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Ecological Solutions and Evidence

PRACTICE INSIGHTS

The ungulate pretender: Why the non-native Sika deer may become Scotland's new Monarch of the Glen

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Abstract

1. High deer densities conflict with carbon sequestration and nature restoration objectives in Scotland, and heavy culling is increasingly common, alongside woodland expansion.
2. To date, there is little coordination of deer control to address the spread of the non-native Sika deer. Sika differ from native species in several ways that make them more likely to occupy newly created woodland habitat, achieve high densities, cause environmental damage and evade culling.
3. In the absence of strategic management, there is a risk that culling has limited or perverse outcomes for Scotland's natural environments and native deer by reinforcing Sika's advantages, inadvertently creating a population dominated by non-native deer and hybrids.
4. We, a group of ecologists, deer managers and foresters, use our own experience alongside existing literature to highlight the challenges of, and to make a series of recommendations for, coordinated Sika management.
5. *Solution*. We call for official recognition of the threats posed by Sika as an invasive non-native species, in order to support strategic control of Sika populations at the edges of their range and at key points within them. This control can benefit enormously from collaborative evidence gathering using new technologies such as drone-based censuses, information sharing and coordinated culls.

KEYWORDS
afforestation, deer management, ecological restoration, environmental management, invasive species, rewilding, species monitoring

1 | INTRODUCTION

Deer populations in Scotland are thought to be at an all-time high of between 800,000 and 1 million, having probably doubled over the past 35 years (NatureScot, 2024b; Scottish Government, 2024a). The majority of these animals are the native species Red deer *Cervus elaphus* (an estimated 500,000) and Roe deer *Capreolus capreolus* (300,000), with smaller numbers of non-native Sika *Cervus nippon* (25,000) and fallow deer *Dama dama* (8000) (NatureScot, 2024b). Densities vary widely, but Forestry and Land Scotland, the

government agency responsible for managing national forests and land, has recorded up to 64 deer km^{-2}, while NatureScot, the governmental public body responsible for natural heritage, estimates an average density of Red deer of around 10 km^{-2} (Albon et al., 2019; Forestry and Land Scotland, 2021).

High deer densities pose a serious challenge for environmental restoration, particularly in limiting regeneration of Scotland's small, fragmented native woodlands. This challenge has new urgency following the expansion of restoration management in recent years, prompted by Government targets for tree planting, biodiversity recovery and climate change mitigation (Scottish Government, 2020, 2022), as well as the development of natural capital markets and mechanisms such as the Woodland Carbon Code (Scottish Government, 2024b; Woodland Carbon Code, 2019). Efforts are now being made in many areas to reduce deer populations to densities of 2–7 deer km^{-2} to allow recovery of over-grazed ecosystems (Forestry and Land Scotland, 2021).

Population reduction is hampered, however, by a number of issues. Firstly, the culling required is time-consuming and costly especially where, as is often the case, surrounding land is managed to maintain high numbers for commercial hunting (Pollock et al., 2022). Secondly, any reductions in density can cause compensatory increases in recruitment and dispersal within or among species, potentially making culling a victim of its own success (Putman, 2012). Thirdly, effective responses to these challenges are undermined by the difficulty of gathering accurate and timely information on population dynamics, leaving culling to proceed under substantial levels of uncertainty.

Advances in technology could be used to transform this difficult situation. Drone-based thermal imaging has particular promise because it allows rapid, repeatable and highly accurate monitoring to be carried out (Zabel et al., 2023), although variable detection under different types of vegetation remains an issue. The cost of the equipment required has fallen sharply in the past few years, making regular surveys feasible for many landowners. In principle, this may allow near real-time feedback from population dynamics and impact monitoring to culling plans. As well as making culling more effective, such monitoring can also greatly improve our understanding of ecological responses. In particular, evidence is already suggesting that populations of non-native Sika deer are larger and harder to control than previously appreciated (see example below).

We are a group of ecologists, deer managers and foresters working on rewilding estates in Argyll, Highland and Aberdeenshire (western, northern and eastern Scotland, respectively), on which intensive culling efforts have been combined with a range of deer population and impact monitoring programmes. These efforts are made as essential components of ecological restoration, but do not directly generate income through commercial stalking or other means. In this *Practice Insights* article, we review published evidence (cited in the text) and present our own experience (uncited statements) to identify a range of advantages that non-native Sika deer have over native species. Worryingly, these advantages may be reinforced by culling if it is not appropriately targeted. In writing this article, we hope to prompt further consideration of these critical emerging issues, and we make a series of recommendations for ecologically appropriate deer management in Scotland.

