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RETHINKING RODENT CONTROL: TOWARDS A MORE ANIMAL FRIENDLY APPROACH

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Abstract Nuisance caused by rats and mice is typically addressed through lethal control methods. However, this approach raises significant ethical concerns, as it adversely affects the welfare of both target and non-target species. Moreover, such measures are often ineffective if the underlying causes of the nuisance are not properly addressed. Without implementing preventative strategies to mitigate rodent presence, the issue remains unresolved. Future rodent management strategies can adopt another approach, one that is focussed on preventing conflicts from arising and one that is future proof, promotes co-existence and resonates with modern approached to animal welfare. Recent advancements in Integrated Pest Management (IPM) in the Netherlands highlight a shift towards prevention as a fundamental component of rodent control. Nevertheless, there is potential for further enhancement of animal welfare in the management of commensal rodents. This paper proposes a series of recommendations aimed at fostering a more animal friendly approach to rodent control. These suggestions are informed by the International Consensus Principles for Ethical Wildlife Control and other current and other current or future developments in both rodent management practices and animal welfare.

Key words Animal welfare, control methods, integrated pest management,

INRODUCTION

Humans share the planet with many other animals. Both human and non-human animals (hereinafter animals) have moral status, they are subject of a life and have interests that should be taken seriously, e.g. living a life, reproducing, not being harmed, being free of suffering and experiencing positive emotions (Singer, 1975; Regan, 1983; Francione, 2010; DeGrazia, 2020). With shared spaces, interests of humans and animals may however collide, and conflicts arise. Commensal rodents, e.g. Norway rats (Rattus norvegicus), black rats (Rattus rattus) and house mice (Mus musculus) populate human dominated areas in abundance. They are perfectly adapted and make smart use of everything that humans offer them, such as shelter and food. It is no surprise that conflicts develop between humans and these rodents. Rats and mice may enter houses or other buildings and gnaw on electricity cables or eat from food storages. Furthermore, they may transfer pathogens such as viruses, bacteria and parasites causing disease risks for humans or other animals such as livestock and pet animals (Meerburg et al., 2009; Himsworth et al., 2013; Velkers et al., 2017; De Cock et al., 2023). It is for those reasons that most humans see rats and mice rather leave. Commensal rodents are typically stigmatized as ‘invaders’ who do not belong at certain locations (Donaldson and Kymlicka, 2011). This results in a situation in which humans actively perform rodent control, usually with lethal methods. Common control strategies contain different types of poisons and traps (Buckle and Smith, 2015; Van Gerwen et al., 2020;

Baker et al., 2022; De Ruyver et al., 2023). The application of these different control methods raises however ethical concerns. They violate basic interests of rodents, such as (the continuation of) life, not being harmed and good welfare (e.g. Singer, 1975; Regan, 1983; Yeates, 2010; Francione, 2010). Several studies have investigated these impacts and ratings with relative welfare impacts of control methods were made (Littin et al., 2014; Baker et al., 2022; De Ruyver et al., 2023).

Another problem is that these control methods have a negative impact on other species than mice and rats. From anticoagulant rodenticides it is well known that they cause poisoning in natural predators of rats and mice, such as martens and birds of prey (Buckle and Smith, 2015; Van den Brink *et al.*, 2018), and pet animals (Caloni *et al.*, 2016). Also, mechanical methods may impact non-target species (Peitz *et al.*, 2001; Schlötelburg *et al.*, 2021). In snap traps animals such as martens, small birds, amphibians, hedgehogs and squirrels may be trapped and killed (personal communication by pest controllers).

The final concern is that (lethal) control does not solve the underlying cause of the conflict. It only has a temporary effect and needs to be applied repeatedly when the core cause of nuisance or conflict is not considered and tackled, leading to more victims over time. Without implementing preventative strategies to mitigate rodent presence, the issue remains unresolved. This means that neither the interests of humans are safeguarded for the long term.

