

# Natal movements of a harvested mammal



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# Summary

- Role of dispersal in population viability
- Importance for mountain hare in Scotland
- Results of a study investigating movements of mountain hare
- Implications for hare and moorland management

# Dispersal

- Natal dispersal most common
- Cost vs. benefit of dispersal
- Sex bias in polygamous mammals
  
- Density dependence
- Positive:  density  dispersal
  - Increased competition
- Negative:  density  dispersal
  - Increased aggression - 'Social fence' hypothesis

# Dispersal

- Harvesting artificially reduces density
  - Positive density dependent dispersal



Compensatory

- Important role in population persistence
- Can affect efficacy of host culls for disease control
  - E.g. bTB and badgers<sup>1</sup>

<sup>1</sup>Donnelly et al (2006) Nature 439: 843-846

# Mountain hare

- Traditional game species
- Common on grouse moor<sup>2</sup>
- ~10 year population cycle<sup>3</sup>
- Management culls to control ticks<sup>4</sup>
  - Louping ill virus



<sup>2</sup>Newey et (2007) Biological reviews 82: 1-23

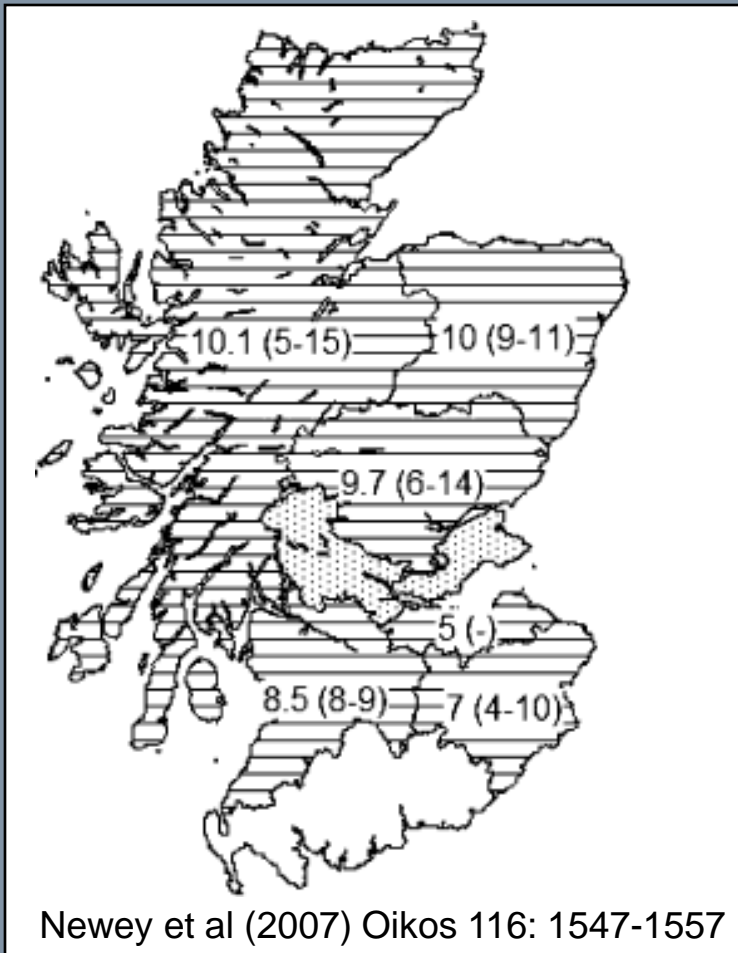
<sup>3</sup>Newey et al (2007) Oikos 116: 1547-1557