2 | IDENTIFYING THE PROBLEM

Three of the authors are experienced deer managers who have observed the spread of Sika deer over several decades. Since 2020, we have worked on three estates managed by Highlands Rewilding Ltd., a private company dedicated to nature restoration, in the Scottish Highlands (Bunloit, 500 ha), Argyll (Tayvallich, 1400 ha) and Aberdeenshire (Beldorney, 350 ha). Our work on these sites has occurred alongside a range of monitoring programmes to record deer numbers and impacts (Figure 1).

Deer numbers (Red, Roe and Sika combined) on each of these sites are high, ranging between 13 and 22 deer km^{-2} as of 2024. Browsing impact surveys (using the method of Armstrong et al., 2023) have revealed that browsing almost entirely precludes regeneration in many areas. Monitoring of one restock site, in which almost 25,000 native trees were planted in 2024, found ca. 96% (non-fatal) browsing of tree seedlings after 6 months, despite being a focus of stalking pressure. Over the past 2 years, drone-based censuses using thermal imaging and super-zoom optics have revealed higher numbers of deer than we had estimated using systematic ground-based visual counts, especially of Sika deer on the two estates where they are present (Tayvallich and Bunloit, where they formed 61% and 88% of the total deer populations recorded in 2024, respectively). In these cases, deer populations recorded in 2025 were higher than those recorded in 2024 despite culls of up to 190% in the interim (Table 1). These figures are subject to uncertainties and ingress from neighbouring land, but indicate both the scale of the challenge and the role that repeated spatially explicit data of this kind can play in targeting and monitoring culling effort.

3 | EXPLAINING THE PROBLEM

Sika are native to eastern Russia and Asia, but were introduced to Scotland from 1860 onwards. They were thought to have colonised 14,000 km^2 by the early 2000s, expanding their range at rates of up to 7.4% per annum (Harris & Yalden, 2008; Pérez-Espona et al., 2009). They are considered one of the most invasive mammal species in Europe (Saggiomo et al., 2020). Much research has focused on Sika ecology and management in Japan (e.g. McCullough et al., 2008 and references therein), but for reasons of space and relevance, we here primarily rely on literature and experience from Scotland (Figure 2).

3.1 | Sika hybridise with Red deer

As they spread, Sika have hybridised with native Red deer (as they do in east Asia, where the two species naturally overlap)