To prevent and solve conflicts in such a way that both the interests of humans and animals are taken seriously we need to take another approach, one that prevents conflicts from arising in the first place and resolves them in a both human and animal friendly manner. An approach which is future proof, promotes co-existence and resonates with modern approaches to animal welfare such as the Five Domains model (Mellor and Beausoleil, 2023). In this paper recommendations aimed at fostering a more ethical and animal friendly approach to solve conflicts between humans and commensal rodents are presented.

METHOD

As a start for the recommendations, I use both the principles of Integrated Pest Management (IPM) and the International Consensus Principles of Ethical Wildlife Control (Dubois et al., 2017).

Following EU legislation (Regulation (EU) 528/2012, art. 19(5)), IPM is a prerequisite for rodent control in the Netherlands since 2023 (IPM, 2023; HIK, 2023; Van Gerwen et al., 2024). The IPM approach makes the use of anticoagulant rodenticides and cholecalciferol only possible for professional pest controllers with a license. Private persons are no longer allowed to use these types of rodenticides for controlling rats or mice. The objective of IPM is to minimize the use of these chemical methods by preventing rat and mouse infestations from developing. Prevention covers measures such as sealing off holes in buildings, storing food and animal feed in rodent-proof containers, proper recycling of waste and cleaning up food spills. When prevention and mechanical methods (e.g. snap traps) fail to solve the conflict or in emergency situations with acute health risks, chemical methods can be used as a last resort. The IPM approach highlights a shift towards prevention as a fundamental component of rodent control and has the potential to be beneficial for rodent welfare (Van Gerwen and Meijboom, 2022). Nevertheless, the practical implementation of IPM can still be a challenge (Van Gerwen et al., 2024) and can be improved to facilitate a more animal friendly control which is in line with the International Consensus Principles of Ethical Wildlife Control (Dubois et al., 2017). This can be done by including or improving the following four steps (see also steps 1-5 in figure 1) in the

IPM approach: setting an objective threshold, execute a risk and ecological assessment, apply smart monitoring and prevention and choosing control methods with lower welfare impacts. With each recommendation, also some points of attention and/or discussion are presented.

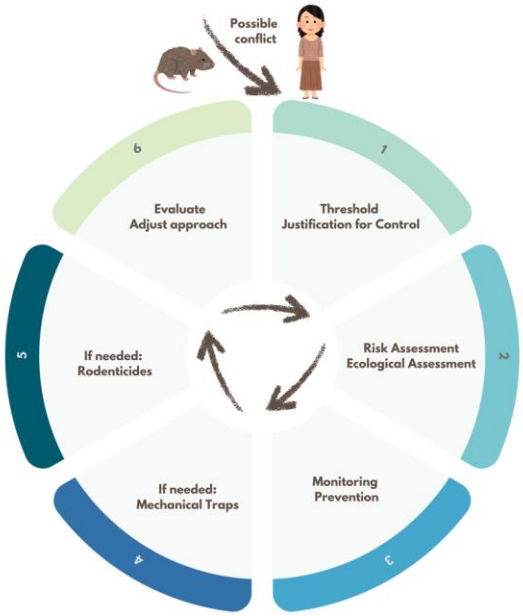

Figure 1. Schematic representation of the steps to take for a more animal friendly management of commensal rodents, based on the principles of Integrated Pest Management (IPM).

THRESHOLD AND JUSTIFICATION FOR CONTROL

IPM starts with a first contact with the client to get to know the reasons for contracting a pest controller. This first conversation forms a good moment to get a description of the desired situation, which also entails identifying conditions that do not meet this ideal by setting a specific threshold for rat and mice presence and activity. A threshold, as a part of the risk assessment (step 2 in figure 1), can be used to establish the objectives of an intervention (ranging from prevention to lethal control), set up monitoring (criteria), to evaluate the effects afterwards and adjust the approach accordingly (step 6 in figure 1). It sets the point at which risks become unacceptable and can be used to facilitate informed decision-making regarding the initiation or cessation of specific control interventions.

