

Carnivores: introductions and alien invasive species

This issue of *Lutra* has two articles on mink. One is on the feasibility of reintroducing the almost extinct European mink (*Mustela lutreola*). The authors (Zwartenkot et al.) come to the conclusion that the Netherlands has a considerable number of suitable areas for the reintroduction of the European mink. A few months ago Springer Nature published the volume on carnivores as part of the Handbook of European Mammals. It showed that, apart from Russia, the critically endangered European mink is now restricted to south-western France, northern Spain, the deltas of the Danube and the Dniestr (Romania and Ukraine) and the Ukrainian Carpathians. Since the mid-19th Century its range has contracted by 90%. There is an introduced population on the island of Hiiuma (Estonia). This introduction succeeded, but two recent introductions in Germany (in Saarland and Steinhuder Meer) failed. This shows that we should not take the success of an introduction in the Netherlands for granted.

One of the drivers for the disappearance of the European mink is its displacement by the invasive, alien, American mink (*Neogale vison*), which brings us to the second article on mink in this volume of *Lutra*. La Haye traces the disappearance of feral American mink in the Netherlands to the closure of mink farms during the COVID-19 period. Apparently, the presence of free-living American mink was being sustained by constant escapes from mink farms. The disappearance of American

mink in the wild offers a unique opportunity to reintroduce the highly endangered European mink in the Netherlands, which takes us back to the article by Zwartenkot et al.

The successful reintroduction of the otter (*Lutra lutra*) in the Netherlands shows that introduction of a semi-aquatic carnivore can succeed. This success also shows that water quality has improved, for example, with a reduction in pollution from organochlorine substances. On the other hand, there may be a risk of intraguild predation, which means that the well-established otters may kill European minks, which will be present in low numbers just after release.

Whereas the impact of pollution on otters seems to be resolved, this may not be the case for the garden dormouse (*Eliomys quercinus*), which just like the European mink, has lost a large part of its range. The cause of the disappearance is still not clear, but recently an article published in Germany suggested that pesticides may have a negative effect. Van Norren et al. provide a first indication of the exposure of the Dutch garden dormouse population to currently used pesticides. The Netherlands has only two populations of garden dormouse left and one is the result of an introduction. Both populations consist of not more than a few dozen animals.

The American mink is listed on the European Union List of Non-Native Species of Concern, as is the raccoon (*Procyon lotor*). This means that EU member states should at least

try to control American mink and raccoon. Van den Berge et al. describe the settling of raccoons in Flanders. After decades of records of raccoons that must have been just local first-generation escapes, a raccoon population has been establishing itself in Flanders since 2014. Van den Berge et al. come to the conclusion that it is useless to start a full-scale eradication campaign, as this simply is not going to work, in view of the experiences in Germany.

Raccoons are considered to be a threat to indigenous breeding birds, as they raid bird nests. This could be a reason for local control of raccoons. To protect the nests of meadow birds the Province of Friesland had issued a licence to kill beech martens (*Martes foina*), but two months ago a court nullified the licence, stating that the Province should first improve the general conditions for the meadow birds. This would involve extensification of agriculture.

As all bat species are listed on Annex IV of the EU Habitats and Species Directive, compensation measures are often obligatory, in the cases of, say, development that will endanger their habitat or roosts. Boonman

and Broer studied the occupancy of different types of bat boxes. The boxes were used by noctules (*Nyctalus noctula*) and brown long-eared bats (*Plecotus auritus*). It took five years until noctules started to use the bat boxes regularly and occupancy increased up to 25% after ten years. Noctules seem hesitant to accept new roost sites and/or need a lot of time to discover that bat boxes are suitable roost sites. Official guidelines suggest that placing bat boxes one year before trees are cut would give bats sufficient time to habituate to the new roost sites. However, this study shows that a lot more time may be needed.

The final paper in this volume is from Diekmann et al., who studied the effect of an agrivoltaic system on the presence of medium-sized mammals, including the raccoon, in Germany. Visit frequency and use intensity of the individual species hardly differed between the agrivoltaic site and the control site. However, the species observed are common and adaptable and it remains unclear how other more sensitive species might react.

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