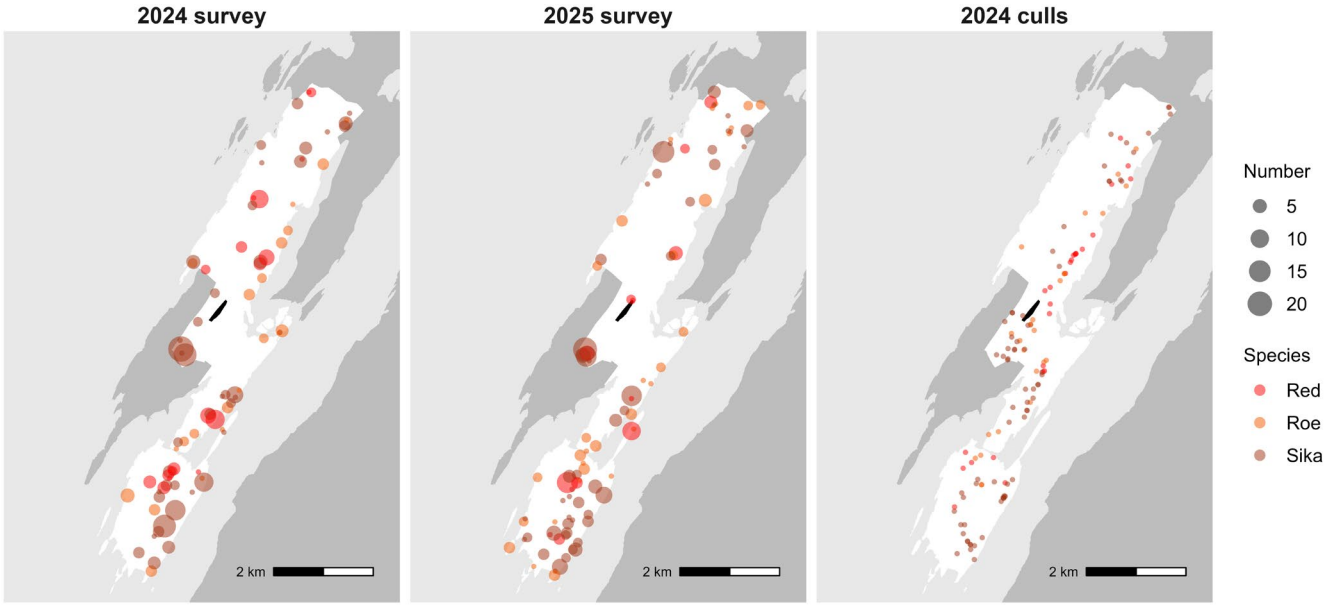

FIGURE 1 Results of annual drone-based thermal imaging census surveys (left, middle) and cull records (right) from Tayvallich estate, Argyll. The estate is shown in white, with areas of thick vegetation that were not surveyed in black, external land dark grey and sea light grey.

TABLE 1 Results of annual drone-based thermal imaging census surveys (left, middle) and cull records (right) from each estate.

	2024 survey	2025 survey	2024 culls
Tayvallich			
Red deer	68	53	24
Roe deer	46	57	21
Sika deer	175	192	61
Bunloit			
Red deer	0	11	18
Roe deer	8	10	18
Sika deer	61	91	95
Beldorney			
Red deer	9	0	0
Roe deer	70	25	59
Sika deer	0	0	0

Note: Census numbers are minimums, given the lack of visibility in some areas under thick vegetation, but species identifications are made visually and with high confidence.

(Bartoš, 2008). Hybridisation in Scotland is recorded as being rare and limited by strong assortative mating, but capable of occurring in mass hybridisation events, generally driven by Sika stags mating with Red hinds (Pérez-Espona et al., 2009). However, genetic analysis suggests that hybridisation events may be more common than currently recognised (McFarlane et al., 2020; Smith et al., 2018). In our experience, hybridised stock is common but not ubiquitous in Argyll, and is often the product of Sika stags either loitering unchallenged around Red groups, or approaching them at night and mating. Anecdotally, heavy culling of Red deer stags during the 1980s and 1990s for forestry may have helped to establish hybridisation in Argyll, because Sika stags had a competitive advantage under culling (as we highlight here) and subsequently formed a larger part, or even locally the whole, of the male population mating with Red deer hinds.

3.2 | Sika are highly tolerant of poor weather and resources

Hybridised young are likely to have competitive advantages (Gélin et al., 2019), but Sika themselves have several advantages over native species that may make them harder to control. Sika are known to use lower quality habitats when present in high densities in Japan (Borkowski, 2000), and our observations suggest that they tolerate poorer habitat in Scotland too. They thrive on lower-quality food and have the advantage, over Red if not Roe deer, of smaller mouths that allow them to access emerging vegetation through precise browsing. They appear more resilient to cold and wet weather (perhaps because of their thicker winter coats), and are found at higher densities than Red deer in the same habitat (Pepper et al., 2019). We believe that they feed better during the rut (as well as do better on the feed) than Red deer, which eat little or nothing in this period. Sika that we have culled—at any time of year—are usually in good condition, notably with more fat on their backs than Red or Roe.

3.3 | Sika are hard to cull

Sika spend more time in or close to the edge of thick cover, especially coniferous plantations, and are more vigilant when feeding

