CellPress

Quick guide

Mobbing

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What is mobbing? Sometimes, when an animal discovers a predator, instead of hiding or fleeing, it does exactly the opposite: it makes itself conspicuous and moves towards the predator. This type of anti-predator behaviour is called 'mobbing' (Figure 1). During mobbing, animals harass or even attack predators, while performing a suite of stereotyped and conspicuous displays and vocalizations.

What kind of animals mob predators? Mobbing is surprisingly common and has been well documented in a wide range of vertebrates and invertebrates. Mobbing is especially common in birds. Birds are conspicuous, and their mobbing behaviour tends to be loud and often directed against humans during breeding season, so this group has been well studied. Chickadees, for example, noisily and aggressively mob hawks and owls. Mobbing also occurs in other groups of animals, including mammals, fish and insects: meerkats, for instance, surround and attack snakes until they kill or drive them off; black bass swim towards and bite some predators; and Japanese honey bees surround and kill predator hornets.

Do all animals mob in the same way? Mobbing behaviour appears to vary quite a bit across species. The characteristic 'harassment' behaviour ranges anywhere from aggressive posturing from a safe distance, as in giant otters, to physically attacking a predator, as in ash-throated flycatchers. In some cases, mobbers may even end up killing the predator, as often happens in honeybees. While mobbing appears to be most common in social species that live or travel in groups, such as primates and damselfish, solitary or territorial species such as rufous hummingbirds or European robins will also mob predators. Unfortunately, the components of mobbing behaviour are often poorly or only vaguely described in many cases, making direct comparisons of mobbing behaviour between species difficult. Mobbing also varies across seasons. Some species only engage in mobbing when their young are in danger, as in brown towhees. Other species, such as crested tits, mob year-round, though they often still peak around the breeding season. Finally, the vocal component of mobbing also varies widely across species. While, most commonly found in birds, mobbing vocalizations are also produced by mammals, fish and even some reptiles. While some species simply repeat discrete calls in response to predators, others will produce different call types. There is some evidence that the acoustic structure of mobbing calls is conserved across species.

Why do animals make so much noise when mobbing? As part of mobbing behaviour, many species produce specific 'mobbing calls'. These calls tend to be loud and have an acoustic structure that makes it easy for other individuals to locate the calling animal. Mobbing calls warn others about the presence, type or threat level of a predator, which allows them to respond appropriately. For example, Siberian jays that hear mobbing calls before seeing a predator are more likely to escape attack than those that do not. Mobbing calls also let nestlings know to remain still and hidden in a nest, allowing their parents to keep them safe from afar. White-browed scrubwren (*Sericornis frontalis*) nestlings, for example, stop calling when they hear their parent's mobbing calls. Japanese great tit juveniles respond differently to mobbing calls that signal different kinds of nest predators. The nestlings will duck when their parents give a mobbing call in response to crows and jump from the nest when their parents give a different mobbing call in response to snakes.

While mobbing calls are usually directed to conspecifics, mobbers may also be signalling to the predators themselves. Many people have direct experience with this aspect of mobbing, including terns dive-bombing people who get close to their nests or crows who 'remember' past harassment and act aggressively when encountering the same human again. Mobbing behaviour combined with mobbing calls may serve as a pursuit-deterrent signal, designed to stop a predator before it even begins hunting.

Figure 1. Mobbing.
Mobbing behaviour is found in many animals. Top left: a raven defending itself from mobbing blackbirds (photo: Bruce Lyon). Top right: a squirrel mobbing a rattlesnake (photo: Donald Owings, courtesy of Barbara Clucas). Bottom left: small fish mobbing a great barracuda (photo: Clark Anderson/Aquaimages). Bottom right: Japanese honeybees mobbing a giant hornet (photo: Masato Ono).

Mobbing is dangerous, isn't it?
It can be very dangerous. Animals can be injured or even killed during mobbing, either by the predator itself or through collisions with other mobbing individuals. Aside from direct injury or death, the conspicuous vocal and visual signals produced during mobbing have potentially negative indirect effects of attracting other predators. Mobbing also costs energy, as the behaviour itself tends to involve a lot of movement and vocalizing. However, the cost to a mobbing individual has, surprisingly, never been quantified.

But surely there must be benefits?
Mobbing is assumed to lower the likelihood of future predation by driving and keeping predators away from an animal's territory or home range. Many predators, when confronted with mobbing groups, become agitated and leave the area. Other predators, such as powerful owls, will avoid hunting or roosting near mobbing species, while leopards and European kestrels will give up hunting sooner and move further away when they are mobbed. By attacking *en masse,* mobbing aggregations take advantage of grouping to avoid being killed. For example, large numbers of individuals lower the chance of any one individual being eaten while frequent shifting of positions makes it difficult for predators to single out individuals. Mobbing has an additional benefit: naïve individuals can learn about potential predators by observing mobbing behaviour of experienced adults. Blackbirds and black-capped chickadees, for example, will mob a non-threatening novel predator after witnessing a conspecific mobbing that predator.

Why do biologists study mobbing?
Mobbing behaviour is often studied as a proxy for animal cognition. By understanding how animals classify and communicate about different predators, researchers can gain new insights into 'animal language' and the cognitive abilities underlying anti-predator communication. Mobbing is often used to determine how individuals classify or generalize between different predators. Many studies use predator models in order to determine what specific cues animals use to assess the threat a predator poses. This type of information can provide insights into predatory–prey dynamics in particular environments. Further, determining which species can successfully generalize across predators can provide insights into which species can recognize novel predators based on their similarity to existing predators. Mobbing also provides a useful context for the study of learning. Blackbirds, for example, learn to recognize predators by observing conspecifics mob animal models, and can learn to mob previously un-frightening models, even plastic bottles. This ability to learn about novel predators by watching others mob has proven very useful for conservation. Many invasive predators are so successful because their new prey do not recognize them as dangerous. However, if naïve species are trained to recognize novel predators, such as New Zealand robins learning to recognize introduced stoats, they can learn to respond appropriately to these dangerous predators, increasing survival and facilitating conservation efforts.

Mobbing calls often contain information about the danger level of a predator, making them ideal to study how animals communicate vocally. Many species, such as Siberian jays, use different types of calls to differentiate between different predators, for instance owls vs. hawks. These call types can be modified to include gradations based on a predator's distance, size, speed of approach or even behaviour. As mobbing is often instigated by only a few individuals and attended by many, it provides an opportunity to study cooperation. In some cases, mobbing appears to require some form of cooperation that can be enforced. Pied flycatchers, for example, may punish cheaters by withholding assistance during mobbing events at cheaters' nests. Other species, like downy woodpeckers, take advantage of other species' antipredator behaviour, but do not reciprocate by engage in mobbing themselves.

Is mobbing affected by human disturbance? Yes. Like the songs of birds, the vocal signals associated with mobbing are often drowned out, or masked, by human-generated noise. In fact, chickadees, tufted titmice, dwarf mongooses, white-breasted nuthatches and great tits living in noisy environments are less likely to respond appropriately to mobbing calls. While some species modify their mobbing call structure to combat noise pollution, at least in great tits, these alterations are not sufficient to overcome the negative effects of noise. Masking of mobbing calls by noise may have far-reaching repercussions, as animals that are unable to hear anti-predator warnings are more likely to be killed, potentially increasing community-wide mortality. Mixed-species groups are found around the world, often assembling around one or two key sentinel species that engage in intense mobbing and serve as sources of information for the community. If mobbing calls are masked, preventing dissemination of this critical information about predators throughout these communities, then the ecology of these species may change, possibly even resulting in the dissolution of these species assemblages.

Where can I find out more?

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