



Trends and Barriers to Wildlife-Based Options for Sustainable Management of Savanna Resources: The Namibian Case

18

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Abstract

Use of wildlife as an alternative or complimentary rural livelihood option to traditional farming has become popular throughout southern Africa. In Namibia, it is considered a climate change adaptation measure since livestock productivity has declined across much of the country in the past few decades. In contrast with neighboring South Africa, Namibian landowners and custodian often avail large open areas to this purpose, such as in the communal conservancies where fences are prohibited. The SPACES II ORYCS project considered wildlife management in a multiple land-use and tenure study area in Namibia's arid Kunene region. The aim was to investigate positive and negative impacts of the inclusion of wildlife on livelihoods and ecosystem services. Movement is recognized as an important survival strategy for wildlife in arid landscapes such as Namibia's north-west, and this study found that movement barriers within and between the land uses could present a challenge to wildlife survival and productivity. Notwithstanding, wildlife persisted in crossing many of these barriers, including the national veterinary cordon fence to satisfy their requirements. This often led to human-wildlife conflict, especially with elephants and predators. Interviews

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499

found that despite this conflict, an understanding of the need for wildlife and general biodiversity provided complimentary livelihood opportunities and improved land productivity.

18.1 Wildlife as a Complementary or Alternative Livelihood Strategy in Arid Environments

Free-range beef production has been the cornerstone of Namibia’s rural livelihood strategy since colonial times (Lange et al. 1998). For freehold farmers south of the veterinary cordon fence (see Fig. 18.1) cattle farming is a commercial venture on individually owned freehold units, while north of the fence it was, and remains, mostly for cultural, ploughing and homestead use (Groves and Tjiseua 2020; Mendelsohn 2006). Crop farming is limited to the far north and north-east of the country where rainfall is above 600 mm per annum. Most of Namibia however is considered marginal for livestock farming as a result of its aridity (Mendelsohn 2010). Cattle numbers peaked in the 1950s with around two and a half million head and has since gradually declined. Reasons for the decline include land degradation as a result of overgrazing and deteriorating grazing production caused by bush thickening and encroachment (De Klerk 2004).

Another factor affecting rangeland productivity for cattle, linked to abovementioned land degradation and bush encroachment, is purported to be climate change (Midgley et al. 2005; Reid et al. 2008). Much of Namibia is expected to receive

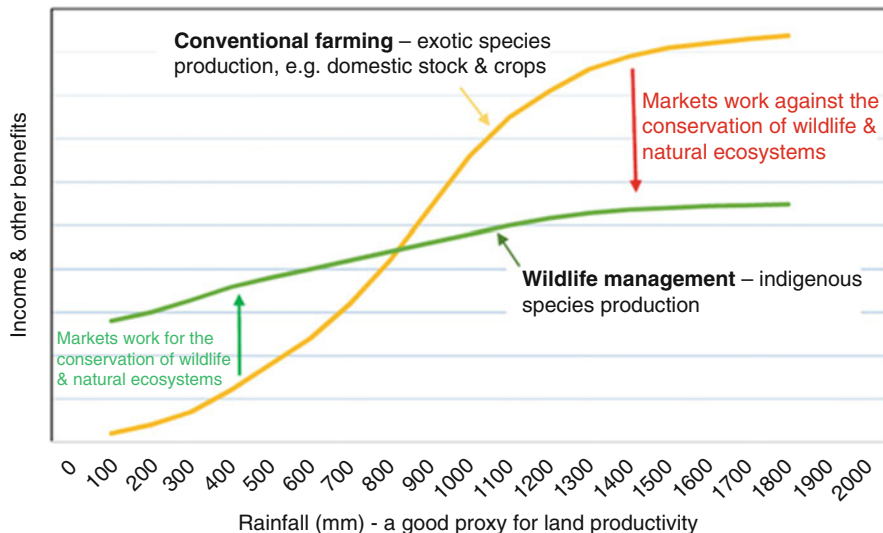


Fig. 18.1 Revenue and benefits from wildlife and commercial farming in relation to annual rainfall (Brown 1996)

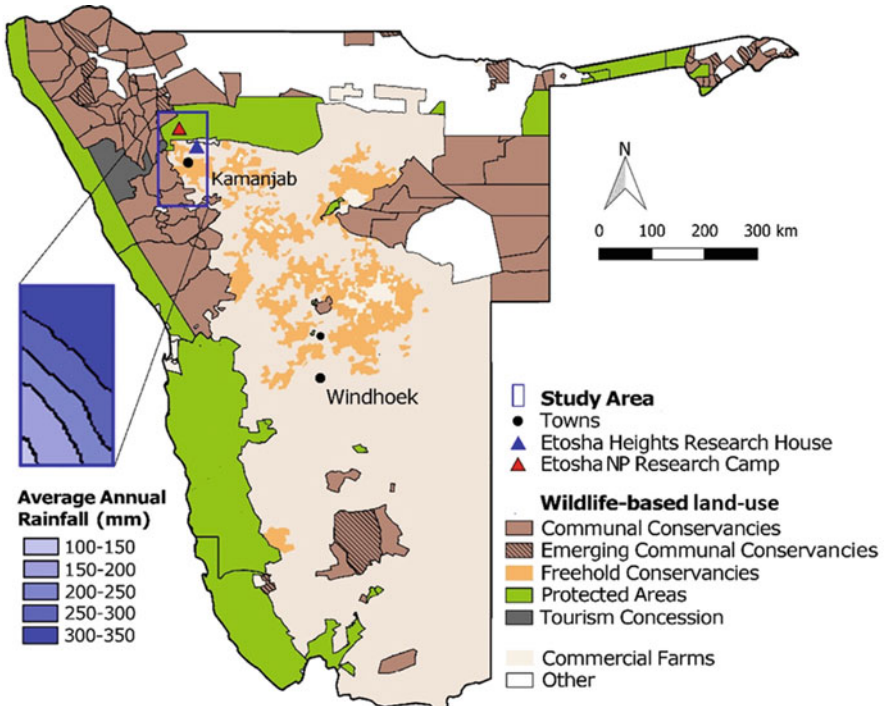


Fig. 18.2 Wildlife land use in Namibia, highlighting the ORYCS project study area (ORYCS 2018)

lower and more erratic rainfall (Barnes et al. 2012; Midgley et al. 2005) leading to increased pressure on rangelands and farm revenue. Wildlife and tourism-related revenue streams are considered effective strategies to either replace or compliment livestock production on communal and commercial farmland (Crawford and Terton 2016). Brown (1996) postulated that livestock and other agricultural enterprises are marginal at best considering Namibia's poor and erratic rainfall. As illustrated in Fig. 18.1, wildlife revenues and benefits seem to outperform conventional farming in arid environments while commercial agriculture is more viable at higher rainfall. Since the SPACES II ORYCS study site (blue box in Fig. 18.2) receives annual rainfall of between 250 and 400 mm per year, this area is ideal to investigate in terms of the value wildlife provides, and the attitudes of persisting livestock farmers toward wildlife. More detail of the project is provided later in this subchapter.

