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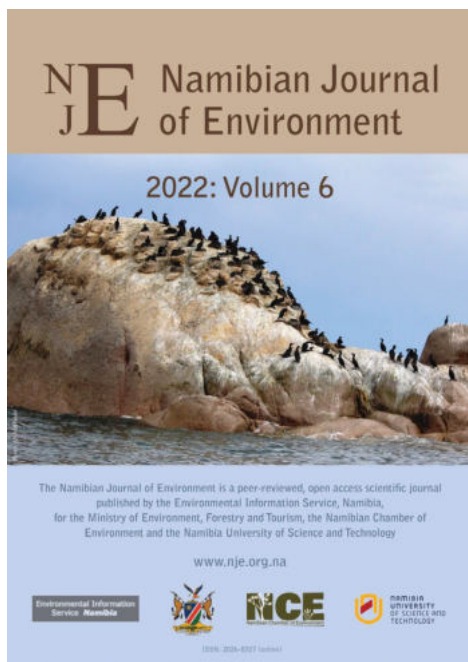
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## SECTION A: RESEARCH ARTICLES

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## Analysis of records from community game guards of human-elephant conflict in Orupupa Conservancy, northwest Namibia

MJ Wenborn<sup>1\*</sup>, V Nijman<sup>1</sup>, D Kangombe<sup>2</sup>, R Katira Zaako<sup>2</sup>, U Tjimuine<sup>2</sup>, A Kavita<sup>2</sup>, J Hinu<sup>2</sup>, R Huwe<sup>2</sup>, VJ Ngarukue<sup>2</sup>, KJ Kapringi<sup>2</sup>, MS Svensson<sup>1</sup>

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<sup>1</sup> Faculty of Humanities and Social Sciences, Oxford Brookes University, Gipsy Lane, Oxford OX3 0BP, UK.

<sup>2</sup> Orupupa Conservancy, Orundu, Kunene Region, Namibia.

\* 16040486@brookes.ac.uk

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### ABSTRACT

Competition between local people and elephants (*Loxodonta africana*) for water and vegetation is an increasing concern in many conservancies in northwest Namibia. Many livestock were lost during droughts in 2018-2019, and there are risks of more severe droughts in the future because of climate change. Little research has been published on elephants in the Northern Highlands, although the community game guards have been collecting data for many years in Event Books, as part of their role within conservancies. These include records of human-elephant conflict incidents. The objective of this study was to assess in detail the data on human-elephant conflict in Event Books for Orupupa Conservancy. In addition to analysis of Event Book data, consultations were carried out with community game guards in 2021 and 2022. Incidents involving elephants tend not to be frequent, but damage at water points can have a major impact on a local community because of the time taken and expenses of repairing the infrastructure. In 2019 and 2020 there was a changing dynamic in which some local communities set up vegetable gardens near water points or springs. The number of incidents of elephant damage at vegetable gardens greatly increased in 2020. Our study demonstrates that detailed analysis of Event Book data for additional conservancies would be useful. Combined with local ecological knowledge, the Event Book data can be used to inform the planning of local actions to reduce human-elephant conflict, including conservation of elephants and their habitats, in line with the actions in Namibia's National Elephant Conservation and Management Plan. The study also confirmed the substantial knowledge of community game guards and their important work in keeping records in Event Books. The expansion of their monitoring role to identify specific elephant herds would provide benefits in terms of improving knowledge on the elephant population and movements, and the potential for early warning between villages about the more problematic herds.

