



**Managing invasive Reeve's muntjac (*Muntiacus reevesi*) against legal, political and social constraints**

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Animal Health and  
Veterinary Laboratories  
Agency

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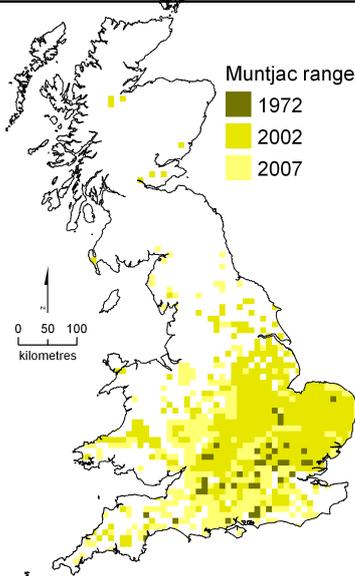
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**Muntjac range**

-  1972
-  2002
-  2007

0 50 100  
kilometres

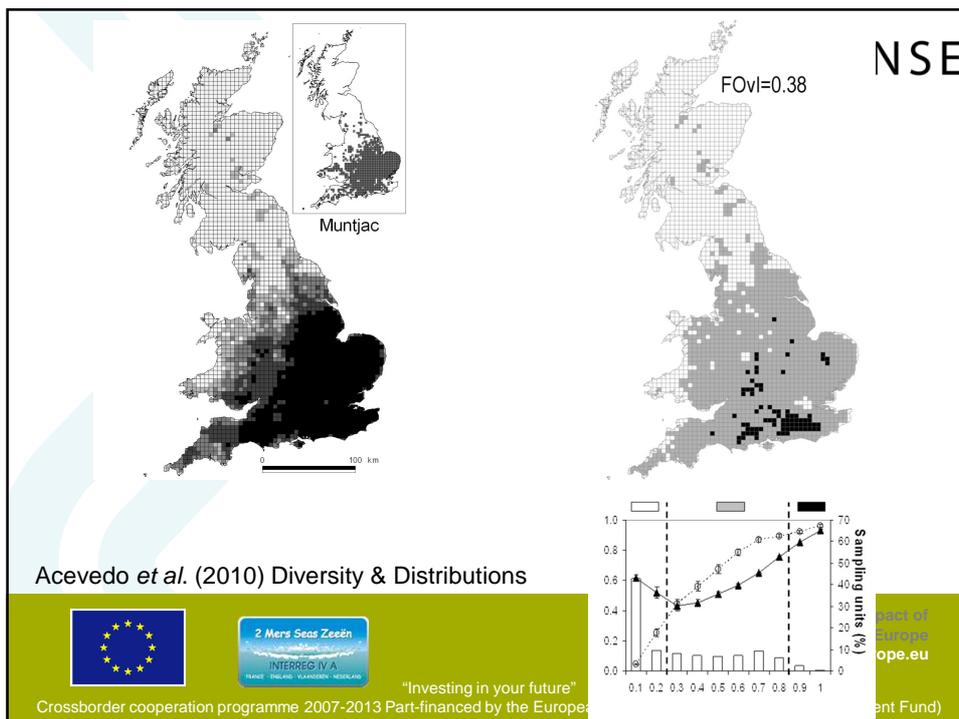


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The RINSE logo is located in the top right corner. Below it is a photograph of two deer in a grassy field. The text 'British Deer Society' is centered below the photo. On the left side, there is a list of bullet points. At the bottom, there are logos for the European Union and the INTERREG IV A program, along with the text 'Investing in your future' and 'Crossborder cooperation programme 2007-2013 Part-financed by the European Union (European Regional Development Fund)'. The website 'www.rinse-europe.eu' is also present.

- Browse line
- Loss of understorey e.g. primulas
- Browsing of hazel coppice
- Ivy – also for monitoring relative abundance/activity

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- BASC - 13,400 deer hunter members
- BASC - c.250,000 deer shot by members
- BASC - c.20,000 muntjac shot
- FC - Thetford c.1000 muntjac p.a. over 15,500ha
- TMS – 128,000 muntjac in England and Wales



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**BASC (2004) Deer stalking survey**




