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Research Letters

Unleashing the unknown: feral dog ecology and wildlife interactions in the southernmost island ecosystem

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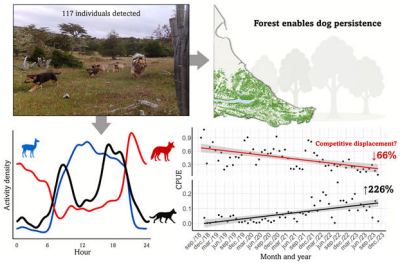
HIGHLIGHTS

- 117 feral dogs were identified in groups of up to nine individuals, with breeding hotspots observed in the south region.
- Dog detections increased 226% over 5 years, while chilla foxes fell 66%. The endangered culpeo fox was never recorded.
- Diurnal activity peaks in the morning and evening, with moderate-high temporal overlapping with guanacos.
- Chases and attacks on guanacos were recorded, as well as individuals with clear injuries caused by dogs.
- Forest patches may provide key refuge for sustenance and breeding.

GRAPHICAL ABSTRACT



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ABSTRACT

Domestic dogs (*Canis lupus familiaris*) are the most widespread carnivores and act as disruptive agents in insular ecosystems. In Tierra del Fuego, feral dogs have expanded into rural landscapes, affecting wildlife and livestock. Using 21 camera traps, we assessed their presence, activity, and interactions with the Fuegian culpeo fox (*Lycalopex culpaeus lycoides*), the chilla fox (*Lycalopex gymnocercus*), and guanacos (*Lama guanicoe*). We identified 117 individuals, roaming solitary or in groups of up to nine. Reproductive activity was evident, with 87 pup detections, especially during autumn and winter. Dogs exhibited stable bimodal diel patterns, peaking in the morning and late afternoon, and shifting toward nocturnality in winter. Overlap was *moderate-to-high* with guanacos ($\Delta = 0.73$, peaking in winter at $\Delta = 0.82$) and *moderate* with chilla foxes ($\Delta = 0.65$). The endangered culpeo was never recorded, raising conservation concerns. Chase events and injured guanacos evidenced direct predatory impacts. Over five years, dog detections increased almost 230%, while chilla detections declined by 66%, suggesting competitive displacement. Forest patches were frequently used by dogs, potentially as shelter and breeding sites. These findings suggest that feral dogs function as apex predators in this system, highlighting the urgent need for management to mitigate their ecological and economic impacts.

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Introduction

Domestic dogs (*Canis lupus familiaris*) are the most widespread carnivores globally, with a population nearing one billion (Gompper, 2014). Dogs born in the wild lack human socialization and become feral, acquiring resources and breeding independently. They harass, pursue and kill animals but are "inefficient" hunters, often wounding or killing prey without consuming them, relying mainly on scavenging (Coppinger and Feinstein, 2015). Feral dogs are a growing global issue, affecting ecosystem structure through predation on wildlife and livestock (Doherty et al., 2017), competition, behavioral changes, hybridization, and pathogen transmission (Banks and Bryant, 2007; Gompper, 2014).

At the southernmost tip of South America, in Isla Grande de Tierra del Fuego (hereafter Isla Grande), the free-roaming dog population increased over the past four decades due to human neglect and weak municipal management (Zanini et al., 2008; Arona and Schiavini, 2023). Resource availability and lack of predators facilitated their expansion into rural areas. Feral dogs prey on livestock and attack guanacos (*Lama guanicoe*) (Zanini et al., 2023), which lack adaptations to escape from group hunters (Silva Rochefort and Root-Bernstein, 2021). The only native terrestrial carnivore, the Fuegian culpeo fox (*Lycalopex culpaeus lycoides*), is isolated from continental populations (Jiménez and Novaro, 2004) and faces competition from the introduced chilla fox (*Lycalopex gymnocercus*) and the expanding feral dogs (Lucherini, 2016), which may become the dominant predator. Despite the recognized impacts, information on feral dogs in Tierra del Fuego remains scarce, and mostly urban-oriented (Arona and Schiavini, 2023), focused on zoonoses (Cociancic et al., 2020; Zanini et al., 2023), wildlife attacks (Liljesthröm et al., 2014; Schüttler et al., 2018) or livestock predation (Zanini et al., 2008; Flores et al., 2023).