Since the promulgation of the Nature Conservation Ordinance in the 1970s, commercial farmers on freehold land were given right of use and ownership of wildlife on their properties, driven by the economic benefit that adding this income stream on their farms could bring (GRN 1975; Lindsey et al. 2013; Schalkwyk et al. 2010). These rights were only afforded to communal residents after Namibia's independence with the gazetting of the Nature Conservation Amendment Act of

1996 (GRN 1996). This led to the establishment of communal conservancies, able to utilize wildlife through meat production, trophy hunting and eco-tourism (Ashley and Barnes 2020; Murphy and Roe 2004; Schalkwyk et al. 2010). Consequently, wildlife protection and management is now being practiced across 45.6% of the country's land surface. (GRN 2018) (Fig. 18.2). This has brought with it an increase in large indigenous mammal numbers from under 500,000 in the 1960s to over 3.5 million (Brown 1996), mostly through wildlife breeding, translocations and protection as economic resource. Within communal conservancies alone, it resulted in a contribution of almost N\$ 9.8 billion to net national income and 5200 jobs in addition to traditional farming benefits (GRN 2018).

Namibia's wildlife protection and management systems vary similarly across its different land-tenure systems. These can be categorized as follows:

- (i) National Parks (green in Fig. 18.2): Gazetted national conservation areas as part of Namibia's commitment to biodiversity conservation as signatory to the Convention on Biological Diversity (CBD);
- (ii) Communal conservancies: Registered under the Nature Conservation Amendment Act of 1996 (GRN 1996) not separated from human settlements or livestock by fencing;
- (iii) Freehold Conservancies: A loose association of privately owned game farms, mostly individually fenced but agreeing to common wildlife conservation objectives; and
- (iv) Tourism concessions relying on eco-tourism benefiting national conservation and sustainable use objectives.

A unique element to the Namibian wildlife management sector is the large variation in spatial scale of wildlife management units. Three of Namibia's national parks are in excess of 2 million hectares, and since communal conservancies are unfenced, there are clusters of conservancies which allow for free movement of wildlife across vast areas. As example, the north-western conservancy cluster stretching from the veterinary cordon fence in the south to the Kunene river in the north spans over 4.2 million hectares (Bollig and Menestrey Schwiieger 2014). By contrast a private game farm can legally be as small as 1000 hectares and is fenced (Nature Conservation Ordinance 4 of 1975). The social-ecological feedbacks, diversity and productivity of wildlife versus livestock land use have been studied on individually fenced neighboring commercial farms during the study, but ecological differences caused by spatial size variations in wildlife management units have not been assessed. Against the background of climate change, the research project aimed to close the knowledge gap in the design of adapted land use management options for semiarid regions. This includes differing perspectives of stakeholders on the interactions between wildlife management and ecosystem services in fenced areas compared to areas where wildlife movements are unrestricted, and to consider them in shaping adequate solutions (Hauptfleisch 2018).

18.2 Wildlife Management in the Etosha South-West Landscape Case Study (The SPACES II ORYCS Project supported by the Biodiversity Economy in Landscapes Project)

The SPACES II project ORYCS (Options for sustainable land use adaptations in savanna systems: Chances and risks of emerging wildlife-based management strategies under regional and global change) investigated ecological and social factors associated with wildlife-based land-use strategies at vastly varying spatial scale in the western part of Etosha National Park and surrounding commercial and communal areas (blue box in Fig. 18.2). This multiple land use and management landscape covering more than 30,000 km² provides an opportunity to compare the ecological and social linkages within and between each management type containing wildlife. This includes Ehirovipuka and #Khoadi–//Hôas Communal Conservancies, Etosha National Park (over 2.2 million hectares), Etosha Heights Private Reserve (a larger fenced area of 50,000 hectares) and individually fenced cattle and wildlife farms with an average size of ± 5000 hectares each. Table 18.1 illustrates the different wildlife-based land uses, and specific benefits they derive from wildlife consumptive and nonconsumptive use.

18.2.1 The Importance of Long-Distance Mobility for Wild Herbivore Survival in the Arid Savanna

It is well known in ecological science that the main survival strategy of large mammals in arid landscapes is movement (Bailey 2004; Wato et al. 2018). Herbivores disperse to find growing vegetation, followed by carnivores seeking the migrating protein. Impressive “treks” of large springbok herds were regularly documented in the nineteenth and twentieth centuries (Scully 1913), and John Skinner was convinced that fences would not have stopped the movement of these large herds (Skinner 1993). Rinderpest and breach-load firearms largely laid waste to the herds and their migration. Humans have used a similar strategy of regular movement in arid areas, and even today the Ovahimba pastoralists outwit the unpredictable droughts of northern Namibia and southern Angola through following scattered rain-fed grasslands (Gibson 1977). In contrast, fencing is seen to be a key drought buffer strategy of the modern western-trained pastoralist (Barnes and Denny 1991). Controlling the movement of livestock through camping, it allows for micro-level rotational grazing and the protection of grazing camps for drought conditions (Tainton 1999). Ironically, fencing allowed arid-savanna farmers to apply Savory’s high intensity/long rest method to pastures which mimic the large herd migrations by trampling and heavily grazing a rangeland before moving to the next. (Savory 1983; Savory and Parsons 1980) This has led to most livestock range, no-matter how marginal to be checkerboarded by fencing.

Table 18.1 Characteristics of different land-use units which derive benefits from wildlife within the Etosha South-West Landscape study area

Land-use type	Tenure type	Livelihood commodities	Management of wildlife	Benefits from wildlife
National Park	Government owned, proclaimed a National Park under Ordinance 31 or 1967	Wildlife only	Extensive passive management	National reputational benefits in protecting critically endangered species, tourism, source of breeding stocks for other parks and communal conservancies, wildlife research
Private Nature Reserve	Private ownership of multiple farms amalgamated with no internal fencing. Private concessions for tourism and/or hunting with tourism or hunting operators. No formal proclamation.	Ecotourism and hunting (wildlife only)	Privately managed, consumptive use of wildlife is regulated by government through the Nature Conservation Ordinance 4 of 1975 (GRN 1975)	Exclusive "high-end" eco-tourism, occasional hunting for raitons
Individual hunting farm	Private ownership either by an individual or Closed Corporation	Mostly mixed wildlife and livestock	Privately managed, consumptive use of wildlife is regulated by government through the Nature Conservation Ordinance 4 of 1975 (GRN 1975)	Trophy hunting, commercial meat hunting, products from wildlife skins
Communal conservancy	Owned by government but managed by an elected conservancy committee as mandated through the Nature Conservation Amendment Act of 1996 (Act 5 of 1996) (GRN 1996)	Mixed wildlife and livestock, and occasionally crop production for own use	Managed by the conservancy committee with support from Namibian and international nongovernmental organizations (NGOs). Tourism ventures are mostly operated through concessions by recognized tourism specialist companies	Eco-tourism, trophy hunting, meat hunting, products from wildlife skins

18.2.2 Private Wildlife Farming and Fencing

Many Namibian farmers have over the past 30 years gradually added wildlife to their production activities, and indigenous wild herbivores have been reintroduced to the micro-fenced land as personally owned assets. Namibian legislation currently requires game-proof fencing as a condition of private wildlife ownership on farms (GRN 1975). Fences are known to be effective in limiting and containing some animal diseases. Namibia's commercial beef production is protected from Foot-and-Mouth (FMD) disease by a through the veterinary cordon fence which traverses the country for 1300 km. The double-fence intends to prevent possibly FMD infected cloven-hoofed mammals (wild and domestic) from carrying the disease to the commercial farmland south of the fence.

There has been scant research on the effect of fencing on wildlife movement in Namibia, although alarming mortalities of wildlife along fences have been recorded, mostly in neighboring Botswana (Mbaiwa and Mbaiwa 2006; Williamson 1981). Anecdotally, farmers immediately south of the Namibian veterinary cordon fence (VCF) have become increasingly aware of regular breaches of the fence, and wildlife moving into their farmland, especially those bordering Etosha National Park ("Close to N\$500 million needed to fix damaged Etosha fence" n.d.). This is discussed in more detail below.