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*Research Article*

### Achieving Landscape-Scale Deer Management for Biodiversity Conservation: The Need to Consider Sources and Sinks

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**ABSTRACT** Hyper-herbivory following predator removal is a global issue. Across North America and Europe, increasing deer numbers are affecting biodiversity and human epidemiology, but effectiveness of deer management in heterogeneous landscapes remains poorly understood. In forest habitats in Europe, deer numbers are rarely assessed and management is mainly based on impact. Even where managed areas achieve stable or improving impact levels, the extent to which they act as sinks or perist as sources exporting deer to the wider landscape remains unknown. We present a framework to quantify effectiveness of deer management at the landscape scale. Applied across 234 km<sup>2</sup> of Eastern England, we assessed management of invasive Roe's muntjac (*Moschus moschiferus*) and native roe (*Capreolus capreolus*), measuring deer density (using thermal imaging distance transects 780 km/year), fertility, neonatal survival, and culling to quantify source-sink dynamics over 2008–2010. Despite management that removed 23–40% of the annual population, 1,287 (95% CI: 289–2,680) muntjac and 585 (454–1,533) roe deer dispersed annually into the wider landscape, consistent with their ongoing range expansion. For roe deer, culls of individuals comprised fewer young deer than predicted by a Leslie matrix model assuming a closed population, consistent with age-dependent emigration. In this landscape, for roe and muntjac, an annual cull of at least 60% and 53%, respectively, is required to offset annual production. Failure to quantify deer numbers and productivity has allowed high density populations to persist as regional sources contributing to range expansion, despite deliberate management programs, and without recognition by managers who considered numbers and impacts to be stable. Reversing an unfavorable condition of woodland biodiversity requires appropriate culls across large contiguous areas, supported by knowledge of deer numbers and fertility. © 2013 The Wildlife Society

**KEY WORDS** *Capreolus capreolus*, evidence-based observation, invasive species, landscape-scale, *Moschus moschiferus*, source-sink dynamics.

Across much of North America and Europe, growing deer numbers are of increasing concern (Duc-Jarvis 1994; Dolman and Wilber 2008; Newton et al. 2012). In modified landscapes that provide high quality food and lack large predators, deer populations are projected to increase further (Went 2005; Stansington and Druel 2006). Deer have severe impacts on woodland biodiversity, altering structure (Martin et al. 2010; Holt et al. 2011; Newton et al. 2012), reducing woodland bird abundance (Holt et al. 2011; Martin et al. 2011), modifying small mammal (Bauchop et al. 2011) and invertebrate (Altemeyer et al. 2005) assemblages, and affecting ecosystem functions including carbon storage (Tannerup and Coomes 2012). Currently high deer numbers threaten to jeopardize proposals to mitigate carbon emissions through increased woodland production (Palmer and Rothery 2010) and are a vector for Lyme disease (Hartfield et al. 2011), with implications for human health. In Europe, fatalities and injuries from deer-related road traffic accidents are increasing, with vehicle damage costing more than 1 billion dollars annually (Brandstark and Hansbock 1996; Apollonio et al. 2010). To control such impacts, deer management is necessary (Department for Environment, Food & Rural Affairs [DEFRA] and Forestry Commission 2010). To be accountable and defensible to the public, deer management should be based on robust, verifiable evidence. Although fencing can alleviate local problems and over- and under-pastures can reduce problems at collision hotspots (Gibbs et al. 2009), management at landscape or regional scales requires lethal control (Department for Environment, Food & Rural Affairs [DEFRA] and Forestry Commission 2010).

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Additional supporting information may be found in the online version of this article.

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Wäber et al. • Considering Sources and Sinks in Deer Management

Wäber et al (2013) J Wildl Manage

- Planned cull of c.3000 annually
- 23-40% removal rate
- Annual density measurements imply population stability
- 289-2680 muntjac dispersed



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“The British Deer Society, a charity, works to enable the deer of the United Kingdom to exist in today’s environment and ensures that their future is secure for generations to come”

[www.bds.org.uk](http://www.bds.org.uk)

“BASC is a national representative body for sporting shooting. We have five strategic objectives:

- A strong and unified voice for shooting
- All [political] party backing for shooting
- Balanced comment to the media
- Continued opportunity to go shooting
- High standards”

[www.basc.org.uk](http://www.basc.org.uk)

“Muntjac stalking packages from Euro 60-410 per animal”  
[www.muntjacstalker.com](http://www.muntjacstalker.com)







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Deer Act 1991

CHAPTER 54

[A table showing the derivation of the provisions of this consolidation Act will be found at the end of the Act. The table has no official status.]

ARRANGEMENT OF SECTIONS

*Offences relating to deer*

Section

1. Poaching of deer.
2. Taking or killing of certain deer in close season.
3. Taking or killing of deer at night.
4. Use of prohibited weapons and other articles.
5. Attempts to commit certain offences, etc.
6. General exceptions to certain provisions of this Act.
7. Exceptions for occupiers etc. of land where deer are.
8. Exceptions for persons licensed by the Nature Conservancy Council for England or the Countryside Council for Wales.
9. Penalties for offences relating to deer.

*Offences relating to venison etc.*

10. Offences relating to sale and purchase etc. of venison.
11. Licensed game dealers to keep records.

*Enforcement etc.*

12. Powers of search, arrest and seizure.
13. Forfeiture and disqualifications.
14. Offences by bodies corporate.

*Supplementary*

15. Orders.
16. Interpretation.
17. Transitional provisions, consequential amendment and repeals.
18. Short title, extent and commencement.





