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[1]

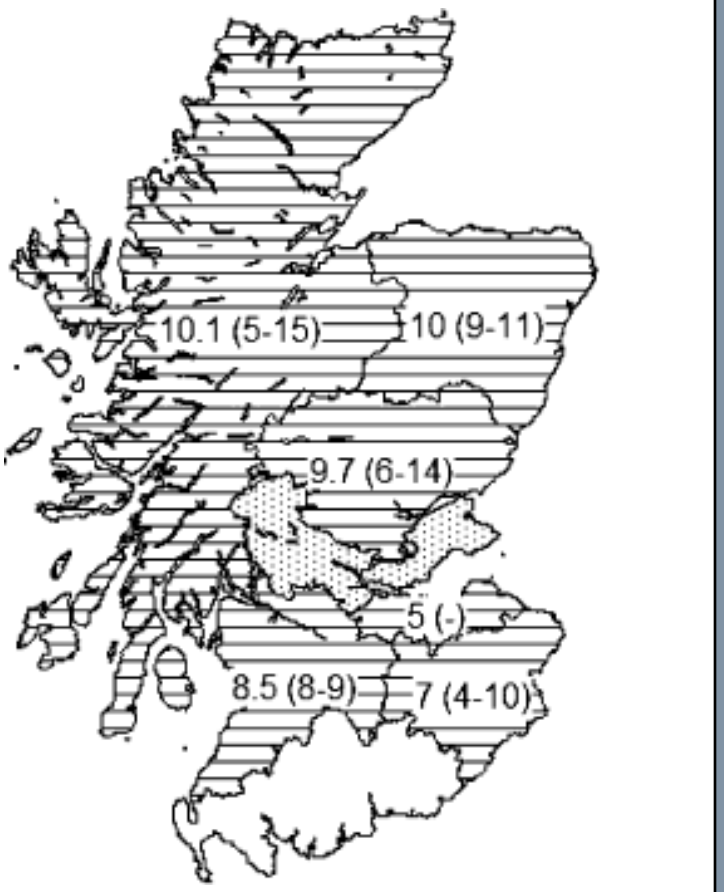
[1]Donnelly et al (2006) Nature 439: 843-846

Mountain hare

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

[2]Newey et (2007) Biological reviews 82: 1-23
[3]Newey et al (2007) Oikos 116: 1547-1557
[4]Patton et al (2010) Mammal Review In press

Metapopulation dynamics



Newey et al (2007) Oikos 116: 1547-1557

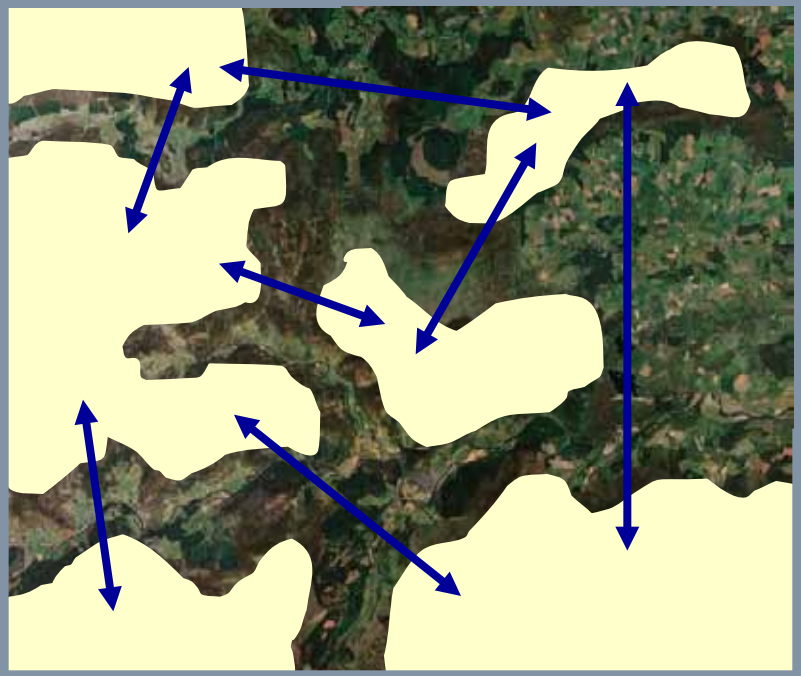
- Asynchronous population dynamics
- Fragmented habitat

