

TIRERAGAN a real and virtual field experiment

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Background

As lecturers running ecology and conservation courses from first year undergraduate to masters, we are aware that access to real datasets and large-scale experiments is often difficult. Consequently, when we had the opportunity to begin a long term study we decided to share our results via the web. We hope that colleagues will find the material useful for their teaching. We are also aware that the data may be of value for some disabled students. We have been careful to ensure that, as far as possible, the web material should be accessible using devices such as screen readers, for example all of the project web pages have been validated by W3C markup validation service.

The web pages can be accessed from
<http://obelia.jde.aca.mmu.ac.uk/knockvol/tireragan1.htm> or
<http://asio.jde.aca.mmu.ac.uk/knockvol/tireragan1.htm>

Tireragan

MMU have used Tireragan, a small estate (approximately 5 km²) on the south west tip of the island of Mull, as the basis for an MSc field trip for almost 10 years and we are familiar with many aspects of its biology and ecology. In 2003 we started a long-term study that aims to identify the effects of grazing and woodland management on the biodiversity of mature broadleaf woodland by using manipulative, experimental treatments. Students have full access to the data via the web site, and if they can visit the island, the experimental sites. The estate is open to the public at all times.

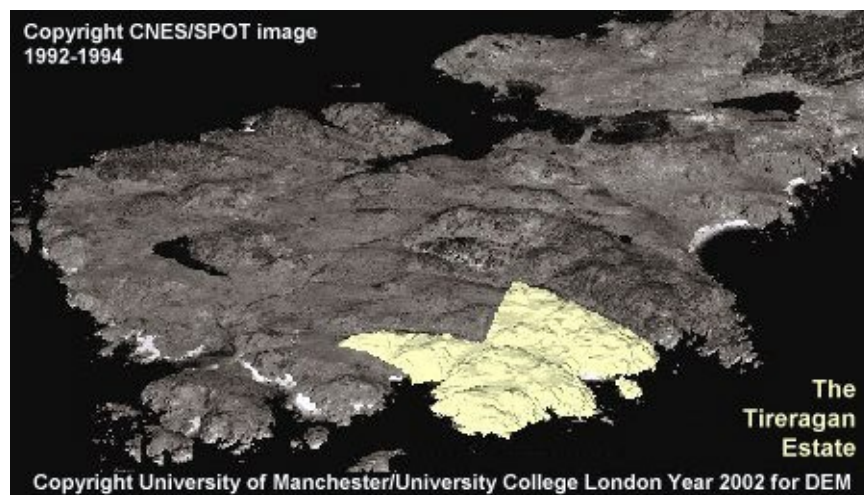


Figure 1: The Tireragan Estate location and boundaries

Tireragan is managed by a charity called Highland Renewal (<http://www.highlandrenewal.org/>), whose current aim is to manage the land so that an

invaluable ecosystem can be regenerated. Tireragan is an important, and perhaps unique, area in terms of conservation importance. Its vegetation was comprehensively mapped (NVC) and surveyed by Averis and Averis in 1994 and 1999. They found remnants of the original native deciduous woodlands and identified several features of particular note.

- More scrubby, wind-pruned woodland than anywhere else in Scotland.
- Rich and varied woodland vegetation, on variable soils, that has not been severely disturbed.
- A woodland flora that shows that the microclimate below the trees is much more sheltered than that of the surrounding exposed heaths and bogs.
- Some nationally or regionally uncommon plant species. The woodlands and sheltered gullies are particularly important for uncommon plant species.
- Good representation of oceanic plant species (13 oceanic vascular plant species and 27 oceanic bryophyte species).
- Good representation of the nationally uncommon, pollution-sensitive *Lobarion* lichen assemblage in the woodlands.
- Abundant tree and shrub regeneration in the heaths, especially of downy birch and eared willow.
- Patches of dry heath dominated by heather and bearberry. Such heaths are scarce in the western Highlands and have been found only in a few very exposed places.



Figure 2. Traigh Gael beach on the southern shores of Tireragan

The web site provides lists of all species that have been identified within the Tireragan boundary fence. We are reasonably confident that the lists are complete for vertebrates

(mammals, reptiles, amphibians and birds) but relatively few detailed studies have been undertaken on the invertebrates. We are also reasonably confident that few plant species have been missed. Most of the confirmed identifications, particularly the lower plants, were obtained from detailed vegetation surveys undertaken by A.B.G. Averis and A.M. Averis in 1995 as part of an SNH contract. In total we have recorded 67 birds, 15 mammals, 5 reptiles and amphibians, 30 spiders, 17 carabids, 12 lichens, 134 mosses and liverworts, 18 pteridophytes, 58 monocots, 6 orchids, 96 herbs and 23 shrubs and trees.

The experiment

In 1994 grazing by large herbivores ceased in Tireragan with the erection of a perimeter deer fence and the removal of red deer and sheep. Past grazing management practices such as muirburn also ceased and natural woodland regeneration was encouraged. However, some of the Tireragan woodlands are quite old, with little sign of internal regeneration, perhaps reflecting the consequences of previous grazing and management. We want to investigate how the woodland flora and fauna will respond to the experimental clearance of some mature trees. Because most changes are likely to be quite slow we have established permanent quadrats that can be monitored over a long period of time. Four experimental sites were identified on the slopes of Torr Fada (Figures 3 & 4). At each site permanent quadrats were established and marked to allow continuous recording over a number of years. Full details of the experimental protocols and data are available from the project web site. Briefly, we provide fine resolution photographs (1 mm pixel resolution) of the permanent quadrats, details of nearest trees to each quadrat and detailed information on felled trees (including sections through stems and photographs of the rich epiphyte flora).



Figure 3: Location of the hazel wood experimental plots



Figure 4 Hazel wood experimental site in early May 2003

Because we do not expect rapid changes we have also included a small number of other datasets that may be of value for data analysis exercises. The first three relate to the Tireragan site, others are from elsewhere on the island or other Hebridean islands. Html and Excel versions are available for most.

- Pit fall trapping data for surface-active invertebrate communities within a mosaic of habitats dominated by wet heath.
- Small bird survey data obtained from transects. Distances to sightings are given and can be used with distance sampling analyses.
- A survey of whitethroat territories
- Details of the contents of 122 barn owl pellets
- Between 8th August 1995 and 14th May 1998 weather data (4389 records) were collected using a Delta T logger. Rainfall (mm), Windspeed (m/s), Wind Direction (degrees), Air Temperature (°C), %RH, Radiation (kW/m²) and Soil Temp (°C) were recorded for each 4 hour period.
- All of the raw data used in a published study of black rats on the Shiant islands. (Key, G., Fielding, A. H., Goulding, M. J. and Stevens-Woods, B. 1998. Ship rats *Rattus rattus* on the Shiant Islands, Hebrides, Scotland. *Journal of Zoology (London)*, 245: 228-233).
- An extract from a 1994 Landsat image (full data for 6 bands) of Tireragan is provided, plus approximately 100 georeferenced photographs that can be used for ground-truthing.

We intend to keep adding to these data sets.

We welcome comments on the web material and suggestions for possible additions.