The transition from the southern forests to the northern Magellanic steppe—known as the ecotone—creates a complex landscape where forest patches may function as critical hotspots, potentially offering suitable sites for denning and providing corridors that facilitate movement. The area of livestock rangelands affected by feral dogs steadily increased from 2.5% to 69.3% between 1990 and 2012, encompassing nearly the entire ecotone (Schiavini and Narbaiza, 2015). In this region, sheep production has declined from 522,276 to 339,877 heads between 2002 and 2022, which has prompted many ranches to shift towards cattle production (Zanini et al., 2008; Schiavini and Narbaiza, 2015; Flores et al., 2023). In contrast, ranches in the treeless steppe at north have remained stable, showing no comparable sheep losses over the same period. Additionally, interviews conducted with producers over the years reveal that feral dog impact is limited to the ecotone (Supplemental Material S1), suggesting an important role of forest cover. Understanding how these landscape features influence dog presence is essential to explain why certain rural areas, particularly those with higher forest connectivity, experience greater impacts on livestock and wildlife than the open steppe.

This study aims to characterize the ecology of feral dogs in rural areas of Tierra del Fuego. We evaluate their presence and activity patterns, their temporal interaction with wildlife—specifically chilla foxes and guanacos—and the functional role of forest patches in their presence. We expect that feral dog activity would show a high temporal overlap with their potential prey (guanacos) and drive spatial partitioning with subordinate competitors (foxes). Additionally, forest patches would act as critical landscape features with higher dog activity.

Materials and methods

Study Area

The study was conducted in the Argentine part of Isla Grande, within a 10,000-hectare livestock ranch located in the forest–steppe ecotone. The climate is cold and slightly humid, with a mean temperature of 4 °C and 400–500 mm annual rainfall (Olivia et al. 2001; Collado and Farina, 2006). The landscape is a mosaic of undulating relief, watercourses, deciduous forest patches (*Nothofagus spp.*), grasslands and wet meadows. These pastures are particularly suitable for livestock production, the principal economic activity of rural livelihoods. Approximately half of the island's surface is occupied by livestock ranches, whereas the remaining percentage comprises areas that are unproductive or natural reserves (Oliva et al., 2001; Livraghi et al., 2021). The ranch is located at 37 km from Río Grande, the largest city in the province, and at 60 km from Tolhuin. Both cities are separated from the study area by unpaved roads and rural lands, with no permanent human settlements beyond livestock-related infrastructure.

Sampling design

To assess feral dog activity, we deployed 21 camera traps in a grid of fixed stations covering paddocks where livestock density fluctuates due to transhumance within the ranch (Fig. 1). We used different commercial models (Bushnell Trophy Cam R, Bushnell Core S-4 K and Browning DarkOps). We strategically placed cameras spaced 2–4 km^2 apart, along linear features such as trails and fences to maximize detection probability. The variable spacing reflected logistical constraints in rugged or restricted terrain, the need to assist producers with predator control, and the highly variable home range of free-ranging dogs documented elsewhere, in some cases exceeding 4 km^2 (Scott and Causey, 1973; Boitani and Ciucci, 1995). All cameras were set to operate 24 h a day year-round, and shoot bursts of 3–5 pictures per trigger, with 60 second delay between bursts. The units were checked every 1–2 months to download data and replace batteries. Data was collected from October 2018 to November 2023. As the number of active units fluctuated due to battery malfunctions, mechanical failures, or theft, we provide the specific operational history for each camera in the Supplementary Material S2.

Data analysis

Pictures were tagged using DigiKam software (www.digikam.org) and date discrepancy corrected by Exif Date Changer program. A database was built using the package camtrapR (Niedballa et al., 2016) containing the capture site, species recorded and date. Independent photographic events were defined as consecutive images of identifiable individuals or images ≥30 min apart from unidentifiable individuals of the same species.

For the individual identification, we relied on distinctive phenotypic traits, such as body size and coat characteristics (i.e., colour pattern, fur length, scars or injuries, tail and ear shapes). We categorized dogs as "unidentified" if they lacked unique markings or if we could not distinguish their traits due to motion blur or poor lighting. Working dogs were excluded from the analysis. Livestock protection dogs are crossbreeds of Maremmano-Abruzzese Sheepdog and Great Pyrenees breeds, presenting a distinguishable phenotype from feral dogs. Working shepherd dogs are also easy to identify, as all wear collars and are only recorded with handlers during working hours. At night, they remain confined to kennels and do not roam freely. In cases of uncertainty (e.g., collars not visible), we confirmed individual identities with the owners. As all the cameras were located >30 km from cities, and dogs did not have any sign of ownership, we assumed that only feral individuals were included in the analyses. Pups were counted but not identified due to trait variation during growth and the risk of duplicate identifications. Individuals were classified as "pups" (around 2–4 months of age) when exhibiting paedomorphic traits (body size less than one-third of adult height, shortened limbs, tails, and muzzles, and rounded forehead), and as "adults" once exceeding ~60% of average adult shoulder height or displaying adult cranial profiles.