<sup>4</sup>Patton et al (2010) Mammal Review In press



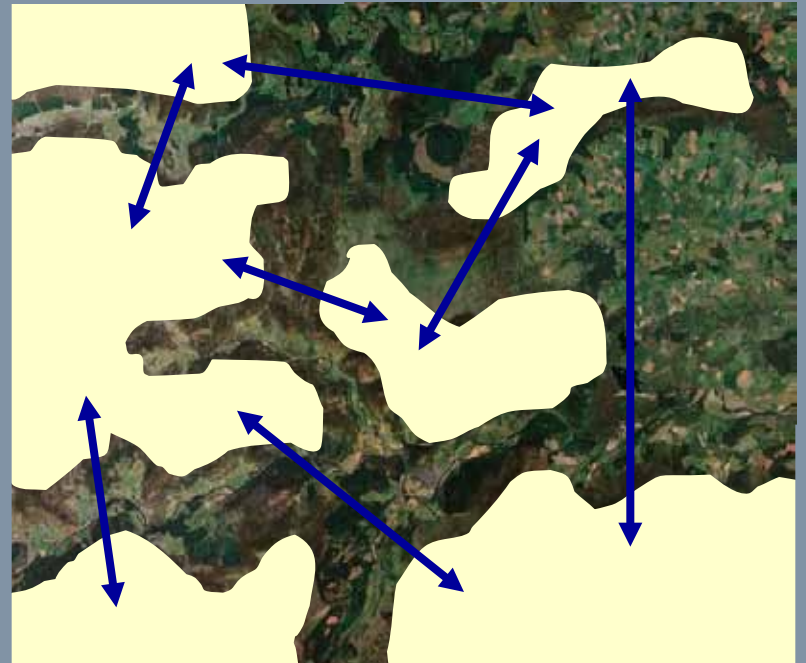
# Metapopulation dynamics

- Asynchronous population dynamics
- Fragmented habitat



# Metapopulation dynamics

- Dispersal of individuals between subpopulations
- Subpopulation linkage
- Gene flow
- Population viability



# Aims

- Little known about mountain hare movement patterns
- Natal dispersal in particular
- Importance for population persistence



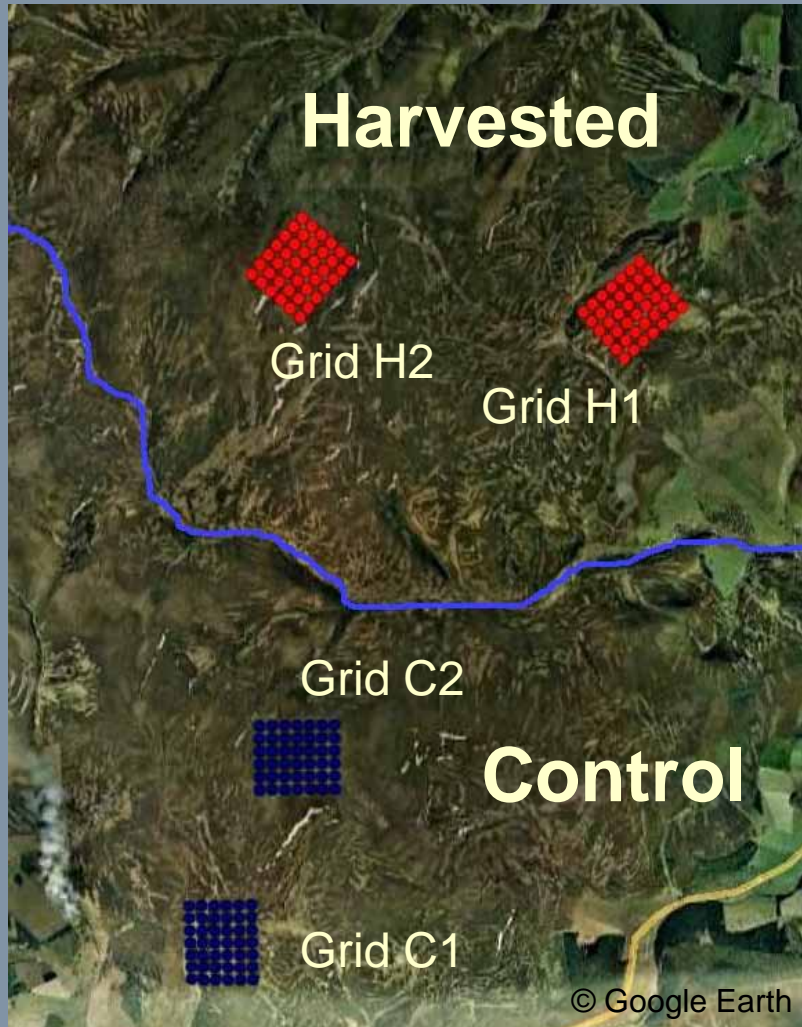
**Investigate effects of harvesting on leveret movement patterns**