**Keywords:** community conservancies, game guards, human-wildlife conflict, Kunene, local ecological knowledge, Namibia

### INTRODUCTION

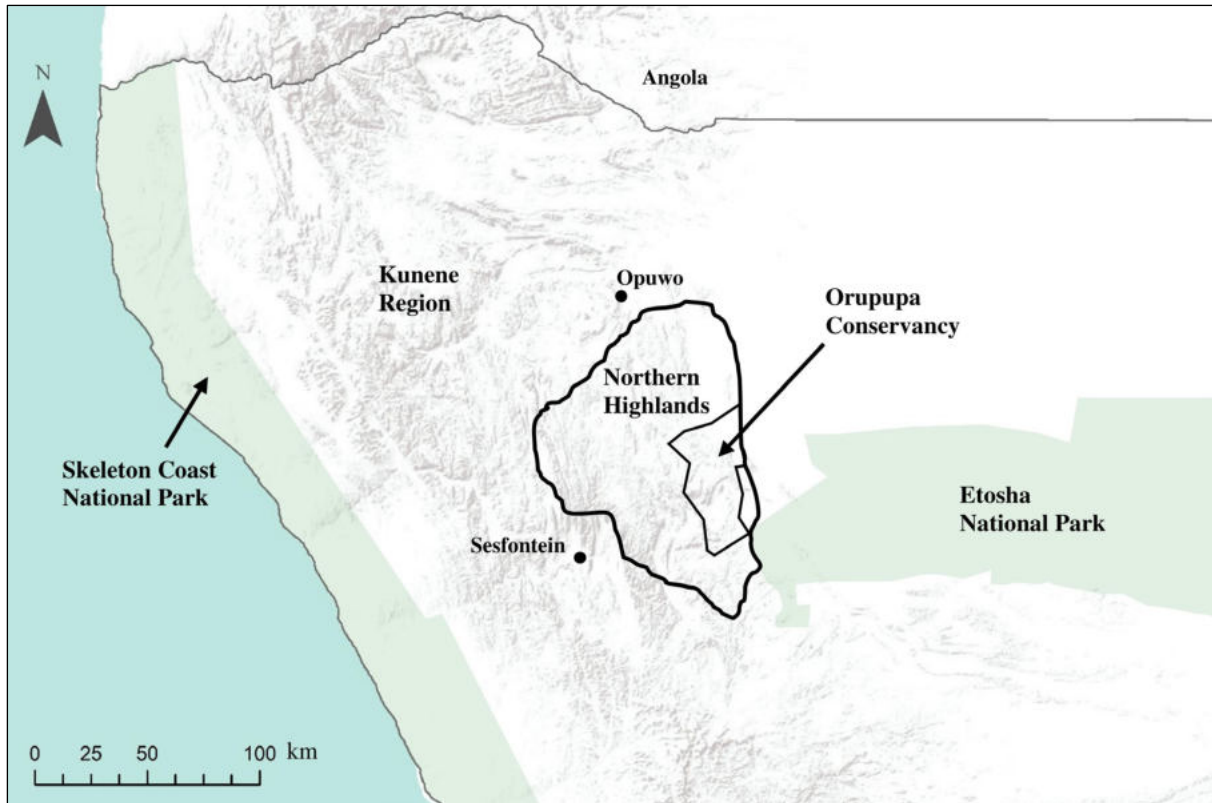
The National Elephant Conservation and Management Plan in Namibia, adopted in 2021, stated that conflict between local communities and elephants (*Loxodonta africana*) is increasing, including on communal lands as well as commercial farms (MEFT 2021). Over 80% of the elephant population in Namibia is located in the Zambezi and Khaudom-Kavango Regions in the northeast of the country, with a significant population also in Etosha National Park (Thouless *et al.* 2016). There is a small elephant population in Kunene Region in northwest Namibia (Figure 1a), across parts of former Kaokoveld and Damaraland, and this population is impacting local communities.

Located between the Skeleton Coast National Park and Etosha National Park, the Northern Highlands is a mountainous and remote area of about 12,000 km<sup>2</sup> (Figure 2). Some people refer to its population of elephants as "Highland elephants". These elephants live alongside the communities in the Highlands,

where the human population density is very low (about 1 person/km<sup>2</sup>, NACSO 2020). The rural communities in Kunene Region are some of the poorest in Namibia (GRN 2015; Heydinger *et al.* 2019). Northwest Namibia is an extremely dry area and the communities have been greatly affected by droughts between 2013 and 2020, with poverty levels increasing because of the loss of livestock due to the lack of vegetation during the droughts (Inman *et al.* 2020). The economic impact of the Covid-19 pandemic has added to the challenges for local communities. The drought years have resulted in increasing pressures in terms of competition between wildlife and communities for local resources (Heydinger 2021). It has been reported that human-elephant conflict at community water points in northwest Namibia is a particular problem that is adding to challenges for the communities (Hunninck *et al.* 2017; MEFT/NACSO 2021; MEFT 2021).