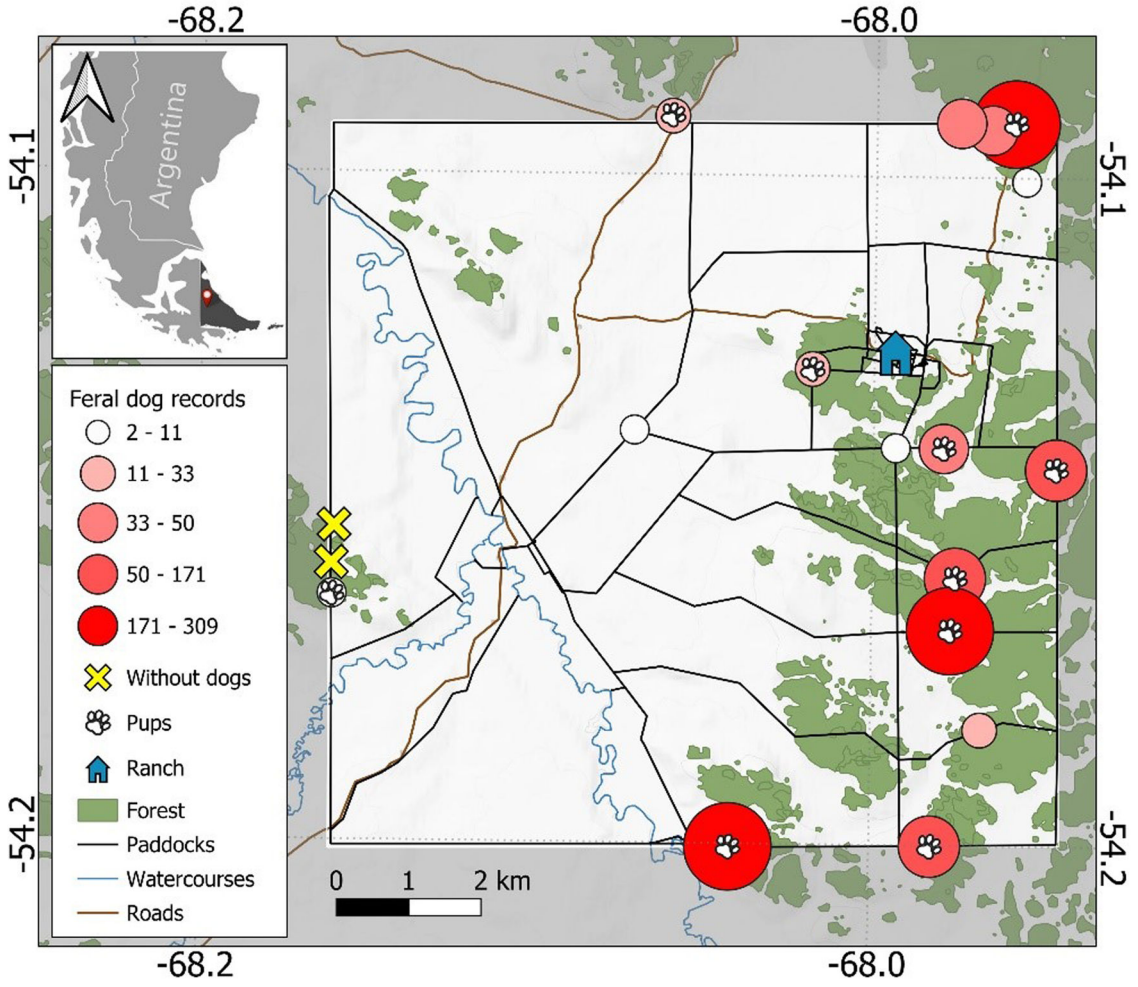

Fig. 1. Study area in Isla Grande, southern Patagonia, Argentina. Circles represent detection frequency and paw symbols identify locations with pup presence.

Presence and activity patterns

We assessed the circadian activity of feral dogs, chilla foxes, and guanacos for each season between 2018 and 2023. Seasons were defined as 90-day periods centered on equinoxes and solstices, due to the wide seasonal variation in daylight duration in Tierra del Fuego (Supplemental Material S3). Activity patterns were estimated by fitting circular kernel density distributions (Ridout and Linkie, 2009) to radian rime data using the *fitact* function from the activity package (Rowcliffe, 2023). To valuate differences in activity levels between seasons, we used the *compareAct* function, which performs a Wald test. We calculated the percentage of activity during daylight, nocturnal, and crepuscular hours based on local sunrise and sunset times. Species were classified as diurnal, crepuscular or nocturnal according to their peak activity densities. The Fuegian culpeo fox was excluded due to the lack of records.

