist's own genes (all members of a species have more than ninety-nine percent of their genes in common, but close relatives share more specific gene sequences). Thus, there is an evolutionary tendency to behave most altruistically toward your children (you provided fifty percent of their genetic makeup) and less so toward your cousins (who carry on the average twelve and one half percent of your genes). In an extreme example kin selection explains a host of altruistic parental behaviors on the basis that the risk to the parent is outweighed by the genetic benefits received from the survival of its offspring. Kin selection predicts that altruism can evolve by natural selection and the apparent paradox between altruism and self-interest is removed. As stated by one author (Perrins 1968, p. 201):

. . . the evolution of such alarm calls [distress calls] must have taken place as a result of selection during the breeding season when the evolutionary advantage gained in protecting the young outweighs the small risk to the parent bird itself . . . Natural selection would favor the evolution of any call so long as the risk of death to the parent bird itself was outweighed by the chance of saving the young.

Some evidence supports the kin selection model for the evolution of distress calls. In their experiments with Song, Swamp, and White-throated sparrows, Stefanski and Falls (1972) found that the highest intensity of mobbing response coincided with the parents' nest building and egg-laying activities and during the late nestling and fledgling stages. It was thus most intense at the times when mobbing and distraction would "be most effective in increasing the probability of survival of the responder's progeny" (Stefanski and Falls 1972, p. 1511). It seems that we are left with the interesting conclusion that the evolution of distress calls might require substantially different mechanisms for the caller and the responder: individual selection in the first case, kin selection in the second case. We are also left with some unanswered questions. For example, why does a Downy Woodpecker come to the aid of a House Sparrow to which it is only distantly related? Is there a learning component to these behavior patterns that may obscure the evolutionary history of the genetic component? Clearly, there is no simple scenario that explains all of the observations, and the evolutionary development of distress calls remains an enigma.

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