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RESEARCH ARTICLE

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Five small antelope species diets indicate different levels of anthrodependence in the Overberg Renosterveld, South Africa

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Abstract

The Overberg area, Western Cape, South Africa is highly suitable for agricultural practices and has subsequently been severely transformed over the last four centuries. This has created a novel habitat for many wildlife species. The objective of this study was to determine the forage use of five antelope species and thereby assess their level of anthrodependence in terms of diet. The five species were bushbuck (*Tragelaphus sylvaticus*), Cape grysbok (*Rhaphicerus melanotis*), common duiker (*Sylvicapra grimmia*), grey rhebok (*Pelea capreolus*) and steenbok (*Rhaphicerus campestris*). To do this, we performed a histological analysis on dung samples collected. Our study indicated a high ratio of anthropogenic to natural vegetation in the diets of bushbuck, grey rhebok and steenbok, as anthropogenic vegetation presented a high nutrient food resource, which is easily accessible. However, Cape grysbok and common duiker indicated a higher use of natural vegetation. The results indicated that all the species benefit from the resources offered by the altered landscape and that some species may be dependent on these resources while others appear to be more dependent on the pockets of natural vegetation in the landscape.

KEYWORDS
agricultural practices, dietary niche, forage use, histology, movement corridors, novel ecosystems, resilience, transformed landscapes

Résumé

La région d'Overberg, située dans la province du Cap-Occidental, en Afrique du Sud convient parfaitement aux activités agricoles et a connu des transformations considérables au cours des quatre derniers siècles. Cela a créé un nouvel habitat pour de nombreuses espèces sauvages. L'objectif de cette étude était de déterminer l'utilisation fourragère de cinq espèces d'antilopes et d'évaluer ainsi leur niveau d'anthropodépendance en termes de régime alimentaire. Les cinq espèces ayant fait l'objet de cette étude étaient le guib harnaché (*Tragelaphus sylvaticus*), le grysbok du Cap (*Rhaphicerus melanotis*), le céphalophe commun (*Sylvicapra grimmia*), le rhébok gris (*Pelea capreolus*) et le steenbok (*Rhaphicerus campestris*). Pour ce faire, nous avons effectué un examen histologique sur les échantillons d'excréments collectés. Notre étude a indiqué un rapport élevé de végétation d'origine anthropique et naturelle dans les régimes alimentaires du guib harnaché, du rhébok gris et du steenbok, car la végétation anthropique présentait une ressource alimentaire riche en nutriments et facilement accessible. Cependant, le grysbok du Cap et le céphalophe commun ont démontré une utilisation plus élevée de la végétation naturelle. Les résultats indiquent que toutes ces espèces bénéficient des ressources disponibles dans cette environnement altéré et que certaines espèces peuvent être dépendantes de ces mêmes ressources, tandis que d'autres semblent être plus dépendantes des poches de végétation naturelle présentes dans cette région.

1 | INTRODUCTION

Human alteration of landscapes could introduce new alien plant species and increased species richness with a subsequent wider forage choice for herbivores (Bagchi et al., 2018; Barbar et al., 2015). This often creates novel ecosystems with a higher availability of resources (Barbar et al., 2015; Hulme-Beaman et al., 2016). Fragmented landscapes may offer generalist species more nutritious feed, at least during certain seasons (Abbas et al., 2015). However, not all species are equally adaptable and altering the landscape may also homogenise diversity in the area, leaving only species that remain more resilient to change (Barbar et al., 2015).

