Of Blue Jays and Mimicry

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Most of us are aware that Blue Jays (*Cyanocitta cristata*) are capable of giving imitations of hawk calls. Few of us, however, may actually have heard a jay doing so, for in my experience, it is only a relatively few jays that do the imitations. Some people may have heard an imitation, but been unaware of what they were hearing. Some of the imitations are remarkably good, and if heard only, without seeing the caller, a listener may consider that it was given by the appropriate species.

In a variety of papers relating to this behaviour in wild birds, the species mimicked include Red-shouldered Hawk (*Buteo lineatus*) (Nicholson 1936, Bent 1946, James 1988), Red-tailed Hawk (*B. jamaicensis*) (Baird et al. 1875, Bent 1946), Broad-winged Hawk (*B. platypterus*) (James 1988, Tarvin and Woolfenden 1999), Cooper's Hawk (*Accipiter cooperii*) (Tarvin and Woolfenden 1999), Osprey (*Pandion haliaetus*) (Atkins 1989, Hailman 1990), and American Kestrel (*Falco sparverius*) (Baird et al. 1875, Chapman 1904). Two species other than hawks also have been mimicked by wild Blue Jays, the Eastern Screech-Owl (*Otus asio*) (Sutton 1977, Tarvin and Woolfenden 1999), and Fish Crow (*Corvus ossifragus*) (Phillips 1993). To this list I will add another species, and present some further observations of mimicry in Blue Jays that suggest a new interpretation of why the jays mimic.

Observations

From 23 to 25 August 2000, I visited a cottage on southern Georgian Bay (north of Wasaga Beach). The first afternoon there, I quickly saw and heard Blue Jays in the pine trees about the cottages. There were single jays, or a few well-spaced birds, possibly family members, foraging through the trees. Few other species were about and none were as noisy as the jays. It was easy to tell what was doing the calling. On the deck in the late afternoon, I was soon treated to the sound of a jay calling loudly in what was a very uncharacteristic way. I expected a hawk call, but could not identify it as such. There did not seem much chance of any hawk being resident here among the several rows of cottages extensively spread along the shores in this area.

Finally, after hearing several more calls, it became clear to me that it was not what I expected at all, but an imitation of the penetrating "scream" of a Ring-billed Gull (*Larus delawarensis*). There were gulls screaming from time to time in the background along the shores of the bay. The cottage, however, was

in the third row back from the beach, and all lots were more or less well treed. It was only beyond the cottages and over the sand dune back of the beach before it became open enough for the gulls. There were no gulls near the jays when they were calling like a gull. The gull calls of the jay were not frequent, but a few were rather randomly given among the more usual ringing jay calls expected at this time of year. In other words, the calls were not associated with any behaviour other than foraging, as far as I could see. The jay doing the gull call was apparently resident here at this time, and I heard at least one such call on the three days I was there, without spending a great deal of time where I could have heard it.

The second observations of Blue Jay mimicry that are of relevance here occurred near my home. I live in the rolling rural farmland near Sunderland, Ontario, with plenty of wooded areas along the Beaver River, and in fence rows. For a couple of years now, I have been aware of a jay (presumably only one) that regularly imitates the scream of a Red-tailed Hawk (also an inhabitant of the area). The imitation is a good one, and I have to consider where it is coming from before deciding which species is actually calling. The jay would reveal itself soon by giving a typical jay call after initially giving one or several hawk calls. But, the pertinent point in relating this is that I can hear the Blue Jay much more frequently imitating a hawk than I ever hear the real hawk. And, more importantly, the jay imitates the hawk at any season of the year.

The hawk imitation by the jay is most frequently heard in late summer or autumn, when the jays are more vocal anyway. And I have heard it when there is snow on the ground (although the jays seem to retreat to town to the bird feeders in most of the winter). I think I have heard it probably at least once a month (sometimes several times a month) over the past couple of years. The calling bird may be alone (or probably within hearing of another jay, or jays), or may be accompanied by one or more other birds. There is never any apparent conflict or excitement of any sort. The jay just uses it as if it were any other jay call to let the world know it is there.

Hypotheses

Numerous explanations have been offered to try to explain the functional significance of the mimicry of hawks by Blue Jays (Goodwin 1976, Hailman 1990, Tarvin and Woolfenden 1999). Among the possibilities put forward are:

1) Enhanced sexual selection during pairing. Certainly, enlarged song repertoires are known to enhance the chances of successful pairing (Howard 1974, Krebs et al. 1978). However, if this were the reason, why would they call in autumn (more than spring), or even in win-

ter? And why imitate only hawks instead of any species, as the mimids do?

2) Mate identification within pairs. While individual recognition is important, not only to pairs, but also among neighbours, why call at seasons when birds are not closely paired, and often flocked? And again, why only hawks?

3) Enhanced territorial defence during the mating season. But, the defence of consistent or extensive territorial boundaries is nonexistent as far as other Blue Jays are concerned (Tarvin and Woolfenden 1999). Blue Jays do keep away neighbouring pairs, but neighbours are the very ones likely to be well aware that it is only mimicry anyway. And why would they call more outside the breeding season?