Metapopulation dynamics

- Dispersal of individuals between subpopulations

- Subpopulation linkage
- Gene flow

- Population viability



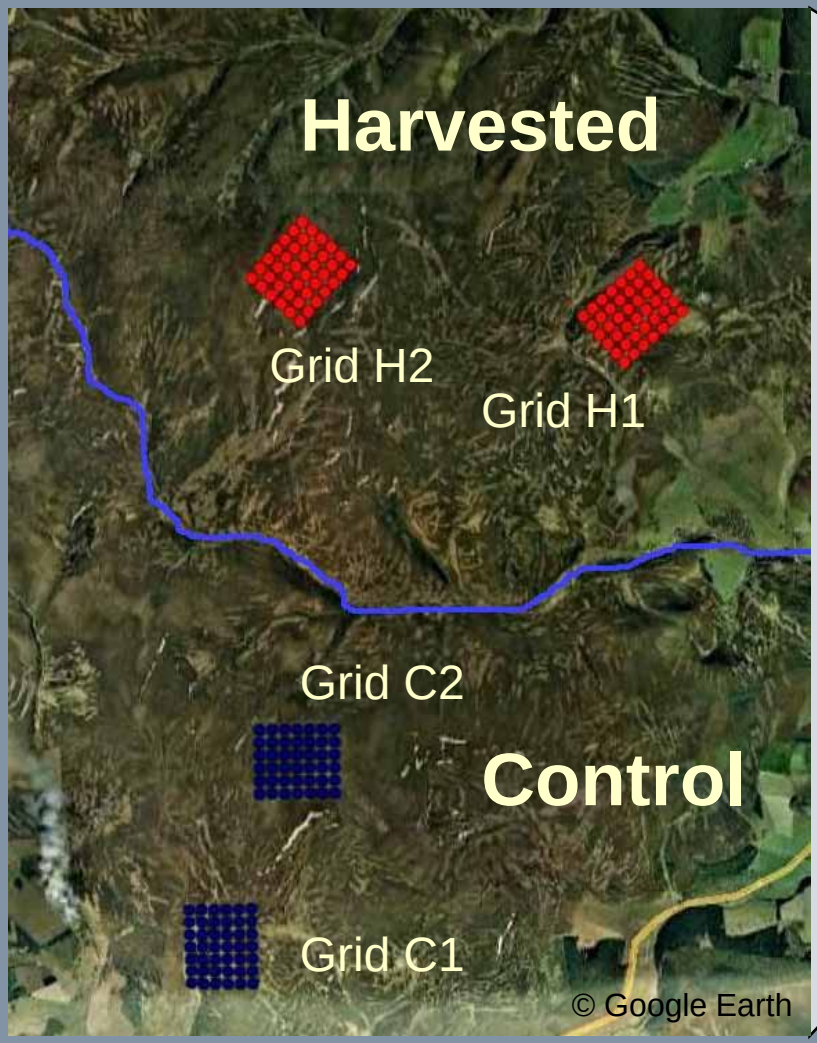
Aims

- 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


Harvested
Grid H2
Grid H1
Grid C2
Control
Grid C1
© Google Earth

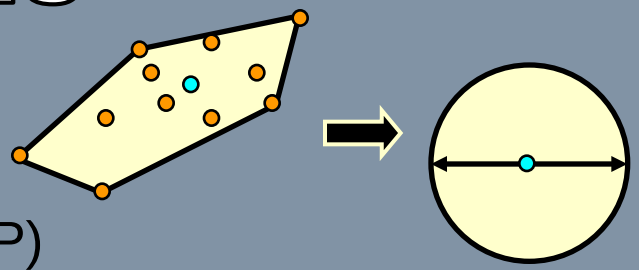
Methods

- 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[5]
- Radio-tracked 2-4 times per week

[5]Iason (1989) Oecologia 81 : 540-546

Definitions



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

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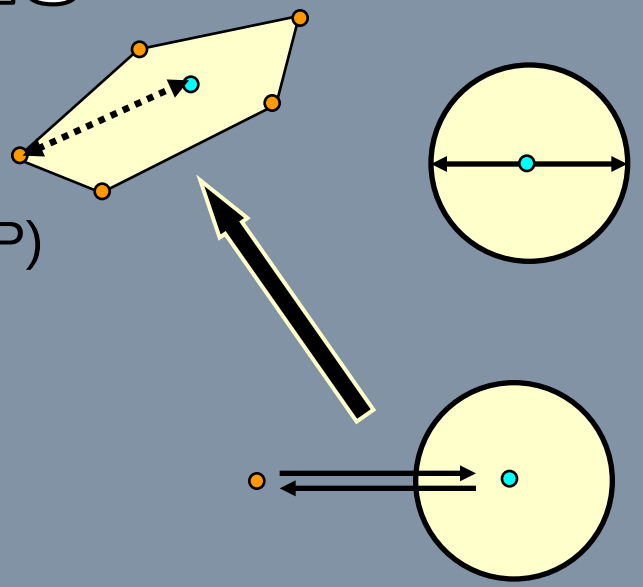
  - Home range centre
- Exploratory distance
  - Distance from home range centre to each location
  - Explorative = distance > MCP diameter



