Waterlife Recovery East: a mink free East Anglia

Operational Plan

Introduction

This document sets out the rationale for the project and stipulates how it will be managed and carried out in the field. To succeed in what is a huge challenge, this eradication trial must be based on a strategy that is evidence-based, pragmatic and clear to everyone - trappers, funders, reviewers, organisers, advisers and public alike. The strategy need not remain unchanged for the lifetime of the project, and in fact there are very good reasons why it should be regularly reviewed and suitably amended, but at every stage there should be a definitive document setting out the *current* strategy.

Objective

The objective of this project is to eradicate the invasive American mink *Neovison vison* (hereafter 'mink') from a landcape-scale area of East Anglia such as to provide a meaningful test of the feasibility, cost and duration of a GB-wide eradication campaign. In this context, the minimum area over which eradication should be achieved is 5,000 km^2.

Purpose

The reason for seeking to eradicate mink is to stop the damage they inflict on native wildlife such as water voles and many bird species, thereby allowing native biodiversity to recover.

The problem

American mink were introduced to Great Britain for fur farming in 1929 (Cuthbert 1973). By 2002, when farming was banned, mink had become established in the wild throughout most of England, Wales and Scotland. Today, mink occur from Cornwall in the south-west of England to northern Scotland, on many islands off the Scottish west coast and on Anglesey, North Wales. A lack of records from Shetland, Orkney, the Isle of Man and the Isle of Wight indicates that they are not established on these large islands, despite decades of opportunity for colonisation via vehicle ferry. Mink are widely distributed in mainland Europe and Ireland (Bonesi & Palazon 2007). Mink farms still operate within the European Union; indeed the Republic of Ireland has several, posing a threat of animals escaping or being released (Department of Agriculture, Food and the Marine 2012).

Mink damage native bird and mammal populations (Woodroffe et al. 1990, Craik 1997, Niemczynowicz et al. 2017), and are consequently termed 'invasive' - an invasive alien species or invasive non-native species. In Europe, the American mink is probably the most publicised invasive mammal species, not least because it threatens its native counterpart, the European mink *Mustela lutreola* with extinction (Macdonald et al. 2017). In Britain, populations of one charismatic small mammal, the water vole *Arvicola amphibius*, classified as endangered in GB in the Red list of British Mammals (Mathews & Harrower 2020) and a priority species under the UK Biodiversity Action Plan, are often wiped out by mink (Macdonald & Harrington 2003, Lambin et al. 2019). The vole species declined in England by 81% in the period 89-90 to 96-98 (Strachan et al 2000) and by a further 47% in the 17 years to 2016 (Mathews et al 2018).

Status of mink control in Britain

Efforts to control mink in Britain by trapping have been ongoing for decades, varying in scale from individuals working on private land to multi-million pound landscape-scale campaigns (Baker 2010, Lambin et al 2019, Macleod et al. 2019). But, if it occurs at all, in most areas trapping is temporally and geographically discontinuous, and with few exceptions the effects are temporary; if and when the work stops, mink return (Baker 2010, Lambin et al. 2019, Macleod et al. 2019). There is growing recognition that current efforts in Britain to control the damage caused by mink to native wildlife, especially water voles, are not even containing the problem in many areas (McGuire & Whitfield 2017) and would eventually cost more than a co-ordinated eradication campaign (Moorhouse et al. 2015).

Conflict with native otters *Lutra lutra* and polecats *Mustela putorius* may plausibly diminish mink density and/or range (Bonesi et al. 2006), although a recent review concluded that there was no evidence of otters having caused a decline in mink numbers in Britain (Harrington et al. 2020). Certainly, otters and mink co-exist in many parts of Britain (Bonesi & Macdonald 2004), and the mink is now so well established that it is highly likely to perpetuate without concerted human intervention. The only long-term solution to the 'mink problem' in Britain is to remove them entirely - a prospect that has long been considered by scientists and conservationists (Thompson 1968). However, the eradication of invasive mustelids is notoriously challenging (King et al. 2009), and the logistics and cost have hitherto been considered insurmountable after a failed eradication attempt in the 1960s (Macdonald & Strachan 1999, Baker 2010).

Prospects for a GB-wide eradication attempt

As difficult as it would be to eliminate this mustelid over such a large island, relevant precedents have been set in Britain. Native polecats and pine martens *Martes martes* were exterminated over much of their range by gamekeepers using traps (Lovegrove 2007). Mink appear to be just as vulnerable to trapping, and have been greatly diminished over, or entirely removed from, vast areas of Scotland due to well-co-ordinated, persistent trapping regimes (Bryce et al. 2011, Macleod et al. 2019). In this respect, mink eradication may be feasible in principle, although success would be dependent on finding a way to detect and destroy the last, possibly trap-shy, animals in each area (Zuberogoitia et al. 2010). Removing mink could, importantly, be achieved without collateral damage. The use of live traps as the primary means of capture leaves no toxic residues, and non-target animals captured can be released. Mink eradication would be as close to a 'surgical' process as any pest eradication could be.