The desert-adapted elephants in areas such as the lower Hoanib River have been researched in detail (Viljoen & Botha 1990; Leggett *et al.* 2003; Leggett





**Figure 2:** The Northern Highlands, showing Orupupa Conservancy in northwest Namibia.

of damage and complainant, and the number of elephants if known. The Event Books have provided a tool for consistent monitoring and many conservancies in Namibia have records going back over 10 years. The Event Book system was set up by the Ministry of Environment, Forestry and Tourism (MEFT) and Namibian NGOs, and extensive training has been provided to game guards. It is evident from discussions with the game guards that the training and support from MEFT and the NGOs has resulted in strong commitment to the monitoring system by the conservancies, as had been the intention at an early stage in the monitoring system (Stuart-Hill *et al.* 2005).

The objective of this study is to assess in detail the data on human-elephant conflict incidents in Event Books for one conservancy. The analysis of incidents can potentially provide useful information for detailed planning of local interventions for conservation of elephants and to address community priorities.

**METHODS**

Orupupa Conservancy was gazetted in 2011 and has an area of 1,234 km<sup>2</sup> (NACSO 2020). This excludes the area east of the C35 main road, which is under review in terms of becoming gazetted as part of the conservancy. The conservancy has been monitoring

wildlife and recording in Event Books since 2012, including the area to the east of the main road.

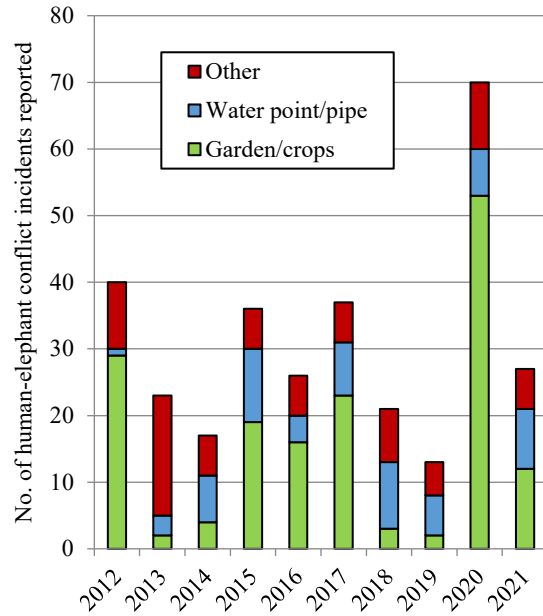
Orupupa is located in the eastern part of the Northern Highlands. According to community game guards, it is potentially part of a corridor on a historical migratory route for elephants from western Etosha National Park in the rainy season to find their preferred vegetation, and back to the park in the dry season. The main villages in the conservancy are near the roads or springs in the northern part. Since it was set up in 2011, Orupupa Conservancy has had no investment in tourism and received minimal revenues. According to the Conservancy Management Team, the communities have growing concerns about incidents of human-elephant conflict.

We consulted with the Conservancy Chairperson and the six community game guards that work in the conservancy in April 2021 and March 2022 about trends in types of human-elephant conflict and reasons for changes. We also conducted site visits with game guards through much of the conservancy to villages, natural springs and community water points. The Conservancy Chairperson gave approval for analysis of the Event Book data. Copies were taken, with co-operation from the game guards, of relevant sections of the Event Books for the 10 years from 2012 to 2021 inclusive.