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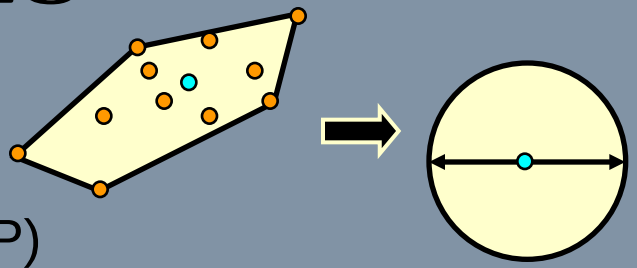

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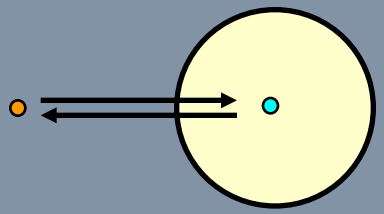
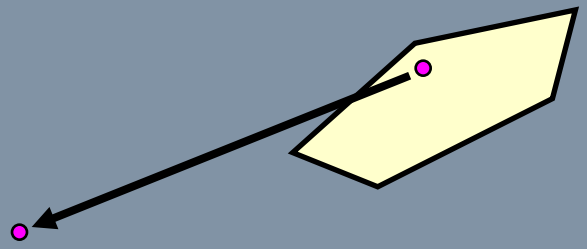
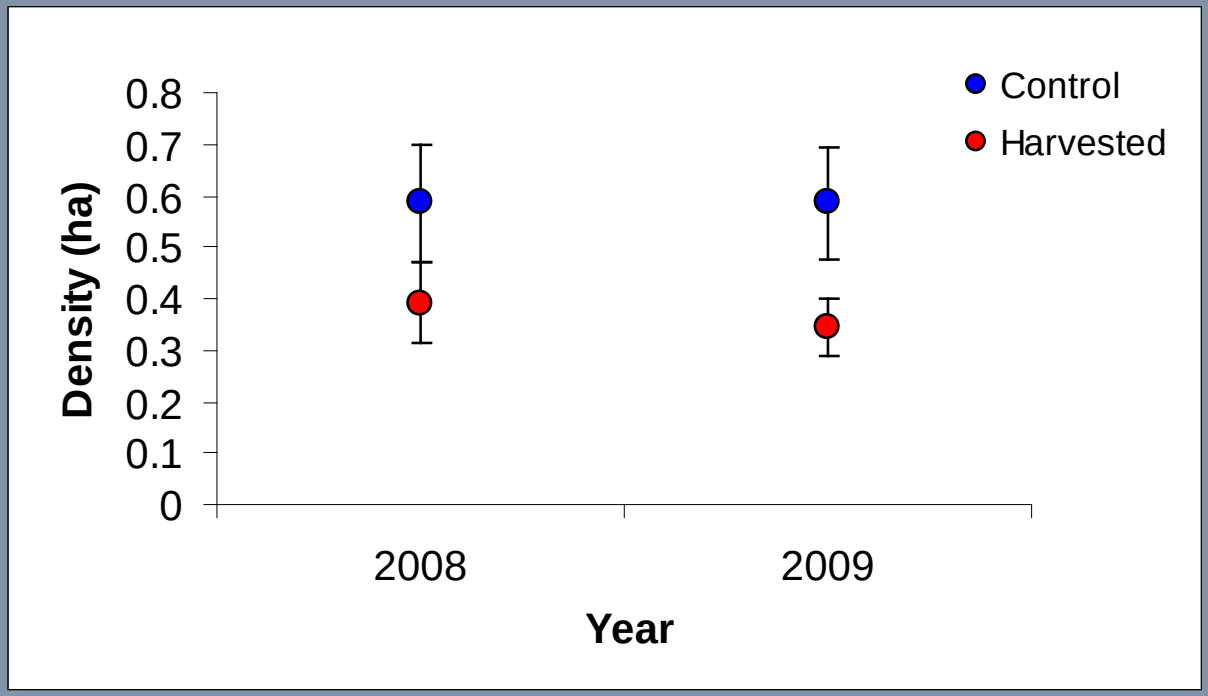


- Natal site
- Dispersal distance
  - Distance from natal site
  - ‘True’ dispersal = dispersal distance > mean adult female MCP diameter