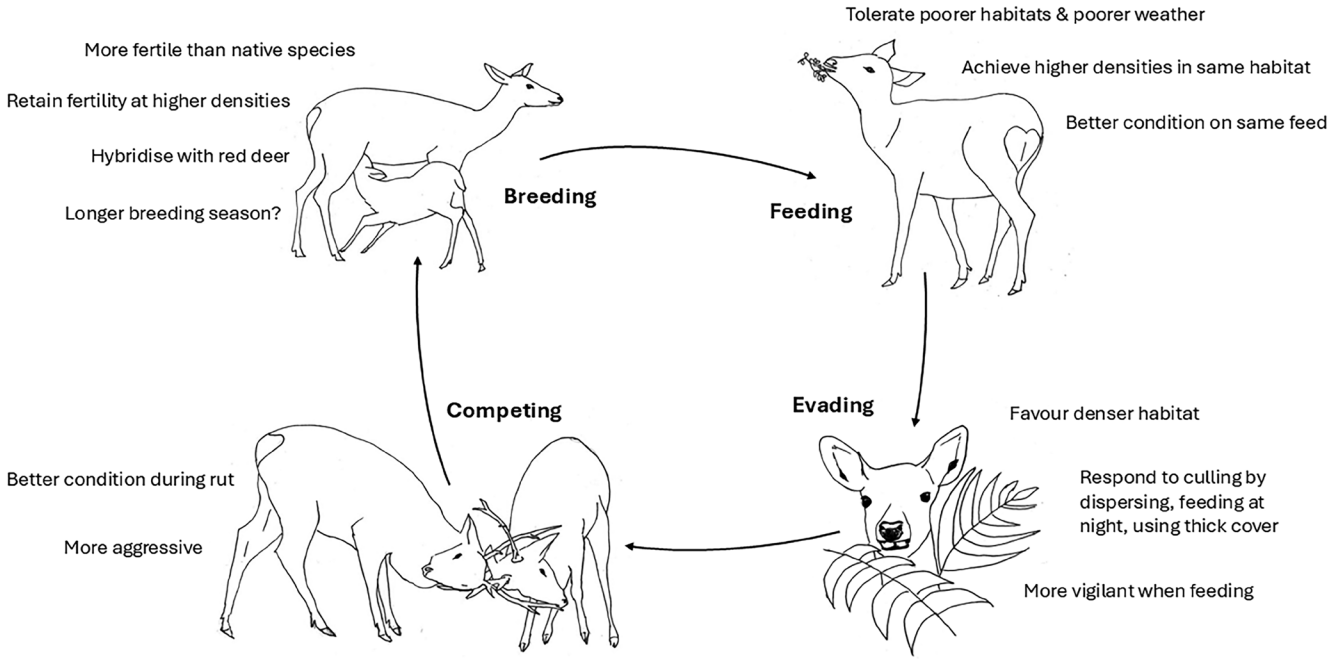

FIGURE 2 Advantages of Sika deer at key stages in the life cycle.

than Red deer (Chadwick et al., 1996). Research using camera traps on our Bunloit site has revealed a strong association of Sika (and Roe) to woodlands (Lovell et al., 2024). When culling occurs, Sika respond by dispersing and becoming more active at night and within denser vegetation (Ikeda & Koizumi, 2024; Pepper et al., 2019). The expansion of commercial conifer forests in Scotland during the 20th century increased their range, which was estimated to have reached at least 40% of that of Red deer by the turn of the century (Smith et al., 2018). We have known them to use gaps underneath fences of less than 25 cm (they are occasionally caught in snares as a result). For all of these reasons, we estimate that it takes 1–2 h to cull a Red deer, but 8–10 h to cull a Sika (with commensurate increases in cost).

3.4 | Sika have high fecundity

Once established, Sika are also more fecund than Red or Roe deer. The population of Sika deer in South Scotland was found to be one of the most fertile populations in the country and could sustain a cull in the region of 25% per annum, compared with around 20% for Scottish woodland Red deer (although Albon et al. (2019) suggest the figure for Red deer has increased over the years from 17% to 22% for stable populations). Sika deer have been found to be more fertile than Red deer in all age classes (Chadwick et al., 1996), and they show no reduction in reproductive performance at densities which would have this effect in Red deer (Pepper et al., 2019). Their breeding advantage is bolstered by their better condition during the rut, and their tendency to be more aggressive than native species. We have observed that Red and Roe deer are uncomfortable when Sika whistle during the rut. We have also noted in recent years that the Sika rut extends before and after the Red rut, with young being born across a larger portion of the year, and we suggest that this in combination with other advantages may explain Sika's high recorded levels of fecundity.

3.5 | Sika cause distinct environmental damage

There are also differences in the impacts of Sika. Sika cause considerable damage to woodlands through browsing, bark stripping and bole-scoring, in which stags gouge vertical grooves into trees as part of territorial rutting behaviour (Pepper et al., 2019). Sika are not the only deer to bole-score, but they do it more frequently, and more damagingly, than other species, and are associated with distinct impacts on woodlands as a result (Saggiomo et al., 2020). Substantial damage to saltmarsh from Sika browsing has also been found in the United Kingdom (Diaz et al., 2005), and long-term damage to canopy formation that can only be reduced via professional culling in New Zealand (Husheer & Tanentzap, 2024).