Animals that are observed benefiting from an altered environment experience commensal-specific evolution (Hulme-Beaman et al., 2016). Becoming dependent on these altered landscapes is what defines the evolution of these commensal species (Kark et al., 2007). According to Hulme-Beaman et al. (2016), there are different categorisations of how species interact with an altered landscape. These categorisations should be investigated at a population scale because different populations of the same species can interact differently with anthropogenically altered landscapes (Hulme-Beaman et al., 2016; Kark et al., 2007). Commensal and anthrodependent populations consist of individuals that are completely dependent on resources from, and skilled at surviving in altered landscapes (Hulme-Beaman et al., 2016). However, the relationship may eventually switch from commensal to antagonistic if antelope-crop consumption begins to substantially reduce crop yields for farmers. Anthropophilic populations are considered to frequently benefit from altered landscapes but are not dependent on the resources emanating from it (Hulme-Beaman et al., 2016). For example, some browser species such as Roe deer (*Capreolus capreolus*) in Southwestern France, adapted their feeding behaviour to accommodate crops (Abbas et al., 2013). They may be doing this as a result of a more rewarding nutrient availability in the crops versus lower nutrient rewards of their usual browse (Abbas et al., 2013).

The distribution and behaviour of prey species is largely influenced by the presence of predators (Hopcraft et al., 2011; Winterton et al., 2020). Prey behaviour is affected by direct predation from predators as well as the fear of injury or fatality (Gallo et al., 2019; Laundré et al., 2010). Prey species need to make trade-offs between food and safety, as they need to consider both their need for food and their fear of predators for survival (Venter et al., 2019). When predation risk is increased, prey animals may reduce their use of, or completely avoid, habitat patches with valuable resources (Gallo et al., 2019). Altered landscapes may assist prey to avoid predators by presenting novel resources, or it may prevent them from distributing across the landscape and force them to co-exist with predators on the same patch of habitat (Hewison et al., 2001). Predators are also presented with novel food resources in the altered landscape, which decreases the necessity for hunting wild prey (Gallo et al., 2019). Newsome et al. (2014) stated that a predator, the Australian dingo (*Canis lupus dingo*), uses the readily available anthropogenic food items to conserve energy which would normally be consumed while searching for and hunting prey. They furthermore found that anthropogenic resources possibly enlarge populations to abnormal sizes and if these resources are removed, the dingoes will have to substitute their prey selection until a more sustainable carrying capacity is achieved. Interaction with humans also present new and more daunting threats than those from natural predators (Hopcraft et al., 2010; Lunt, 2011). Examples of human threats may be fatalities or injuries by vehicle collisions and deaths related to human–wildlife conflict (Hewison et al., 2001) Human–wildlife conflict occurs when animals raid crops (which in some cases are the main source of human livelihoods) (Branco et al., 2019), when predators hunt livestock (another main source of livelihoods) and when these animals pose a physical threat to humans, such as lions outside Niassa National Reserve in Mozambique (Begg et al., 2007). These threats indicate the changes within the workings of an ecosystem when it is presented with novel resources and how this may influence the movement, behaviour and consequently the diets of prey species. The anthropogenic landscape and its novel threats thereby complicate the trade-offs species need to make for survival (Gallo et al., 2019).

In the Overberg (Western Cape Province, South Africa), the Renosterveld areas are highly suitable for agricultural practices because of its nutrient-rich soils and have subsequently been severely transformed over the last four centuries (Mucina et al., 2006; Shiponeni & Milton, 2006). Today there is very little natural vegetation left and most of the area is composed of agricultural land used for grain crops, vineyards, indigenous flower crops and livestock farming (Curtis, 2013; Shiponeni & Milton, 2006). There are, however, conservation initiatives with the intention to conserve the remaining natural vegetation and creating corridors out of deserted agricultural land and small remnant pieces of natural vegetation to encourage animal movement across the landscape (Curtis, 2013).

Five small antelope species are prominent in the Overberg region of South Africa area and appear to be affected by anthropogenic alteration of the landscape. These species are bushbuck (*Tragelaphus* *sylvaticus*), Cape grysbok (*Rhaphicerus melanotis*), common duiker (*Sylvicapra grimmia*), grey rhebok (*Pelea capreolus*) and steenbok (*Rhaphicerus campestris*).

