

tag team

Using satellite tags to understand wildlife crime

Although we are called the FitzPatrick Institute of African Ornithology, our research does extend beyond the African continent. This was recently the case when Natural England, the statutory conservation agency in England, asked us to help analyse their satellite-tag data from one of the UK's rarest raptors, the Hen Harrier *Circus cyaneus*.

Some readers may not be familiar with this species, as only the occasional vagrant reaches North Africa. However, in the UK the Hen Harrier is infamous as the most persecuted species in the country. The species is at the centre of a human-wildlife conflict between conservationists and managers of land used for the recreational shooting of Red Grouse.

In the UK, vast areas of the uplands, the so-called 'grouse moors', are managed for driven grouse shooting. The grouse are flushed by beaters towards shooting 'butts', where they are shot in large numbers. Driven grouse shooting requires very large populations of Red Grouse – often more than 200 birds per square kilometre. To achieve these densities, grouse moors are intensively managed and wild predators are killed in order to increase grouse numbers. The extermination of many predators, such as foxes, stoats, weasels and crows, is legally permitted; however, the illegal killing of raptors and other protected species is also thought to be widespread on many grouse moors.

The Hen Harrier is one such protected species. Its diet consists mainly of small mammals and birds, but it also preys on grouse chicks and in some circumstances can reduce the number of grouse available to be shot.

Within the UK, the status of the Hen Harrier in England is particularly worrying. Based on the available habitat,



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England should support some 300 pairs of Hen Harriers, but in the past decade only a handful of pairs have bred each year. The illegal killing of the species by people associated with grouse moor management has long been thought to limit its population size. However, identifying the scale of these crimes and their impact on harrier populations has been difficult because they occur in remote areas and evidence is likely to be destroyed. As a result, successful prosecutions are rare.

In 2007, Natural England started fitting Hen Harrier fledglings with satellite transmitters. Their aim was to better understand why numbers remain so low and to establish whether the illegal killing of the species could be responsible for this pattern. Between 2007 and 2017, 60 young harriers were fitted with transmitters. Together with Professor Steve Redpath and other colleagues in the UK, we analysed these data to explore whether patterns of their deaths and disappearance were linked to areas of land managed for driven grouse shooting.

Our study, recently published in *Nature Communications* ([doi:10.1038/s41467-019-09044-w](https://doi.org/10.1038/s41467-019-09044-w)), showed that the likelihood of tagged harriers dying or disappearing was 10 times higher within areas managed for grouse shooting than in other areas. This pattern also applied to protected areas, with those containing more grouse moors having

The Hen Harrier, sometimes called the 'skydancer' because of its amazing acrobatic breeding display, is one of the UK's rarest birds.

the highest likelihood of harriers dying or disappearing.

We estimated that 72 per cent of tagged harriers were likely to have been killed illegally, meaning that first-year survival of these tagged harriers was exceptionally low (17 per cent) compared with harriers from other areas (36 to 54 per cent). While dead harriers can be disposed of, the pattern of their disappearance revealed by the tracking data could not be hidden. All analyses led to the same conclusion: Hen Harriers in England suffer elevated levels of mortality on grouse moors and this is most likely as a result of illegal killing.

Our study shows just how widespread illegal killing is on grouse moors and that the species is not safe even within protected areas. The study also reveals that satellite tags can be useful to quantify levels of wildlife crime. Their use in this way is likely to increase and we are pleased to have contributed to the advancement of the field.

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