Temporal overlap

Temporal interactions between species were evaluated using the overlap coefficient Δ_4, recommended for large sample sizes (Ridout and Linkie, 2009), available in the overlap package. We calculated the 95% confidence intervals (CIs) using 1,000 bootstrap samples. Overlap was categorized as 'low' was defined as $\Delta_4<0.5$, 'moderate' between 0.5−0.75, and 'high' as >0.75. To determine the statistical significance of these interactions, we tested for differences in the entire shape of the kernel distributions using the *compareCkern()* function based on 1,000 randomizations iterations. This non-parametric test generates a null distribution to evaluate whether the observed differences in activity curves are greater than expected by chance (Ridout and Linkie, 2009). A *p*-value <0.05 was considered evidence of significant differences in temporal activity patterns. Together with the bootstrap assessment, this approach allows us to measure both the magnitude and statistical significance of temporal overlap. *P*-values were corrected using the Benjamini–Hochberg procedure to control the false discovery rate.

Temporal trends and the effect of forest cover

Temporal trend in detections was assessed for each month using the capture index (O'Brien, 2011) as the frequency of independent detections adjusted by the actual days each camera operated (catch per unit effort, CPUE). We modelled the temporal variation of the activity index using a Generalized Linear Model (GLM) to evaluate the significance of the trend over the study period.

To evaluate the influence of forest patches features on feral dog activity, we modelled the relationship between dog activity and forest cover. We analysed the capture index in relation to the proportion of forest within a 2-km radius buffer surrounding each camera station using a Generalized Additive model (GAM) with a Negative Binomial distribution. The model included capture index as the response variable, with the proportion of forest cover and time as smoothed covariates. To account for site-specific variability, we included each camera site as a random effect. Model fitting was performed using the mgcv package (Wood, 2017), and we verified model assumptions, including dispersion

and zero-inflation, using the DHARMa package (Hartig, 2024).

Results

We obtained 37,003 independent records of which 1,412 (3.8%) corresponded to feral dogs, 10,512 to guanacos, 10,133 to chilla foxes, and the rest were non-target species (Supplemental Material S4). Guanacos and chilla foxes were recorded at all sites, while dogs appeared at 16 of 21 stations (Fig. 1).

All dogs recorded were medium to large-sized mongrels, and it was not possible to identify any predominant breeding type. Of the 1,412 dog records, 87 were pups. Among the remaining adult records, 1,151 (81.5%) yielded identifiable images from which 117 distinct individuals were recognized, while 261 could not be assigned due to image quality. Adults were recorded roaming alone or in groups of up to nine individuals and roaming with up to four pups (Fig. 2). The annual median group size was one individual, indicating that solitary individuals were the most frequent (Supplemental Material S5). The largest group was recorded in spring. Pups were mostly recorded in autumn (n = 40) and winter (n = 32), with record's hotspots (n = 48) in the south of the study area (Supplemental Material S6).

The GAM model showed a significant nonlinear effect of time and a marginal effect of forest cover ($p = 0.082$; $edf = 0.72$). The camera location presented a random effect that was not significant ($p = 0.208$). This model showed an explained deviance of 21% and a 31.2% of variance explained. Given that the random effect was not significant, a more parsimonious model was adjusted, with time and forest proportion as the only covariates. This model yielded similar results, with time as a significant smooth term with $p = 0.02$, as expected, and forest cover with also marginal effect ($p = 0.06$). The model converges well, but the forest proportion presents an insufficient k. The test suggests that the relationship is more complex than the level of k can capture. However, the $edf = 1$ shows that the model only detects a linear relationship. This could be a sign of an undetected pattern or forced over-smoothing.

Daily activity patterns

The circadian activity of feral dogs showed a predominantly bimodal pattern, characterized by a morning peak around 6 AM, a midday decay and a more pronounced peak around 6 PM, during crepuscular and nocturnal periods (Fig. 3). Chilla foxes were nocturnal, peaking after 9 PM. Conversely, guanacos were diurnal, peaking around midday and shifting towards dusk and even night hours during winter. While the overall seasonal pattern remains similar, the partition of activity between light and dark periods revealed a radical behavioral shift throughout the year, particularly for feral dogs. During winter, dogs were primarily nocturnal/crepuscular, with only 32.5% of their activity occurring during daylight hours. During summer, dog activity was mostly diurnal (86.1%). Autumn and spring showed intermediate values, with 56.5% and 60.5% of daylight activity, respectively.

