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Editorial: Behavioral and physiological adaptations of mammals and birds to anthropogenic disturbances

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Editorial on the Research Topic
Behavioral and physiological adaptations of mammals and birds to anthropogenic disturbances

Anthropogenic activities are expanding exponentially and are transforming large areas of natural habitat dramatically. Habitat loss is not the only anthropogenic disturbance that directly affects wildlife, other disturbances that accompany urbanisation and industrialization can also disrupt natural activities of wildlife. Some species are able to adapt their behaviour to thrive in these transformed environments, whereas others disappear. Anthropogenic activities are regarded as a threat to biodiversity, and there is a dire need for mitigation actions which would allow humans and wildlife to co-exist in the same space.

Construction of roads is an integral part of urbanization, and it can impact wildlife negatively not only by fragmenting their habitat, but also by creating traffic noise. Previous studies frequently investigated the effect of traffic noise on acoustic communication, reproductive success and stress hormones in animals (Crino et al., 2013; Caorsi et al., 2017). Chronic exposure to traffic noise can also affect other factors such as behaviour and metabolic rate. Qu et al. showed that chronic noise exposure increased exploratory behaviour and stress hormones while it decreased the resting metabolic rates of pikas, and it altered the correlations between these factors. Increased stress levels can negatively affect the health and survival of animals.

Anthropogenic disturbances are not exclusively associated with the expansion of cities, but also include other disruptions to natural ecological systems such as those caused by farming practices. Grasslands are frequently degraded by grazing livestock. The timing, duration, and intensity of grazing of large herbivores can change the composition and height of vegetation (Wei et al., 2022a; Wei et al., 2022b), that in turn can affect population densities of small mammals, in particular since there are predation risk implications (Wei et al., 2023). The effect of grazing appears to be species specific, and dependent on whether small mammals are able to take advantage of changes in vegetation and exploit this niche. Changes in the vegetation structure could proportionally increase preferred food sources of small rodents. They spend less energy to on feeding, thereby reducing foraging costs which can make the habitat more appealing for them (Zhang et al.). In addition, the perceived

predation risk can further be lowered by living in groups and is evident in the behaviour and physiology of small mammals. Zhou R. et al. showed that at higher population densities, pikas increase their foraging time, and reduce their vigilance, they have lower levels of stress hormones, and higher reproductive hormone levels. Together, these factors increase the reproductive potential of the animals, and can lead to a population explosion, resulting in increased human-wildlife conflict.

Li et al. demonstrated that grazing activities of large herbivores in the Alxa desert (China), changed interspecific interactions between small herbivorous mammals. Grazing reduced plant heights, density, and cover, inducing a significant reduction in the activity of small desert rodents. Increasing competition between the different rodent species effected changes their timing of their activity to reduce the temporal overlap. Desert rodents displayed an increased sensitivity to environmental changes. This is of concern since climate change research suggests drier and warmer climates in future (Idris et al., 2022), which could have serious implications for animals that already live in harsh habitats and appears to be vulnerable to environmental changes.

Grazing by large herbivores can also change the community structure of small mammals. Grazing, and overgrazing typically change the structure of the plant community and can have knock-on effects on small mammals that relies on it. Yuan et al. demonstrated a reduction in the rodent community resilience, evident from the reduced number of r- selected strategists, and an increase in resilience variability as is apparent from larger variability in abundance and species richness of r-selected strategists.

Agricultural land use as intensified in the past few decades and has transformed large areas of natural habitat to arable land (Foley et al., 2005). Monocultures such as maize reduce biodiversity, soil fertility and ecosystem stability (Wang et al., 2019). Although rodents perform useful ecosystem services such as biological pest control and pollination in crop fields, the abundance of food can lead to population explosions of rodent species that can exploit these food sources (Fischer et al., 2018). Monocultures can have how levels of certain organic compounds that are essential that for survival. Niacin is one such a compound and deficiencies thereof affect animals that are already restricted to a suboptimal habitat, adversely. Selimovic A. et al. showed that niacin deficiencies affect the reproduction of European brown hares negatively and contributes to the decline in their local populations. Selimovic A. et al. also undertook a more focused study to investigate the effect of dietary niacin deficiency in European brown hares. They revealed that although there was no difference in the reproductive output and survival rate of leverets in European brown hares, a niacin deficit caused females to have a lower body mass and their leverets did not grow as fast.

The effect of agricultural crop farming on the small mammal community is further illustrated by the reduction in community stability when the temporal variation of the community increases. Yuan et al. showed that when land was reclaimed for agriculture in the Alxa desert, a decrease in rodent community stability was evident from the decrease in the number of K-selected strategists and the increase in their abundance and species richness variability.

We conclude that responses of wildlife to anthropogenic disturbances are species dependent. Many species are well adapted to their natural habitats, such that when the climate and/or vegetation changes, they retain the characteristics of their historical habitats. These species do not respond well to changing environmental conditions as a result of anthropogenic disturbances, and such changes can result in the destabilization of ecosystems by altering the community structures. Some species are more tolerant and flexible to disturbance and are able to take advantage of changed environmental conditions to a certain extent. It is clear that, depending on the life history of the different species, anthropogenic disturbances can have profound implications for biodiversity.

Author contributions

MO: Writing – original draft. WW: Writing – review & editing. DL: Writing – review & editing.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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