# Study site



# Study site



# Methods

- Adults and leverets live-trapped between April-July, (2008,2009)
- 53 leverets captured
  - Harvested grid=28
  - Control grid=25
- Fitted with radio tag or collar
- Birth date back-calculated from capture weight using growth curves<sup>5</sup>
- Radio-tracked 2-4 times per week

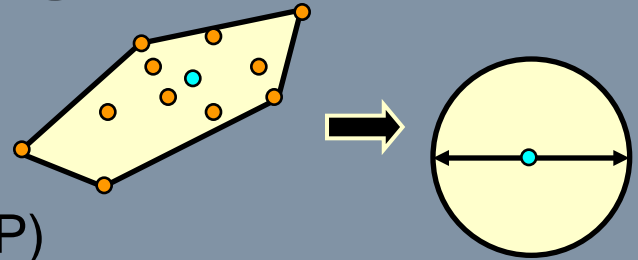


<sup>5</sup>lason (1989) Oecologia 81 : 540-546

# Definitions

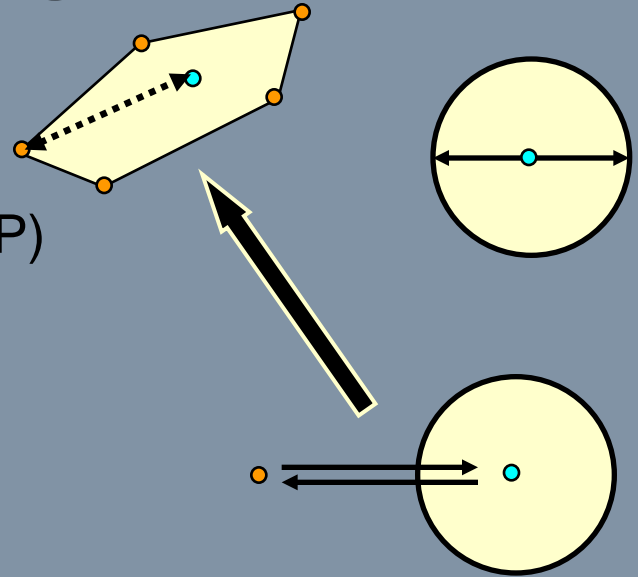
- Home range

- Minimum convex polygon (100% MCP)
- Home range centre



# Definitions

- Home range
  - Minimum convex polygon (100% MCP)
  - Home range centre
- Exploratory distance
  - Distance from home range centre to each location
  - Explorative = distance > MCP diameter

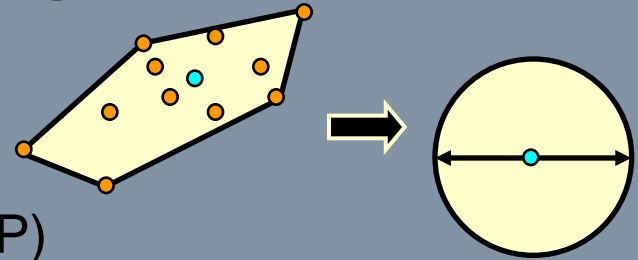




# Definitions

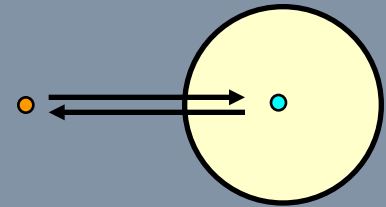
- Home range

- Minimum convex polygon (100% MCP)
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- Exploratory distance

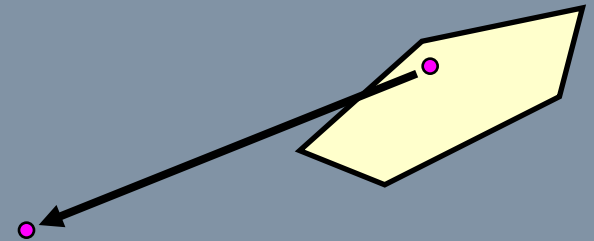
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- Natal site

