Commentary

The mink is not a reliable sentinel species☆

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A B S T R A C T

In a recent review paper, Basu et al. [Basu, N., Scheuhammer, A.M., Bursian, S.J., Elliott, J., Rouvinen-Watt, K., Chan, H.M., 2007. Mink as a sentinel species in environmental health. Environ. Res. 103, 130–144] suggested that the American mink (formerly Mustela vison, now Neovison vison) should be used as a sentinel species for studies of the effects of pollution on environmental health. They based this assertion in large part on their conclusion that mink meet a set of criteria required by a sentinel species. In this commentary, we suggest that Basu et al. overlooked an important criterion for sentinel species – that the species must be a continuous resident of the environment under evaluation. Across their native range and beyond, mink are commonly farmed for the fur industry, and a long history of studies has shown that where they are farmed, they escape. For example, in southern Ontario, Canada, 64% of the mink have been genetically identified as domestic in origin, or domestic–wild hybrids. Thus, we argue that mink do not meet the criterion of continuous residence, and cannot be reliably used as sentinel species. There is a strong likelihood of biased inference when mink are used for such purposes.

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1. The occurrence of domestic mink in the wild

It has been well known for decades that American mink escape from farms in Europe, and this phenomenon has been studied intensively (Bonesi and Palazon, 2007). Indeed, American mink are not native to Europe but have largely colonized the continent via escape from farms. More recently, we have studied the escape of mink from farms in Canada, and have concluded that its occurrence there is also common and widespread. For example, in southern Ontario, 64% of free-ranging mink sampled were genetically determined to be either of domestic origin, or domestic–wild hybrids (Kidd et al., 2009). We estimate that across Canada in any given year, up to 38% of the mink population harvested by trappers is a farm escapee (Bowman et al., 2007).

Domestic mink escaping from farms can confound studies of environmental pollution. For example, Basu et al. concluded that mink can provide data on spatial trends in environmental Hg

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not straightforward. Although domestic mink can sometimes be identified by their pelts characteristics, samples donated by trappers are usually skinned, and so this option is not routinely available. Body size could be used as an indication because domestic mink are larger but there is variation in body mass of both domestic and wild mink (Kidd, 2009). Further confounding the use of mass as an index of size is the fact that it appears that domestic mink can lose mass very quickly after escaping from a farm. We have observed the loss of nearly 1 kg in less than 1 month (unpubl. data). A better option may be to use a measure of structural size such as skull length (e.g., Tamlin et al., 2009). Even better, genetic methods could be used (e.g., Kidd et al., 2009), but this adds a costly, time-consuming element to studies of environmental health. Regardless of methodology, it is clear that domestic mink must be excluded from samples taken to characterize environmental pollution. It is not apparent that this step is routinely taken in such studies. We consider it quite likely that escaped domestic mink have been included in many studies of pollution in purportedly wild mink. If we assume that mink originating from mink farms would tend to be less polluted than mink born in the wild in the same geographic area, the inclusion of domestic mink in samples would both contribute to variability in the apparent body burdens of pollutants, and would lower the mean burden. This would lead to the biased inference that the environments being assessed are less polluted than they actually are, and thus mink would be unreliable sentinels.

The issue of escaped domestic mink is particularly relevant for 2 of Basu et al.’s 10 recommendations for using mink as a sentinel species (recommendations 1 and 8). We discuss each of these below.

1.1. Recommendation 1

Basu et al. state that “wild mink” are spread across Europe and South America. They also state that carcasses can readily be obtained from trappers. The implication of these statements is that wild mink can be sampled to provide information on pollution of local environments across Europe and South America.
This is clearly false. All American mink in Europe and South America are either domestic mink or the progeny of domestic mink. This species is only endemic to North America. Furthermore, there is substantial evidence that mink continue to escape from farms at a high rate in many of these jurisdictions (e.g., Hammershøj et al., 2006). Thus, the criterion of continuous residence cannot be easily confirmed. Beyond the issue of continuous residence, we also feel it is inappropriate to suggest using an invasive alien (such as American mink in Europe) as a sentinel for environmental health.

1.2. Recommendation 8

Basu et al. state that “behavioural tests are a vital component of toxicity programs”. They argue correctly that it is important to understand how toxins affect behaviour because altered behaviour can be an important sublethal effect of contamination. Although we have not mentioned behaviour in our comment to this point, it has been very clearly demonstrated that owing to pleiotropic effects, the behaviour of domestic mink varies by color line, in a variety of substantial ways. For example, mink of different colors vary in their tendency to behave defensively toward humans (Trapesov et al., 2008). Further, domestic mink very likely have different behaviour than wild mink because domestic animals are often selected for tamability (Trut, 1999). Thus, behavioural data are susceptible to being confounded by domestic mink.

2. Summary

To summarize, we are less confident than Basu et al. that mink can be used reliably as sentinel species in studies of environmental health. We have tried to point out why this is so. Mink farming is a large and global industry. In 2007, nearly 60 million pelts were produced from domestic mink in more than 20 countries. A long history of studies shows that wherever mink are farmed, they routinely escape. Thus, an important criterion for a sentinel species, that of continuous residence in the environment being sampled, cannot be reliably assumed for mink in most jurisdictions. Where this criterion cannot be ensured, we suggest that mink should not be considered a sentinel species.

References


