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SHORT COMMUNICATION

Seasonal Pattern of Springbok Fence Related Mortalities in Southern Namibia

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ABSTRACT

Analysing a decade of records on fence-related springbok mortalities at an 8000 ha farm with 36 km of internal (height: 1 m) and 48 km of boundary fences (height: 1.4 m) resulted in an average mortality occurrence of 0.25 and 0.61 mortalities/km (over the 10 years period) for boundary (1.4 m) and internal (1 m) fences, respectively. Male mortalities occur mainly during summer (hot/wet season) with equal numbers killed in internal and boundary fences, while female mortalities are mainly associated with winter (cold/dry season) and internal fences. Mitigations to minimise mortalities include varying the width of the upper fence strands and leaving camp gates open when livestock are not present to facilitate the movement of springbok.

1 | Introduction

Linear barriers, especially fences that curtail movement, can have catastrophic implications for migratory ungulate species (e.g., Sawyer et al. 2013). Such barriers could limit the flow of genetic material (e.g., Bartlam-Brooks et al. 2010; Mbaiwa and Mbaiwa 2006), prevent access to important resources (e.g., Hering et al. 2022b; Spinage 1992), result in the overexploitation of resources (e.g., Vanak et al. 2010) as well as cause entanglement and death (e.g., Mbaiwa and Mbaiwa 2006; Safner et al. 2021).

Livestock fences are typically used to manage domestic stock for rotational grazing purposes under extensive farming practices and are effective barriers for ungulates such as oryx (*Oryx gazella*) and springbok (*Antidorcas marsupialis*) (Urban 2021) associated with most farms throughout southern Namibia. However, no fences are entirely impermeable, with various species often becoming ensnared during attempts to pass through/over these artificial barriers. The impacts of fences on biodiversity are substantial (e.g., McInturff et al. 2020); however, there is a dearth of published data regarding actual ungulate mortalities associated with livestock fences on farms in Namibia. Here I present empirical evidence of springbok mortalities associated with livestock fences over a period of 10 years between January 2015 and December 2024 on a freehold farm in the Grünau area, southern Namibia.

2 | Materials and Methods

All springbok carcasses encountered in the livestock fences (internal fences with a height of 1 m and seven steel wire stands and boundary fences with a height of 1.4 m and six steel wire strands covered with wire netting—i.e., jackal proof) on an 8000 ha farm in southern Namibia with 36 km of internal and 48 km of boundary fences during weekly and otherwise serendipitous inspections were documented, aged, and sexed before being removed (Figures 1 and 2).

The average rainfall for the area is between 50 and 100 mm p.a., which occurs as thundershowers during the summer months (hot/wet season) between September and April (mainly between December and March) with opportunistic rainfall occurring during the winter months (cold/dry season) between May and August (Mendelsohn et al. 2002). Rainfall was collected in