Given the large sums currently spent on mink control projects in Britain (Lambin et al. 2019), their limited geographical reach and ephemeral results, it is surely appropriate to keep under review the wisdom of maintaining the management status quo rather than attempting a permanent solution. Indeed, recognising the damage caused by American mink throughout Europe, the Bern Convention on the Conservation of European Wildlife and Natural Habitats, of which the UK is a signatory, recommends that 'Contracting Parties carry out campaigns aimed to eradicate mink, where feasible' (Council of Europe 2017). The only recent true eradication (rather than control) campaign in Britain is that which has sought to eliminate mink from the northern islands of the Outer Hebrides (Moore et al. 2003). By early 2019, that campaign had been almost, but not totally, successful (Macleod et al. 2019). The difficulty in extinguishing the last few animals is reminiscent of the successful English coypu *Myocastor coypus* eradication campaign in the 1970s and 80s (Gosling & Baker 1989, Baker 2010), and an illustration of the very significant differences between control and eradication operations.

In recent years, technological and design innovations have been trialed and/or implemented in mink control operations, and others are expected to be available soon. Together, these developments render the detection and removal of mink more humane and much more efficient. As the scale, complexity, benefits and awareness of successful invasive predator eradications grows (Jones et al. 2016, Martin & Richardson 2019, Martin et al. 2019), so does the vision and ambition to achieve even greater ecological restoration nationally and internationally (Russell et al. 2015, Gardiner 2019). Ecological problems caused by invasive alien species that once seemed insurmountable are increasingly recognised as potentially solvable; as experience is now showing, geographical scale, in itself, is no barrier to success (Martin et al. 2019).

Definition of success

A period of 12 months with no evidence of mink breeding within the landscape-scale project Core Area, despite substantial trapping effort and searching, would be deemed trial success.

Relevant notes:

1. A lack of breeding would inevitably lead to population extinction in the absence of immigration.
2. Removing every mink is not necessary; removing all animals of one sex will bring breeding to a halt.
3. Evidence of breeding could include the confirmed presence of young mink in a family group or the capture of one or more pregnant, lactating or post-lactating females.

Project Management

The project will be overseen by a Steering Group (SG), comprising representatives of major stakeholder bodies (both Government and NGO) and contributing counties, together with relevant experts and volunteer trappers. The SG will meet several times a year, and will make decisions on project strategy and methodology, seeking advice from external experts as necessary. It will provide guidance on Health and Safety matters to contributing organisations and individuals, but will not be directly responsible for the employment or H&S of trappers and others conducting fieldwork. The SG will seek to raise funds to allow the project to proceed, initially directing money raised to contributing NGOs for specified purposes. A charity (the Waterlife Recovery Trust) has been formed in order to raise funds and employ staff directly.

Recognising that this project will be unlikely to ever have the resources to saturate every waterway in the region with rafts and traps, it must seek to maximise the potential of its finite resources. This will be achieved, in part, by adaptive management, i.e. by regularly reviewing management in light of the most recent trapping and other evidence, and modified it as necessary so that trapping effectiveness and efficiency is continuously improved.

To aid evidence-led management, applied research will be encouraged and commissioned by the Steering Group. This research will include genetics and mathematical modeling, perhaps in collaboration with a university (Masters or PhD student). Research to identify an effective synthetic scent lure may well be extremely valuable, especially if it can be manufactured commercially and delivered automatically to traps.

Methods

High level strategy

The following bullet points set out the main elements of the Project's methodology:

1. The project area comprises two adjacent and equally important geographical parts (see Appendix). The first of these, termed the *Core Area*, has a marine boundary to the North and East, and is the area over which project success (i.e. mink eradication) will be tested and determined. The second sector is termed the *Buffer Zone*. It's function is to prevent mink from entering the Core Area overland or via waterways from the West and South. The Buffer Zone will be a minimum width of 60km - this being just greater than the maximum natal dispersal distance found by Oliver et al., (2016). Intensive trapping will occur year-round in both the Core Area and Buffer Zone.

2. The main tool for removing mink will be a cage trap on a raft. This methodology, pioneered by the Game and Wildlife Conservation Trust, is very effective because mink are inquisitive and will often enter a tunnel on a raft even without any lure. Furthermore, any captured non-target animals such as water voles and moorhens can be released unharmed. In some unusual circumstances it may be better to use a cage trap on land. All traps deployed by this project will be fitted with a Remote Monitoring Device (RMD) - an electronic box that detects when the trap door closes and immediately notifies nominated people by text and email to that effect. RMDs allow traps to be set continuously with minimal cost in terms of operator visits, improve the humaneness of trapping and routinely yield valuable information on trap activity.

3. In all but exceptional cases, the day-to-day management of mink rafts will be carried out by volunteers, ideally living locally. These volunteers will normally attend to trap activations and carry out routine raft checks. If any volunteer is unwilling or unable to dispatch a mink, another will be summoned to do so.

