

Conservation genetics of Irish and Scottish red grouse

By Kevin Mulder

Legend has it that Irish warrior Fionn mac Cumhaill built a causeway to Scotland connecting the two islands to challenge the Scottish giant Benandonner to a fight. When the much stronger and larger Benandonner arrived in Ireland, Fionn had disguised himself as his own baby. When Benandonner saw the size and strength of the baby he got scared of meeting Fionn himself and ran back to Scotland tearing the causeway away behind him. This led to the identical hexagonal basalt columns now seen on both sides of the Irish Sea and named a UNESCO natural heritage site since 1986.

Nowadays, geologists know that the very unusual looking basalt columns can easily be explained by specific cooling mechanisms of lava which happened millions of years ago. For a long time now, however, Ireland and Scotland have been separated by the Irish Sea and the red grouse that live on either side do not meet and breed with each other. Due to the loss of habitat and game hunting the Irish red grouse have dwindled in numbers and scientists estimate that there are only about 4000 left. In order to conserve the red grouse for Ireland, it is important that their remaining habitat is well protected.

It is however known that small populations can go extinct in what is called an inbreeding depression if there is not enough genetic variation to keep the population healthy. This is similar to what happened to monarchies in Europe who suffered from diseases because they interbred within small families. Inbreeding depressions can be reversed with the introduction of DNA from other populations (e.g. by bringing Scottish birds to Ireland). This is however only a good idea if the populations are at risk of an inbreeding depression and if the two populations are not too different from each other.

Two years ago, it was found that in so called noncoding-DNA there were signs of possible inbreeding. Non-coding DNA, as the name suggests, does not code for proteins and as such is not important for the survival of the bird but can serve as a proxy for coding DNA. The strength of non-coding DNA as a proxy has however been called in to question, and for this reason we looked at the genetic variation in genes that are important for the immune system of both Irish and Scottish red grouse. We investigated three genes in several hundred grouse from both populations in order to assess how much variation was left in the small population of Ireland and if Irish and Scottish differed in their immune genes.

We found that contrary to what was found in non-coding DNA, in immune system genes there were no signs of inbreeding and the Irish population still had sufficient genetic variation. Furthermore, Irish and Scottish populations were significantly different from each other in the type of variation and thus proteins they had, which is a sign that the two populations differ in their immune system.

It has been proposed to introduce Scottish birds to Ireland and help the small Irish populations. Our results show that Ireland and Scotland differ in the immune genes they have and that the Irish birds are doing better than expected. Instead of "reopening the giant causeway" and bringing Scottish birds to Ireland, we should focus on preserving the Irish birds that are still here and help the population grow.