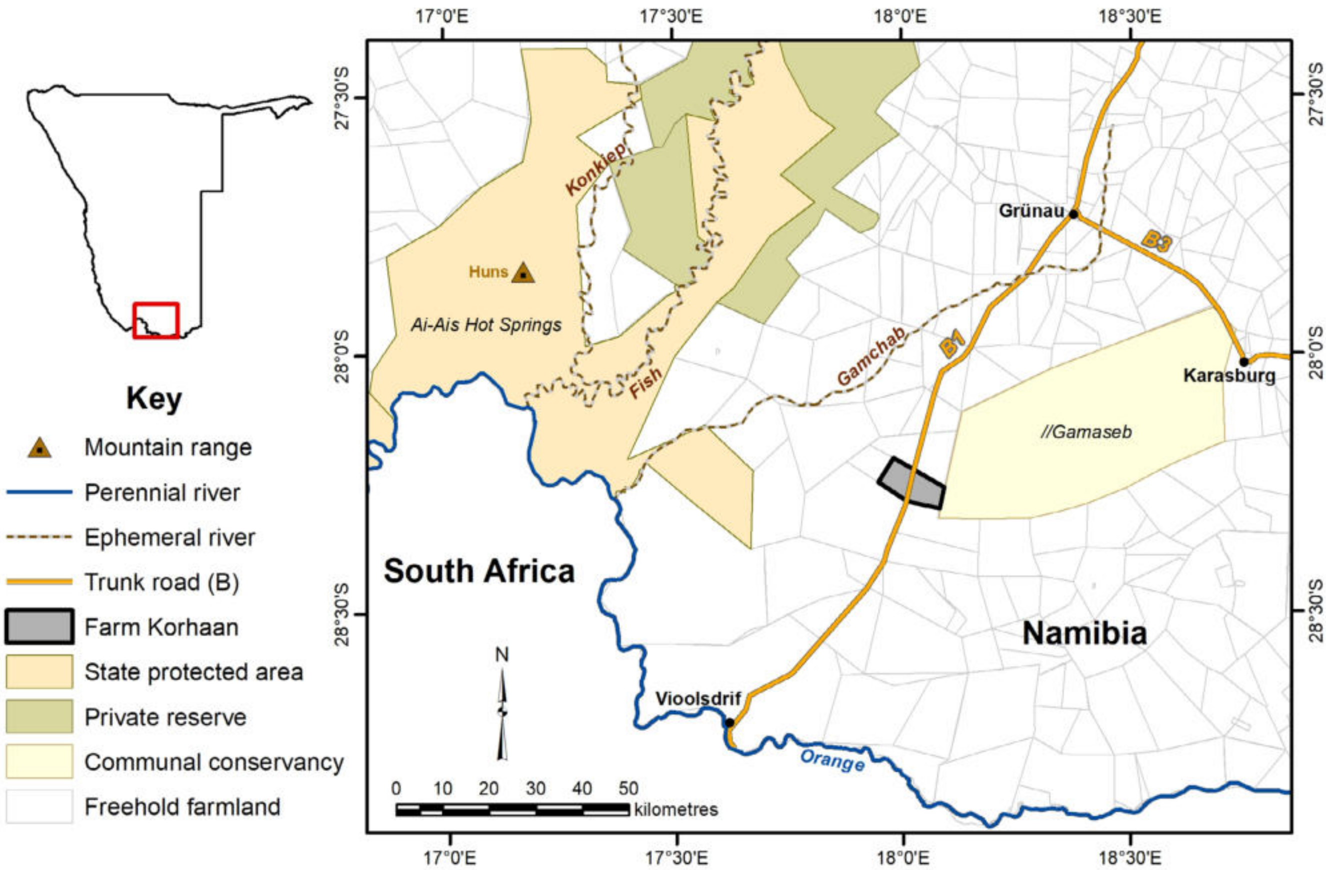

FIGURE 1 | The study site located in southern Namibia (Jaro Consultancy).

FIGURE 2 | Sub-adult male springbok ensnared in an internal fence during an attempted crossing, April 2015.

calibrated plastic rain gauges at 13 measuring sites throughout the farm.

No use of any Artificial Intelligence Generated Content (AIGC) tools such as ChatGPT and others based on large language models (LLMs) was used in developing any portion of this manuscript.

3 | Results and Discussion

A total of 34 springbok carcasses (20 males, 13 females, and 1 lamb) were removed from fences over the 10-year period, with the majority ensnared by the topmost two steel wire strands. Most springbok mortalities, both sexes, were encountered during the rainy season between December and March (Figure 3), while more male mortalities were encountered during the summer months (January–March) and females during the winter months (July–August).

Rainfall results in the emergence of fresh herbs and grasses, and when springbok pursue such new vegetative growth (e.g., Berry et al. 2024), within and across farms, they encounter fences more frequently. Consequently, the risk of entanglement rises, and more mortalities are observed during the rainy season (Hering et al. 2022a; Jackson et al. 1993). Springbok spend less time foraging with an increase in daytime temperature (Berry et al. 2023, 2024), potentially resulting in more nocturnal foraging (Bigalke 1972; Stapelberg 2007). As Stapelberg (2007) indicates that male springbok maintain constant activity throughout the night, this may increase entanglement with fences due to low visibility and could explain the higher boundary fence-related mortalities for male springbok.