3.6 | Sika tolerate parasites and pathogens

Sika are also considered responsible for the presence and spread of the parasitic nematode *Ashworthius sidemi* among ungulates in many European countries (Saggiomo et al., 2020). This multi-host nematode can heavily infect species including Sika, but Red and Roe deer are typically only infected with a few hundred worms

and show little or no pathology (Brown et al., 2022). In Ireland, Sika deer have been infected with Bovine Tuberculosis from cattle, while pathogenic and antimicrobial-resistant *Escherichia coli* have been found in Red–Sika deer hybrids in the same area (Brown et al., 2022). At the same time, Sika are resilient to parasitic infections, and seem better able to tolerate tick infestations than Red or Roe deer.

4 | SOLVING THE PROBLEM

There is substantial and growing evidence that Sika deer represent a distinct problem for environmental management in Scotland. Our experience suggests that the scale of this problem is not yet fully appreciated, and that efforts to reduce browsing pressure may be ineffective or even counter-productive if species-specific approaches are not taken. Our data and the wider literature suggest that culling has a smaller impact on population sizes where Sika are present, and that it can favour hybridisation and replacement of native with non-native species. These population impacts are long-lasting and hard to reverse, with worrying implications for Scotland's environmental targets.

This problem will not be solved under current circumstances. Sika deer are eaten in Scotland and so carcasses do have some value, provided the legal requirement for rapid transportation to a hygienic, chilled 'larder' for further processing is met. Nevertheless, we estimate that it costs approximately £120 per deer to stalk, cull, transport to larder and prepare a carcass for the game dealer. At normal weights and meat value, this results in a loss of around £80 per animal, even without considering the costs of the necessary infrastructure. Tens of thousands of pounds are likely to be lost annually by any estate seriously attempting to reduce deer populations. Evidence from Japan shows that in such resource-limited circumstances, control can only be ensured within small areas (Ijima et al., 2015).

We therefore suggest that bold and urgent action is needed to address the risks of Sika dominance. These suggestions are derived from our own experience, evidence from Japan (see e.g. McCullough et al., 2008) and from Scotland.

1. Official recognition, regulation and support
   a. Prominent official support for information-gathering and appropriate management of Sika as an Invasive Non-Native Species;
   b. A national objective to reduce and ultimately reverse the spread of Sika deer, with targeted efforts supported by governmental bodies, in particular NatureScot (Pepper et al., 2019);
   c. A requirement for coordinated management among landowners, especially at range frontiers;
   d. A public campaign to encourage recognition of the problem, support for management and consumption of wild venison as a sustainable meat.
2. Increased magnitude and targeting of culls
   a. Variation in open seasons and support for targeted Sika culls to increase relative pressure (e.g. a 'Sika bounty', as currently being trialled in an area of 527 km^2 on the south-eastern side of Loch Ness (NatureScot, 2024a)), and greater use of night-time shooting (Ikeda et al., 2019).
   b. To ensure achievement of cull targets, government-funded Sika control programmes may need to use professional contractors (Husheer & Tanentzap, 2024);
   c. Normalisation of carcasses being left out to decompose in hard-to-reach areas, to reduce barriers to culling and deliver nutrient benefits;
   d. Development of deer larders that can handle large numbers of carcasses in affected areas, enabling increased culls, local food provision and employment.
3. Monitoring and planning
   a. Specific consideration of Sika ecology and impacts in nature restoration projects to avoid inadvertent facilitation of invasion;
   b. Forest design that prioritises mosaics with open areas over large contiguous blocks, and use of sacrificial species such as Salix (willow), to enhance culling opportunities;
   c. Research into Sika's notably diverse feeding habits, to understand use of food sources and locations throughout the year;
   d. Use of thermal imaging, browsing impact surveys and camera traps for frequent, accurate monitoring;
   e. Application of these data in population growth and dispersal models to plan effort and maximise impact (with the possibility of near-real-time 'digital twin' systems).

