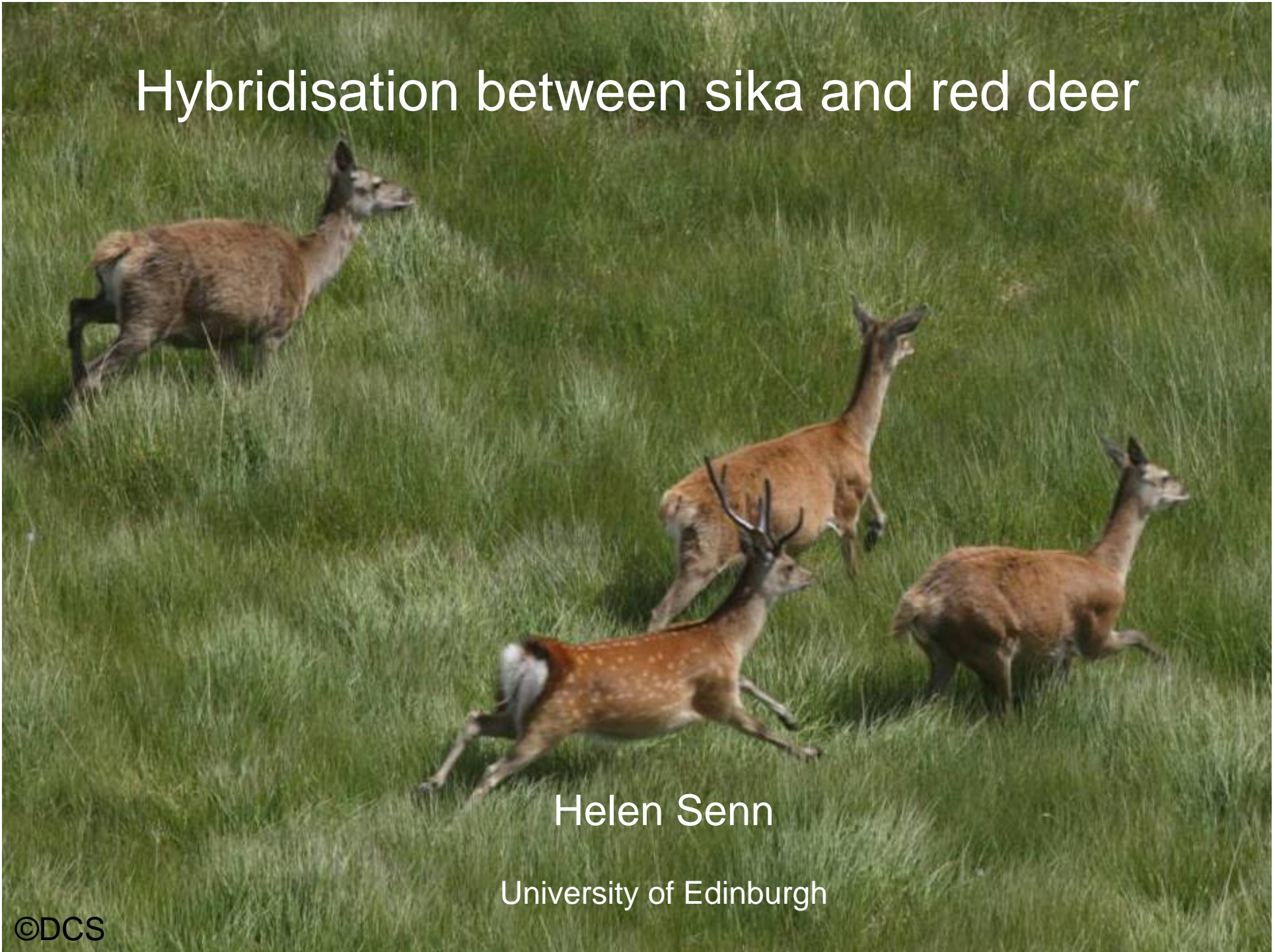


Hybridisation between sika and red deer



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Outline

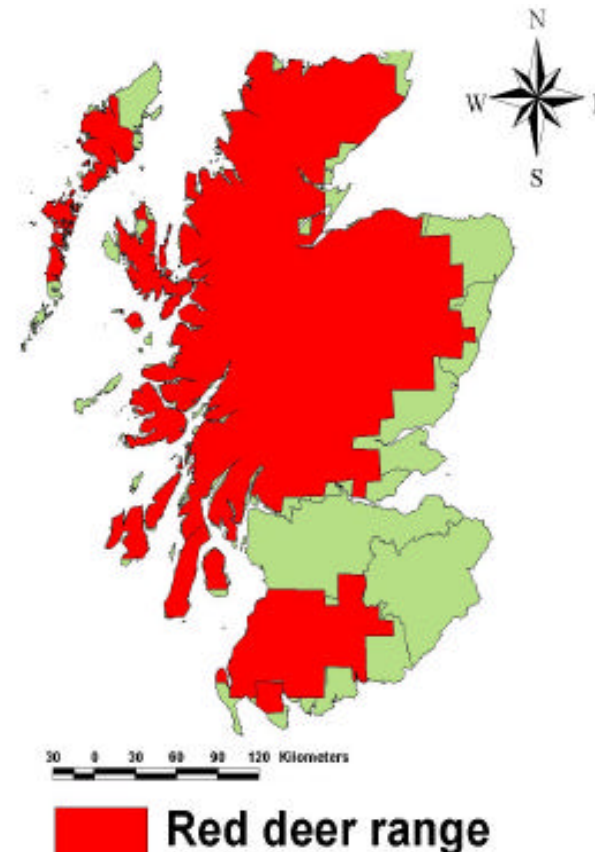