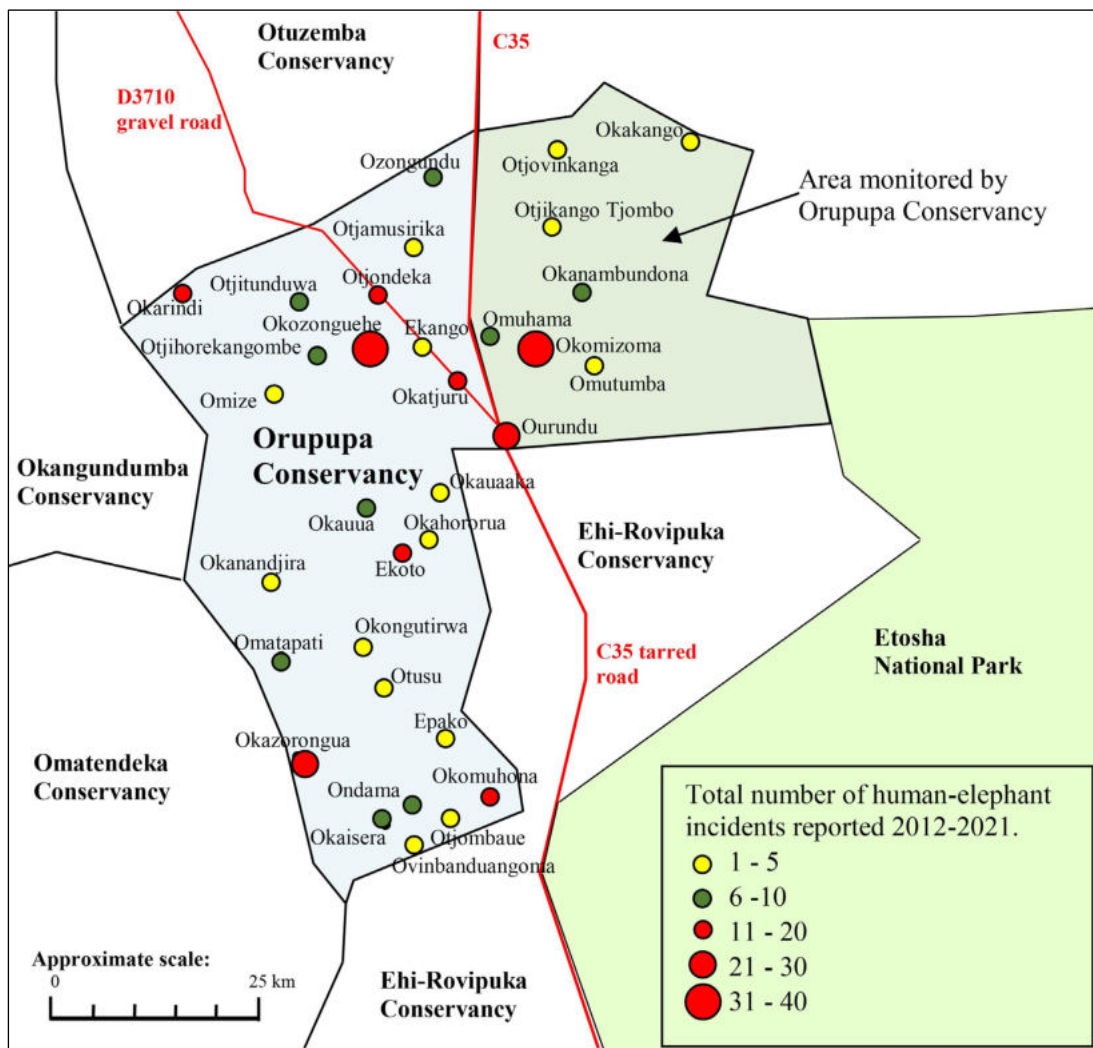
**RESULTS**

The six community game guards recorded a total of 148 pages of incidents of human-wildlife conflict between 2012 and 2021. The total number of reported incidents involving elephants was 310. Thus over the 10 years, an average of 31 incidents involving elephants were reported each year, with the highest number being in 2020 when 70 incidents were reported (Figure 3).