18.2.3 Wildlife Movement and the Veterinary Cordon Fence (VCF)

The complexity of the situation increases when not only local interests are considered, but also international stakeholders who influence local fence construction. A VCF stretches from west to east through the country (red line in Fig. 18.3) and runs along the southern boundary of Etosha National Park. It was constructed in the 1960s after the occurrence of FMD outbreaks in the northern part of the country (Schneider 2012). According to the Animal Health Act Regulations (GRN 2018), today's area south of the cordon fence is declared free from the contagious bovine pleuropneumonia (CBPP) and FMD, the latter being a highly infectious disease that may be transmitted from wildlife to livestock (Gadd 2012). Only beef originating from this area south of the fence is allowed to be imported to the European Union (Kreike 2009; Gadd 2012).

Veterinary fences and strict controls enable commercial farmers to participate in international markets (McGahey 2011). In 2019, beef with the value of around 44.8 million euros was imported from Namibia to the EU (European Commission's Agricultural and Rural Development Department 2021). However, the benefits and the long-term maintenance of this fence is increasingly under scrutiny among different interest groups: On the one hand, negative effects on wildlife ecology are increasingly observed (Martin 2005); On the other hand, the trade regulations set by the World Organization for Animal Health (OIE) implore government to maintain the fence which is frequently damaged by elephants and other wildlife

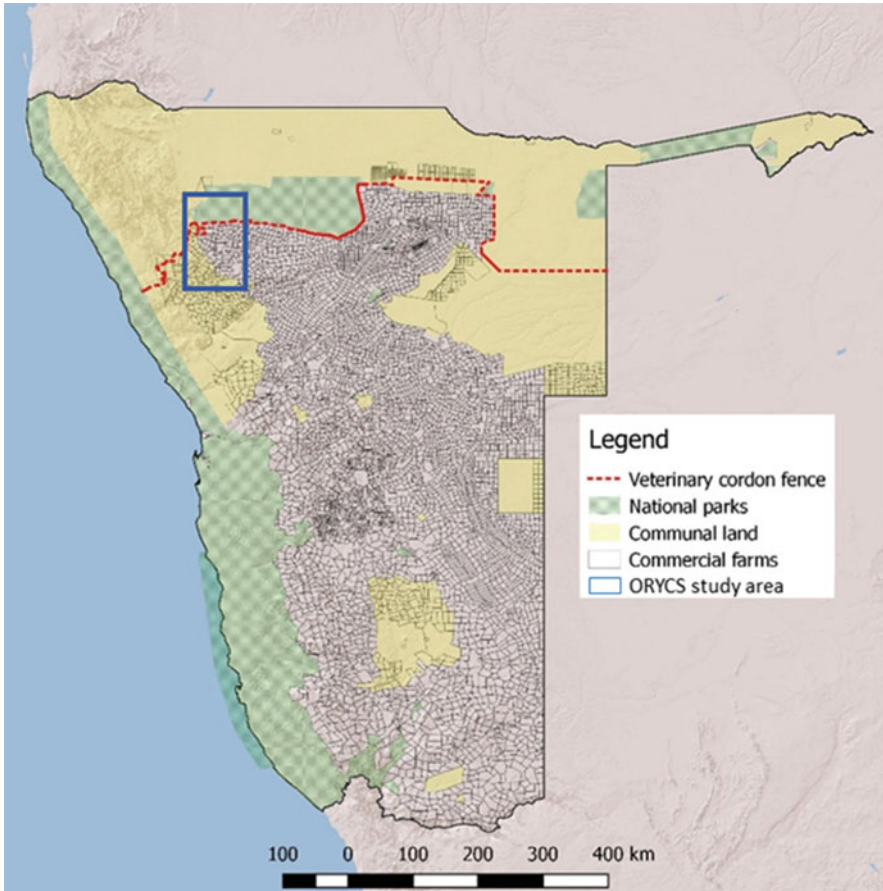


Fig. 18.3 Land tenure and the location of the Veterinary Cordon fence in Namibia

(Grant et al. 2008; Smit 2018). Interviews with local farmers in 2019 revealed their concern regarding dependency on the EU, as their business heavily relies on the fence's integrity. Considering the costs of the VCF, Scoones et al. (2010) suggest detachment from the fence-dependent strategy and instead to apply other mechanism like commodity-based trade: setting the focus on an acceptable risk coming with the product to be traded. This may require seeking other international markets or lobbying the EU to amend mechanisms of disease control. In this regard, certification was suggested to adapt to additional markets and allow more farmers to benefit. This strategy might be interesting for Namibia whose vision is to also develop the livestock sector north of the VCF in order to integrate farmers into international markets (Meat Board of Namibia 2015).

The presence of the VCF across the Etosha South-West Landscape is a conundrum for livelihoods in the area. This is detailed in the next section which

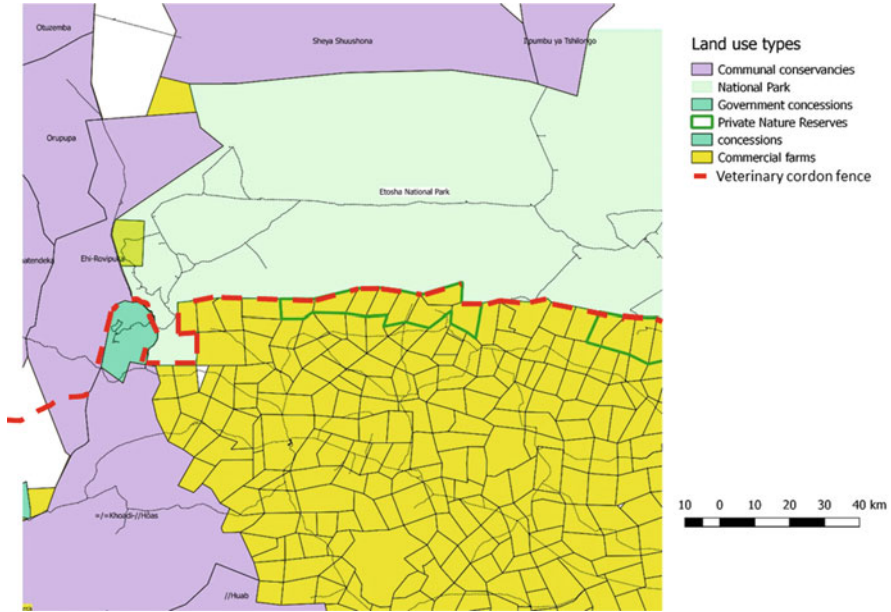


Fig. 18.4 Land use in the Etosha South-West Landscape

documented livestock farmers' attitudes toward wildlife within the landscape. The barrier to improve cattle commercial value in the southern portion of the landscape clearly reduces the ability of wildlife to move and impedes peripheral benefits to communities surrounding the Park. When scrutinizing land use along the southern boundary of Etosha (Fig. 18.4), three wildlife sanctuaries have been established on rewilded commercial livestock land. Ongava Private Wildlife Reserve, Etosha Heights Private Reserve and the Karros hunting farms derive their revenues entirely from consumptive and nonconsumptive wildlife utilization. These areas are comprised of combined rewilded livestock farms and benefit from resident wildlife and, in some cases from wildlife movement across the VCF. Despite regular maintenance of the fence the need for wildlife to move in relation to resource availability and territorial expansion causes regular breaching of the fence by large wildlife.

