

The Mob Attacks!

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WRITER'S COMMENT: The last assignment of my Raptor Biology class was a term paper on any topic that was at least somewhat related to birds of prey. I wanted to write about something tangible, something one could see simply by walking outdoors. So I decided to delve into bird mobbing behavior. The more articles I read on the topic, the more pleased I grew with my choice. The sheer number of published articles and the fact that every single one covered a different aspect of mobbing made research fresh and rather enjoyable. My finished paper was an attempt to pull together many of the prominent ideas concerning avian mobbing behavior into a single, broad overview. I would like to thank my instructor, Allen Fish, for making Raptor Biology one of the most enjoyable classes I have ever taken, and for encouraging me to make this paper all it could be.

—Lisa Knapp

INSTRUCTOR'S COMMENT: With nine years of teaching raptor biology at UCD, I get a little cynical when I sit down to read term papers and see the same old topics. I'm thinking where is the excitement? Where is the lust for life, the fever pitch, and the quickened pulse? These are birds of prey, after all! Then I started reading Lisa Knapp's essay on mobbing: vivid imagery, predation, prey, survival, death, cunning. It made me sit up straight, smile, and anticipate the next page. Thank you, Lisa! Here it is: the curve ball, the banana skin slip, the bungled wineglass. This is my favorite kind of writing. Is it science writing? Is it essay form? I don't know. I don't care! It's life! It's unfolding and it's edge of the seat, and I am compelled. Lisa gives us communication between species. She gives us families and cohorts working together to subdue a predator. She gives us a falcon taking a nosedive into a lake as a strategy to escape a flock of blackbirds. And even the raptors win a round: Lisa gives us a harrier snagging a mobbing willet in mid-air. Bird plus bird equals a continual unpredictable dynamic, and you don't want to miss a trick. So sit up straight and read on.

—Allen Fish, Department of Animal Science

ACROCODILE SLOWLY APPROACHES an oblivious zebra getting a drink. A lioness stalks a wobbly, newborn gazelle. Or an eagle pushes a young goat off a cliff so it falls to its death. What do these scenarios have in common? A poor, defenseless, and adorable animal is preyed on by a bloodthirsty, cunning, and cold-hearted predator. Or that is how we tend to stereotype these situations. We are more likely to sympathize with the victims of such encounters than with the predators. But what if the roles were switched and the once-savvy predator had to high-tail it out of there to escape a horde of retaliating dinner entrées? These “retaliating dinner entrées” would be exhibiting a behavior known as *mobbing*.

Mobbing behavior has been observed in species of fish (Dominey 1983 *in* Betts et al. 2005), mammals (Tamura 1989 *in* Betts et al. 2005), birds (RSPB 2001), and insects (Seeley 1982 *in* Betts et al. 2005). In this paper I review numerous articles on avian mobbing to provide an overview of the factors influencing mobbing and the risks and benefits of this intriguing behavior.

In birds, mobbing includes many behaviors: alarm calls, flight displays such as diving and swooping, defecating and vomiting towards the predator, and the occasional striking of a predator (RSPB 2001). Ground predators, avian predators, and even humans have been subjected to mobbing attacks by birds (RSPB 2001), but nothing touches the drama of smaller birds mobbing aerial predators such as raptors.

While mobbing is often started by one bird, it is very common for the mobber to be joined by more birds of the same species and even different species in the close vicinity (Hurd 1996). Hurd (1996) found that the mobbing call of a Black-capped Chickadee (*Parus atricapillus*), with no visual cues from a potential predator or from the chickadee, was enough to stimulate the arrival of other mobbing birds, even some of other species (Hurd 1996). This suggests that birds with a similar predator can recognize the mobbing call of another potential prey species, and that they may be willing to assist it in driving the predator from the area.

A visual cue of a predator is the easiest way to stimulate a mobbing response in prey birds. However, while mobbing behavior is often initiated by the sight of a predator, an auditory stimulus, such as the call of an Eastern Screech-Owl (*Otus asio*), can prompt a response if the predator is not in the visual range of the mobbing birds. These attacks may have little direction because the birds cannot see the predator (Chandler and Rose

1988). Comparatively, a visual stimulus increases the mobbing intensity and longevity (Chandler and Rose 1988), as does a living predator, as opposed to the stuffed specimens sometimes used by researchers (Gard et al. 1989). Apparently, prey birds need a tangible object on which to focus their attack.