Visiting water points are expected to be less significant reasons for attempting fence crossings and potential entanglement as springbok are water independent (Nagy and Knight 1994) and utilise water intermittently (Stapelberg 2007). Drinking makes up a very small portion of their time budget in southern Namibia, and this only during the dry period (Cunningham and Cunningham 2023).

The increase in female springbok mortalities during the winter months (July and August) is less clear and not expected

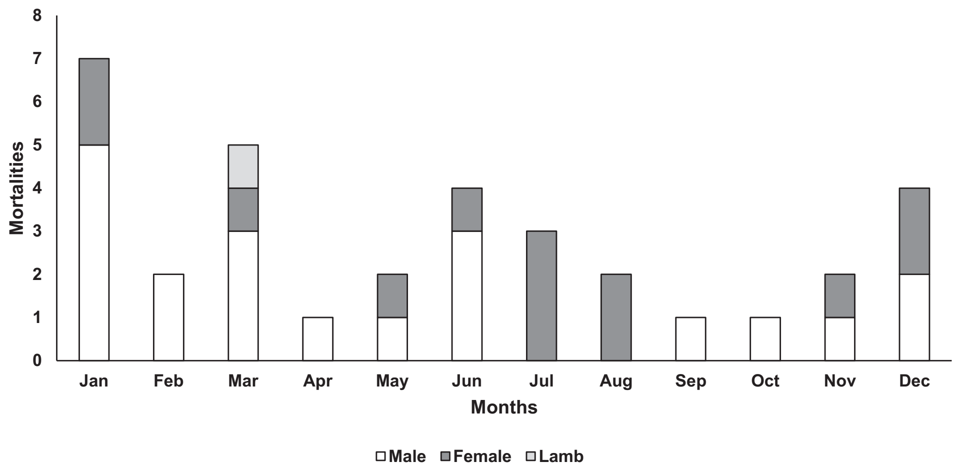

FIGURE 3 | Springbok monthly fence-related mortalities over a 10-year period (2015–2024) from southern Namibia.

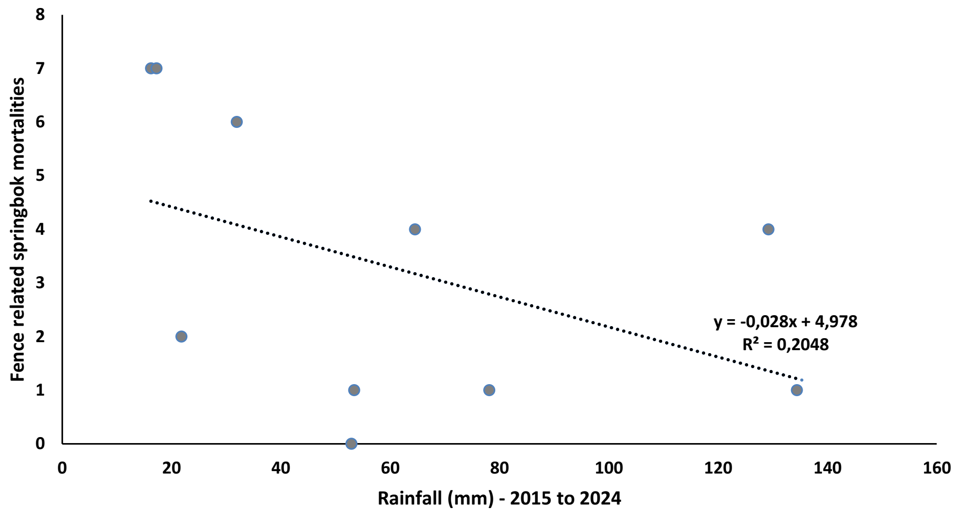

FIGURE 4 | Springbok fence-related mortalities in relation to mean annual average rainfall over a 10-year period (2015–2024) from southern Namibia.