In comparison, the chilla fox maintained a more consistent nocturnal/crepuscular preference, showing its highest nocturnal activity during winter (85.3%) and remaining predominantly nocturnal even in spring and autumn. Only during summer did foxes increase their diurnal activity to 59.8%, though this was still markedly lower than the diurnal peaks of the other species. Conversely, the guanaco exhibited a strong diurnal bias throughout most of the year. In summer, their activity was almost exclusively diurnal (99%), a pattern that remained robust in spring (90.5%) and autumn (84.2%). However, winter prompted a significant shift for this species as well, with daylight activity dropping to 48.8%, resulting in a nearly equal distribution between light and dark periods.

Seasonal pairwise comparisons revealed contrasting patterns among species. Feral dogs maintained consistent activity levels across all seasons (Wald test, all $p > 0.05$), suggesting a stable overall activity budget despite the pronounced diel shifts described above. In contrast, guanacos showed significant seasonal variation, particularly involving winter: activity differed significantly between winter and all other seasons (all $p < 0.001$), while autumn and spring ($p = 0.13$) and summer and spring ($p = 0.11$) were not significantly different from each other. Chilla foxes exhibited the most marked seasonal restructuring, with significant differences between most seasonal pairs (all $p < 0.03$), except between

Fig. 2. Adult feral dogs and pups photographed by camera-traps.

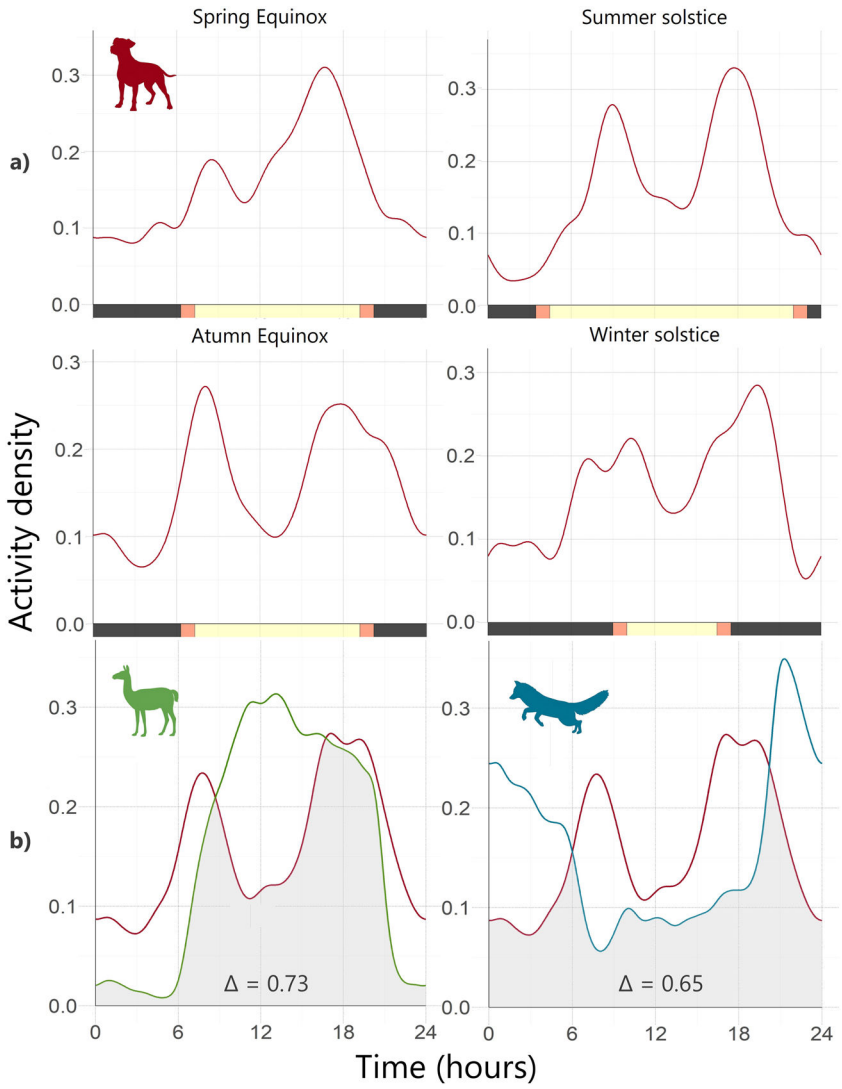

Fig. 3. (a) Daily activity pattern of feral dogs across seasons. Bottom bar indicates the daily cycle of sunlight (yellow shading), twilight (red shading), and darkness (black shading). (b) Annual activity overlap between feral dogs (red line) with guanacos (green line) and chilla foxes (blue line). Overlap between activity patterns is shaded grey, and delta (Δ) indicates the coefficient of overlapping (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article).

spring and summer ($p = 0.1$).