This study used camera trap monitoring of three regularly breached sites (e.g., Plate 18.1) along the fence over a four week period in October 2019. Over a combined 81 trap days, 10,362 wildlife-fence interactions of 20 different species were recorded at the VCF with only 1058 individuals turning back at the fence-line the rest moving through the fence-line. This preference to traverse the fence with little hesitation indicates that the cross-fence movement is regular and habitual. The highest recorded fence-crossing species was springbok (*Antidorcas marsupialis*) with 8454 separate interactions with the fence followed by gemsbok (*Oryx gazella*) with 1058 and common eland (*Taurotragus oryx*) with 486 observations. During the study period 38.54% of the movements were from the National Park

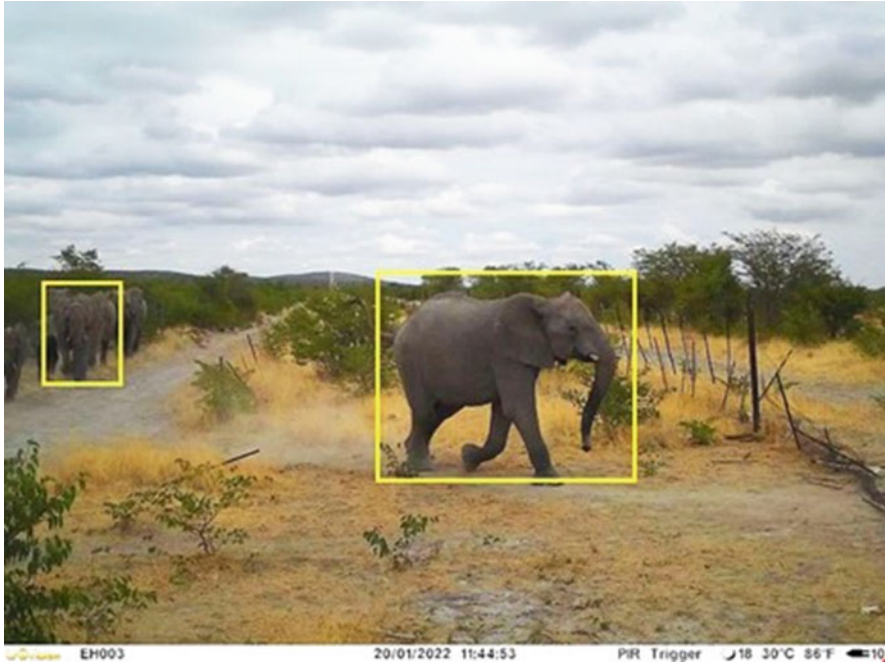


Plate 18.1 Camera trap image of a fence breach used by wildlife to cross the veterinary cordon fence. The elephant in the center of the photo is between the farm fence (left) and the national park fence (right). The breaches are mostly created by elephants

into the southern commercial sanctuaries and 61.46% into Etosha National Park. Movements are detailed in Table 18.2.

Two key determinants likely drove the extensive movement of wildlife across the VCF in the study area. (i) surface water resources—the study area is almost exclusively supplied with surface water by pumping groundwater into artificial reservoirs. As in most arid savannas the distribution of these reservoirs is a key determinant of the distribution patterns of wildlife throughout the landscape (Crosmary et al. 2012). Matson et al. (2006) found that black-faced impala (*Aepyceros melampus petersi*) seldom moved further than 1 km from water in Etosha, while elephant movements were also found to be highly influenced by available surface water (De Beer et al. 2006; Wato et al. 2018) but would move up to 70 km from water in search of sufficient forage (Leggett 2006). Water is scarce in the Etosha National Park portion of the landscape and mostly limited to waterholes along the 19^o latitude (Fig. 18.5). This was partly to reduce the movement of wildlife, and hence human–wildlife conflict, in farms south of the Park. Evidence in Table 18.2 disproves the effectiveness of this strategy. The high density of artificial surface water in the commercial farmland south of the Park is likely a significant attractant for wildlife.

Table 18.2 Movement of wildlife across the Veterinary Cordon Fence between Etosha National Park and neighboring Private Nature Reserve farms in October 2019

Species	Number of animals			Turning at the fence	Moving along the fence
	Southward	Northward			
Springbok (<i>Anidorcas marsupialis</i>)	2968	5011		284	191
Gemsbok (<i>Oryx gazella</i>)	389	587		39	43
Common eland (<i>Taurotragus oryx</i>)	230	245		4	7
Giraffe (<i>Giraffa giraffa angolensis</i>)	47	39		0	10
African elephant (<i>Loxodonta africana</i>)	38	10		0	6
Greater kudu (<i>Tragelaphus strepsiceros</i>)	14	2		0	6
Blue wildebeest (<i>Connochaetes taurinus</i>)	9	16		5	4
Steenbok (<i>Raphicerus campestris</i>)	8	16		1	22
Cheetah (<i>Acinonyx jubatus</i>)	6	2		0	0
Black-backed jackal (<i>Canis mesomelas</i>)	5	4		1	5
Burchell's plains zebra (<i>Equus quagga burchellii</i>)	5	5		14	1
Red hartebeest (<i>Alcelaphus buselaphus caama</i>)	4	3		1	2
Common warthog (<i>Phacochoerus africanus</i>)	3	1		0	0
Hartmann's mountain zebra (<i>Equus zebra hartmannae</i>)	3	0		0	0
Leopard (<i>Panthera pardus</i>)	2	0		0	1
Caracal (<i>Caracal caracal</i>)	1	0		0	0
Brown hyena (<i>Hyaena brunnea</i>)	0	6		0	1
Scrub hare (<i>Lepus saxatilis</i>)	0	1		0	0
Total:	3727	5943		335	298

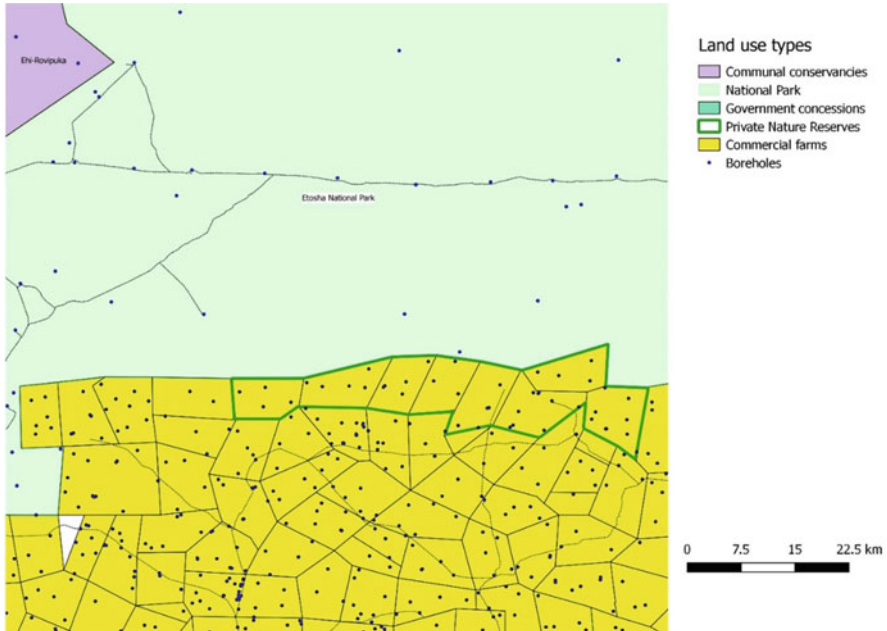


Fig. 18.5 Water-point distribution in the west of Etosha National Park and surrounding land use

Telemetric monitoring of giraffes in the Etosha South-West Landscape provided an apt example of this (Fig. 18.6). Giraffe female 3620 was fitted with a satellite tag in Etosha National Park (19.0147°S , 14.8196°E) 18.77 km due north of the southern boundary of the Park on 25 July 2020. In the late dry season of 2021, Fig. 18.6 clearly illustrates the reliance of this animal and assumed associated herd on a waterhole outside the Park while continuing foraging within the Park.