Bushbuck are selective concentrate feeders (Apio & Wronski, 2005). They are classified as browsers but occasionally graze on young grasses (Bothma et al., 2016; Kingdon, 1982). They prefer to feed on dicotyledonous trees, herbs and shrubs (Kingdon, 1982). They usually select shoots, fruits, leaves and flowers (Apio & Wronski, 2005) as well as agricultural and garden produce and shrubby leguminous plants (Kingdon, 1982). Cape grysbok are classified as selective browsers and their diet contains very few plant species (Kigozi et al., 2008). Their occasional utilisation of grasses is merely an example of how highly adaptable they are to their environment (Palmer, Birss, & du Toit, 2016; Palmer, Birss, Kerley, et al., 2016). In the Nelson Mandela University Nature Reserve (Port Elizabeth), their diet contains a large percentage of *Acacia cyclops* (Kigozi et al., 2008). The eradication of *A. cyclops* had little effect on the grysbok, indicating that they can adapt their diet as resources alter (Kigozi et al., 2008). Common duiker are classified as selective browsers and feed on trees, shrubs, flowers, forbs, fruits, seeds, bark, roots and cultivated crops (Kigozi, 2000). They are very resilient regardless of their fragmented habitat (Kigozi, 2000). They adapt well, and in some cases have resorted to the use of agricultural crops, given the remaining natural vegetation remained undisturbed (Birss et al., 2016; Kigozi, 2000). Grey rhebok are classified as selective mixed feeders and prefer to feed on forbs (Estes, 1992; Taylor et al., 2016). They feed predominantly on the flowers and leaves of the forbs (Estes, 1992; Taylor et al., 2016). Steenbok are classified as concentrate selectors and they have been recorded feeding on shoots and leaves of smaller trees and shrubs, fruits, seeds, flowers, young grasses and forbs (Estes, 1992).

The objective of this study was to determine the forage use of each of the five small antelope species and assess their level of anthrodependence in terms of diet. To do this we asked three questions: (a) Which plant species do the each of the five small antelope species select while foraging?; (b) Is there a difference in forage use between the five small antelope species? and (c) Which level of anthrodependent behaviour do each of the five small antelope species display in terms of diet? Based on the literature reviewed, we expect bushbuck, common duiker and Cape grysbok to consume the most crops. This expectation for Cape grysbok is based on their resilience and highly adaptable diet.

2 | METHODS

2.1 | Study area

Data were collected in the Overberg, between Swellendam and Bredasdorp in the Western Cape. A provincial protected area, the De Hoop Nature Reserve (DHNR), was included in the study area. The Overberg vegetation is very diverse, with DHNR consisting of mostly De Hoop Limestone Fynbos, Potberg Sandstone Fynbos, Overberg Dune Strandveld, Albertinia Sand Fynbos, Potberg Ferricrete Fynbos and Eastern Ruens Shale Renosterveld (Mucina et al., 2006). Outside of DHNR the remainder of the study area consists mostly of transformed Eastern Rûens Shale Renosterveld, Rûens Silcrete Renosterveld and De Hoop Limestone Fynbos (Curtis, 2013; Mucina et al., 2006).

Fynbos in DHNR is characterised mainly by Proteoid Fynbos, Asteracious Fynbos and Restioid Fynbos (in sandy areas) (Rebelo et al., 2006). De Hoop Limestone Fynbos is classified as least threatened with only 2% that has been transformed (Rebelo et al., 2006), which may be as a result of low nutrient, sandy soils (Shiponeni & Milton, 2006). Geologically, De Hoop Limestone Fynbos is comprised of neutral to alkaline sand and bedrock close to the surface. Karst landscapes such as caves, sinkholes and valleys are characteristic to this geology (Rebelo et al., 2006).

Renosterbos (*Elytropappus rhinocerotis)* is characteristic to Renosterveld in the Overberg region (Rebelo et al., 2006). Renosterveld can be described as short, fine leaved, grassy shrubland (Curtis, 2013; Rebelo et al., 2006). Geologically, Renosterveld occurs in mainly the Bokkeveld Group shales with some Mesozoic Uitenhage Group sediments forming the clays and loam soils (Rebelo et al., 2006). Renosterveld is classified as critically endangered as more than 80% of the biome has been transformed for agricultural purposes (Rebelo et al., 2006). This is as a result of the partially nutrient-rich soils and the rolling hills in the area which makes it suitable for agricultural practices (Kraaij, 2010; Shiponeni & Milton, 2006). The study area has a mean annual precipitation of 385 mm (Mucina et al., 2006). The mean annual temperature for the area is 16.8°C (Shaw, 1998).