Of all reported incidents in Orupupa Conservancy involving elephants, 53% occurred at vegetable gardens (Figures 3 and 1c). There was a large increase in incidents at vegetable gardens in 2020. Incidents at water points (e.g. pipes, tanks) accounted for 21% of the total reported incidents over the 10 years (Figure 1d). The "other" category of incidents in Figure 3 mainly refers to damage to structures, such as fence enclosures for livestock, but there were also a few reports of livestock loss because of elephants.



**Figure 3:** Trends in total human-elephant incidents recorded by game guards in Orupupa Conservancy.



**Figure 4:** Location of human-elephant incidents recorded by game guards in Orupupa Conservancy between 2012 and 2021.

Of all incidents involving elephants over the 10 years, 65% were reported in the northern part of Orupupa Conservancy, including the area to the east of the C35 road that is not yet formally part of the conservancy but is monitored by its game guards (Figure 4).

Different types of incidents were recorded in different parts of the conservancy (Figure 5). In southern parts 39% of the human-elephant conflict incidents involved damage to water points and 30% to vegetable gardens. In the north, more vegetable gardens have been set up, and 65% of the incidents reported there involved damage to vegetable gardens, and 12% involved damage to water points. There

were increases in the number of incidents in 2020 in the villages of Otjondeka, Okozonguehe, Ourundu and Otjihorekangumbe in the north, and Okazorongua and Ekoto in the south, and many of those increases were at vegetable gardens. In 2021, the number of recorded incidents involving elephants at vegetable gardens decreased to the typical levels reported for 2012 to 2019. If analysed on the basis of incidents per square kilometre during the 10 years, there were over double the number of incidents (0.21 per km<sup>2</sup>) in the mountainous areas of the conservancy to the west of the main C35 tar road than in the flat, sandy area to the east of the main road (0.09 incidents per km<sup>2</sup>).