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Scottish Natural Heritage  
Commissioned Report No. 457

### Analysis of cost of preventing establishment in Scotland of muntjac deer (*Muntiacus spp.*)



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**AHVLA**  
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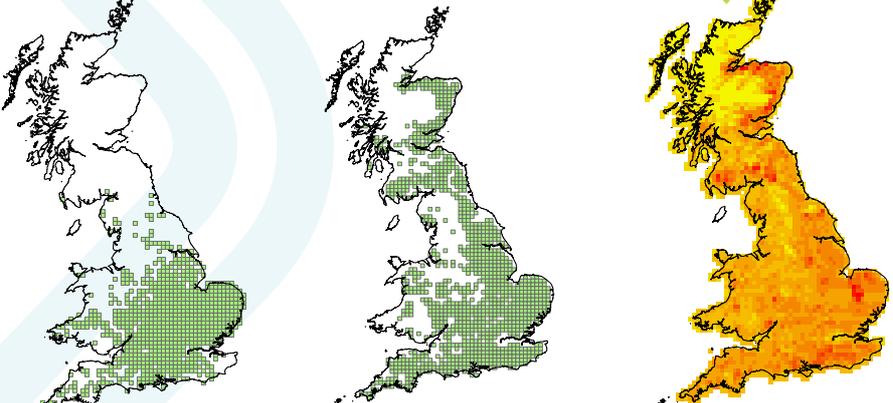
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Crossborder cooperation



(in Regional Development Fund)



**RINSE**

2007 distribution      Predicted climax distribution      Predicted climax density

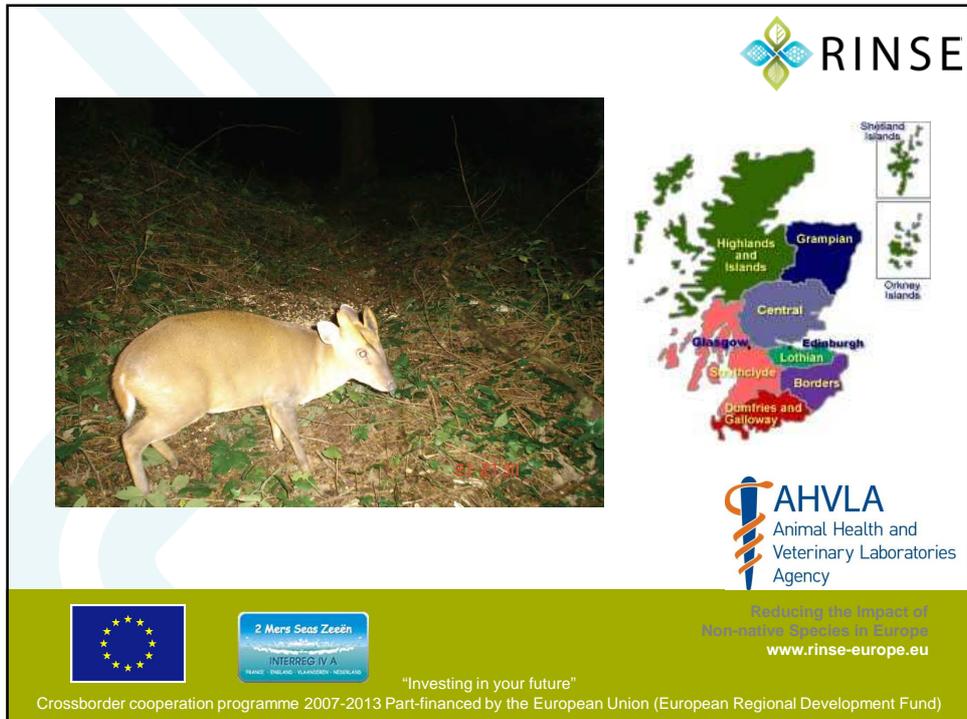
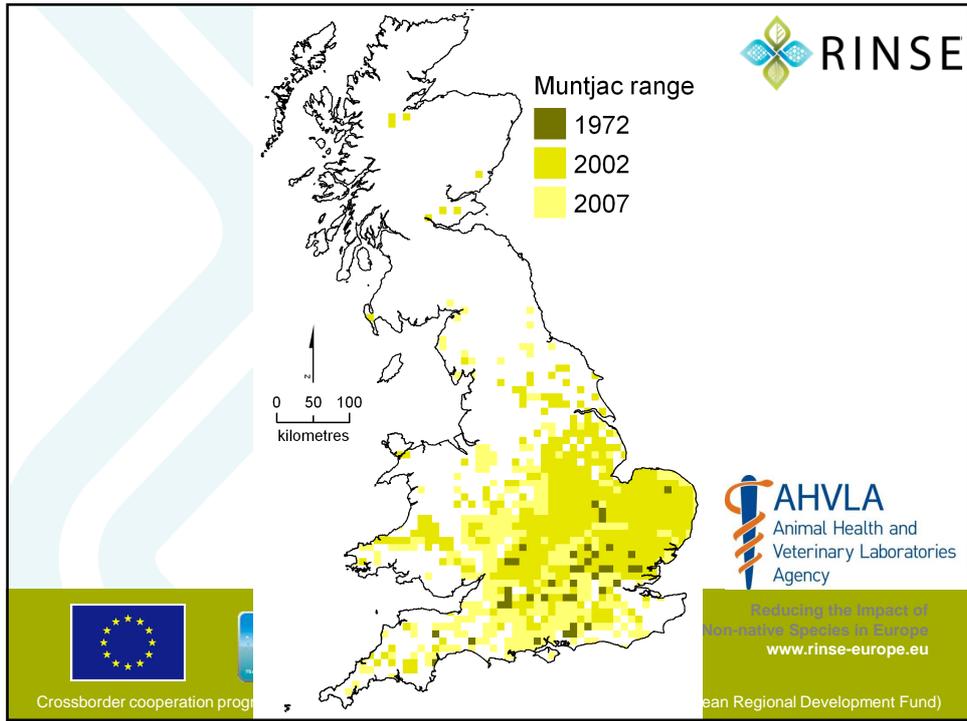
Georgina Palmer unpublished data. University of Durham