The Renosterveld in the area is highly transformed for agricultural purposes (Shiponeni & Milton, 2006). The crops that have been sampled and identified in the study area are canola (*Brassica napus*), barley (*Hordeum vulgare*), oats (*Avena sativa*), lucerne (*Medicago sativa*), lupin (*Lupinus angustifolius*), lamb's quarters (*Chenopodium album*), fodder crops (crop mixtures for livestock feed), harvested crops (any of the abovementioned crops that has been recently harvested), 'opslag' (regrowth of vegetation after harvest) and fallow land (land that is intentionally rested or kept out of production).

2.2 | Data collection

Fresh dung (less than a week old) from the study species was collected, ensuring no contamination between dung samples (Codron et al., 2005). The samples were placed directly into paper bags (Shiponeni & Milton, 2006). The paper bags were labelled, and the coordinates of the location where the dung samples were collected were recorded. The number of samples collected for each species are as follows, bushbuck $n = 5$; common duiker $n = 7$; grey rhebok $n = 38$; Cape grysbok $n = 12$; steenbok $n = 22$. The samples were opportunistically collected both in the croplands as well as in the natural vegetation. Along with the dung samples, evidence of browse on the vegetation was studied and plant samples were collected (cf. Codron et al., 2005). Dung samples were collected during the months of May, July, August and November of 2019 and March and August of 2020.

Histological analysis was used to determine the percentage contribution of crops to the diet as well as the species of plants foraged by the five small antelope species. The histological analysis used was an adaptation of the method used by Kigozi et al. (2008). Studying the dung microscopically delivered an estimated indication of the composition of the digested matter (Sparks & Malechek, 1968). The pellets were oven dried for 3 days at 65°C (MacLeod et al., 1996). To prepare it for analysis, the faecal samples were boiled in 10% nitric acid and then in water for roughly 5 min (MacLeod et al., 1996). After boiling, the faecal samples were rinsed over a 2 mm sieve with running water to remove all the excess nitric acid and unidentifiable fragments (Chapuis et al., 2001). The remaining particles were prepared into slides to be examined under a microscope (cf. Chapuis et al., 2001; MacLeod et al., 1996).

The microscope slides of the dung samples were prepared by spreading processed dung onto a microscope slide under a 22 mm by 22 mm cover slip and no stain was used (Chapuis et al., 2001). The subsample was then observed through the microscope. The observations were done at 10× objective (100× magnification) with a compound microscope and each field of view was 2.0 mm × 2.0 mm. We processed 55 fields of view per dung sample collected for all five species.

Plant matter within the dung was identified by comparing the slides to identification keys and a reference collection of plant epidermal cells (MacLeod et al., 1996). A reference collection was not available, so we created one (cf. Kigozi et al., 2008; Smits, 1986). Various plant samples were identified and collected from both crops as well as natural vegetation. Reference plant sample leaves were cut up into 15 mm lengths and boiled in 10% nitric acid for 5–10 min (Kigozi, 2000; Kigozi et al., 2008). By this time, the leaf epidermis started to peel away (Gaylard & Kerley, 1995; Kigozi et al., 2008). The leaves had to be washed and the cuticle layer was removed (Gaylard & Kerley, 1995; Kigozi et al., 2008). The smaller leaves of the fine leaved species were boiled whole and were then cut around the edges after boiling, as this made it easier to handle the cuticle without tearing it. The cuticle layer was stained lightly with haematoxylin and permanently mounted on a microscope slide and photographed (Kigozi, 2000; Kigozi et al., 2008).