4) Used in mobbing or enhancing threats to predators approaching nests. While calling like a hawk might enhance the chances of discouraging other birds from coming near a nest, why bother using these calls in late summer, autumn, and winter? And the hawks most frequently mimicked are buteos, not particularly dangerous to other birds in woodlands. In none of the many instances I have witnessed has there been any evidence of mobbing.

5) To alert other individuals (presumably jays) to the near presence of a raptor. Again, in the numerous instances I have witnessed, there has never been a hawk anywhere near, and there were not any gulls close to the jays at Wasaga. And I imagine the birds are well able to communicate danger by other calls.

6) To indicate where a hawk was previously. Why bother? Why would there be any threat if it was gone? And hawks could be anywhere, so they would have to use them all over the place. Also, it would be more beneficial to imitate an accipiter than a buteo or a Ring-billed Gull.

7) To deceive other species into believing a raptor is present. There seems little reason to do so at most any time of year other than the breeding season. I do not have a bird feeder from which jays might be trying to chase other species and jays probably are well able to chase off most other species that might compete for food anyway.

8) Blue Jays simply incorporate environmental sounds into their repertoire. While Blue Jays are certainly capable of imitating other things (captive birds have imitated cats, whistles, words, and other birds; see Ramsey 1972, Terres 1980), why would they not incorporate the songs of many birds other than raptors in the wild? Steller's Jays (*Cyanocitta stelleri*) incorporate many other animal sounds (Greene et al. 1998).

9) Hawk calls are native to the repertoire of jays. Why would the calls of hawks be native to jays any more than the calls of some other species? If hawk calls were native to jays, why would all jays not be using these calls all the time? I have seen relatively few jays using hawk calls. And are we also to suggest that Fish Crow calls, or Screech-Owl, or Ring-billed Gull calls are also native to Jays?

In the end, all we have are possible uses of hawk calls, that might apply some of the time, and then apparently apply only with a few individuals. There is some anecdotal evidence to suggest some of the above uses may have happened at some place to some birds. But, despite more than a century of observations, nobody has a good explanation that would provide any real functional significance to Blue Jays imitating raptors.

Discussion

Most passerine birds learn at least part of their vocal repertoire, often by imitating the sounds of neighbouring birds (Kroodsma 1982). Learning is certainly a component of the development of Blue Jay calling (Tarvin and Woolfenden 1999). Such learning typically takes place during the first few weeks or months of life, and once incorporated into a vocal repertoire, a call is likely to remain through the life of the bird (Marler and Mundinger 1971, Nottebohm 1975, Marler and Peters 1981).

Early in life, a bird is subject to the greatest probability of being killed by a predator. I suggested before (James 1988) that perhaps the raptor calls were learned at a time of stress or high excitement when the birds were learning their calls. Such excitement could be caused by a raptor near a nest or a recently fledged jay, and could provide a model from which to learn. This would be consistent with their learning only the calls of potential predators, primarily hawks, but also gulls, owls, and crows. Several authors have noted that Blue Jays often appear to give hawk imitations at times of high excitement (Goodwin 1976, Tarvin and Woolfenden 1999). This suggests that they may be given in a situation offering a stimulus similar to that in which the calls were learned. I have seen very little excitement evident in any of the incidents I have witnessed, but at least if given at such times, it is consistent with the stimulus situation that would promote the learning only of the calls of predators.

I would suggest then, that in most instances, there is probably no particular functional significance to the mimicry of hawk calls by Blue Jays. These calls are given in a whole variety of situations that have suggested many functions, none of which are supported by any compelling evidence. This might not preclude an individual jay from learning to use a hawk call in a functional way to its advantage. But, the inci-

dence of such functional use of a predator call seems very rare. Overall, it seems more likely that the calls are learned inadvertently by a few birds, enhanced perhaps by the presence of a calling predator at a critical time in the life of the jay; something that is likely to be remembered in more ways than one.

Young birds are usually constrained in what they learn by inherited "sensory templates" that allow them to select only certain songs from a rich sound environment of many bird species (Marler and Peters 1982). Why Blue Jays should so easily be able to pick up a fairly wide variety of types of predator calls is unknown. However, Blue Jays are very vocal, using many variations of typical calls, with many calls used in multiple contexts, such that functions of any one of them are difficult to identify (Tarvin and Woolfenden 1999). Some of the hawk imitations are considered to be variations of their usual "jeer" call (Tarvin and Woolfenden 1999). Variations on existing calls, and a fairly wide facility to improvise, may provide jays with the ability to learn novel sounds especially with a strong stimulus. Then, once the calls are incorporated into the repertoire, they become just a part of their calling. Hawk (owl or gull) imitations would serve the same function as typical "jay" or "jeer" calls that are used in many contexts and situations. While the "jeer" call may be used in mobbing, it also is apparently used just for contact, and often by lone jays not obviously interacting with other jays or engaged in any apparent social behaviour (Tarvin and Woolfenden 1999).

What I find intriguing is that we may be able to test the possibility that predator imitations have no particular functional significance for Blue Jays. By providing a strong novel stimulus to young Blue Jays, with recorded calls and/or mounted predators, at an appropriate song learning age, we can see what are the results among those birds as they mature. The major difficulty may be finding the dispersed young again, dispersal being something we apparently know nothing about.

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