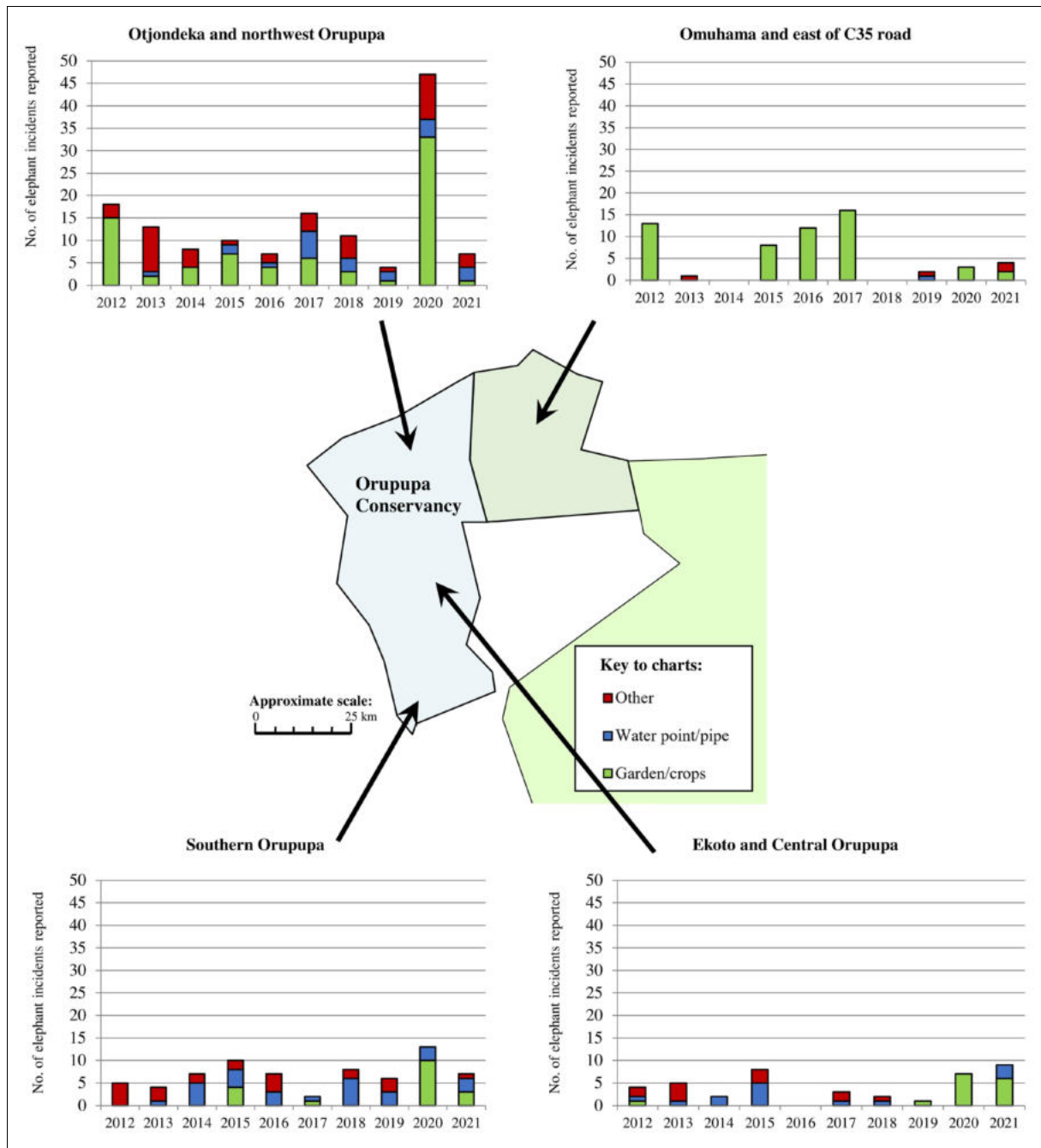


Figure 5: Trends in human-elephant incidents recorded by game guards in different areas of Orupupa Conservancy.

One of the main points of feedback from discussions with game guards in 2021 and 2022 was their perception that human-elephant conflict in Orupupa Conservancy is becoming more serious overall, including at water points and vegetable gardens. The perception of the game guards, based on their own observations and on feedback from local people, is that the number of elephants in the conservancy has been increasing.

## DISCUSSION

### Water supply infrastructure

The overall frequency of human-elephant conflict incidents reported in Orupupa Conservancy is low, with typically about three incidents reported per month on average. The water points that had the most frequent damage by elephants are Okomuhona, Okazorongua, Ondama and Okauua in the south, and Okarindi in the northeast. The most incidents reported at water points was at Okomuhona village in the southeast, with nine incidents reported over the 10 years. However, even though the frequency of reported incidents is low in these villages, the damage resulting from an incident by elephants at a water point can have a substantial impact on the local community. When water point infrastructure is damaged, in practice it often takes much time to repair, partly because of the large distances to travel to suppliers to buy parts and equipment. For example, for several months in 2021 the water point at Okomuhona village in the southeast of the conservancy was not operational and, although this was not a result of damage by elephants, water had to be transported into the village by truck, which is expensive. The water point at the cattle post at Otjamusirika is an example where the infrastructure was damaged by elephants (Figure 1e), and could not be immediately repaired, so for one month people were having to walk 5km to Otjondeka to obtain water.

Even when elephants have not damaged any infrastructure, but have drunk the water that had been pumped into a holding dam for livestock, this often results in a cost for the village in terms of the diesel needed to pump the extra groundwater. Although such incidents are not recorded in Event Books, they do affect community attitudes towards elephant conservation. The main actions that villagers can take to reduce damage at water points is to ensure that the holding dams are full of water for elephants to drink, because damage often occurs when elephants find no water in the dams but they smell water in the pipes. Ensuring holding dams are full costs the community money at water points with diesel pumps. In the village of Okazorongua the community has constructed an earth dam to store rainfall for livestock and wildlife, which for a few months reduces the costs of diesel fuel at the community

water point and the risk of elephant damage. The water supply at Okatjuru is another example of the fragile situation for communities. Several years ago the community decided to close the groundwater borehole because of the costs of diesel fuel for pumping, and instead they use a hand pump. The most effective and sustainable intervention to address these challenges and reduce operational costs is to upgrade the water points to include protection from elephants and to install solar pumps (Figure 1f). Such upgrades tend to be funded by the national government or donor organisations, and are a priority for many villages and cattle posts in Orupupa Conservancy. Investment in converting water infrastructure to include solar pumps and adding walls to protect water points from elephant damage is the main intervention included in the National Elephant Conservation and Management Plan for reduction of human-elephant conflict at water points in the northwest (MEFT 2021).