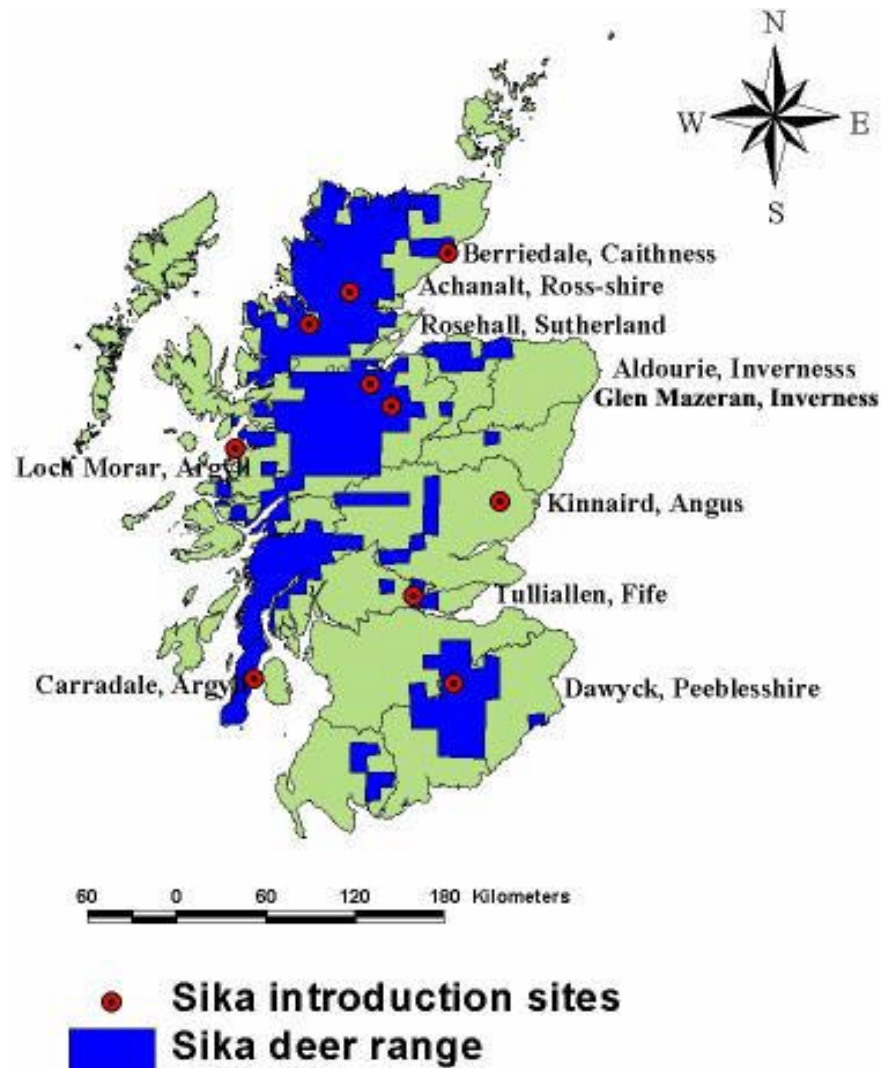
1. What effect is hybridisation with sika having on the genetic status of red deer?
2. What effect is hybridisation having on phenotype?
3. Management recommendations