Temporal overlap

Activity patterns of feral dogs differed significantly from both chilla foxes and guanacos across all seasons (randomization tests, all $p < 0.001$, Supplemental Material S7). However, temporal overlap was *moderate* with foxes ($\Delta_4 = 0.65$) and *moderate-to-high* with guanacos ($\Delta_4 = 0.73$). Seasonal overlap between dogs and foxes was relatively stable across spring ($\Delta_4 = 0.68$), summer ($\Delta_4 = 0.68$), and autumn ($\Delta_4 = 0.65$), but decreased markedly during winter ($\Delta_4 = 0.58$). Overlap between dogs and guanacos followed a different pattern: values were similar across spring ($\Delta_4 = 0.68$), summer ($\Delta_4 = 0.68$), and autumn ($\Delta_4 = 0.69$), but increased during winter ($\Delta_4 = 0.82$), coinciding with the period when both species shifted toward nocturnal/crepuscular activity. Seven dog pursuit events involving guanacos were documented, along with a further seven individuals exhibiting clear evidence of dog attacks, including significant bite wounds and tissue damage. Dogs were observed acting in pairs during harassment incidents.

Events by month and seasons

Linear regressions revealed significant temporal trends in activity for all three species over the 60-month study period (Fig. 4; Supplemental Material S9). Feral dogs showed a strong positive trend ($\beta = 0.002$ per month; $p < 0.001$), equivalent to a mean monthly increase of 2.2%, which corresponds to a 226% increase relative to the baseline relative (i.e., activity more than tripled). While their activity was stable for the first three years, it reached a turning point in spring 2021, after which the upward trend accelerated sharply. The model explained 24.7% of the variance (adjusted $R^2 = 0.247$).

Guanacos also showed a significant but weaker positive trend, characterized by wider seasonal fluctuations ($\beta = 0.002$ units per month; $p = 0.02$). Over the five-year period, guanaco activity increased by 40% from the initial level. Despite the overall significance, the model fit for this species was lower (adjusted $R^2 = 0.07$), reflecting the high variability and non-linear spikes in their temporal presence.

In contrast, the model indicates that fox detections per month decreased consistently ($\beta = -0.007$ per month; $p < 0.001$), accumulating an overall reduction of 66% (i.e., activity fell to one-third of its initial value). The linear regression for foxes showed a robust fit,

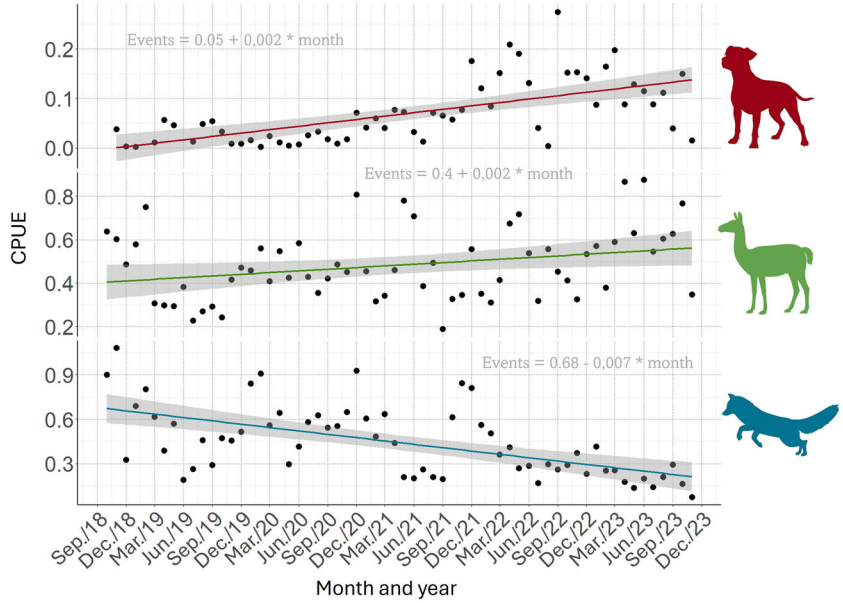

Fig. 4. Variation in feral dog, chilla fox and guanaco records per month, adjusted by effort. Colour lines show the fitted regression with their significance.

explaining 32% of the observed temporal deviance (adjusted $R^2 = 0.32$).