For each antelope species, we computed the mean number of plant fragments belonging to natural and anthropogenic vegetation, respectively.

2.3 | Data analysis

The mean observations of each vegetation type (natural/anthropogenic) were calculated for each antelope species. The mean observations of each vegetation type were plotted in a graph comparing the observations for each antelope species. The mean observations per plant species were calculated for each antelope species as well. The mean observations of each plant species in the dung samples were compared in graphs for each antelope species. A confidence interval of 95% was used for the error bars on all the graphs.

3 | RESULTS

As predicted in our hypothesis, bushbuck consumed the most anthropogenic foods on average (although this is highly variable due to our low sample size). Contrary to our hypothesis that common duiker and Cape grysbok would consume anthropogenic foods, they were the only two species that selected natural vegetation more often. On the other hand, steenbok and grey rhebok selected anthropogenic foods more often than natural vegetation (Figure 1).

Differences in anthropogenic food use were confirmed by taxon level descriptions of each antelope's diet. The dominant components of grey rhebok diets (n = 22,918 plant observations) were the anthropogenic *Chenopodium album* (n = 8995, per-sample mean = 237) and *Hordeum vulgare* (n = 3421, per-sample mean = 90). The lumped *Fabaceae* taxon, which may consist of both natural and anthropogenic plants, was the second most observed taxon (n = 4228, per-sample mean = 111) (Figure 2a).

Steenbok diets (n = 11,345 plant observations) predominantly contained the anthropogenic *Brassica* (n = 3395, per-sample mean = 154) and *Chenopodium album* (n = 2005, per-sample mean = 91) but also included the natural *Hermannia species* (n = 2943, per-sample mean = 134) (Figure 2b).

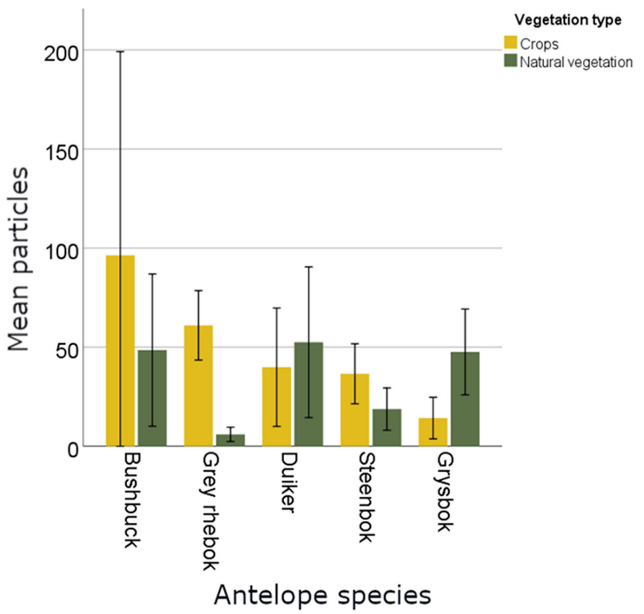

FIGURE 1 The proportion of each vegetation type (mean particles per sample), for example natural versus anthropogenic, represented by the plant species present in the dung samples for each of the five antelope species. The error bars signify the variability of the vegetation types recorded in the diets of each species