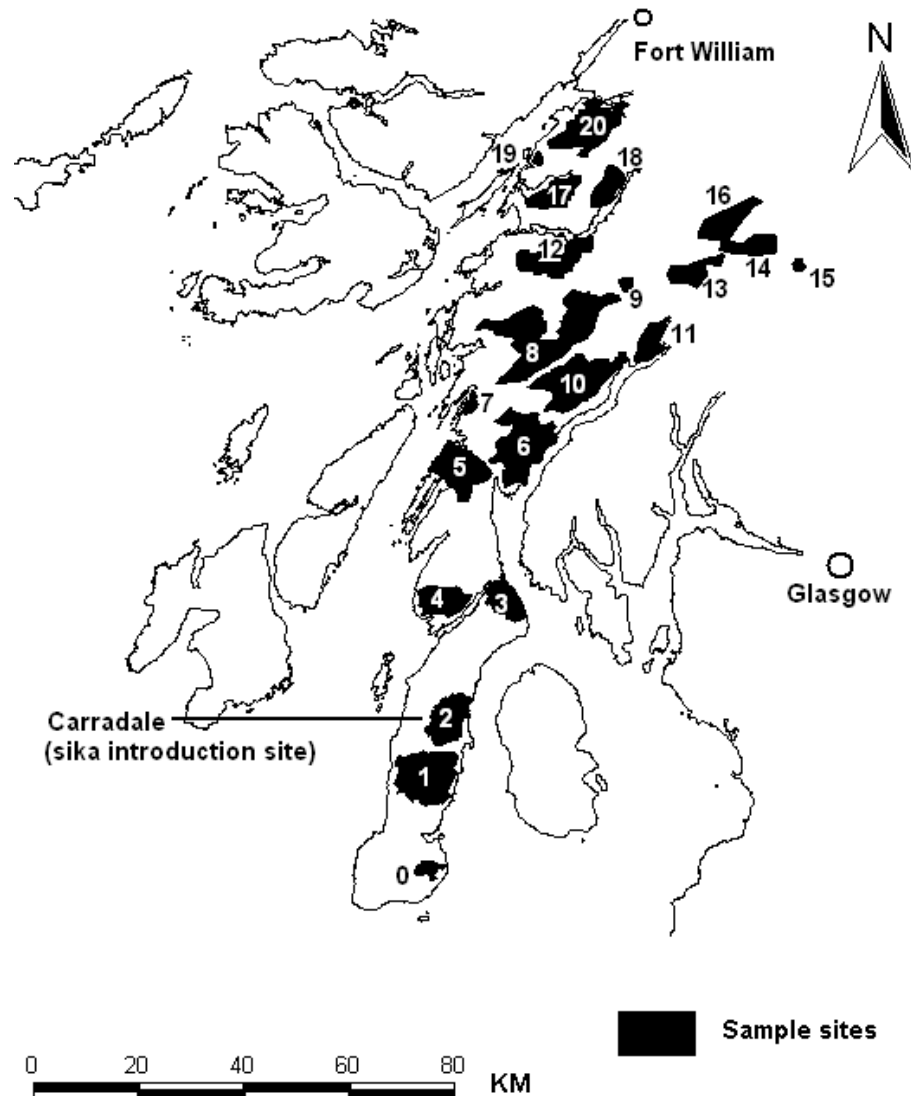
Cervus nippon (sika deer)

Cervus elaphus (red deer)

Species distribution



Methods for genetic survey



- Ear tissue collected by Forestry Commission Rangers.