Seasonal foraging preferences were also determined to affect movements. The Namibia University of Science and Technology's Biodiversity Research Centre (NUST-BRC) and Potsdam University satellite collared a total of 57 springbok, eland, kudu and giraffe to investigate their movements in the Etosha South-West Landscape. Over 1.8 million GPS-localizations at a high temporal resolution (every 5–15 min) were recorded considering vegetation, management structures such as water points and fences, and land use type. The species that did not challenge fences to a great degree were sedentary browsing kudu which occupied very restricted areas of a few dozens of square kilometers and spend most of their time in woody vegetation with only slight seasonal variation (Fig. 18.7 left). Nomadic, mixed feeding elands used vast areas of hundreds of square kilometers, constantly moved around and shifted vegetation use from shrublands during dry season (May to October) to more grasslands during the rainy season (November to April) and crossed the VCF multiple times (Fig. 18.7 center). Mixed feeding springboks formed temporal home ranges, which shifted in the course of the year and used a

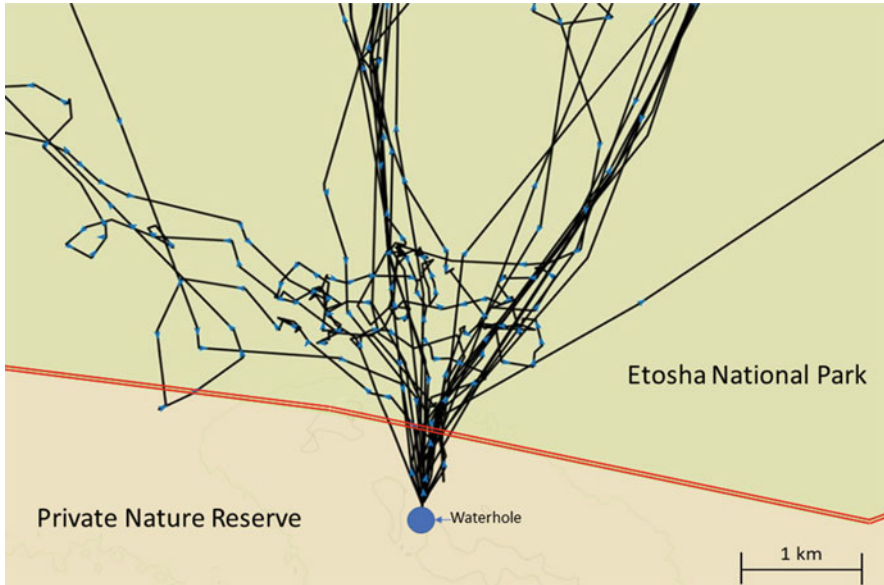


Fig. 18.6 Tracks of four-hourly movements of giraffe 3260 between September 1 and October 15, 2021. Light green shading represents Etosha National Park, light yellow area an adjacent private nature reserve and the double red line the VCF (Earthranger 2021)

few hundreds of square kilometers in total. Springboks mostly used open grasslands but shifted to more shrubby vegetation in late dry and early rain season (Fig. 18.7 right), mostly crossing the VCF to do so. The longest distances travelled away from the mostly visited waterholes was 44.8 km (mean: 5.4 ± 10.2 SD) for kudu, 73.4 km (mean: 10.2 ± 10.2 SD) for eland and 86.9 km (mean: 8.4 ± 12.2 SD) for springbok.

Thousands of animal–fence interactions occurred all year long and reached highest numbers right before the rain season started. Despite porosity of the VCF in some areas, fences limited movements on a large scale (Fig. 18.8). For instance, eland home-ranges differed vastly between areas without fences, compared to fenced areas (Etosha National Park: 22895 km², Etosha Heights Private Reserve: 480 km², private farm with livestock and wildlife: 99 km²).

18.3 North-West Namibian Farmers' Perception on Coexistence with Wildlife

The results of Sect. 18.2 suggest that rural communities in the study area live in close proximity with wildlife, some without choosing so. This is not unique with wildlife and human coexistence being prevalent in many African countries and is expected to increase globally (Lamarque et al. 2009; Carter and Linnell 2016). Interaction with wildlife can generate ecological and societal challenges and various conflicts

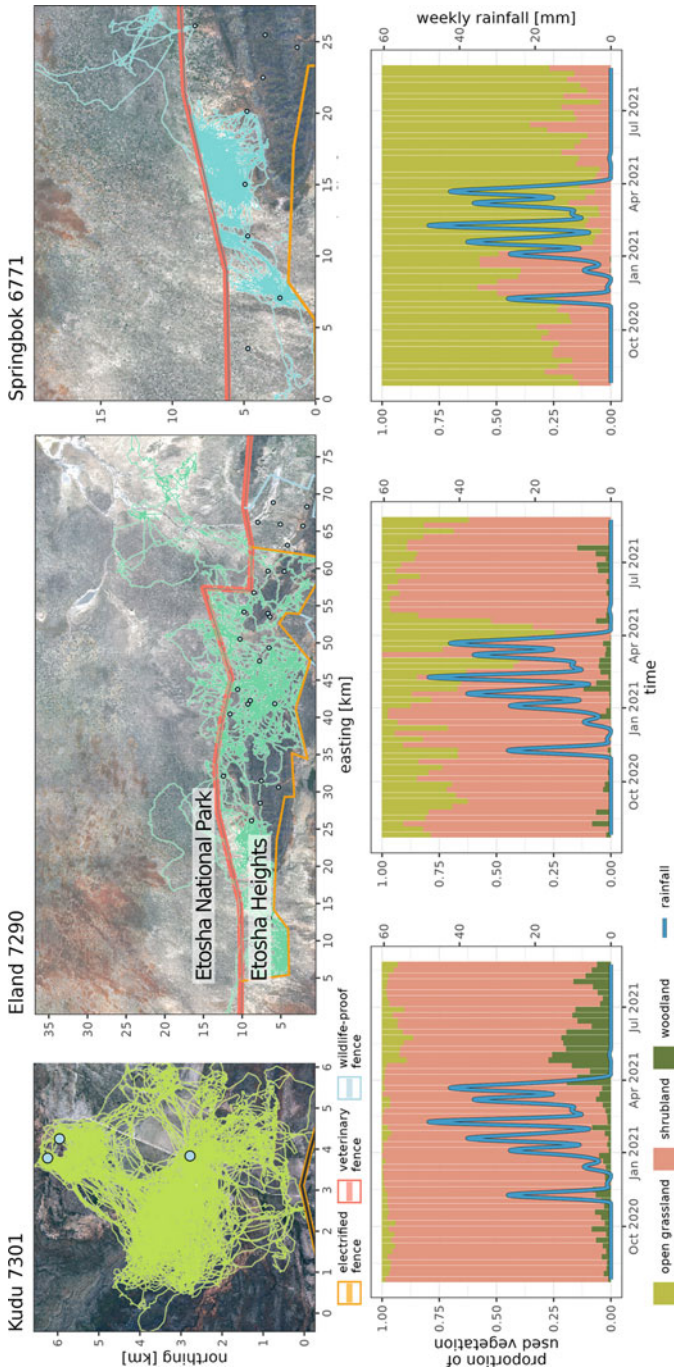


Fig. 18.7 Examples of antelope movements and used vegetation type in the Etosha South-West Landscape. Shown are one year movement tracks (first row) of three antelope species (left—kudu, center—eland, right—springbok) and proportion of weekly used vegetation (second row) with general vegetation types (see legend) and amount of weekly rainfall (blue line). Note that the scales of the maps differ