Discussion

Feral dogs' groups

Our study provides the first long-term assessment of feral dog ecology and interactions with wildlife in Tierra del Fuego. Increasing detections over time indicate the establishment and successful breeding of dogs in the wild. Dog activity was concentrated in forested southwestern patches, particularly from 2022 onwards, when pup records peaked. Forest cover decreases progressively from the mountain range to the Magellanic steppe, and landscape elements such as fences, seismic lines, watercourses, and roads likely act as movement corridors (Supplemental Material). Taken together, these patterns suggest that forested areas facilitate movement, provide shelter and protection from harsh weather, and offer suitable breeding sites, supporting the persistence and growth of feral dog groups. Consistently, ranches located ~60 km north, in the treeless steppe, have not experienced the sheep losses reported in the ecotone over the past 20 years (Zanini et al., 2008; Schiavini and Narbaiza, 2015). Previous interviews with producers reporting dog detections, captures, and den locations in the ecotone, reinforce the idea that open areas without forest are less suitable for dogs (Supplemental Material). Nevertheless, although forest cover did not significantly predict dog presence in this study, it showed a tendency worth exploring further.

While domestic dogs are typically monoestrous and breed year-round (Boitani and Ciucci, 1995), seasonal whelping may occur due to food availability, weather, or selective pressures (Lord et al., 2013). Most puppy sightings occurred in autumn and winter—78% between March and June—suggesting either a single annual litter in spring/late summer, or a second whelping peak in autumn.

Group living enhances territorial defense, predator defense, and the ability to subdue large prey (Mech and Boitani, 2003). We observed groups of 2–9 individuals, but the median group size was one. As feral dogs are primarily scavengers (Boitani and Ciucci, 1995; Coppinger and Feinstein, 2015), large groups may offer limited advantages, which could explain the prevalence of small groups. Individual identification also suggests low inter-annual group persistence, likely driven by high mortality (Boitani and Ciucci, 1995) and/or movements between ranches. Ongoing work in neighboring ranches will clarify this pattern.

Species activity patterns are shaped by ecological, physiological, and abiotic factors (Halle, 2000; Kronfeld-Schor and Dayan, 2003; Monterroso et al., 2013). In Tierra del Fuego, feral dogs are generally diurnal with a bimodal pattern and reduced midday activity, consistent with previous studies (de Cassia Bianchi et al., 2020; Gutiérrez-Zapata et al., 2024), a pattern consistent across seasons. Dogs may avoid warmer midday periods (Beck, 1973; Berman and Dunbar, 1983) even at these latitudes. Although some studies report predominantly nocturnal or crepuscular dogs (Galetti and Sazima, 2006), shorter daylight hours in winter, a period of food scarcity, may force dogs to extend their activity into the night to exploit alternative prey or locate carrion.

Wildlife interactions

Feral dogs play a different ecological role than wild canids and may outcompete small solitary predators. In our study, dogs and chilla foxes never co-occurred on cameras and showed strong temporal segregation. Roaming in groups would grant feral dogs an advantage over solitary foxes, potentially by reducing the carcass biomass availability. Although direct resource competition was not demonstrated, chilla fox might avoid dominant dogs (Silva-Rodríguez et al., 2010; Zurita et al., 2024). Nevertheless, this remains unconfirmed, since nocturnal activity has also been reported in other South American studies (Hernández et al., 2021; Zurita et al., 2024).

Recent work, based on a subset of our data and a shorter sampling period, suggested that chilla foxes are cathemeral, with activity increasing from noon to midnight and peaking around 10 PM (Allen and Allan, 2024). In contrast, our five-year dataset with broader spatial coverage indicates that chillas are predominantly nocturnal, considering both clock time and sun time, with activity peaking around 9 PM. Accounting for solar time is crucial in high-latitude systems like Tierra del Fuego, where daylight length varies markedly across seasons.

Activity overlaps between feral dogs and chilla foxes remained stable from spring to autumn but declined in winter, when dogs became more nocturnal. This seasonal divergence was reflected in the lowest dog-fox overlap recorded during winter ($\Delta_4 = 0.58$), when dogs shifted toward nocturnality and further encroached on the fox's temporal niche, potentially intensifying competitive pressure despite reduced co-occurrence. Moreover, their detection trends were opposing, suggesting that although both species can co-occur, chilla fox populations may be declining. This finding aligns with Zurita et al. (2024), who reported

a >50% drop in chilla density on the Chilean side of Isla Grande between 2007 and 2022, attributed to free-ranging dogs. Regarding the Fuegian culpeo fox, the only large native canid on the island, Allen and Allan (2024) reported two detections in the area. However, this species was never detected during our study, which includes the dataset they analysed. In Tierra del Fuego, the culpeo is largely restricted to the southern mountain range (Jaksic et al., 2024). Historical pressures such as intensive hunting between the 1970s–1990s (Novaro, 1995; Funes et al., 2006), natural fluctuations, the introduction of chilla foxes, and the recent competition with feral dogs may have pushed its distribution southward (Jaksic et al., 2024). With fewer than 2,500 individuals (Pía et al., 2019) and low genetic variability, this endangered species warrants urgent conservation attention, facing threats from both resource competition and potential disease transmission by feral dogs. Comparable dynamics have been documented in other canid systems, where dominant species, such as dingoes or free-ranging dogs, affect fox occurrence (Mitchell and Banks, 2005; Johnson and VanDerWal, 2009; Silva-Rodríguez et al., 2010; Vanak and Gompper, 2010).

