Life and Behaviour of Wolves: Mesopredators in a scary world

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Mesopredators in a scary world

European red fox – photo by Mario Massone

There is little doubt that stable ecosystems, complete with top predators, are of value. It can, however, become difficult to untangle the web of ecological interactions that stem from predators, as identifying benefits or "ecosystem services" from apex predators can be problematic. It is relatively well known that predators like wolves can affect the behaviour of their prey species (Wolf Print issue 46). While there is some debate about the extent of their impact, top predators like wolves may also impact numbers, distribution and behaviour of other predators too. Particularly those smaller predators known as mesopredators, who are not at the top of the food web. Larger predators can consequently limit the impact of these smaller predators on their own prey in a trophic cascade.

Competitive killing between species, predation and harassment are common in a whole range of mammalian carnivores, particularly between species with elements of niche overlap, food sharing or habitat resources. Such competing species often have a similar body mass and are of the same family. For example, wolves have been observed to interact competitively with other canids such as the coyote and red fox.

The ultimate cost to fitness that an animal can experience is that of predation. Harassment and associated energetic loss can also impact overall fitness. Two main mechanisms offer explanation for the suppression of mesopredators by larger predators: direct lethal encounters and behavioural or distribution responses motivated by fear of direct encounters. Wolves can consume or kill other predators but more importantly they also scare them. Large carnivores can impact the habitat use and the foraging efforts of smaller mesopredators. Harassment, competition for prey and kleptoparasitism (the stealing of food kills) can generate avoidance of larger carnivores through using different spaces or using the same spaces at different times, as well as investment in other anti-predator strategies like defence. Predation risk and disturbance create trade-offs between avoiding risk and other fitness enhancing activities (feeding, breeding), to the point that risk avoidance carries costs in the form of missed opportunities.

Competitive killing between species, predation and harassment are common

Suppression of mesopredators by wolves can result in a reduction of population density or even exclusion from habitats or regions, either completely or at particular times. In the absence of larger more dominant predators; smaller predators and omnivore populations often explode, increasing abundance by up to ten times before release. The mesopredator release hypothesis predicts that a decrease in the abundance of top predators results in an increase in the abundance of mesopredators, due to a reduction in direct predation and competition. Mesopredator release can have detrimental impacts on the prey species of mesopredators and consequently economic and social costs. Whether this is through a decline in game birds or other mesopredator prey species utilised by people, a decline in seed dispersal services from rodents and birds, or even increased disease transmission to domestic animals from mesopredators. Interactions between predators that are induced by fear can have cascading effects on interactions between mesopredators and other species. This consequently can impact population dynamics and species composition further down the food chain. Because of fear from larger predators a mesopredator may respond to the risk associated with certain types of habitat where they are more vulnerable. This may include open spaces where mesopredators are more exposed. Woodlands may provide cover and reduce detection but they can also present obstacles. Woodlands with many fallen tree branches can carry a different risk, making escape more difficult. Vulnerable mesopredators may avoid areas highly used by wolves, or even times of day when they are more exposed, such as during the day or moonlit nights. As a consequence of aggression between carnivores, foraging decisions by mesopredators are also influenced by risk or fear from their own predators. It is quite likely that the significance of behavioural interactions between predators has been

underestimated. If smaller predators change their feeding behaviour then this may alter the species composition, behaviour, adaptive evolution or population dynamics of their prey and perhaps other competitors as well.

Mesopredators have been reported using peripheries of larger predator territories, presumably reducing encounters with larger predators and increasing fitness. Distribution of predators over large spatial scales may be dependent on competitive interactions. The presence of wolves in North America is thought to be strongly linked with the distribution of coyotes, with wolves limiting habitat use by coyotes. This is something that humans could consider beneficial, considering coyotes generally have higher predation rates upon livestock. However, those interested in large game animals may prefer coyote presence to that of wolves.

The removal of wolves and the range expansion of smaller predators can effectively throw the balance out of whack. Coyotes, due to their smaller size, cannot easily prey upon adult deer, which are a prey species for wolves. Therefore deer are released to forage more freely. An increase in coyotes however, may mean that young deer become more heavily predated. Coyote prey species and smaller competing predators such as kit or red fox as well as their prey species may also be more heavily affected by both predation and fear from Coyotes in the absence of wolves. Fearful interactions between predators may be part of what permits the co-existence of multiple prey species, with certain prey species prospering in places or at times where dominant predators limit the presence of subordinate predators. Rodents, important seed dispersers, are often more abundant where wolf presence limits rodent predators.

There is great debate about the strength of impact apex predators have upon mesopredators. Rarity and inconsistency of agonistic interactions and or behavioural avoidance of encounters may permit co-existence between predators. The extent to which mesopredators are impacted by larger carnivores and consequently the effects of mesopredators on other species is likely to be highly variable. Larger predators may competitively suppress smaller predators but also provide scavenging opportunities, and sometimes have negligible impact. The degree to which mesopredators have to adjust their foraging efforts, activity patterns, vigilance and risk taking is likely to vary depending on the predators involved, habitat complexity and food availability but particularly with human influences. Additional fear from humans could further limit foraging opportunities for mesopredators and human interference with larger predators could potentially reduce mesopredator suppression.

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In trying to manage predator communities it is not only difficult to please all the people concerned but also to predict the outcomes of human interference. Caution must be expressed when interfering with ecological interactions. The addition of alien predators such as free roaming dogs and cats can interfere with interactions between predator communities. Predator eradication can also have unforeseen consequences, even with conservation in mind. Invasive species removal can have undesired effects through mesopredator release. The removal of invasive predators such as the domestic cat have in some cases actually increased predation pressure upon native bird species through the release of pressure on invasive rats, who also prey upon bird nests.

As the most dominant landscape user on the planet, humans have the potential to influence ecosystems and the organisms that inhabit them in a myriad of ways. Human disturbance could interfere with the competitive interactions between species, ultimately affecting spatial occupancy and foraging, with consequences for ecosystem services and trophic cascades. Humans modify the landscape in many ways through roads, fencing, urbanisation, logging nature reserves and agriculture, to name but a few. We provide competition for resources through hunting (so removing potential food sources), livestock grazing (competing with wild prey species), and provide food supplements (discarded waste or feeding stations for hunting). Humans also implement predator control or conservation measures. All of these actions can cause changes to species composition and change the interactions between predators and consequently their prey. Benefits derived from the presence of apex predators could be very much dependent on the human context, so it is important to understand the many different interactions that large predators have with other species and how human action may change this, for the worse or for the better.

Raccoon – photo by Dave Menke

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