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SELOUS - NIASA WILDLIFE PROTECTION CORRIDOR PROJECT**

**STUDY REPORT No. 10
AFRICAN WILD DOG AND LARGE CARNIVORE SURVEY
APRIL 2010**



**Wildlife
Conservation
Society of
Tanzania**



AFRICAN WILD DOG AND LARGE CARNIVORE SURVEY: SELOUS-NIASSA WILDLIFE PROTECTION CORRIDOR

April 2010



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SUMMARY

In southern Tanzania, the Selous-Niassa Wildlife Corridor (SNWC) and its adjacent natural areas form a globally significant landscape linkage within the Selous-Niassa Ecosystem. The SNWC falls within the Namtumbo and Tunduru District and covers an area of approximately 17,030 km² (Games, 2009). It is predominantly covered with miombo woodlands and partially by savannas. The SNWC is also home to 29 village settlements, supporting over 86 000 people (Namangaya, 2009). The SNWC has been formalised through the establishment of five Wildlife Management Areas (WMAs).

African wild dogs are considered Endangered with only 3299 individuals in 257 packs estimated for East Africa (IUCN/SSC, 2007 a) and 6371 individuals in 750 packs estimated for Southern Africa (IUCN/SSC, 2007 b). Wild dogs have disappeared from much of their former distribution range with a global population estimated at fewer than 10000 individuals.

*The Selous-Niassa Transboundary Conservation Area (TBCA) may still provide sanctuary to a large percentage of the global African wild dog (*Lycaon pictus*) population. Good wild dog population estimates are available for Niassa National Reserve (Begg & Begg 2007). Information is also available on the density of wild dogs in Selous Game Reserve, primarily based on a study conducted during the 1990s (Creel & Creel, 2002). However, very little is known about the status of wild dogs in SNWC. Similarly, little is known of the status of other large carnivores in SNWC, particularly lion, leopard and spotted hyaena.*

In order to get an indication of the status of wild dog and other large carnivores within the SNWC area, a short-term survey was conducted over the period August 2009 to February 2010. This was done through questionnaire surveys and collating opportunistic sightings that had previously been reported. This report describes the methodology and results of this survey, and provides recommendations for future activities to secure and monitor the carnivores in this area.

A total of 193 distinct wild dog observations were gathered during the survey period, with all 15 survey villages reporting sightings of wild dog activity. The data indicated that wild dogs have been observed throughout the entire corridor area, with "hotspots" of activity occurring near Magazini, Matepwende, Mtelawamwahi and Twendembele. During the questionnaire survey 42 prey records were reported for wild dogs, with reedbuck, sable and duiker being the most common. Only one domestic species (goat) was reported as prey and this represented only 2% of the total prey recorded.

*Sightings of wild dog in an area does not necessarily mean the wild dogs are resident. The presence of resident packs can be confirmed by observations of den sites, packs consisting of adults and yearlings, sightings of packs consisting of more than three individuals and sightings of wild dogs throughout the year. Pack size varied from individual wild dog observations to packs of up to 25 and 30 dogs with 78% of the sightings of more than three individuals. The average pack size varied from 5 to 8, depending on the method used to determine the average. Thirty-five percent of these observations were considered a mix of adult and young dogs and wild dogs were observed throughout the year. Six confirmed den sites were also recorded. **The survey data therefore conclusively show that wild dogs are resident and breeding within SNWC.***

Density estimates are difficult without visual identification of individual packs. However, a coarse estimate of at least 11-13 packs or a population of 55-105 wild dogs was determined through visual analysis of the data using an estimated home range size of 450-800 km². This translates into a density of 0.3 - 0.6 adults/100km². This would need to be verified by further surveys but is likely to be a minimum estimate given the low coverage of the survey.

The results of this survey suggest that the SNWC is a vitally important link of the globally significant wild dog populations in Selous Game Reserve (Tanzania) and Niassa National Reserve (Mozambique). In addition our findings of several resident packs within SNWC suggest this is one contiguous transboundary wild dog metapopulation. This population of African wild dogs is likely to be second largest population remaining in Africa and of global conservation significance.