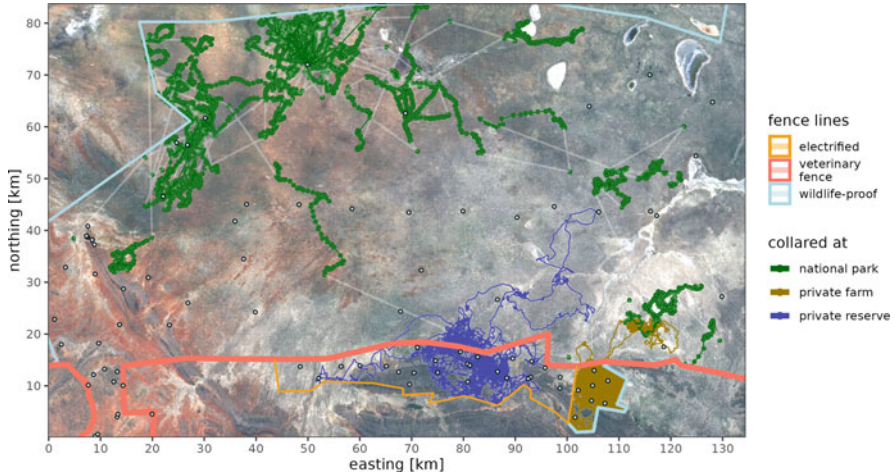


Fig. 18.8 Tracks of three eland females from August 2020 to August 2021 collared at three places of different land use. Fence lines of different types are indicated. Water sources are shown as blue points (note: points north of the red line not necessarily represent actual water points). Note: data of eland with green points contains data recording gaps due to transmission schedule, one day sections of consecutive points are connected by gray lines, gaps last three days each

(Martin et al. 2020). This introduces a range of risks for both (Carter et al. 2020). On the one hand, humans can degrade and fragment habitats of wildlife or even directly kill certain wildlife species. On the other hand, wildlife can be a reason for damages and threats to human well-being (Ceașu et al. 2018). The intention of successful coexistence is often to maximize human benefits; nevertheless, the interaction can also result in nonbeneficial outcomes and can induce effects that are harmful to human interests (Dorresteijn et al. 2017; Campagne et al. 2018). Yet, wildlife populations are essential for a functional ecosystem and provide both benefits and costs for human society (Ceașu et al. 2018).

In recent years there has been more scientific interest on topics exploring human–wildlife conflict and coexistence (e.g., Jordan et al. 2020; Lamarque et al. 2009; Marker and Boast 2015; Matinca 2018; Seoraj-Pillai and Pillay 2017). In Africa, for example, Namibia is one of the countries that includes conservation and sustainable use of natural resources in its constitution, resulting in a noticeable conservation success and increased wildlife numbers (MET and NACSO 2018; Jones and Barnes 2006). However, according to the Namibian Ministry of Environment, Forestry and Tourism (MEFT) (2020), human–wildlife conflicts remain an ongoing challenge.

To learn more about the driving forces of human–wildlife conflicts and farmer attitudes toward certain wildlife species, structured interviews (surveys) were conducted within the Etosha South-West Landscape study area. Interviews were conducted with 20 commercial and ten communal farmers. Specific activities on the commercial freehold farms include commercial livestock (cattle, sheep, goat), wildlife (conservation hunting, photo tourism, meat hunting/sales), a mixture of

both or other activities (e.g., charcoal production). Communal farmers, on the other hand, live and manage state land that is allocated to a traditional authority; they do not have private ownership. They mostly earn their livelihood with small-stock farming but can also benefit indirectly from utilization of wildlife through the conservancy (MEFT 2020). This can be either through tourist activities or, within the allocated limits of a government controlled wildlife utilization quota, meat and trophy hunting. The interviews with commercial farmers were conducted in English or German and the interviews with communal farmers were held in their indigenous language with the help of a local translator. The survey included questions about general attitudes toward specific wildlife species. The survey also included questions about cost and benefits of wildlife as well as opinions about wildlife heritage value. In addition, the same survey was also used to investigate the perception of biodiversity (see below) and incorporated another set of questions about the farmers' knowledge background and policies about biodiversity.

A key aspect of human–wildlife coexistence is attitudes toward species. All respondents felt *happy*, *excited*, or *fine* about sharing land with giraffes, oryxes and springboks (Fig. 18.9). In contrast, leopards, hyenas, and elephants evoked contrasting feelings among the farmers. The majority of respondents expressed negative feelings toward hyenas and elephants: 64% had negative feelings (*afraid*, *angry*, *disgusted*) toward hyenas and 56% toward elephants. Overall, leopards were perceived slightly more positively, with 56% of the respondents feeling *happy*, *excited* or *fine* about them. However, the attitudes toward these animals strongly

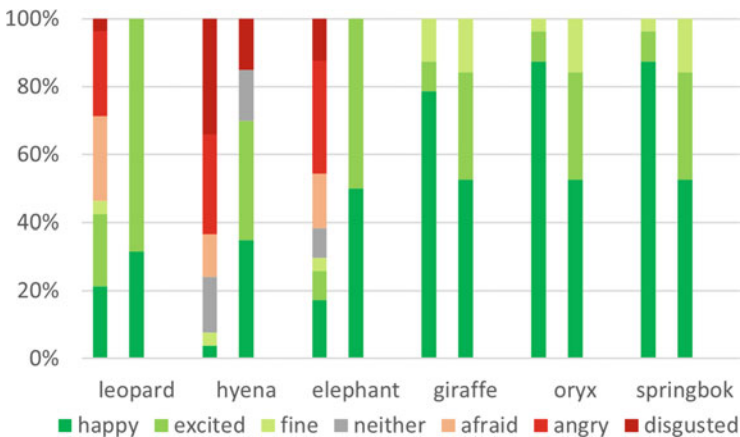


Fig. 18.9 Livestock vs. wildlife-based farmers' general feelings toward wildlife species; red colors represent negative feelings, green colors represent positive feelings; each left bar per category indicates the feelings of the livestock farmers, the right of the wildlife-based farmers; Answers from structured interviews: $N = 30$, with $N_{livestock} = 24$, $N_{wildlife-based} = 6$

depended on the farm income-generating activity (livestock vs. wildlife-based¹; Fig. 18.9).

Wildlife-based farmers felt exclusively positive (*happy, excited*) toward elephants and leopards, while livestock farmers have a variety of feeling toward these species. For leopards, in each case 25% of the livestock farmers responded they felt *afraid*, or *angry*, and 4% of them were even *disgusted* by them. Notwithstanding, 46% of the livestock farmers felt positive toward them (*happy*: 21%; *excited*: 21%; *fine*: 4%). Elephants evoked slightly more negative feelings among the livestock farmers (*afraid*: 17%; *angry*: 33%; *disgusted*: 13%). However, the species most negatively regarded by livestock farmers was spotted hyena. In each case, only 4% felt *happy* or *fine*, whereas 13% felt *afraid*, 29% felt *angry* and 33% *disgusted*.