- 735 samples of red and sika deer collected in 2006/7

- All samples genotyped using 22 unlinked microsatellite markers and a diagnostic mtDNA marker

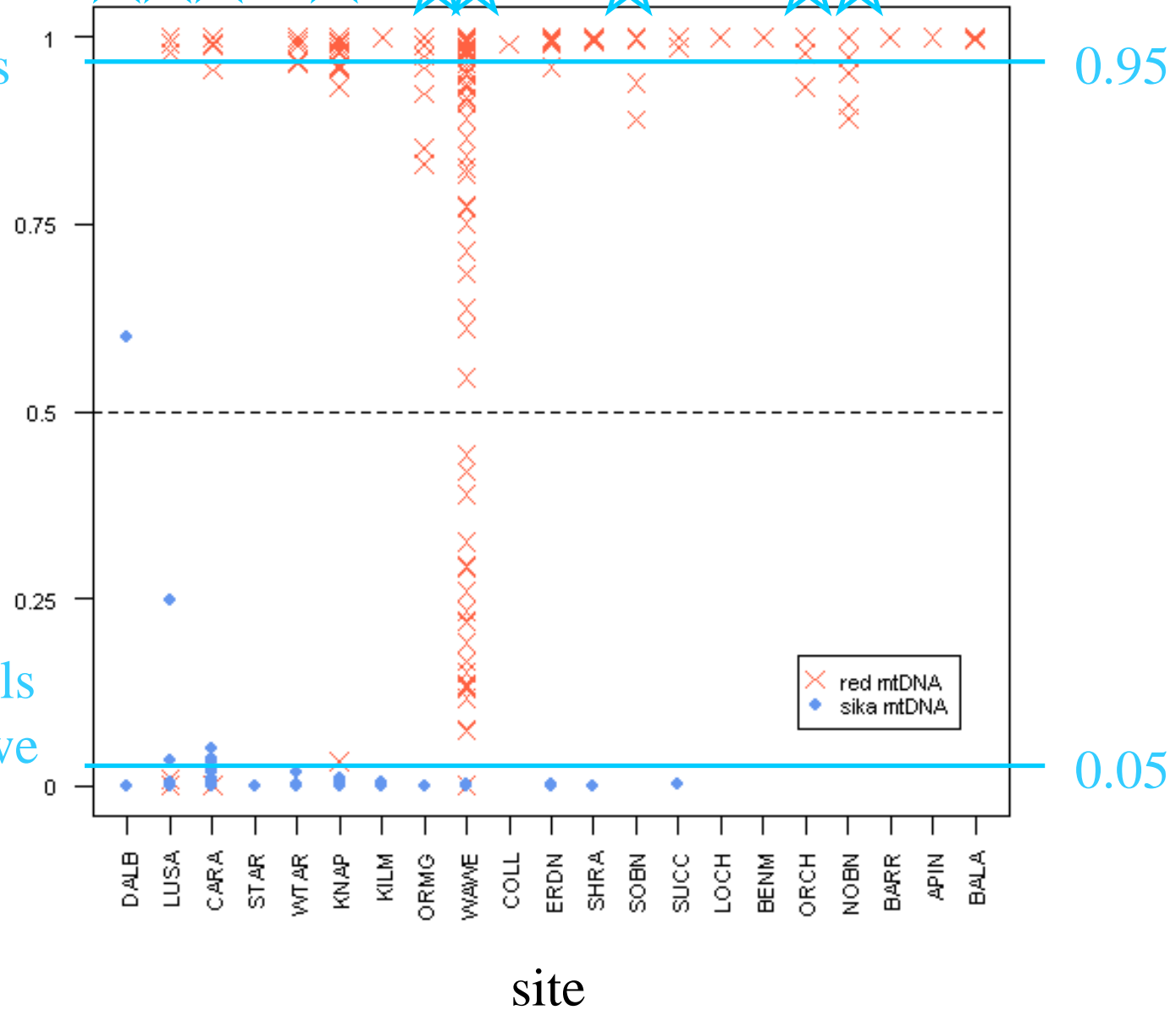
- Based on their microsatellite genotype, individual samples were assigned to 'red', 'sika' or both species using the Bayesian clustering software STRUCTURE (K=2).