Many of these recommendations are far more achievable than they were before recent advances in technology and increases in public and private sector support for nature restoration. We therefore suggest that after decades of watching this situation worsen, we are now simultaneously able to recognise its true scale and tackle it successfully. If so, Sika could become emblematic of Scotland's newfound determination and ability to manage its environments sustainably.

AUTHOR CONTRIBUTIONS

Calum Brown led the writing, review and analysis, to which all authors contributed. David Butkowski, Ewan Paterson, Keir Smith and David Tulloch contributed experience in deer management. Cathy Atkinson and Penelope Whitehorn developed the Figures. All authors approved the manuscript.

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CONFLICT OF INTEREST STATEMENT

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PEER REVIEW

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DATA AVAILABILITY STATEMENT

This article does not use research data but the illustrative data shown in Figure 1 is provided in Table 1.

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REFERENCES

Albon, S. D., McLeod, J., Potts, J., Irvine, J., Fraser, D., & Newey, S. (2019). *Updating the estimates of national trends and regional differences in red deer densities on open-hill ground in Scotland* (No. Scottish Natural Heritage Research Report No. 1149). Scottish Natural Heritage. https://www.nature.scot/sites/default/files/2019-11/A3115490.pdf

Armstrong, H., Black, B., Holl, K., & Thompson, R. (2023). *The woodland herbivore impact assessment method user guide*. Scottish Forestry. https://www.forestry.gov.scot/publications/1480-the-woodland-herbivore-impact-assessment-method-user-guide/viewdocument/1480

Bartoš, L. (2008). Sika deer in continental Europe. In *Sika deer* (pp. 573–594). Springer Japan.

Borkowski, J. (2000). Influence of the density of a sika deer population on activity, habitat use, and group size. *Canadian Journal of Zoology*, *78*(8), 1369–1374.

Brown, T. L., Airs, P. M., Porter, S., Caplat, P., & Morgan, E. R. (2022). Understanding the role of wild ruminants in anthelmintic resistance in livestock. *Biology Letters*, *18*(5), 20220057.

Chadwick, A., Ratcliffe, P., & Abernethy, K. (1996). Sika deer in Scotland: Density, population size, habitat use and fertility—Some comparisons with red deer. *Scottish Forestry*, *50*, 8–16.

Diaz, A., Pinn, E., & Hannaford, J. (2005). 14. Ecological impacts of Sika deer on Poole harbour saltmarshes. In *The ecology of Poole harbour* (Vol. 7, pp. 175–188). Elsevier.

Forestry and Land Scotland. (2021). *Deer numbers placing unprecedented pressure on environment*. Forestry and Land Scotland. https://forestryandland.gov.scot/news-releases/deer-numbers-placing-unprecedented-pressure-on-environment

Gélin, U., Keller, M., de Beaupuis, V., Nowak, R., Lévy, F., & Locatelli, Y. (2019). Impact of hybridization between sika and red deer on phenotypic traits of the newborn and mother–young relationships. *Animal Behaviour*, *158*, 65–75.

Harris, S., & Yalden, D. W. (2008). *Mammals of the British isles: Handbook* (4th ed.). Mammal Society.

Husheer, S. W., & Tanentzap, A. J. (2024). Hunting of sika deer over six decades does not restore forest regeneration. *The Journal of Applied Ecology*, *61*(1), 134–144.

Ijima, H., Fujimaki, A., Ohta, U., Yamamura, K., Yokomizo, H., Uno, H., & Matsuda, H. (2015). Efficient management for the Hokkaido population of sika deer *Cervus nippon* in Japan: Accounting for migration and management cost. *Population Ecology*, *57*(2), 397–408.

Ikeda, T., & Koizumi, I. (2024). Evaluation of multiple behavioral responses of sika deer to human hunting pressures. *The Journal of Wildlife Management*, *88*(1), e22499.

Ikeda, T., Takahashi, H., Igota, H., Matsuura, Y., Azumaya, M., Yoshida, T., & Kaji, K. (2019). Effects of culling intensity on diel and seasonal activity patterns of sika deer (*Cervus nippon*). *Scientific Reports*, *9*(1), 17205.