### Vegetable gardens

Between 13 and 40 incidents per year were reported in total (e.g. water points, vegetable gardens, other) across Orupupa Conservancy from 2012 to 2019, but the total then jumped to 70 incidents in 2020. This increase was because of 53 incidents at vegetable gardens in 2020. There was a major reduction in livestock during the drought in 2018-2019. From that time some villages in the Northern Highlands established small vegetable gardens, particularly next to water points or springs. This increased the potential for human-elephant conflict in the area. In the conservancy, several incidents were reported of elephant damage at vegetable gardens in 2020; including in Otjondeka, Okozonguehe and Otjihorekangombe in the north, and Okazorongua and Ekoto in the south. This is an example of the changing situation in northwest Namibia. Although typically elephants tend to stay away from villages during the rainy season because they have access to water elsewhere, the setting up of vegetable gardens resulted in some visits of elephants to villages during the rainy season. In Okazorongua, there had been no incidents of elephant damage at the water point between 2012 and 2018, but six incidents were reported during 2019 and 2020. The establishment of vegetable gardens in Okazorongua might have led to the damage at the water point in 2019 and 2020 by tempting elephants into the area.

In 2021 vegetables were not planted at many gardens because of the concern of the local people that this would attract elephants to the villages. The number of incidents at vegetable gardens in 2021 did significantly decrease, except for ongoing incidents at the vegetable gardens at Ekoto in the centre of the conservancy. There are currently few actions that villagers take to reduce incidents at vegetable gardens, apart from making noises to try to scare the

elephants away. The main action taken in 2021 was simply to stop growing vegetables. The National Elephant Conservation and Management Plan identifies the problems with damage at small crop fields and vegetable gardens in the northwest and proposes interventions such as electric fencing and exploring the feasibility of chilli production and use to deter elephants (MEFT 2021).

### **Trends in reported incidents of human-elephant conflict**

The trends shown in Figures 3 and 5 do not confirm the perception of game guards of increases in incidents of elephant damage in Orupupa Conservancy. The marked increase in reported incidents at vegetable gardens in 2020 (Figure 3) is likely to be an outlier compared to the stable trend of similar numbers of cases each year for 2012-2019 and 2021. A detailed analysis of Event Books in other conservancies in the Northern Highlands would provide a more complete picture.

### **Local community commitment**

Namibia has been leading the implementation of the community-based conservancy model to wildlife conservation, which involves a structured legal mechanism that empowers the communities to make decisions on the use of local natural resources. Several studies have concluded that the focus of the conservancy model on supporting communities to gain from the value of wildlife has been a major factor in the increase in wildlife populations in northwest Namibia since the 1990s (Naidoo *et al.* 2011; Silva & Mosimane 2013; MEFT/NACSO 2021; Störmer *et al.* 2019; Wenborn *et al.* 2022). However, Orupupa Conservancy is one of the conservancies that has received no investment in tourism and minimal revenues, and has not gained from local employment and other benefits from wildlife tourism. According to the game guards consulted in our study, this is affecting the commitment of communities to wildlife conservation. The local perception of an increase in reported human-elephant conflict, including the high number of incidents in 2020 from which communities lost vegetable crops, is likely to be further negatively impacting the perception of communities on the conservancy model. Competition between humans and wildlife for natural resources is a particular concern given the increasing risks of more severe droughts in future because of climate change (Hunninck *et al.* 2017; IUCN 2020).