Besides this more technical function of threshold, it may have an ethical function, which is to use it for the justification of control measures (Yeates, 2010; Dubois *et al.*, 2017). By providing evidence that the presence of rats or mice is harmful to humans (e.g. human health, human property, ecosystems, or other animal species) and the advantages of control measures outweigh these harms, control measures can be justified. But how to define this threshold?

From an ecological standpoint, the threshold may correspond to the ecological carrying capacity. The number of animals that can be sustained in a particular location is determined by the availability of food and the opportunities for reproduction and shelter. This ecological carrying capacity can be influenced by preventive measures (see also point 2), such as the removal of waste or excess food and closing entrance to potential shelters.

In practice, decisions regarding the control of rodent populations are, however, often not based on this ecological carrying capacity but rather on cultural carrying capacity (Dubois *et al.*, 2017; Van Gerwen *et al.*, 2021). This concept refers to the maximum number of animals that humans are willing to tolerate in an area (Ellingwood and Spignesi, 1986). Cultural carrying

capacity may be influenced by various factors, including the number of animals present, the type of location (Van Gerwen *et al.*, 2020; 2023; 2024), and public perceptions of the animals (Taylor and Signal, 2009; Donaldson and Kymlicka, 2011; Herzog, 2011; Bradley *et al.*, 2020). Different stakeholders may hold different views on this matter (Van Gerwen *et al.*, 2020, 2023, and 2024). To fulfil the second and third principles of ethical wildlife control (Dubois *et al.*, 2017), namely the justification for control and the establishment of clear and achievable outcome measures, the threshold and plan for the risk assessment should be determined in an objective and quantifiable manner. Examples of doing so can be found in other areas where risk assessments are common, like for example invasive alien species management (Andersen *et al.*, 2004; Matthews *et al.*, 2017). A threshold can be established location or situation specific. What is still acceptable in a city park might not be acceptable in a supermarket (Van Gerwen *et al.*, 2020; 2023; 2024). An important point of attention is that thresholds should not be predicated on negative labels (e.g., pest, vermin or even alien species) assigned to the animals (Dubois *et al.*, 2017), but on measurable indicators. Public education or the implementation of anti-stigmatization safeguards through legislation and policy could overcome those labels (Donaldson and Kymlicka, 2011; Dubois *et al.*, 2017).

ISK ASSESSMENT AND ECOLOGICAL ASSESSMENT

Upon establishing the threshold, it is essential to ascertain whether this has been or could be exceeded. This can be achieved through the implementation of a risk assessment. The risk assessment should comprehensively document all factors related to the presence of commensal rodents and the resultant nuisances (levels above the threshold) in an objective manner. It should in any case cover how many rats or mice are (or could be) present at the location, what kind of (health) risks this brings for humans and other animals, what the (potential) economic and ecological consequences are and what regulations and policies are in place in relation to rodent presence (e.g. hygiene codes) (HIK, 2023). Like the establishment of the threshold, the risk assessment should also be objective and contain clear and measurable indicators for measuring risks. It should be uniform and applicable to different situations and locations. Examples and points of discussion for executing risk assessments can be found in literature related to for example invasive alien species. In addition to the risk assessment, I recommend conducting a broader ecological assessment, particularly in outdoor environments. This assessment will provide insights into the presence of natural predators of rodents, as well as other fauna that may be affected by potential control measures. The findings from this ecological assessment should be integrated into any approach that follows and might be included even in the risk assessment method as a specific category.

MONITORING AND PREVENTION

Monitoring and prevention are actions in the IPM approach that need to be executed permanently throughout the whole process, also at moments where (lethal) control methods are applied because prevention alone did not lead to an acceptable situation.

Monitoring in the practice of rodent control can be conducted in different ways, using observations of rodent tracks, non-toxic bait or snap traps, that are inspected at regular intervals. When using snap traps (or other lethal traps) for monitoring rodents already have been killed during the monitoring phase and their interests infringed. Traps might also catch non-target species. This is both problematic for those species as for the effectiveness of monitoring (with another animal in the trap there is no measurement of rodents). I recommend performing

monitoring in a smart way, without harming animals and using other monitoring methods, such as camera traps and live observations in the field. Furthermore, the technique of eDNA might be useful for the monitoring of presence of commensal rodents (Shiels *et al.*, 2018; Piaggio *et al.*, 2024).