4. Every trap will be allocated to a WRE-appointed Co-ordinator, whose task it is to ensure that the trap is managed in a professional and humane way. The Co-ordinator will be aware of every trap alarm and error notification, will check that the trap has been visited and that the Responder has completed the visit safely, and will subsequently enter information about these events in the project database.

5. Scent lures, and especially those derived from anal gland secretions, have proved to be very effective in attracting mink into traps, both in this project and elsewhere (e.g., Roy et al., 2006). Consequently, the anal glands of as many mink as possible will be harvested and the contents used to increase the effectiveness of the trap network.

6. RMDs will be fitted to any older traps/rafts that can be modified to take them. The use of clay detection pads will mostly be restricted to the final stages of the project - to help locate any trap-shy individuals.

7. To achieve the necessary high standards of animal welfare, trap activations should result in a site visit as soon as possible, and always within 24 hours.

8. In conformity with legislation, all captured American mink and grey squirrels (Sciurus carolinensis) will be humanely dispatched.

9. By default, traps should be routinely inspected at intervals of no more than three months, and fresh scent lure added during the visit.

10. Recognising the crucial role of trapping information to the success of the project, by default the location and dates of operation of every trap in the project area will be recorded in the Project database. Similarly, standard information on every mink captured will be collected and recorded on the database, and a tissue sample for DNA analysis will be collected and preserved. By default, every mink captured will be examined and sampled by experienced project personnel, to ensure consistency of data collection and interpretation.

11. Trapping must be carried out year-round. If not, the probability of eradication success will be diminished and the cost and duration of the project will increase, as will the number of mink that have to be trapped overall. Efforts must be made to inform all trappers of the damaging consequences of seasonally closing traps.

12. In principle, traps will be sited throughout the project area, at densities appropriate to waterway habitat and length. Any significant gaps in coverage, for example large nature reserves with suitable breeding habitat, could well create mink refuges and cause the Project to fail. If any significant landowner declines to allow trapping on their property, this situation should be recognised at the earliest juncture and urgently addressed by the SG. It may then be necessary to consult statutory agencies such as Natural England and the Environment Agency to seek a solution.

13. The priority for trapping sites will be where history shows they have the best chance of catching mink or where the habitat will likely be favoured by mink. The most favourable breeding habitats attract roving female mink, and evidence suggests that new mink will move in from elsewhere once the territory holders have been captured. In this sense, these sites would become an ecological 'sink'. This strategy should substantially shorten the period necessary to trap the vast majority of mink.

14. Much trap effort will be focused upon waterways known or likely to be used as a conduit for mink movement, even if breeding habitat is not present.

15. Trapping alone will be the means of removing the vast majority of mink, and trap effort must be continued until the last mink has been accounted for. When the point is reached at which trapping rates are very low, however, intense search effort using trained dogs, eDNA, camera traps and visual searches for mink sign may be required to identify any sites where mink remain in the Core Area. Anglers, boaters, farmers and other members of the public will be actively encouraged to report mink sightings to the project via the WRE website. Once located, these residual mink will be the focus of concentrated trapping effort using lures, and if this fails they will be shot after being located by dogs. Dogs will not be used to catch mink.

16. The purpose of the Buffer Zone is to intercept mink moving into the Core Area, often over relatively large distances. As such, most target animals are likely to be male and are likely to encounter multiple trap sites on their journey. It therefore seems probable that trapping alone will be sufficient for the Buffer Zone to achieve its purpose. However, if it becomes apparent that many mink are passing through the Buffer Zone into the Core Area, and especially if mink born in the Buffer Zone are making this journey, it may be necessary at some stage to instigate the use of dogs to locate mink in the Buffer Zone that cannot be trapped. Use of this expensive means of detecting mink will not, however, be employed in the outer parts of the Buffer Zone because new immigrants can be expected to quickly replace the mink found and destroyed in this way.

17. By default, rafts/traps will normally be left in the same location for many months or even years. However, if trap numbers are limiting, those sited in locations where no mink have been caught for a long period may be moved to another location, perhaps seasonally.

18. Not all mink kills will be made by the Project. Gamekeepers and road casualties account for significant numbers of animals, and knowledge of the location and date of these events will greatly assist effective management of the trial. Consequently, effort must be made to engage gamekeepers and the general public and to persuade them to report dead mink, and indeed live mink.

19. The Project will encourage and engage with organisations and individuals outside the project area, especially those near the Buffer Zone, with the aim of facilitating greater trapping effort to mutual benefit.

Fieldwork protocols

A separate document - Field Manual for Smart Mink Trapping - sets out the details of how trapping will be carried out under this Project. The Manual covers, among other topics, recommendations regarding human health and safety and animal welfare. It is important to state, however, that most Project fieldwork will be carried out by volunteers and employees of established conservation charities, so the Project Steering Group cannot enforce adherence to the guidelines provided.

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Appendix: Map (courtesy of Chris Strachan, Environment Agency) showing the major waterways and river catchments of eastern England, with the boundaries of the WRE Core Area (green) and Buffer Zone (red) overlaid.