Lovell, C., Pettorelli, N., & Dawson, T. P. (2024). Land cover preferences and spatiotemporal associations of ungulates within a Scottish mammal community. *Ecology and Evolution*, *14*(2), e11015. https://doi.org/10.1002/ece3.11015

McCullough, D. R., Takatsuki, S., & Kaji, K. (2008). *Sika deer: Biology and management of native and introduced populations* (Eds. McCullough, D. R., Takatsuki, S., & Kaji, K.; 2009th ed.). Springer. https://books.google.com/books/about/Sika_Deer.html?id=mn9R8-0G4LgC

McFarlane, S. E., Hunter, D. C., Senn, H. V., Smith, S. L., Holland, R., Huisman, J., & Pemberton, J. M. (2020). Increased genetic marker density reveals high levels of admixture between red deer and introduced Japanese sika in Kintyre, Scotland. *Evolutionary Applications*, *13*(2), 432–441.

NatureScot. (2024a). *Deer cull incentive schemes launch to help tackle nature and climate crises*. NatureScot. https://www.nature.scot/deer-cull-incentive-schemes-launch-help-tackle-nature-and-climate-crises

NatureScot. (2024b). *Deer management in Scotland - Frequently Asked Questions (FAQs)*. https://www.nature.scot/doc/deer-management-scotland-frequently-asked-questions-faqs

Pepper, S., Barbour, A., & Glass, J. (2019). *The management of wild deer in Scotland: Report of the Deer Working Group*. The Deer Working Group. https://www.gov.scot/binaries/content/documents/govscot/publications/independent-report/2020/02/management-wild-deer-scotland/documents/management-wild-deer-scotland-report-deer-working-group/management-wild-deer-scotland-report-deer-working-group/govscot%3Adocument/management-wild-deer-scotland-report-deer-working-group.pdf

Pérez-Espona, S., Pemberton, J. M., & Putman, R. (2009). Red and sika deer in the British Isles, current management issues and management policy. *Mammalian Biology*, *74*(4), 247–262.

Pollock, M. L., Holland, J. P., & McCracken, D. I. (2022). *Overcoming deer management challenges*. https://pure.sruc.ac.uk/files/45790889/Overcoming_Deer_Management_Challenges.pdf

Putman, R. J. (2012). Effects of heavy localised culling on population distribution of red deer at a landscape scale: An analytical modelling approach. *European Journal of Wildlife Research*, *58*(5), 781–796.

Saggiomo, L., Esattore, B., & Picone, F. (2020). What are we talking about? Sika deer (*Cervus nippon*): A bibliometric network analysis. *Ecological Informatics*, *60*, 101146.

Scottish Government. (2020). *Update to the climate change plan 2018–2032*. Scottish Government. https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2020/12/securing-green-recovery-path-net-zero-update-climate-change-plan-20182032/documents/update-climate-change-plan-2018-2032-securing-green-recovery-path-net-zero/update-climate-change-plan-2018-2032-securing-green-recovery-path-net-zero/govscot%3Adocument/update-climate-change-plan-2018-2032-securing-green-recovery-path-net-zero.pdf

Scottish Government. (2022). *Biodiversity strategy to 2045: Tackling the nature emergency - draft*. Scottish Government. https://www.gov.scot/publications/scottish-biodiversity-strategy-2045-tackling-nature-emergency-scotland/

Scottish Government. (2024a). *Managing deer numbers for nature and climate*. https://www.gov.scot/news/managing-deer-numbers-for-nature-and-climate/

Scottish Government. (2024b). *Natural capital market framework*. Scottish Government. https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2024/11/natural-capital-market-framework/documents/natural-capital-market-framework/natural-capital-market-framework/govscot%3Adocument/natural-capital-market-framework.pdf

Smith, S. L., Senn, H. V., Pérez-Espona, S., Wyman, M. T., Heap, E., & Pemberton, J. M. (2018). Introgression of exotic Cervus (*nippon* and *canadensis*) into red deer (*Cervus elaphus*) populations in Scotland and the English Lake District. *Ecology and Evolution*, *8*(4), 2122–2134.

Woodland Carbon Code. (2019). *About the code—UK Woodland Carbon Code*. Woodland Carbon Code. https://www.woodlandcarboncode.org.uk/about/about-the-code

Zabel, F., Findlay, M. A., & White, P. J. C. (2023). Assessment of the accuracy of counting large ungulate species (red deer *Cervus elaphus*) with UAV-mounted thermal infrared cameras during night flights. *Wildlife Biology*, *2023*(3), e01071.

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