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Eradication

Starting population size	Costs (£)		
	Median	Lower 95 <sup>th</sup> percentile	Upper95 <sup>th</sup> percentile
5	14733	31358	9983
10	16640	38490	11890
20	18555	39930	12855
50	20500	42825	14325
100	22475	50025	15350
200	24050	60625	16450

Perpetual management: £916,057 (£457,821-£1,915,411)




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INTERREG IVA  
NEDERLAND - IERLAND - DANKEN - NIJERLAND

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**Scottish deer management**

- Deer management groups
- Landscape-scale approach
- Surveillance, reporting and rapid response

**Shooting muntjac**

- Highseats
- Stationary vehicles (engine off)
- On foot
- Bait




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INTERREG IVA  
NEDERLAND - IERLAND - DANKEN - NIJERLAND

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**Capture**

- Long nets
- Box traps
- Clover traps



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**Corral trap (for wild boar!)**



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**Don't**

- Repeat England's missed opportunities
- Allow unregulated keeping
- Allow lawful release into the wild
- Enable public acceptance
- Leave response too late

**Do**

- Consider Scotland's example
- Regulate keeping
- Legislate against release/escape
- Encourage partnerships for surveillance and rapid response

SCOTTISH STATUTORY INSTRUMENTS

2011 No. 172

ANIMALS

DESTRUCTIVE ANIMALS

The Muntjac Keeping (Scotland) Order 2011

*Approved by the Scottish Parliament*

Made - - - - - 2nd February 2011

Laid before the Scottish Parliament 2nd February 2011

Coming into force - - - 1st July 2011

The Scottish Ministers make the following Order in exercise of the powers conferred by sections 1 and 10 of the Destructive Imported Animals Act 1932(a), and all other powers enabling them to do so.

In accordance with section 10 of that Act the Scottish Ministers are satisfied with respect to the non-indigenous mammalian species(b) which are the subject of this Order that by reason of their destructive habits it is desirable to control the keeping of them and to destroy any such which may be at large.

**Title, commencement and extent**

1.—(1) This Order may be cited as the Muntjac Keeping (Scotland) Order 2011, and comes into force on 1st July 2011.

(2) This Order extends to Scotland only.

**Interpretation**

2. In this Order—

“1932 Act” means the Destructive Imported Animals Act 1932; and

“Muntjac” means an animal of the genus *Moschus*.

**Keeping of Muntjac**

3. The keeping of Muntjac is prohibited except under a licence granted under the 1932 Act.

(a) 1932 Act: The power in section 1 is exercisable in respect of species other than the species to which section 10 of the Destructive Imported Animals Act 1932 (“the 1932 Act”), section 10 (Interpretation) was amended by S.I. 1992/340. The title and title of the Minister of Agriculture and Fisheries was changed to that of the Minister of Agriculture, Fisheries and Food by S.I. 1995/554. The functions of the Minister of Agriculture, Fisheries and Food and the Secretary of State were transferred to the Scottish Ministers by virtue of section 10 of the Scotland Act 1998(14).

(b) Section 10(2) of the 1932 Act for the definition of “non-indigenous mammalian species”.




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 INBO, RATO



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