



## Collaboration for Environmental Evidence

### Systematic Review No. 85

**WORKING TITLE:** Do management interventions effectively reduce or eradicate populations of *Mustela vison*?

### Draft Review Protocol (Update)

**Lead Update Reviewer:** *Jacquelyn Eales*

**Postal Address:** School of the Environment, Natural Resources and  
Geography, Bangor University, Bangor, Gwynedd, LL57  
2UW, UK

**E-mail Address:** *j.eales@bangor.ac.uk*

**Telephone:** +44(0)1248 382452

**Fax:** +44(0)1248 354997

## Cover Sheet

Title	<b>Working title:</b> Do management interventions effectively reduce or eradicate populations of <i>Mustela vison</i> ?
Systematic review	N <sup>o</sup> 85
Update Reviewer	Jacquelyn Eales
Original Review team	Claire Tyler, Emma Clark & Andrew Pullin
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Contact address	School of the Environment, Natural resources and Geography, Bangor University, Bangor, Gwynedd LL57 2UW, UK.
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Conflicts of interest	None declared

## 1. Background

Introduced American Mink (*Mustela vison*) are a cause for concern to many UK conservation organisations, game keepers and farmers, as an invasive species. *M. vison* were first introduced into the UK in 1929 on fur farms for the fur trade. Escapes led to breeding in the wild, first known to occur in 1956 (Usher 1986). Further releases both accidental and deliberate have led to feral populations of *M. vison* becoming widespread across Britain (Chanin 1981). The problem of invasive mink is not restricted to the UK. The presence of fur farms in many countries across Europe have led to the establishment of feral populations in Austria, Belarus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Iceland, Ireland, Italy, Latvia, Lithuania, Norway, Poland, Portugal, Slovakia, Spain and Sweden (reviewed in Bonesi & Palazon 2007). Non-native populations have also been reported in Patagonia and Argentina (Previtali *et al.* 1998).

*M. vison* are generalist predators, hunting both on land and in water, preying on rabbits, birds, eggs, and fish. They have few predators in the UK and are associated with a wide range of aquatic and semi-aquatic habitats (Halliwell & Macdonald 1995). Their presence in Europe is perceived as a growing threat to native biodiversity (Moore *et al.* 2003). In the 1960's recorded occurrences in the UK were rare, but by 1980 a ten-fold increase in numbers had been recorded, showing their adaptability and dispersal capacity (Tapper 1980).

Management interventions to control *M. vison* include hunting with dogs, shooting and lethal or non-lethal trapping. There are no UK-approved fumigants or poisons for *M. vison*, and whilst forms of immuno-contraception have been explored (Macdonald and Harrington 2003) there are no reports of their use as a management intervention. With each intervention there is the possibility of killing non target species (Short & Reynolds 2001), and further disturbing the area, therefore non-lethal trapping is the most commonly used intervention, as non-target species can be released if caught.

Tyler *et al.* (2005) conducted a systematic review ([www.environmentalevidence.org/SR7.htm](http://www.environmentalevidence.org/SR7.htm)) to determine the effectiveness of control methods to reduce the population numbers of *M. vison*, and any possible deleterious effects of control techniques. This protocol sets out the plan to update this review by considering evidence generated in the last 5 years.

## 2. Objective of the Review

### Primary question:

Do management interventions effectively reduce or eradicate populations of *Mustela vison*?

The aim of this review is to provide an effective synthesis of studies relevant to this question, including meta-analysis if appropriate data exists.

Subject	Interventions	Outcomes	
		Primary	Secondary
Populations of <i>M. vison</i>	Fatal trapping Non-fatal trapping Shooting Hunting with dogs Exclusion (fencing, including electric)	Change in mink populations or distributions	Change in populations or distribution of native species, and other outcomes from <i>M. vison</i> interventions

### 3. Methods

#### 3.1.1 General searches

The following computerised English language databases will be searched:

1. JSTOR (dependant on the journals)
2. ISI Web of Knowledge (2004 to present)
3. Science Direct (All Sciences, 2004 to present)
4. Scirus (All journal sources, 2004 to present)
5. Index to Thesis Online (2004 to present)
6. Copac
7. Agricola (2 databases for the National Agricultural Library, one Public Access Catalogue, and one Journal Article Citation Index)
8. Directory of Open Access Journals
9. CAB Abstracts

Searches will use the following English language search terms:  
 (*Mustela vison* 'OR' mink) 'AND' (management 'OR' control\* 'OR' pest)  
 \* indicates a wildcard.

All references retrieved from the computerised databases will be exported into a bibliographic software package prior to assessment of relevance using inclusion criteria. Bibliographies of included material will be searched for relevant references. Authors of relevant articles will also be contacted for further recommendations, and for provision of any unpublished material or missing data. Raw data from the existing syntheses (Table 1.) will also be incorporated.