Factors Influencing Mobbing Behavior

ALL MOBBER RESPONSES ARE NOT CREATED EQUAL. One factor influencing the mobbing response is whether the prey species is in breeding or migration season. During the migration season birds are not holding territories nor nesting sites, so mobbing occurrences tend to be low (Krams and Krama 2002). During the breeding season the high parental investment leads to more and greater intensity mobbing attacks by the parents (Curio 1978 in Nijman 2004). These attacks are presumably done to protect vulnerable chicks from predators by driving the predators out of the breeding territory. Biologists have also found that birds of “stable communities” are more likely to initiate mobbing behavior when a predator approaches than those in “unstable communities” such as during migration (Krams and Krama 2002).

While researchers have accepted for the most part that breeding season means more mobbing with higher intensity by the adult prey species, one study of the seasonal variation of the behavior of a small songbird, the Drongo (*Dicruridae*), towards two predators, the Javan Hawk-Eagle (*Spizaetus bartelsi*) and the Black Eagle (*Ictinaetus malayensis*), showed little evidence for this theory. Throughout the course of the study, which took place during the breeding and non-breeding seasons, the mobbing intensity of Drongos towards the two predators did not change (Nijman 2004). However, the Drongos did mob the two raptor species with different degrees of intensity that was season-dependent. The Javan Hawk-Eagle was mobbed more frequently than the Black Eagle during the breeding season, despite the Black Eagle being a common nest predator for Drongo (Nijman 2004). The Black Eagle was also mobbed more frequently during the non-breeding season than the Javan Hawk-eagle (Nijman 2004). This suggests that the threat of a specific predator may be connected to the season of the attack, but more evidence is needed to support this theory.

Still, Nijman’s study does not disprove the theory that mobbing intensity can be great in the breeding season. Many studies have sought

a connection between the mobbing intensity of a breeding pair and the developmental stage of the young, but not enough data has supported this. It has long been assumed, for example—and supported with some experimental evidence—that American Kestrel (*Falco sparverius*) mobbing intensity towards other large raptors such as Great Horned Owls (*Bubo virginianus*) increases from the incubation period to the nestling period (Balgooyen 1976 in Gard et al. 1989). Experiments have shown an increase both in the number of aggressive dives toward the predator and in the number of vocalizations (Gard 1989) but not in great enough numbers to be statistically compelling.

In another example, Betts et al. (2005) tested the movement of breeding pairs of Forest Warblers (*Dendroica caerulescens* and *D. virens*) in a territory in response to mobbing calls. One would expect that the breeding pair would be more willing to mob a perceived predator if the young were fledging versus in the egg or nest. However, they found no differences in the distances moved in the incubation and fledging periods (Betts et al. 2005). This is in opposition to the long-standing prediction that the mobbing intensity of all birds increases with the development of the chicks (Andersson et al. 1980 in Gard et al. 1989).

One study even went so far as to suggest that the experimental techniques used for measuring the intensity of nest defense were creating results that favored the current theory. Richard Knight and Stanley Temple (1996) of the University of Wisconsin suggested that the observers' presence and repeated placement and removal of the "predator" led to positive reinforcement of the test subject. This resulted in the test subjects, often songbirds, being more likely to mob the "predator" as the experiment progressed, which only appeared to correlate with the development of the young.

Their study tested mobbing intensity at occupied nests of American Robins (*Turdus migratorius*) and Red-winged Blackbirds (*Agelaius phoeniceus*). One group of nests was visited repeatedly throughout the incubation and nestling stage, and the other nests were visited only once during the nesting stage. The one-time-visit nests showed no increase of mobbing intensity between the nests visited during the incubation or nestling stage, whereas the repeatedly visited nests showed a significant increase in mobbing intensity as the young hatched and aged (Knight and Temple 1986). These results appear to be very clear and in favor of Knight and

Temple's theory, but one study is not enough to disprove a long-standing hypothesis.

Another factor determining mobbing behavior is the territory or home range of the birds studied. The same 2005 study of the Forest Warblers supported the hypothesis that mobbing behavior is often restricted to the breeding territory (Betts et al. 2005). All test subjects responded to mobbing calls inside their territory and were willing to move up to 125 meters within their territory to respond to mobbing calls, but only 3 of the 37 birds tested responded to mobbing calls played outside their territory, and only if it was within 25 meters of the territorial boundary (Betts et al. 2005). This suggests that the birds only wished the potential predator to be out of their breeding territory and away from the vulnerable young chicks, and were often not willing to move further to continue the mob.