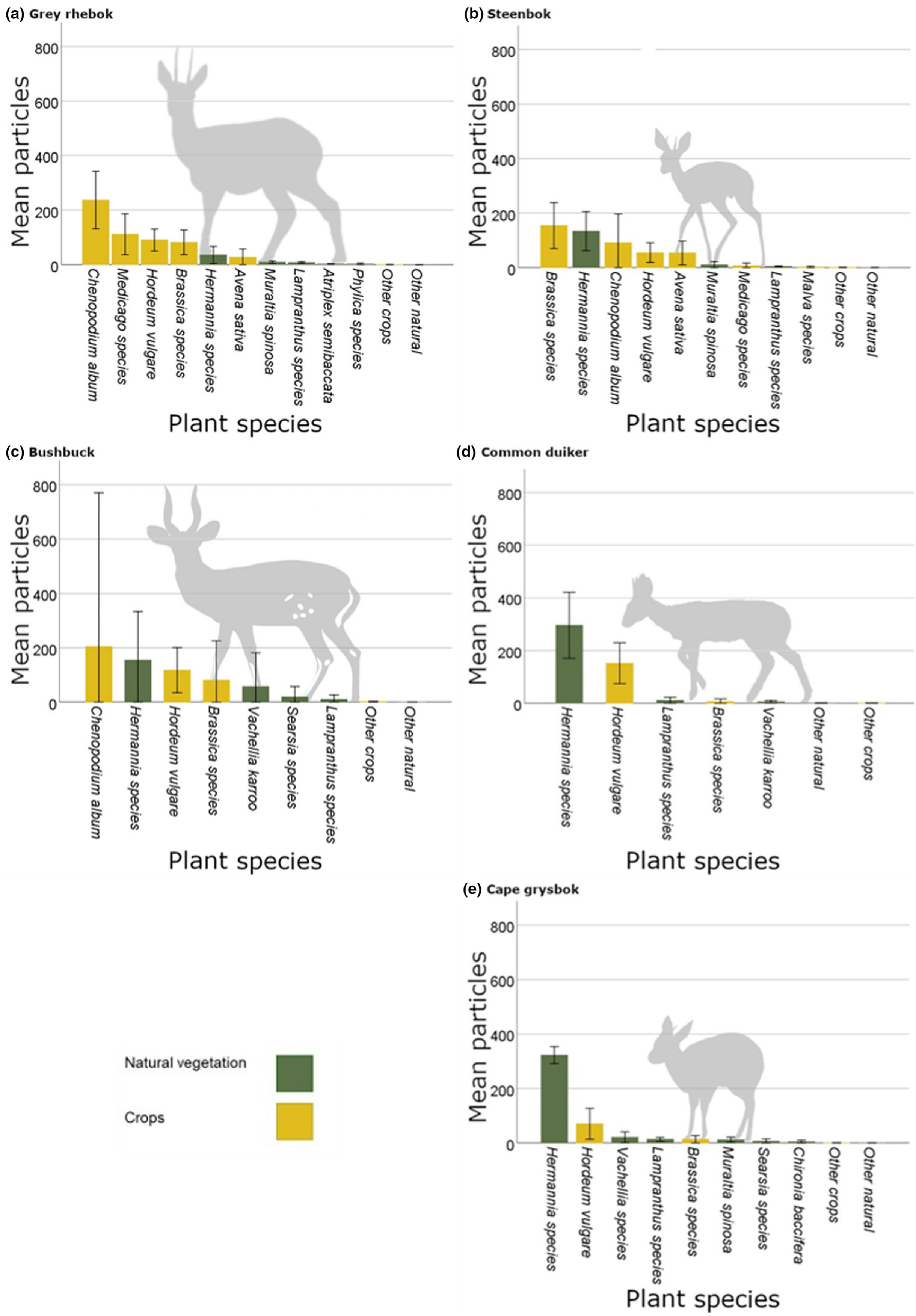

FIGURE 2 The proportion of each plant species recorded (mean particles per sample) in dung samples of five small antelope species using histological analysis. The error bars signify the variability of the plant species recorded in the diets of each antelope species

Likewise, bushbuck diets (n = 3237 plant observations) were dominated by both natural and anthropogenic vegetation with *Chenopodium album* (n = 1020, per-sample mean = 204) and *Hordeum vulgare* (n = 589, per-sample mean = 118) as dominant anthropogenic foods and *Hermannia species* (n = 775, per-sample mean = 155) as the dominant natural food. The low sample size for bushbuck indicates these results may be improved with an increase in samples (Figure 2c).

The dominant components of common duiker diets (n = 3321 plant observations) were the natural *Hermannia* species (n = 2073, per-sample mean = 296) but also included the anthropogenic *Hordeum vulgare* (n = 1063, per sample mean = 152) as the second most consumed species (Figure 2d).