to be rainfall related as winter rainfall during the 10-year study period was scant with no associated vegetative growth (pers. obs.). Furthermore, as springbok do not have a specific breeding season with breeding activity associated with seasonal changes and other environmental vagaries (Skinner and Van Jaarsveld 1987), increased movement (and fence-related mortalities—boundary and internal) also cannot be attributed to rut and/or breeding activities. This is in contrast to Harrington and Conover (2006) who indicate an increase in fence mortalities associated with the weaning of mule deer/pronghorn/elk fawns. However, it is suggested that the poorer quality vegetation during the dry winter months results in springbok (both sexes) walking more in search of food (Cunningham and Cunningham 2023) with lactating and/or post-lactating females (lactation of 120 days during favourable conditions, Liversidge and De Jager 1984) foraging wider to support lambs born during the previous rainy season or their own post-partum recovery. Most rainfall typically occurs between January and March in the area (pers. obs.).

Out of the 20 male springbok mortalities, 10 carcasses each were observed in the internal and boundary fences compared to only 2 female carcasses observed in the higher boundary fences and 11 in the lower internal fences. An average mortality occurrence of 0.25 and 0.61 mortalities/km was determined for boundary and internal fences, respectively. Harrington and Conover (2006) estimated an average annual fence mortality occurrence of 0.25 mortalities/km for mule deer (0.08 mortalities/km), pronghorn (0.11 mortalities/km), and elk (0.06 mortalities/km) albeit mainly fawns during weaning. As male springbok are territorial and more sedentary than females (Jackson et al. 1993), boundary fences pose more of a barrier to female springbok, with fewer boundary fence-related mortalities, while male springbok attempt more boundary fence crossings, some of which can be successful, due to territorial disputes along and through such fences (pers. obs.). However, most attempts by springbok crossing a water pipeline east of Swakopmund in western Namibia indicated that only 6.8% of crossing attempts were conducted at heights more than 70 cm (Cunningham et al. 2015), suggesting that boundary fences of 1.4 m are probably at their upper limit.

There was an increase in springbok fence-related mortalities (both sexes) during below-average rainfall years, with the highest mortalities recorded during the two driest years during the study period (Figure 4). This can probably be ascribed to increased movement in search of food and a decrease in overall body condition, resulting in more fence-related mortalities. Furthermore, springbok are known to migrate in areas where rainfall is sporadic and localised (e.g., historic 'treks') (Jackson et al. 1993) and probably attempt fence crossings more during periods of drought to get to other better foraging areas. Better rainfall years probably have the opposite effect, with springbok in good body condition more successful in fence crossing attempts. The more forage available throughout the camps probably results in less incentive overall to attempt fence crossings.

Disturbances caused by predators, mainly black-backed jackal (*Canis mesomelas*) during this study (also African wild dogs, *Lycaon pictus*—Van Dyk and Slotow 2003) and human-induced (e.g., vehicle movement, etc.) may also contribute to springbok fence mortalities when they attempt to flee the perceived threat.

Based on annual population estimates, fence-related mortalities were 10% of the total springbok population. Mortalities affect the growth rate of ungulate populations, with the inherent growth rate rarely exceeding 40% for larger ungulates (Bothma and Du Toit 2016), and consequently affect the potential for wildlife use. However, according to Harrington and Conover (2006) there was a direct relationship between the frequency of fence mortalities and ungulate abundance.

To mitigate fence-related mortalities, it is recommended that the distance between the top two steel wire strands be increased to 300 mm from the existing standard of 200 mm for internal fences. For boundary fences with three steel wires, a 100 mm gap should be decreased to 50 mm. These alternative gaps could potentially result in fewer fence-related mortalities of various ungulates, most notably kudu (*Tragelaphus strepsiceros*) and springbok. Leaving camp gates open when no domestic livestock are present would also facilitate the movement of ungulates between camps without them having to attempt fence crossings.

Ungulate fence-related mortalities often go unnoticed in areas without vehicle tracks along fence lines, and wildlife managers and farmers should take cognisance of such mortalities and should be included when determining ungulate population growth rate estimates and harvesting quotas for better management.

Conflicts of Interest

The protocol and procedures employed during this observational study were conducted ethically without influencing the focal species—that is, observational in nature.

Data Availability Statement

All data will be made available on request.

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