The study highlights that nondestructive species, such as antelope species or giraffes are viewed exclusively as positive (Fig. 18.9). One reason might be that this group has a benefit-cost ratio that is strongly shifted toward benefits. Without generating high maintenance or costs, these animals can contribute to livelihoods as an additional source of income through live and meat sales or conservation hunting practices and tourism (MEFT 2020). In addition, farmers who do not directly benefit from them, also do not have problems, instead, they refer to these animals as “beautiful to look at” (Interviewee no. 18, commercial livestock farmer) or as a “nice experience for the children” (Interviewee no. 25, communal livestock farmer). In contrast, especially predators such as leopards and hyenas as well as elephants evoke negative feelings among many livestock farmers. These species are predominantly associated with costs as they depredate livestock or damage crops/infrastructure and can be a threat to human well-being. However, the feelings toward these animals were highly dependent on the main farm income-generating activity (i.e., management type) (Fig. 18.9). For example, a farmer with wildlife-based activities (e.g., conservation hunting, photo tourism) might perceive hyenas, leopards, and elephants as financial assets. In this case, the benefits outweigh the possible conflicts, and therefore, wildlife roaming around locally is viewed positively. In contrast, for many livestock farmers, predators and elephants create conflicts by killing livestock or damaging infrastructure without generating a direct benefit.

In conclusion, the attitudes of communities sharing a landscape with nondestructive species were mostly positive across all land-use types, while perceptions toward predators and elephants were highly dependent on the farm management type.

¹ Within the study, livestock refers to farms with only livestock (18) and the ones with a mixture of livestock and wildlife (6). Wildlife-based refers to only wildlife-based (i.e. farms that offer conservation hunting and/or photo tourism; 5) or other activities (e.g. charcoal production; 1). Communal farmers (10) were only included in the “livestock only” group, as they only indirectly benefit from wildlife through the Conservancy. Commercial farmers (20) however practice a greater variety of main farm income-generating activities.

18.4 Namibian Farmers' Perceptions of Biodiversity

Attitudes toward wildlife, and tolerance thereof, often depend on a person's understanding of being part of ecosystems biodiversity, which has been found to differ significantly between communal and commercial farmers. Hence, it is important to examine why people tolerate or do not tolerate co-occurring with wildlife, as well as to enhance, and develop strategies to improve coexistence (Carter et al. 2020; Slagle and Bruskotter 2019).

Biodiversity has been defined by the Convention on Biological Diversity (CBD 1992) as "diversity within species, between species, genes and of ecosystems" (CBD 1992: Art. 2) and has received extensive global research. However, how the different local population groups in the study area, including both communal and commercial farmers, relates to biodiversity concepts is unclear (Bischofberger et al. 2016). Farmers have a daily experience of the natural environment, which brings them to have a more functional view on biodiversity that might differ from the scientists' view (Kelemen et al. 2013).

In addition to perceptions of wildlife, farmers' perceptions of their natural environment were examined, which could influence their land management decisions (Warren 1996). Farmers were asked for their definition of biodiversity. Furthermore, the farmers' evaluation of the temporal change (i.e., now vs. 10 years ago) of the number of different species of large mammals (heavier than 1 kg), small mammals, reptiles, insects and plants gave us an insight of the farmers' perception of biodiversity in practice. To connect the farmers' perception of biodiversity to their farming activities, we asked if specific animal groups (i.e., carnivores, grazing herbivores, browsing herbivores, big herbivores, small mammals, reptiles and insects) have a positive or negative impact on the land productivity. Here, land productivity refers to broad indicators of land health such as soil health, biomass productivity and livestock and wildlife well-being.

Figure 18.10 summarizes that 37% of all farmers did not know or did not have a direct translation for the term "biodiversity" (Fig. 18.10). Consequently, a short explanation was given; in a few cases it was still unclear and the question has been reformulated as "what is nature for you?". Most farmers' own description of biodiversity referred to natural elements such as plants, animals and soil (Fig. 18.10), of which animals are mentioned most often. Similar numbers of commercial and communal farmers included concepts of interrelationships (e.g., diversity, balance) and beneficial elements (e.g., resources, food and farming) in their understanding of biodiversity. Apart from that, some distinct differences between commercial and communal farmers appeared in the descriptions of biodiversity. Commercial farmers used terms closer to scientific concepts (e.g., ecosystems, species) more frequently. Furthermore, only commercial farmers linked sustainability and religious aspects to it. In contrast, for communal farmers "biodiversity is humans, wildlife and trees" (Interviewee no. 26, communal livestock farmer). In other words, they included humans significantly more often as part of biodiversity. In addition, time-related aspects of biodiversity, like *future* and *past*, held more importance for them. This

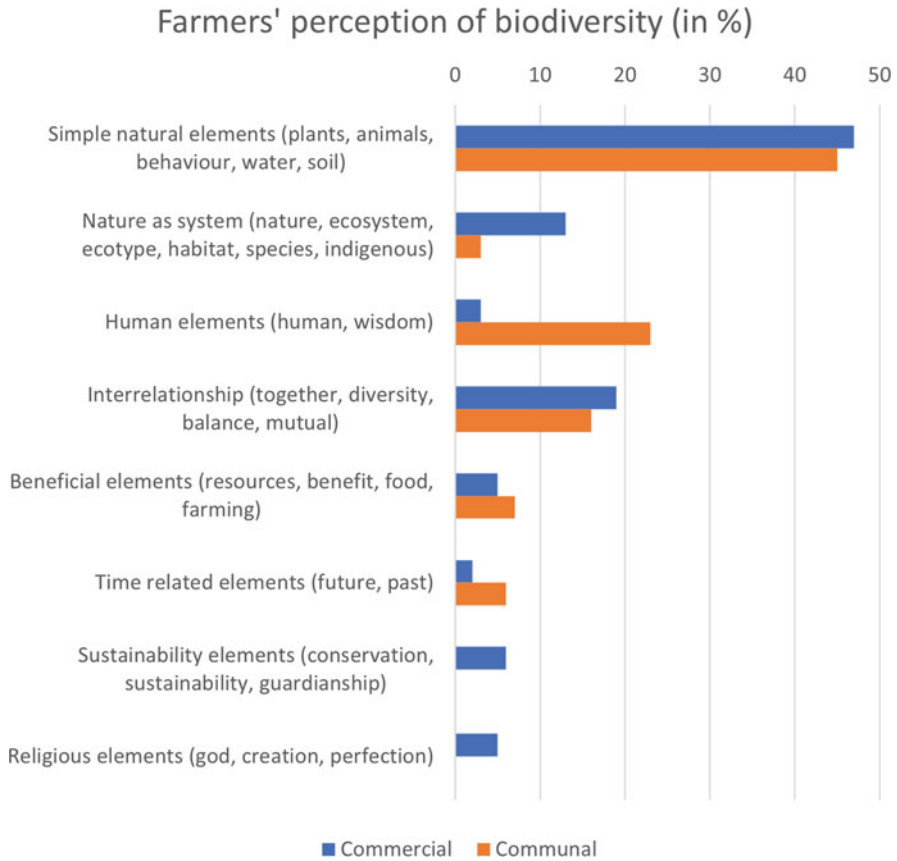


Fig. 18.10 Comparison between commercial and communal farmers' keywords to define biodiversity

seems to indicate a much more inclusive view of biodiversity and nature regarding humans being a part of it in addition to animals and plants, an understanding common to indigenous communities on different continents (Descola 2012). In comparison, commercial farmers understood humans outside of biodiversity and rather saw the linkages between humans and nature, with mutual influence, but also with clear separation: “we have to manage nature in order to preserve it” (Interviewee no. 9, commercial wildlife-based farmer).

Regarding the temporal change in numbers of different species, the majority of communal farmers observed a stable state, while the majority of commercial farmers noted changes (increase or decrease) in species composition except for small mammals and reptiles. Moreover, most communal farmers only saw a positive effect of big browsing and grazing herbivores especially for bush control but did not mention grazing competition with their livestock. They also did not see an effect on land productivity of the other animal groups (carnivores, small mammals, reptiles).