Applying and implementing prevention can be challenging. For prevention to work and be effective different stakeholders are necessary and need to act. Dutch pest controllers have indicated that they have trust in prevention, but also encounter clients who do not want to invest sufficient efforts and money in prevention (Van Gerwen *et al.*, 2020). A follow up study shows that clients, particularly in the agricultural sector do not have a lot of faith in prevention and are sceptical towards IPM (Van Gerwen *et al.*, 2024). Human behaviour in relation to for example garbage disposal and feeding birds in gardens and parks, may also be of large impact to the effect of prevention. Implementing proper prevention strategies may therefore, apart from technical measures, involve strategies focussed on human behaviour change, communication and education. Furthermore, it is important to have more data about the effects of prevention (Van Gerwen *et al.*, 2024). Working with a threshold and measurable outcome objectives for interventions could contribute to achieving this data.

CHOOSING CONTROL METHODS WITH THE LEAST IMPACT

In situations where prevention is not possible (on the short term) or fails to keep the situation below threshold, interventions with (lethal) control methods may be inevitable. In those cases, effective methods causing the least harm to animals (both rodents and other animals) should be selected (Dubois *et al.*, 2017). According to the IPM approach, mechanical methods (step 4 in figure 1) are chosen before chemical methods (step 5 in figure 1). The latter ones can only be used in situations where prevention and mechanical methods are not sufficient.

The assessment of the welfare impact of different methods can be done in a systematic scientific way and different studies rating methods on their welfare impact exist already (Littin *et al.*, 2014; Schlötelburg *et al.*, 2021; Baker *et al.*, 2012 and 2022; De Ruyver *et al.*, 2023). The selection of a method causing the least harm may be done by using decision trees, assessment frameworks or comparable step-by-step approaches or guidance document, see for example the work from Yeates (2010). In that approach the selection of a method should be based on three criteria, namely: the impact on rodents, the impact on the environment or non-target species and the effectiveness of the method.

There are many different methods available, all with their own impact and effectiveness. Some are tested in an independent and objective way before entering the market, but others are not. In the studies on the relative welfare impacts for some methods a range of impact (for example from good use to worst case scenario) is presented, sometimes depending on how the method is used exactly and by whom. It might be complex for users of methods (both professional pest controllers and the public) to get a clear view on the impacts of methods and to choose a method with a lower impact (De Ruyver *et al.*, 2023). To make it easier to select methods and to prevent the use of non-tested methods of which the effects on both animals and effectiveness are not known, it is recommendable to introduce official approval of methods before market entrance. Like is the case for biocides already in Europe (Regulation (EU) 528/2012, art. 19(5)). Sweden is an example of a country where testing and approval of traps is required. The Swedish Environmental Protection Agency (EPA, part of the Ministry of the Environment) approves methods following special regulations and lists of accepted methods are available (Naturvårdsverket, 2025). Depending on regulations and/or testing results of methods,

criteria could also be established to decide whether a method with a high risk for a worst-case-scenario impact can be used by the public or only by licenced and trained professionals (such as is required for the use of rodenticides in the Netherlands).

CONCLUSION

Rodent control (with lethal methods) causes ethical concerns mainly related to the welfare of the targeted rodents and non-target animals. By choosing another approach, the management of commensal rodents can be performed in a more animal friendly manner. This approach starts with defining a threshold or acceptance level and an evidence-based and objective justification of control. By adding an ecological assessment to the risk assessment, natural predators and prevention of by-catch can be included in the approach. In the approach, prevention of conflicts between humans and rodents has a central role. When this is not sufficiently effective, (lethal) control methods with the lowest impact on animal welfare should be chosen. For doing so, more objective data about impact and effectiveness is necessary and should be publicly available.

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