The Deer Initiative

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Deer and climate change

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Abstract

Over the last century, temperatures in the UK have increased by an average of 0.6^0C with the rate of increase much greater in recent years. The most recent predictions indicate a warming of between 2 and 5^oC by the end of the century. The forecast is for hotter drier summers and milder wetter winters. The greatest changes are expected to occur in the south and east of England. The prevailing weather influences herbivore performance and, in turn, their population dynamics, directly via the energetic costs of thermoregulation, as well as, indirectly through impacts on plant growth and senescence, and hence the plane of nutrition. Unfortunately, variation in the plant productivity between seasons and years and its relationship to herbivore population densities is rarely quantified in natural ecosystems.

Coincidental to climate change has been the increase in abundance and/or distribution of the deer species resident in the UK. In Scotland, the red deer population has increased over recent decades despite more intensive culling. Whilst there are no data on the abundance of other deer species at the national level, there is evidence that the distribution of all species is increasing with greatest increases found in muntjac and sika. Reproduction and mortality are key determinants of deer population growth rates and in many species these have been linked to climatic variables and food availability. Milder winters and warmer wetter springs may cause earlier birth dates, and increased juvenile growth rates and survival because of both the direct effect of milder weather on survival and through increased food availability because of extended growing seasons. However, warmer, drier summers may lead to reduced food availability and may have a counteracting effect on animal populations.

Climate effects on roe deer:

Weather effects on roe deer (beneficial)

- Roe (and Fallow) distributions centred on southern Europe
- Earlier birth dates: European trend for earlier birth dates from North to South

- Increase growing season length may benefit roe deer:
  Warmer wetter springs good for kid survival
- Vegetation cover in summer related to kid wt in 1st winter (But summer drought may increase kid mortality?)
- Winter conditions don't tend to affect reproductive rates
- Interaction with forest succession so that kidding rate reduces as tree cover increases.

Climate effects on muntjac and fallow

Muntjac

- Ecology of muntjac suggests that mortality related to snow cover. Therefore climate change related reduction in snow cover may benefit muntjac.

Fallow (and others?)

- Climate change may lead to more year round cropping (cereals) providing superabundant food supply in early winter (food source changing out of proportion to magnitude of temperature change)
- C/f white tailed deer expansions tracking maize crop expansion in Michigan and Illinois

The interdependence of climatic variation, vegetation productivity and herbivore population dynamics is not well understood. Herbivores such as deer can have negative and positive impacts depending on the plant community and the deer density. Although grazing impacts have been described, there is little data that can be used to establish the relationship between deer density and grazing impacts for many habitats and species. Evidence from upland heath communities indicates that deer density is related to heather production and that climate impacts are likely to lead to increased heather production thus fuelling deer population increases with potential consequences for other plant species and communities. In woodlands deer density is negatively related to tree seedling abundance so that deer increases associated with earlier plant phenology and longer growing season predicted by climate warming may have deleterious effects on woodland establishment. Climate induced changes in plant production may lead to changes in plant species interactions with consequences for composition of the plant communities and the animals that rely on them. The extent to which we can mitigate and/adapt to these changes needs to be debated.

- Climate change favours deer expansion (but –ve effect of warmer summers?)
- Habitat selection effect:- wetter sites will become more important to deer in summer
- Climate change may also change plant community composition.

Mitigation means more intensive deer management and herbivore protection strategies
Adaptation means learning to live with changing species composition and distributions…….. and identifying plant species that are both
suited to predicted climate scenarios and deer resistant? (climate matching)

For red deer in Scotland:

Possible future scenario in central and east Scotland:

Winter:

- Warmer, less snow, wetter
- Increased survival
- Earlier antler casting
- Heavier born calves

Summer:

- Warmer, drier
- Heavier autumn weights
- Higher fecundity
- Increased survival

For western Scotland

Winter:

- Warmer and wetter
- Reduced survival, esp. stags
- Lower fecundity
- Reduced proportion stags born
- Later calving

Summer:

- Warmer, wetter
- Heavier born calves

Finally,

- Deer populations may benefit from Climate Change but
- Deer expansion may be a by-product of land use policy (CAP related sheep removal, community forests etc)
- Deer management may be able to contain populations (Need to view deer as an opportunity)
- Climate change impacts depend on location, habitat type and deer density

Speaker' biography

Current Research: My research focuses on understanding the impact of free-ranging herbivores on the habitats they graze. This requires both an understanding of population dynamics and of the socio-economic drivers that affect herbivore management. Current work focuses on how competitive interactions between grazing herbivores may determine herbivore habitat and range use and the consequences this has for natural heritage impacts and biodiversity indicators. In addition, I am developing an interdisciplinary approach to tackle the management of natural resources and recently secured RELU funding for a project entitled "Collaborative frameworks in land management: A case study on integrated deer management" which has brought together a range of stakeholders and researchers relevant to deer management