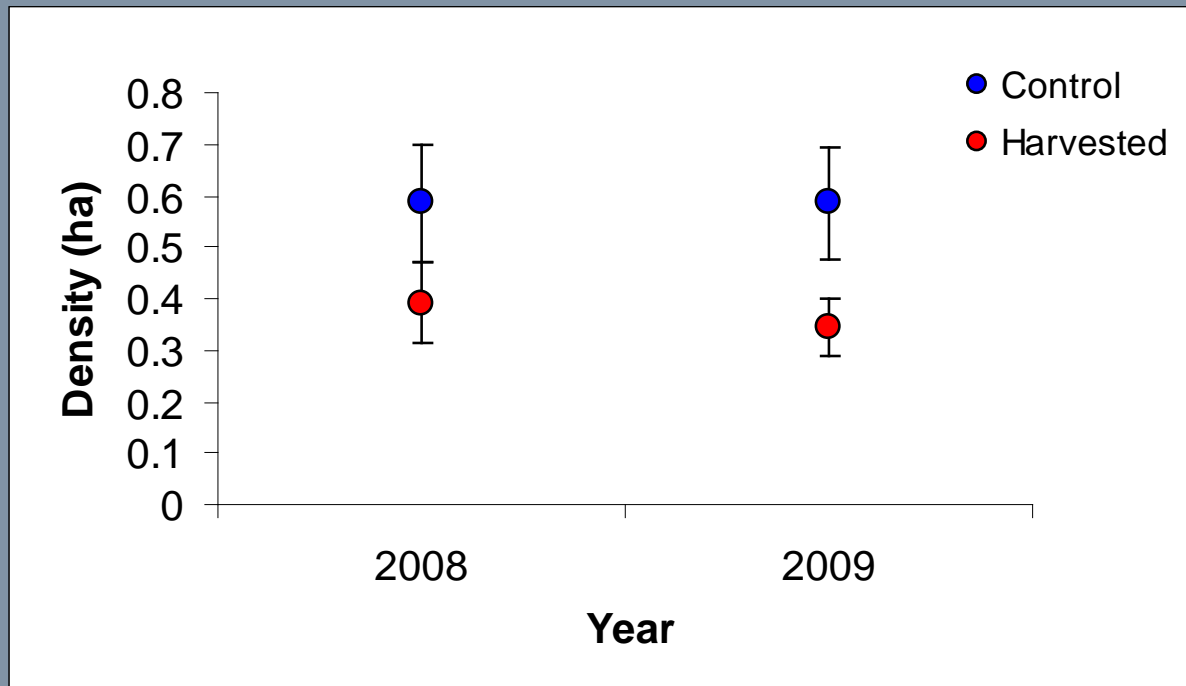
- Dispersal distance

- Distance from natal site
- 'True' dispersal = dispersal distance > mean adult female MCP diameter



# Population density

- April/May population density
- 1 month adult mark recapture data

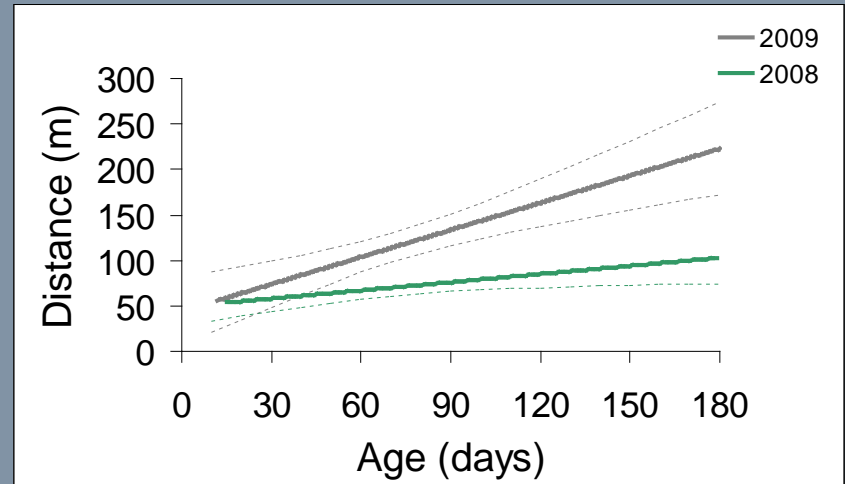
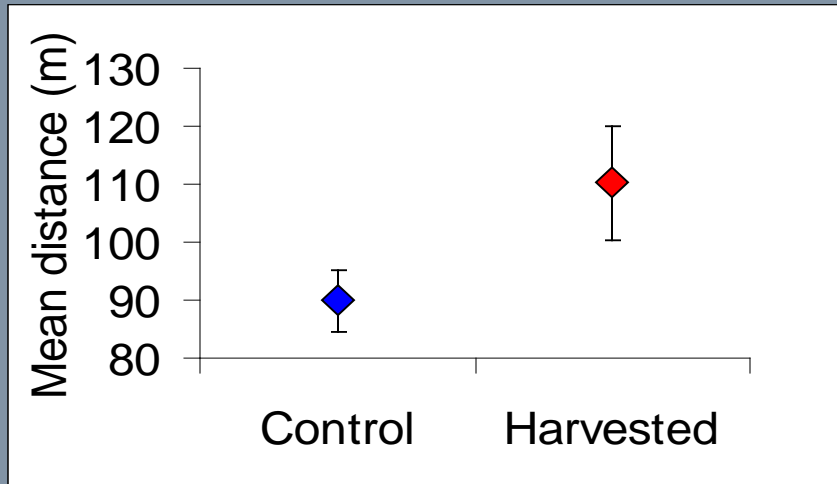