The wild dogs within the SNWC are exposed to several threats. These include: disease; habitat loss; snares; competition with lions and hyaenas; road traffic; and direct persecution as a result of human-wildlife conflict. Of these threats habitat loss and disease pose the biggest threat. Domestic dogs act as reservoirs for rabies, canine distemper and parvovirus. They were partly responsible for the almost extinction of the African wild dog in areas of the Serengeti-Mara ecosystem. The presence of domestic dogs within the SNWC and the reports of several human deaths from rabies, suggest that rabies is prevalent within the SNWC and poses a high potential threat to the wild dog population and human population within the area.

*The survey revealed that five other carnivore species are commonly seen in SNWC: lion (*Panthera leo*); Leopard (*Panthera pardus*); Spotted hyaena (*Crocuta crocuta*); Side-striped jackal (*Canis adustus*); and Honey badger (*Mellivora capensis*). In addition, at Twendembebe Village within in the Tunduru District, cheetah (*Acinonyx jubatus*) were reported by the participants and through discussions about spoor, call, habitat and time of activity it is believed that these sightings are genuine. The presence of cheetah within the SNWC is exciting, as cheetah were thought to have been locally extinct in the area.*

The villagers attitudes towards the five carnivores species differed between species, but were primarily polarised as either positive or negative, with little middle ground (wild dog 66% positive, lion 46 % positive, leopard 42% positive, honey badger 22% positive, jackal 15 % positive, hyaena 8 % positive).

The presence and regular sightings of all the top predators (wild dog, lion, leopard, spotted hyaena, and cheetah) as well as some of the medium sized carnivores (side striped jackal and an indication of the general good ecological "health" of the corridor despite ongoing concerns over habitat degradation, disease, increasing human populations and associated snaring and poisoning. It indicates that there are still sufficient prey and habitat to support a wide variety of wildlife and the ecosystem has remained largely intact.

Based on the findings of the survey, the following recommendations are suggested:

- *Regular review, monitoring and reporting of the status of large carnivores in SNWC, particularly wild dogs, using indicators such as pack size, conflict events and the number of observations.*
- *Further investigation of the potential threat from disease, particularly rabies and possible mitigation measures is needed.*
- *It is essential that human-carnivore conflict particularly lion attacks, be closely monitored and conflict mitigated wherever possible. Education and community outreach to spread information on responsible and safe behaviours (safe shelter, livestock corrals) to reduce carnivore attacks should be implemented as soon as possible.*
- *A more detailed investigation should be undertaken to determine the status of cheetah within the SNWC area. This could include the use of camera traps and spoor transects in areas where cheetahs have been sighted in the past and ongoing monitoring of sightings.*

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1. INTRODUCTION AND STUDY AREA

In southern Tanzania, the Selous-Niassa Wildlife Corridor (SNWC) and its adjacent natural areas form a globally significant landscape linkage within the Selous-Niassa Ecosystem (Figure 1). This ecosystem extends from Selous Game Reserves in Tanzania southwards to Niassa National Reserve in Mozambique, covering an area of approximately 154 000km² of Miombo Woodland, interrupted by wetlands, open woodland and riparian forest. This ecosystem forms Africa's largest TransBoundary Conservation Area and reportedly supports Africa's largest elephant *Loxodonta africana*, buffalo *Syncerus caffer* and sable *Hippotragus niger roosevelti* populations as well as several threatened species.