Other types of territories can be studied as well. The Belted Kingfisher (*Megaceryle alcyon*) has been observed mobbing raptors such as the Cooper's Hawk (*Accipiter cooperii*) and Northern Goshawk (*A. gentilis*) (Kirby and Fuller 1978). In each case, the kingfisher repeatedly flew at the raptor, causing the raptor to give chase before the raptor gave up and moved to another area to hunt (Kirby and Fuller 1978). As each encounter was near a source of water the kingfisher frequented, the water bird was attempting to protect its feeding territory.

The many instances of mobbing during the breeding and fledging season often make sense—the parents protect the offspring when in the most vulnerable and helpless stage of their development. However, after the young leave the nest but remain inside their parents' territory, the parents' mobbing response is still not the same of that of a solo bird. The investment is over, and the parents have done their job; now the young should take care of themselves. Griesser and Ekman (2005) studied the Siberian Jay (*Perisoreus infaustus*) in 2005 and revealed that kin groups, those with young and parents, mobbed a stuffed owl and hawk more aggressively than non-kin groups. More calls were given, and the mobbing had a longer duration on average in kin groups. Specifically, the alpha males of the kin groups reacted more aggressively than other members (Griesser and Ekman 2005). This observation of nepotism suggests that the incentive for the young to stay in their parents' territory is protection that they would not have on their own.

There are few examples of altruism in the animal kingdom, but a growing theory relates altruism to mobbing behavior. Krams et al. (2006) tested the hypothesis that birds were less likely to join in a mob initiated by a bird that did not previously join in a mob initiated by them. Using a population of Pied Flycatchers (*Ficedula hypoleuca*) that were nesting in grouped nest boxes, the researchers took turns trapping a breeding pair in their respective nest box and using a stuffed raptor to initiate a mobbing response near another nest (Krams et al 2006). After the mobbing scenario was over, the trapped birds were released and their nest was subjected to the dreaded “predator.” In this second trial, only a few pairs of unhindered flycatchers assisted the previously trapped pair (Krams et al. 2006). The flycatchers could identify who had assisted them in mobbing the predator and in many cases refused to assist those who had not helped them. In the control groups where the researchers did not trap any breeding pairs in any trials, the proximity of the predator warranted a response by the majority of the breeding pairs in every trial (Krams et al. 2006).

Numerous factors influence mobbing behavior in birds, but few articles collect mobbing data from many different species and subspecies in an attempt to locate and explain broad trends in mobbing behavior. However, in 1981, Tex Sordahl sent out questionnaires in order to consolidate data on mobbing shorebirds. Surprisingly, a clear trend between weight and mobbing behavior was seen. Of the 51 species of North American shorebirds, the larger species, weighing on average greater than 100–120 grams, had been observed exhibiting mobbing behavior. The smaller species, weighing on average less than 100 grams, had not been observed mobbing predators. Whether this information is available in other types of birds is unlikely, as few articles on mobbing encompass a wide range of species (Sordahl 1981).

Benefits of Mobbing Predators

THE BENEFITS OF MULTIPLE SMALL BIRDS ATTACKING and driving off a predator are fairly clear. One bird attacking a predator faces great risk, but if a large number of birds attacks, the overall risk to the individual bird is reduced (Hennessy 1986 *in* Motta-Junior 2007). The calls and confusing flight aerobatics of the mobbing birds can confuse the predator, making it difficult for it to single out an individual (Altmann 1956 *in* Motta-Junior 2007). In an observation of a Gyrfalcon (*Falco rusticolus*) mobbed by a small group of Glaucous Gulls (*Larus hyperboreus*),

the Gyrfalcon made several attempts to catch the gulls, but consistently missed (France 1992). The gulls could have been in greater danger had each tried to attack the Gyrfalcon alone, but the multiple gulls distracted the Gyrfalcon sufficiently for the gulls to be relatively safe.

A group of birds mobbing a predator seem to have one goal: get the predator out of here. While some raptors ignore mobbing birds, others are fast to leave the vicinity. A kingfisher was able to drive two raptors out of its feeding territory by provoking the chase and otherwise harassing the raptors until they left for quieter grounds (Kirby and Fuller 1978). The raptors appeared to have no initial desire to hunt the kingfisher, but they were eventually driven out of the territory nonetheless. In that case, the kingfisher was perhaps acting in its own defense, but other birds may attack predators to protect their more vulnerable young (Gard et al. 1989).