An internet search will also be performed using the following web search engines:

<http://www.alltheweb.com>  
<http://www.google.com>

Searches will use a combination of the terms (*Mustela vison* 'OR' mink) 'AND' (management 'OR' control\* 'OR' pest)

\* indicates a wildcard.

The first 50 hits (Word and/or PDF documents where this can be separated) from each internet search will be examined for appropriate data which will be retrieved. More specific search terms may be added as the search becomes more specific. For example, specific terms for interventions may be used such as trap\* and hunt\*. Foreign language searches will be carried out using the Latin name, *Mustela vison*, if it is deemed that there are likely to be relevant studies published in languages other than English. A single reviewer will search the electronic databases, and the number of citations for each search will be recorded.

### 3.1.2 Specialist sources

Searches for publications on the websites of relevant organisations will be conducted; such as the Game Conservancy Trust (<http://www.gct.org.uk/>), Scottish Natural Heritage (<http://www.snh.org.uk/>), the Countryside Council for Wales (<http://www.ccw.gov.uk>), Natural England (<http://www.naturalengland.org.uk/>) and The Wildlife Conservation Research Unit at Oxford University (<http://www.wildcru.org/>). Bibliographies of articles accepted at full text and relevant secondary articles will be searched. Key stakeholders, recognised experts and current practitioners in the field of mink management and control will be contacted for any unpublished relevant material or for information regarding relevant studies.

### 3.2 Study Inclusion and Exclusion Criteria

- **Relevant subjects:** Areas under a control intervention for non-native *M. vison*. The subject will be considered globally, and the geographical area will be recorded in order to interpret any patterns of variation in the results. The geographical location of papers within the UK will also be recorded as the species is thriving in this country and numbers are rapidly increasing, and there may be differences in effects of the intervention in varying habitats.
- **Types of interventions:** Initially all the interventions listed in Table 1 will be considered valid. The review may also have to be restricted if there is not enough literature available on particular interventions. If this is the case, a scope of the literature will be carried out and the intervention(s) with the most available literature will be the focus of the review.
- **Types of Comparator:** The comparator may be temporal (same area at an earlier time) or spatial (direct comparison with a similar uncontrolled area). In some cases, this may be a computer model of the community without mink control occurring, or it may be the monitoring of the number of mink in surrounding areas, not subject to the intervention. Lower hierarchy evidence may be included using a notable change in base line populations.
- **Types of Outcome:** All outcomes will be recorded although the primary outcome is a change in the abundance of *M. vison*.

- **Types of Study:** Any primary studies including data about a relevant subject, intervention and outcome, along with a valid comparator.

The inclusion and exclusion criteria will be applied to all potential studies at the title and abstract stage by one reviewer. The repeatability of study inclusion will be verified by assessing a random subset of the references for relevance using a second independent reviewer. Agreement between the two reviewers must be substantial ( $\kappa=0.6$ ) before assessment of study quality and data extraction from full text articles can be initiated. Articles will be assumed to fulfil the relevance criteria where there is insufficient information to make a decision without reference to the full texts.

### **3.3 Potential effect modifiers and reasons for heterogeneity**

Potential reasons for heterogeneity between studies include length of the study, initial population size, predation (e.g. by otters, *Lutra lutra*), habitat, season, size of the area under control and trapping effort.

### **3.4 Study quality assessment**

Study quality will be scored according to a hierarchy of evidence. A single reviewer will assess each accepted article independently, using a study quality assessment form, modified with respect to the review. The assessment will be weighted according to importance of included factors, primarily study design. A kappa test as described in section 3.2 will be undertaken to minimise selection bias. A “gold standard” study for inclusion in this review would contain control and intervention areas in a randomised block design with replications and a consistent intervention effort over time. Population data would ideally be collected over several breeding seasons and there would be sufficient data for statistical analyses of effect size.

### **3.5 Data extraction strategy**

Data regarding the study characteristics, study quality and results will be extracted using data extraction forms by a single reviewer. It is likely that these forms will be subject to amendment following consultation with statisticians and piloting the process of data extraction. A kappa test as described in section 3.2 will be undertaken to minimise selection bias.

### **3.6 Data synthesis and presentation**

Summary tables of study characteristics, study quality and results will be presented, accompanied by a narrative synthesis. Quantitative analysis will be undertaken on data that is suitable for more formal statistical treatment. Other statistical treatments may be undertaken, depending on the nature of the extracted data. Meta analysis may be undertaken if appropriate data exist.

## **4. Potential Conflicts of Interest and Sources of Support**

There are no potential conflicts of interest declared.

## 5. References

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