Population denisty

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

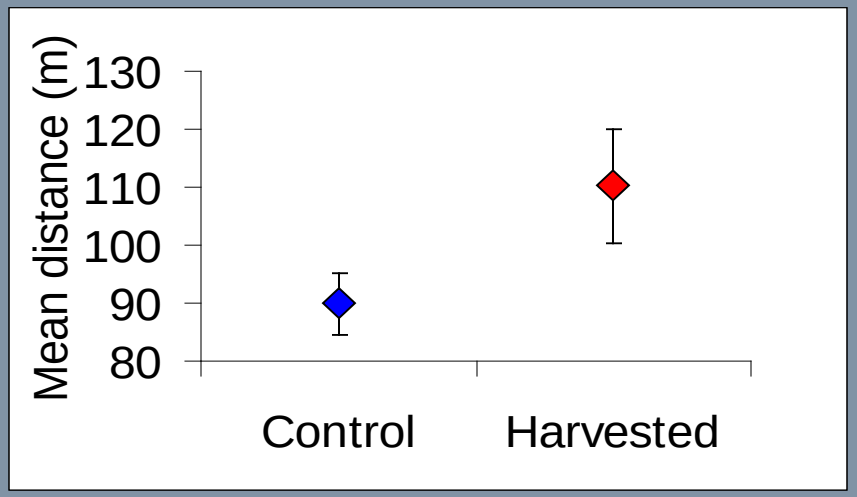


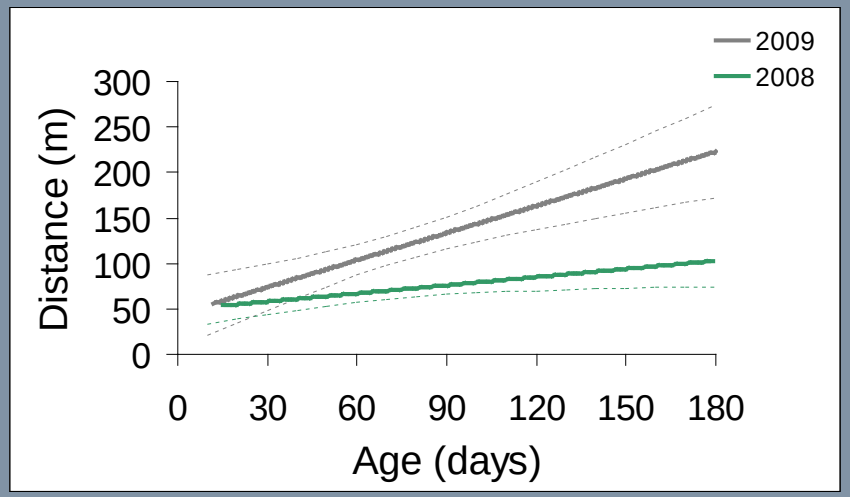
Population density (SE) calculated using closed population methods with $M_{(h)}$ jack-knife estimator and MMDM/2 strip method

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

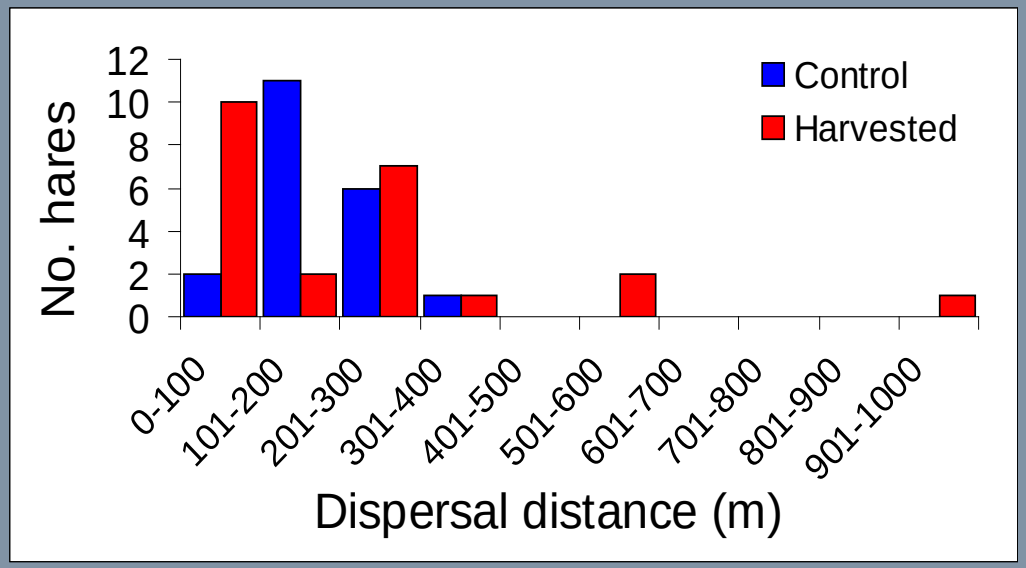
No affect of birth date or sex

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**

- Supervisors:
  Dr Scott Newey (MLURI)
  Prof Dan Haydon (Glasgow)
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