In contrast, the majority of commercial farmers expressed a positive perception of the effects of the different animal groups on land productivity (see also Sect. 18.3).

These differences in the answers might have various reasons. All interviewed farmers shared family sentiment on farming, and here, some ethnic and cultural differences could explain the discrepancies in the views of biodiversity (Olbrich et al. 2009). This might be explained by the closer relation between humans and nature in the worldviews of indigenous communities, opposing the clear human–nature division in modern societies (Descola 2012). The communal farmers’ all-encompassing understanding of nature might lead to a perception of a static state in the ecosystem, while the commercial farmers’ use and resource view of nature might induce a perception of change. Only half of the communal farmers went to school compared to 95% of commercial farmers, which at least attended primary school. This may also lead to different views of biodiversity (Kelemen et al. 2013).

Despite some differences, the majority of farmers acknowledged the importance of most groups of animals and the place value that these groups have in the system to keep the balance. They also mentioned that the number of animals plays a role, if one group is too large the system would be unbalanced. Despite the general feeling of communal farmers that number of different species is stable, many farmers, both communal and commercial, are aware of ecosystem complexity and its cycles. They mentioned seasonal changes and fluctuations between years of aridity and good rainfall influencing animal and plant populations to shrink or thrive accordingly. However, the term “biodiversity” remains an abstract concept for everyone but its understanding interestingly encompasses a richness of aspects from the different dimensions, such as the scientific, but also the economic, social and ethical (Gayford 2000; Wals and Weelie 1997).

18.4.1 Case Study on Human–Elephant Conflict in the Etosha South-West Landscape

African elephants (*Loxodonta africana*) are a keystone and charismatic species, however, reports on conflicts between elephants and humans have increased throughout southern Africa (Cumming and Jones 2005; Twine and Magome 2007). Specifically in Namibia elephant populations increased as elephants result of conservation efforts and its economic value to the tourism and hunting sectors (MET 2007b; CITES 2016; Matinca 2018). While from the nature conservation perspective this trend is seen as a success, land users are increasingly challenged by elephants dispersing to communal and commercial farmland, reoccupying areas from which they have been absent for many years (MET 2018).

To complement the investigation of wildlife movements and perceptions on different land uses, farmer–elephant interactions were explored within the Etosha South-West Landscape. Many farmers live adjacent or in close proximity to Etosha National Park and, despite the previously described benefits derived from wildlife (Fig. 18.2), are prone to experience conflicts with wildlife (MET 2007a; Mackenzie and Ahabyona 2012). As part of this case study, a semistructured

qualitative survey was conducted with 11 communal and commercial farmers and nine wildlife experts familiar with or experiencing human–elephant conflicts in the study area. Furthermore, observations of group discussions at a local meeting on human–elephant conflicts (governmental representatives, commercial and resettlement farmers) revealed insights into the local interactions and challenges associated with elephants.

The interviews and observations uncovered a rather conflicting interrelationship between farmers and elephants. In agreement with a study by Shaffer et al. (2019), the characteristics of these human–elephant conflicts were influenced by elephant and human variables and framed by press and pulse disturbances in the landscape. Land users perceived an increase in the local elephant population, as well as an influx from other areas, leading to destruction and over-use of vegetation resources, and a high demand on surface water. Elephants were further found to destroy fences which farmers use for livestock and wildlife management. Most of the survey respondents had a negative attitude toward elephants influencing their livelihoods, triggering fence construction as a barrier for elephant movement. These new fences likely affect wildlife movement and migration and could result in a displacement of conflict to different areas, and not a reduction.

Coexistence of humans and elephants is improved by the reduction of associated costs and the increase of benefits from the elephants (Thouless 1994). This is crucial when choosing well-adapted conflict mitigation and prevention measures in the face of future challenges such as climate and land use change that are expected to exacerbate competition over shrinking resources (Otiang’ a-Owiti et al. 2011; cited by Shaffer et al. 2019).

There seemed to be a considerable influence of sentiments of the international community on this very localized conflict in the study area. Stakeholders proposed that consumptive use of elephants within the area is critical to be included in options for conflict mitigation. Trophy hunting, or as recently termed conservation hunting, was found to be an attractive option for affected stakeholders. In addition to reducing the local elephant population, it can provide considerable income which will increase tolerance from farmers, and also provide a means to repair damage to water infrastructure and fences. In 2020 elephants were offered as trophies for on average US\$ 43,000 in neighboring Botswana (Sguazzin n.d.). In contrast, international animal welfare organizations reject any use and especially trophy hunting of elephants without having an understanding of local contexts (“South Africa and Namibia hit out hunting trophy ban” n.d.). As a response to the conflict in the study area, 22 elephants were sold and translocated from the study site immediately following this case study. A future study on the effect of this action on tolerances of the farming community toward elephants compared to results found during the study has been initiated.

18.5 Chapter Conclusion

Namibia has a unique blend of multiple land use and tenure activities which have seen benefits from wildlife. Within the arid study area of north-west Namibia it was found that almost all of these include livelihood benefits from wildlife to some extent through consumptive (hunting and meat) and/or nonconsumptive (ecotourism) means. Depending on the strategies of wildlife use, there are however negative impacts, particularly from human–carnivore and human–elephant conflict.

Interviews with stakeholders in the study area clearly indicated that there has been an increasing trend of land-use practices toward extensive inclusion of wildlife into livelihood strategies for commercial as well and communal land users around Etosha National Park. This has resulted in an overall increase of wildlife distribution across the study area, as well as and an increase in overall abundance. A critical distinction from neighboring South Africa's increase in wildlife numbers on private land is that wildlife in Namibia had the ability to naturally occupy communal farmland in the extensive and unfenced communal conservancies. Uniquely this has also been evident in commercial farmland south of Etosha National Park where some landowners benefit through tourism and sustainable hunting from the movement of wildlife across boundaries and even across and through fences to reach grazing and water resources in the greater area. The arid landscape undoubtedly drives wildlife movements for survival, even across substantial barriers such as the Veterinary Cordon Fence.

Complexity in individual rural livelihood choices has an interesting impact on the commercial value of wildlife resources. Using the case study of elephants while within Etosha National Park, it is argued to be an exclusively beneficial and valuable asset. It not only attracts tourism, but also plays a role in improved ecological function in the Park since it reduces bush encroachment and makes browsing resources available to other herbivores through its wasteful browsing methods (Bothma and Du Toit 2016). As soon as that same animal leaves the Park onto commercial livestock farmland, its value immediately disintegrates, and it becomes a significant cost to the farmers since it damages fences and water infrastructure and competes for grazing and browse resources with livestock. The interplay between economics, ecology, conservation, social cohesion and sentiment is complex, but teasing out the dynamics will be an important guiding tool for decision-making and livelihood strategies in this dynamic environment.

There was significant governmental and nongovernmental assistance for communal farmers to develop communal conservancies and include wildlife use since the promulgation of the Nature Conservation Amendment Act 5 of 1996. This, together with the incentive of benefiting from wildlife while still being able to practice livestock farming has led to more acceptance of wildlife. For commercial farmers the inclusion of wildlife was based solely on their socio-economic needs.

Wildlife survival in this arid area with erratic rainfall patterns is dependent on their ability to move in order to find water and forage. The study investigated a large sample set of herbivore movements across the landscape, and with fencing being

the major impediment to movement, its effects on disrupting movements and loss in required energy for the ungulates are clear indications of the negative effect fencing may have on extensive wildlife productivity.

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