Population density ( SE) calculated using closed population methods with  $M_{(h)}$  jack-knife estimator and MMDM/2 strip method

# Home ranges and exploratory movements

- Mean ( SE) home range = 1.49ha ( 0.35)
- No affect of management, sex and year
- Mean proportion of exploratory movements
  - Harvested grid = 0.172
  - Control grid =0.090
- No affect of management, sex and year

# Dispersal



Mean dispersal distance greater in harvested population

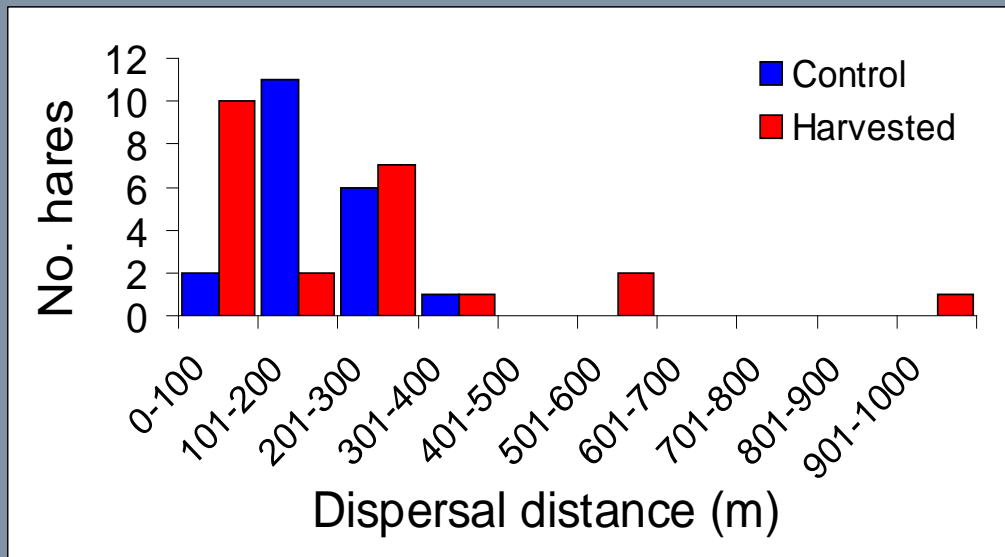
No affect of birth date or sex

Linear relationship between dispersal distance and age  
Effect of age differs between year

# Dispersal

Adult female home range diameter (mean+SE):

- Control grid - 423m
- Harvested grid - 452m



‘True’ dispersal probability:

- Control grid – 0
- Harvested grid - 0.13
  - 2 female
  - 1 male



# Conclusions

- Absence of sex bias
- Home range size and exploratory movement not effected by harvesting or density
- Negative density dependent dispersal

# Implications for management

- Dispersal probability and distance low
- Subpopulation fragmentation
  
- Dispersal probability and distance greater in harvested population
  
- Dispersal important for population persistence
  
- Influence effectiveness of culls for tick control

# Thank you

- **NERC CASE**
- **Game keepers and land owners**
- **Aberdeen University**
- **Game and Wildlife Conservancy Trust**
- **SNH and Home Office**
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**Prof Dan Haydon (Glasgow)**  
**Prof Simon Thirgood**

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