The theory that mobbing during the nesting season serves to protect the offspring could be seen to coincide with nesting success. In an experiment in 2005, Patrick Doran and his colleagues tested a hypothesis that birds with greater reproductive success were more likely to exhibit mobbing behavior when hearing recorded mobbing calls. (In other words, because they had more young in the nest, they had more at stake than the bird parents with fewer young.) The results supported the hypothesis, as birds with higher reproductive success were more likely to try to mob the speaker (Doran et al. 2005). Although these results were not distinct enough to constitute a proven method of determining the reproduction success of a species, they do strongly imply a connection between mobbing response and breeding success in birds.

Risks Associated with Mobbing Behavior

WHILE MOBGING CLEARLY HAS MANY BENEFITS for birds, it carries direct and indirect risks as well. For one, the birds approaching a predator are in danger. Yes, usually many birds are flying around and uttering alarm calls, but this does not mean the individual birds are always safe. Observations of a female Northern Harrier (*Circus cyaneus*) mobbed by a pair of Eastern Willets (*Catoptrophorus semipalmatus*) illustrate this nicely (England 1986). The Northern Harrier was flying low over a field when the breeding pair of willets began mobbing her as she passed too close to their nest. The Northern Harrier seemed unperturbed by the darting and obnoxious willets, until she slowed and suddenly caught one in her

talons from mid-air. The pair of Eastern Willets faced a risk harassing the Northern Harrier and it resulted in one being eaten and their breeding season being disrupted.

While the kill above may be attributed to the small number of birds mobbing the raptor, and therefore not enough to distract it, the next example cannot be explained that way. In 2007 in Brazil, an observer witnessed a group of mixed species of songbirds with numerous individuals mobbing a Ferruginous Pygmy-Owl (*Glaucidium brasilianum*) that was perched on a branch and giving long calls (Motta-Junior 2007). The agitated mobbing birds emitted calls and flew close to the owl, but the Ferruginous Pygmy-Owl appeared unaffected. Suddenly, the owl snatched a female Fork-tailed Flycatcher (*Tyrannus savanna*) in its talons. The flycatcher's flapping caused the owl to fall to the ground, but the owl did not release the prey and eventually flew off with its dead prize (Motta-Junior 2007). This and the observation above demonstrate that the risks of mobbing a raptor cannot be overlooked, no matter how small they may appear.

Indirect risks include inadvertently drawing attention to the very nest that the mobbing parents are hoping to protect. A student researching the Pied Flycatcher in Latvia tested the hypothesis that diurnal mobbing calls towards threats actually attract nocturnal predators to the nest (Krams et al. 2007). Krams found that when tapes of mobbing calls were played near the nest boxes stocked with Common Quail eggs (*Coturnix coturnix*) the boxes experienced significantly higher rates of predation by nocturnal predators such as Pine Martens (*Martes martes*) than when blank tapes were used (Krams et al. 2007). The actions of the mobbing parents during the day caused the nocturnal predators to locate the nest with greater ease.

In a related note, the duration of the mobbing call by the Pied Flycatcher also alters the risk. In an experiment, long mobbing calls, 15 minutes in length, and short mobbing calls of 2 minutes in length were played on a speaker by a nest during the day, and nest predation during the night was recorded. The nests near the long mobbing calls experienced higher rates of predation than the nests situated near the short mobbing calls (Krams et al. 2007). The long duration of the call alerted nearby nocturnal predators such as the Pine Marten to the location of the nest.

Although rarely mentioned, the predator also experiences a risk when it is mobbed. In one observation, a group of Red-winged Blackbirds mobbed a flying male American Kestrel, and the kestrel was actually forced into the lake they were flying over (Smith and Holland 1974). The kestrel then swam awkwardly to shore and was caged by the observers until its plumage was dry. It remains unclear as to whether the mobbing birds intended this to happen, but it was nonetheless a very effective mobbing occurrence that demonstrates the potential danger experienced by the predator when being mobbed.

Mobbing behavior in birds is very complex and the factors influencing it are still debated. Experimental evidence has suggested that the time of season, the breeding stage, and the territory can affect mobbing behavior, as can such factors as altruism and nepotism. Small birds trying to mob a raptor face both obvious risks and benefits, but extensive research is still needed to shed light on the theories surrounding this distinctive behavior.

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