Predators can also shape prey behavior and predator avoidance is a major driver of mammalian spatial patterns (Monterroso et al., 2013). In southern South America, guanacos evolved under solitary ambush predation (pumas or foxes) but lack strategies to evade cursorial, group-hunting predators like feral dogs (Novaro et al., 2009; Silva Rochefort and Root-Bernstein, 2021). Guanacos rely on vigilance while foraging, using open grasslands during daytime and seeking forest shelter at night (Marino and Baldi, 2008; Flores et al., 2018). Their activity peaks at midday, when dogs are less active, yet overlap remains high—especially in winter, when dog activity increases after 7 PM, mirroring the guanaco curve (Fig. 3). This convergence was most pronounced in winter ($\Delta_4 = 0.82$), compared to relatively stable overlap across the remaining seasons, suggesting a seasonal intensification of dog-guanaco temporal co-occurrence driven by the nocturnal shift of both species. This suggests that dog activity may partially respond to guanaco movements. However, since the study area is a livestock ranch, sheep—smaller, less agile, and confined—likely represent an easier and predictable target, which may explain why guanacos have not entirely shifted their activity in response to dogs.

Feral dog activity remained stable across seasons, unlike the more variable patterns of guanacos and chilla foxes. Although temporal overlap was moderate-to-high with guanacos ($\Delta_4 = 0.73$) and moderate with chilla foxes ($\Delta_4 = 0.65$), kernel tests showed significant differences in both cases ($p < 0.001$), revealing structured temporal partitioning rather than random coincidence. These patterns suggest that feral dogs influence the behavior of both prey and subordinate predators. Seven chases and attacks on guanacos were recorded, along with seven individuals with dog-inflicted injuries. Although such events were infrequent on camera and current population impacts appear low—consistent with a 40% increase in guanaco detections over five years—direct and indirect interactions could have cumulative consequences if dog populations continue to expand. These results highlight the need to monitor predation and behavioral shifts in future studies to anticipate potential long-term impacts on guanaco populations, while also considering livestock as a key driver of feral dog activity.

Conclusion

Feral dog populations are increasing and expanding across the landscape, and may be functionally occupying the apex predator role, exerting strong top-down pressures on both wildlife and livestock. This growing presence represents an emerging threat to biodiversity and animal production in the region.

Previous studies have emphasized that effective control of free-ranging dogs requires integrated strategies rather than isolated actions (Zamora-Nasca and Lambertucci, 2023). Key measures include reinforcing environmental education and responsible pet-ownership campaigns, ensuring compliance with existing regulations, sterilization and adoption programs, and implementing ethical removal of feral individuals with sustained monitoring. Transparent communication among institutions, researchers, and the public is equally crucial to build trust and reduce social conflict surrounding management actions, as misinformation can strongly affect public opinion and the measures taken.

In this context, Tierra del Fuego represents a unique case in Argentina, being the only province with a specific law (N°1146) aimed at controlling feral dog populations. This legislation recognizes the multifaceted nature of the problem—bridging conservation, animal welfare, and rural livestock production. Despite its potential, the law remains unregulated and unimplemented, reflecting the broader challenge of translating policy into practice.

Our findings underscore the urgent need for further research on feral dog ecology and the effectiveness of management actions compatible with rural community needs. Unifying criteria and regulations for dog management across property boundaries will improve enforcement and coordination. A participatory, scientific evidence-based approach involving government agencies, livestock producers and conservation organizations will be essential to mitigate the environmental and socio-economic impacts of feral dog expansion in Tierra del Fuego.

Declaration of Generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used ChatGPT (OpenAI) only to improve the language and readability of the text. After using this tool, the authors reviewed and edited the content as needed and took full responsibility for the content of the publication.

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Declaration of competing interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest. Both authors contributed equally to the conception and design of the study, the acquisition of data, the analysis and interpretation of data, the drafting of the article, the critical review and the final approval of the version to be submitted.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.pecon.2026.07.002.

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