Maintaining healthy wild deer populations is important with respect to livestock and human health concerns, as well as potential inter-specific transmission to other wildlife populations. However, the maintenance of health in wild deer, as with many other game species, is also important for the benefits that wild deer bring, such as revenue from tourism, stalking and venison production. All species of deer have been found to host a wide range of endoparasites. Nematode parasites predominantly affect the gastro-intestinal tract and the lungs. Gastro-intestinal parasitism is not thought to be a significant problem in wild deer, although it may cause debilitation in conjunction with nutritional stress, other parasites or disease. Lungworm infection has been most commonly described in deer. *Dictyocaulus* spp, probably the commonest helminth parasites in deer, cause pathological changes in bronchi and larger bronchioles, and research has shown that *Dictyocaulus* cross-infection between red deer (*Cervus elaphus*) and cattle is possible. Protostrongylid lungworms such as *Elaphostrongylus cervi* have been found to mature in the central nervous system, before migrating to the skeletal muscles where they are mainly found within the connective tissue, usually causing subclinical parasitosis. *E. cervi* eggs and first stage larvae have also been obtained from the lungs of red deer, where they are usually associated with mild diffuse interstitial pneumonia. Infection with *E. cervi* is also common in Scottish deer (roe deer *Capreolus capreolus*, red deer and reindeer *Rangifer tarandus*), but other lungworms such as those of the genus *Muellerius* may also contribute.

Liver fluke is the only trematode parasite causing disease in British deer, and causes mortality in roe deer, although it does not appear to lead to clinical signs in red deer.

In this study, we analysed data on key indicator parasite loads and non-specific signs of disease in wild red and sika deer (*Cervus nippon*) in Scotland, U.K., between 1991 and 1999. The data include levels of infection of *Sarcocystis* spp, *Dictyocaulus* spp (the lungworm) and *Elaphostrongylus* spp (the tissue worm). These infections are principally significant from an animal health perspective, although *Elaphostrongylus* has a low pathogenicity in red deer.

*Sarcocystis* spp were present in 27% of red and 20% of sika deer. They were found at significantly higher levels in females than males, and the level of infection was greater in older animals. There were also significant differences in occurrence between years, with levels of infection being generally greater in later years. *Dictyocaulus* spp were present in 15% of both red and sika deer. The level of infection was higher in males than females. *Dictyocaulus* spp showed no significant differences in relation to age or region, but did show significant differences over time. *Elaphostrongylus* spp were present in 82% of red and no sika deer. Apart from the significant effect of species, only age was a significant factor for this infection, with older animals having a higher level of infection.

Of the non-specific signs of cardiac disease, none appeared at greater than 8.6% prevalence in either red or sika deer. The presence of any non-specific sign of cardiac disease was greater in females than males, and the level of infection was greater in older animals. There were also significant differences in occurrence between years, with levels of infection being generally greater in later years. *Dictyocaulus* spp were present in 15% of both red and sika deer. The level of infection was higher in males than females. *Dictyocaulus* spp showed no significant differences in relation to age or region, but did show significant differences over time. *Elaphostrongylus* spp were present in 82% of red and no sika deer. Apart from the significant effect of species, only age was a significant factor for this infection, with older animals having a higher level of infection.

Intensive monitoring of populations in specific areas is useful, but it provides only part of the picture. Where management of populations can vary so much in time and space, this picture may be misrepresentative. The data from our study provide a starting point in quantifying parasite loads.
in wild deer at a national scale. The large-scale sampling strategy has been sufficient to identify significant differences between species and within species (e.g. sex and age), as well as significant trends over time, for specific infections and general signs of health of wild deer in Scotland. However, to further improve our understanding of the distribution of diseases and infections in wild deer and other wildlife, and the risks these pose to livestock and humans, a coordinated long-term monitoring strategy needs to be established across the entire landscape, incorporating different habitats and management conditions, and also accounting for other possible influences such as deer population density and climatic conditions. More detailed examinations, e.g. expanding the number of specific indicator species, especially for zoonotic infections and those potentially affecting livestock, are also required. It is also essential that the data on levels of infection can be linked geographically with other possible influential factors such as population density, livestock farming regimes and climate. It is only by combining these biological and environmental data sets at the appropriate spatial and temporal resolutions, that possible links between disease incidence and abundance with external factors such as climate and deer population density can be established. Such monitoring is essential for ensuring the health and welfare of wildlife populations, and should form an integral part of a wild deer management strategy for the future.