Cape grysbok diets (n = 5601 plant observations) also predominantly contained the natural *Hermannia* species (n = 3870, per-sample mean = 323) and included the anthropogenic *Hordeum vulgare* (n = 849, per-sample mean = 71) (Figure 2e).

4 | DISCUSSION

The objective of this study was to compare the forage use between each of the five small antelope species. Determining this did not only provide information on the diet and niches of the five small antelope species, but it also provided important information on anthrodependence.

The histological analysis of the dung samples from grey rhebok, bushbuck and steenbok indicated that they have a higher content of crops than natural vegetation present in their dung. Thus, we can assume these species selected higher quantities of crops over natural vegetation while foraging and subsequently would spend more time in crop areas versus natural vegetation areas. This is supported by Estes (1992), Palmer, Birss, and du Toit (2016) and Palmer, Birss, Kerley, et al. (2016) who indicate that steenbok and bushbuck show a strong preference for vegetation cover (for predator avoidance). However, steenbok occupy surprisingly open areas and bushbuck can be lured out by attractive food resources or the presence of other bushbuck (Estes, 1992). As grey rhebok naturally occur in open grasslands and are regarded as mixed feeders (Estes, 1992), it is not surprising that they would be foraging in the croplands more, due to similarities in the landscapes. Abbas et al. (2013) found that Roe deer that had access to crops had a higher nutrient intake in their diets. This may serve as an explanation for why these three species select crops over natural vegetation. Living in an altered habitat requires species to adapt their feeding behaviour, and to start feeding on unfamiliar foods (Kark et al., 2007). Based on their dietary usage bushbuck, steenbok and grey rhebok appear to be very good at exploiting the altered landscapes. From all the plant species foraged by bushbuck and grey rhebok, *Chenopodium album* was the plant species which was foraged in the highest quantities. This may be because *C. album* has a high nutritional value (Gqaza et al., 2013). From all the species foraged by steenbok, *Brassica* sp. was the plant species recorded in the highest quantities. A study done on five species of *Brassica* in New Zealand indicated that *Brassica* crops yielded feed of superior quality in comparison with perennial ryegrass-dominated pastures (Westwood & Mulcock, 2012). Therefore, steenbok may have selected to feed on *Brassica* species because of its high nutrient content. Another explanation for this may be that Brassica species were higher in abundance or that it is less digestible and therefore more identifiable in the faeces. Grey rhebok, bushbuck and steenbok in the Overberg would appear to be more anthrodependent in their behaviour because they seem to be more reliant on the resources from altered environments (e.g., crop species).

The histological analysis of the dung samples from common duiker and Cape grysbok indicated that they had a higher content of natural vegetation than crops present in their dung samples. These species, in contrast to the aforementioned species, selected higher quantities of natural vegetation to crops while foraging. Renosterveld is believed to have once been vegetation with high numbers of palatable species (Radloff et al., 2014). As a result of poor fire- and stocking rate management in some areas, unpalatable species become more abundant, decreasing the overall palatability for grazer and browser species (Radloff et al., 2014). It is important to mention that approximately 40% of common duiker diet and a large portion of Cape grysbok diet consisted of *Hordeum vulgare* (a crop from the grass family). Kerley et al. (2010), study on grysbok near Port Elizabeth, South Africa was the first to demonstrate extensive grazing by Cape grysbok, which was initially classified as a browser, when they recorded 51% of its diet consisting of grasses.

Common duiker and Cape grysbok seem to not be as reliant on food resources in the Overberg anthropogenic landscape. Cape grysbok and common duiker both require dense vegetation cover for safety from predation (Birss et al., 2016; Estes, 1992; Palmer, Birss, & du Toit, 2016; Palmer, Birss, Kerley, et al., 2016) such as disturbance from humans and hunting (human or other predators) (Abbas et al., 2013). This, along with potential competition from other herbivores (Abbas et al., 2013), may prevent them from regularly accessing the open areas and utilising crops like the other three species.