Individuals plotted by genotype

7 % of animals are hybrids

Proportion of genes in an individual that are of red deer origin

44% of individuals at West Loch Awe are hybrids



Summary of genetic findings

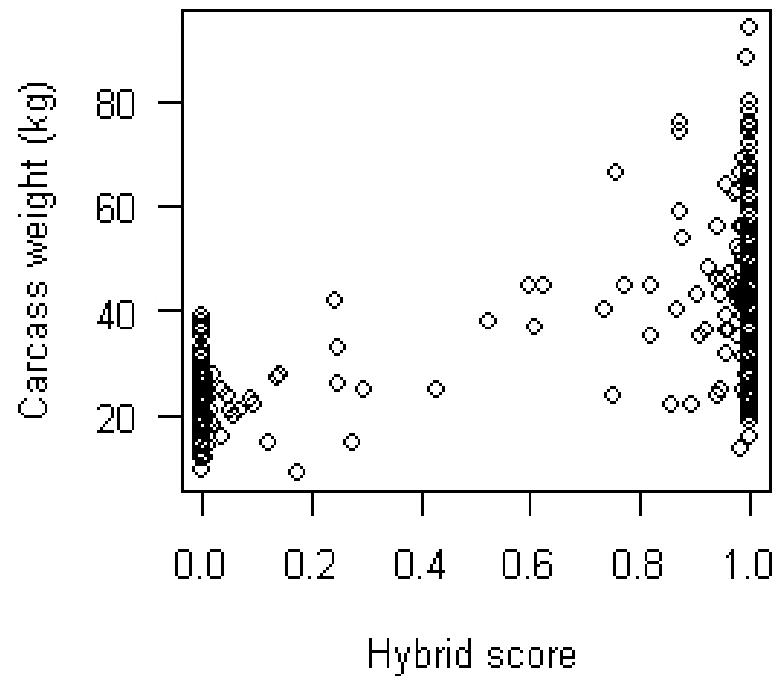
- Genetic evidence of hybridisation at most places where species are in contact, but on the whole, the two species still remain genetically distinct.
- However, there are high levels of hybridisation at West Loch Awe.
- Hybridisation is predominantly occurring between sika stags and red deer hinds.

Methods for phenotypic study

- Used data from individuals collected on Kintyre in 1996/7 & 2006/7
- Regressed genetic hybrid scores at 20 microsatellite loci against carcass weight using linear mixed-effect models in separate datasets of males and females.
- Covariates: Age, day of year shot, pregnancy status, sampling year, sample population (random effect)
- We fitted the model across the whole dataset first, to find the minimal adequate model. Then refitted model to red and sika datasets separately to test for the effect of hybridisation.