### **Elephant movements**

According to the game guards consulted during this study, some elephants leave Etosha National Park during the rainy season from the northwest area of the park to look for preferred vegetation in the Northern Highlands. In terms of location of reported incidents of human-elephant conflict, there have been a higher

number of incidents in the north of Orupupa Conservancy than the villages in the south. Although this could be partly a result of elephant movements in a corridor out of the northwest area of Etosha National Park, the results are inconclusive. The higher number of recorded incidents in the north is more likely to be because of a combination of other reasons. There are several springs in that area and it might be that elephants are more likely to drink at the springs (at which their dung is often observed), because these springs tend to be further away from households than water points. However, according to game guards, elephants also like to drink at community water points because the water might be cleaner. Also, the higher number of vegetable gardens in the north part of Orupupa Conservancy is likely to be a factor. Finally, the higher number of recorded incidents might simply be because there is a higher human population in the north, and therefore incidents are more likely to be reported. As an example, there were no incidents reported at the water point in Otjondeka from 2012 to 2021. This is the village with the largest human population in the conservancy. The water point is located near an area of many houses, the clinic and the school. Elephants would be expected to choose the easier and quieter options of drinking at Otjondeka Springs, which are further away from the village properties. However, there was an increase in incidents at vegetable gardens in Otjondeka in 2020, with eight incidents reported in the year, indicating that elephants might be willing to take more risks when it comes to opportunities to take vegetables from the gardens. Although there is uncertainty into the reasons for more incidents in some areas of Orupupa Conservancy, the detailed analysis has demonstrated that further such analysis and mapping of data on recorded human-elephant conflict incidents across other conservancies will be useful as one indicator of elephant movements in the Northern Highlands.

### **The need for identification of elephant herds**

The total population of elephants in the Northern Highlands is currently not known and their movements are uncertain. More detailed information on the population and movements is needed to plan specific interventions to conserve the elephant population and reduce human-elephant conflict in line with the National Elephant Conservation and Management Plan. Setting up a system for game guards to identify specific elephant herds would help to generate a reliable estimate of the number of herds and the total population in the Northern Highlands. The perception of the game guards is that a small number of elephants are causing most of the incidents. A system to identify elephant herds would also increase knowledge on elephants that cause incidents more often, and facilitate an early warning system between villages about local movements of elephants. The National Elephant Conservation and



Management Plan includes the strategy to enhance monitoring of vulnerable elephant populations in areas of Kunene Region. A method for elephant identification has been developed by Elephant-Human Relations Aid (EHRA), a Namibian NGO, which is testing the method in elephant ranges to the south of the Northern Highlands. Such a system of elephant identification would enhance the data already recorded in the Event Books and increase the usefulness of the monitoring process in terms of knowledge on elephant movements and planning local mitigation actions on human-elephant conflict.

### The important role of community game guards

The data in Event Books should be assessed with consideration of the context of the challenges for the game guards. They receive low salaries and lack suitable walking boots and other equipment. On some days, they might lack motivation for keeping proper records in the Event Books. There is significant uncertainty in whether Event Book data provide a comprehensive record of the total number of incidents. It is likely that some incidents go unreported, particularly in villages located far from the villages in which the game guards live. The game guards usually do not have access to a vehicle and have to walk between villages. Some of these points are potentially demonstrated by the fact that 39% of the total recorded incidents in Orupupa Conservancy took place in the six villages in which the game guards live (Otjondeka, Okozonguehe, Omuhama, Ekoto, Okazorongua and Okomuhona). This is disproportionate because there was a total of 33 villages in which incidents were reported between 2012 and 2021. Overall, the data assessed in this study just represents one conservancy in the Northern Highlands and there is some uncertainty in the data. A wider assessment that includes other conservancies in the Northern Highlands would provide useful information, contributing to the development of local management plans.

Namibian conservation NGOs and the Ministry of Environment, Forestry and Tourism analyse and publish much of the data in Event Books, both at an aggregated level and for individual conservancies, although not to the level of detail presented in this study. Our study has demonstrated the important role of community game guards. We have also shown the benefits of co-operation between the hands-on work of experienced game guards in conservancies, researchers and data analysts.

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