Cape grysbok and common duiker would classify as 'anthropophilic', see Hulme-Beaman et al. (2016), as they frequently benefit from the resources resulting from the altered landscapes, but they seem to be less dependent on it. From all of the plant species foraged by common duiker and Cape grysbok, *Hermannia* species and *Hordeum vulgare* was the plant species which was foraged in the highest quantities. *Hermannia* sp. is a highly palatable species and its seeds have been recorded to germinate from eland (*Taurotragus oryx*), goat (*Capra aegagrus*) and sheep (*Ovis aries*) dung (Gwynne-Evans, 2015). *Hordeum vulgare* (Barley) is also a very nutrient-rich food (Lahouar et al., 2017), which is likely why it is selected by common duiker and Cape grysbok for feeding purposes.

Steenbok, Cape grysbok, grey rhebok and common duiker are small antelope species, leaving them vulnerable to all predators down to the size of caracal (*Felis caracal*) and black backed jackal (*Canis mesomelas*) (Estes, 1992; Jarman, 1974). Additionally, their young are vulnerable to other smaller predators such as eagles

(*Aquila* spp.) (Jarman, 1974; Lunt, 2011). Humans are a novel threat that is synonymous with altered landscapes (Gallo et al., 2019; Worm & Paine, 2016). Humans pose a threat to prey species through hunting, the introduction of new predators such as domestic dogs (*Canis familiaris*) and motor vehicles that cause injuries and mortalities (Gallo et al., 2019; Palmer, Birss, & du Toit, 2016; Palmer, Birss, Kerley, et al., 2016; Taylor et al., 2016). The remaining patches of natural vegetation in the Overberg are quite small and situated far apart, which may limit the movement of prey species across the landscape and force them to share patches with predators causing altered predator–prey interactions (Gallo et al., 2019; Hopcraft et al., 2011). The species-specific predator avoidance behaviour of each species could potentially affect the forage selection and could potentially explain differences in forage selection in this case. This is however an aspect which should be further investigated.

The composition of vegetation selected in the diet by each of the five small antelope species was unique, as they each selected a different ratio of natural vegetation to crops. An explanation for this may be that it is as a result of the avoidance of interspecific competition. There have been several theories resulting from the attempt to address how ecologically similar species co-exist with limited resources (Kartzinel et al., 2015). Different ratios in which large mammalian herbivores consume browse to grasses is a method of resource partitioning, resulting in the classification of predominantly browsers, mixed feeders and predominantly grazers as well as a range from pure grazers to browsers (Kartzinel et al., 2015; Venter et al., 2019). In addition, body size, digestive system and morphology is linked to the dietary niche structure of large mammalian herbivores (Venter et al., 2019). Resource partitioning in grazers has long been a subject of research, whereas in browsers it has only become a subject of interest more recently (Cameron & du Toit, 2007). Our research has indicated an overlap in the diets of the five small antelope species, but the ratios at which they select their forage is different, which constitutes different levels of anthrodependence. This may well be as a result of the traits of each species, their ability to compete for food resources and predator avoidance strategy.

These results cannot confirm whether use is based on preference or availability as species' degree of use of a particular plant species may depend on the particular plant species' availability or as a result of competition between species for the same resources.

5 | CONCLUSION

The study shows that some species readily utilise the resources provided by the human-altered landscape and others are more dependant of the pockets of natural vegetation in the landscape. It is crucial to note that there are species that forage natural vegetation in greater quantities, occasionally supplementing their diets with resources offered by the transformed landscape (anthropogenic vegetation). The forage use of these five species may be dependent on their forage selection specialisation such as morphology and digestive structure as well as their behaviour. Natural vegetation still forms a significant part of the forage used by all five small antelope species, but especially and predominantly those of common duiker and Cape grysbok. This supports the argument that natural habitat, in this case especially Renosterveld, should be conserved and restored for the conservation and well-being of various indigenous animal species and the ecosystem as a whole.

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CONFLICT OF INTEREST

The authors have no conflict of interest to declare.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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