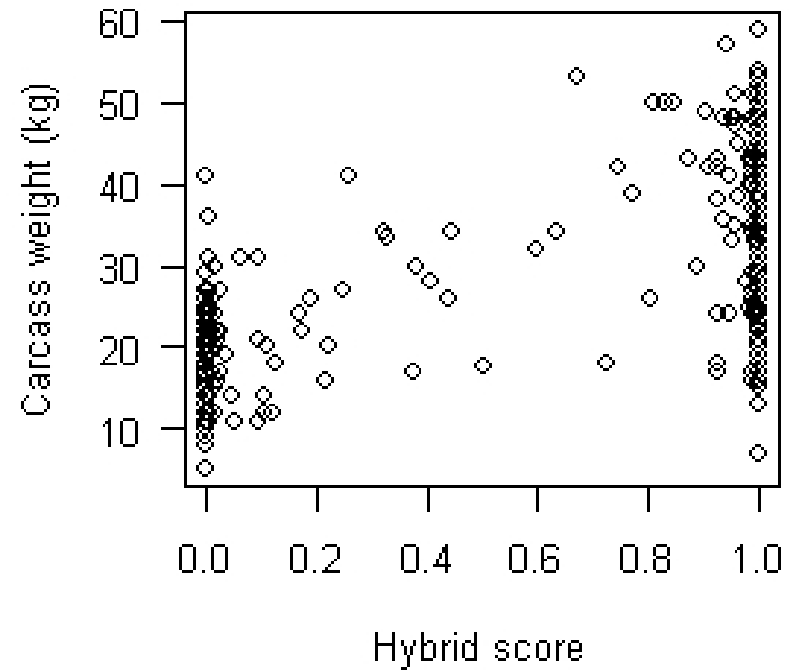
Results

MALES



Red deer (n=295), $t = -1.150$, $p = 0.251$
Sika (n=137), $t = 2.813$, $p = \mathbf{0.033}$

FEMALES



Red deer (n=445), $t = 2.382$, $p = \mathbf{0.018}$
Sika (n=283), $t = 3.090$, $p = \mathbf{0.003}$

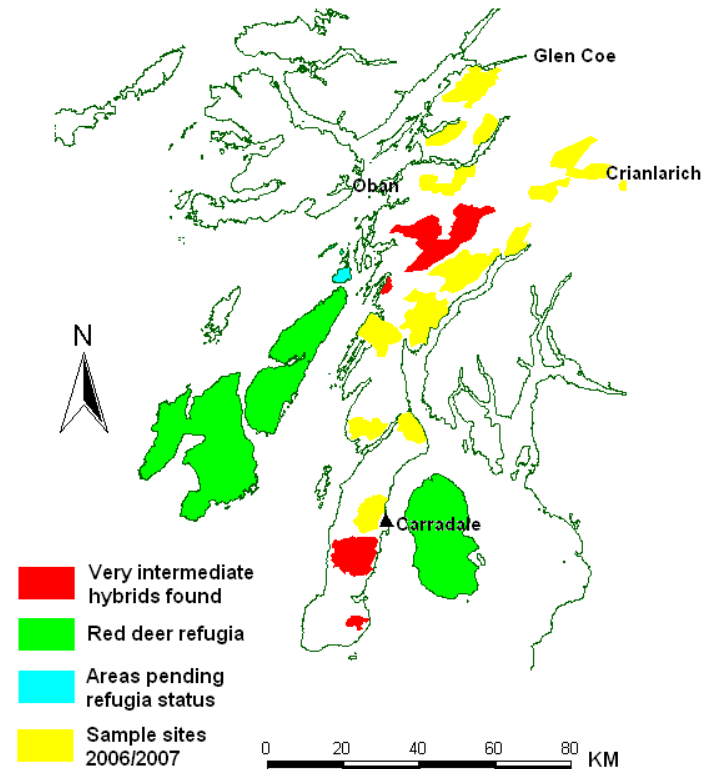
Hybrid Score: 0 = pure sika, 1 = pure red

Conclusions

- Some hybridisation likely between the two species anywhere where they are in contact.
- Even remote red deer populations are at risk because sika stags range far.
- Red and sika populations can form hybrid swarms in the wild and this could be happening elsewhere.
- Hybridisation is accompanied by changes in weight - increasing similarity in size is likely to facilitate further hybridisation.

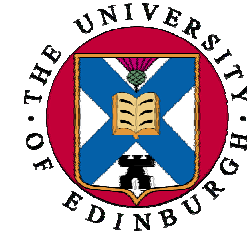
Management Recommendations

- Publicity required to enforce the policy of shooting pioneering sika stags.
- Working group should be set up to investigate possibility of containing the hybrid swarm at West Loch Awe.
- Island refugia policy- further action required.





A **BIG** thanks to:



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