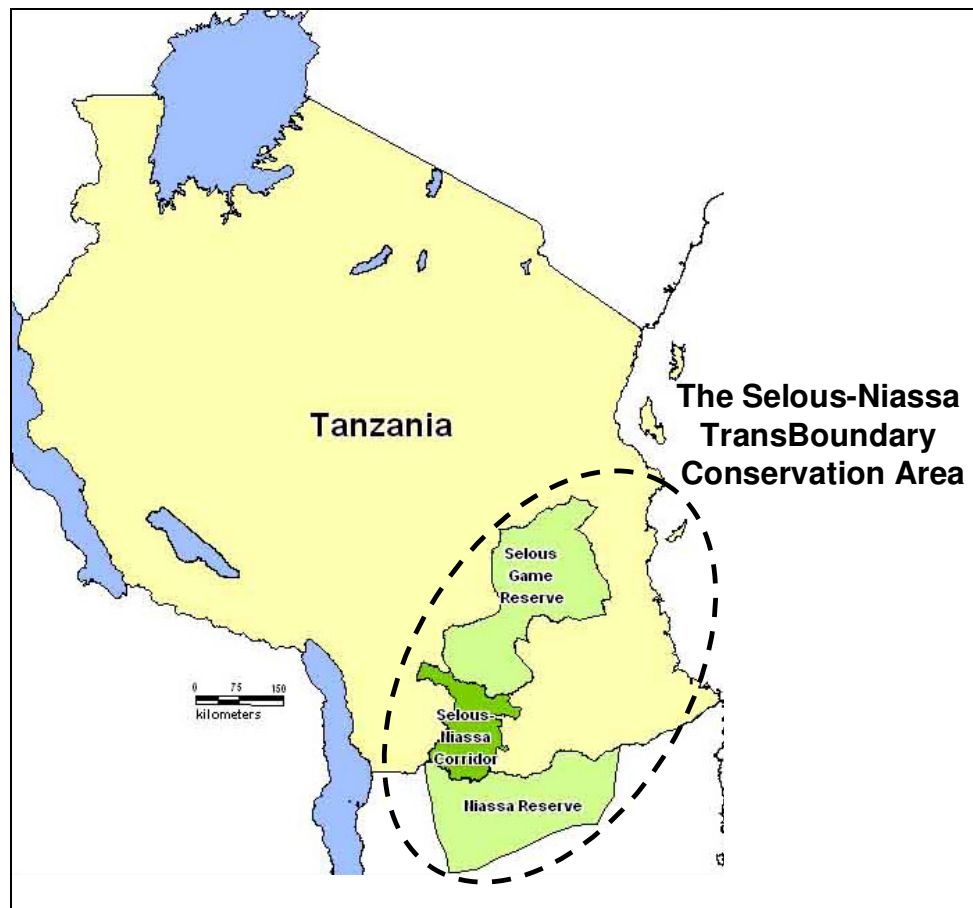


Figure 1: Map of the Selous-Niassa TransBoundary Conservation Area (adapted from Game, 2009)

The SNWC falls within the Namtumbo and Tunduru District and covers an area of approximately 17,030 km² (Games, 2009). The northern part is generally more hilly while the area towards the Ruvuma River is flat to slightly undulated. Several isolated hills and prominent rocky outcrops (inselbergs) are also present, with the highest outcrop being Mtungwe Hill at 1284 m.a.s.l. The plateau slopes toward the Ruvuma River which reaches its lowest level of about 460m a.s.l. in the south-eastern corner. The soils are generally very sandy and leached. Two drainage basins exist in the SNWC. North of the watershed, which is located roughly along the main Namtumbo-Tunduru road, the rivers run into the Rufiji River while south of the watershed the area is part of the Ruvuma River drainage basin. The major tributaries within the SNWC are the Mbarangandu, Lukimwa, Luchulukurun, Luego or Msanjesi which are primarily permanent watercourses (Bloesch & Mbago, 2006).

The mean annual rainfall is about 1220 mm (recorded at Namtumbo from 1993-2005), however rainfall generally decreases towards the south, where it is estimated that the mean annual rainfall may be around 800 mm along the Ruvuma River (Bloesch & Mbago, 2006). Freely drained soils are prevalent at different topographic positions in the SNWC, which are predominantly covered with miombo woodlands and partially by savannas. Dry evergreen riverine

forests of limited extent occur along perennial or intermittent watercourses (Bloesch & Mbago, 2006). Vast areas are annually burnt and late dry season fires are severe due to the prolonged dry drought (Bloesch & Mbago, 2006).

The SNWC is also home to 29 village settlements, supporting over 86 000 people (Namangaya, 2009). The villages range in size, with the largest housing around 9000 people (Lusewa) and the smallest around 700 people (Kimbanda & Kilimasera). The economy depends on agriculture crop production while livestock production (mostly goats) is very poorly developed. Maize, beans and rice are mainly cultivated for subsistence while in some areas cashew nuts and tobacco are grown as cash crops. Very little cattle ranching takes place within the SNWC.

The SNWC has been formalised through the establishment of five Wildlife Management Areas (WMAs). The WMAs were formed through participatory land use planning and each WMA has established a Community Based Organisation which is responsible for managing the area and its wildlife resources (Figure 2).



Figure 2: Map of the Wildlife Management Areas (WMAs) with the Selous-Niassa Wildlife Corridor (adapted from Game, 2009)

African wild dogs are considered Endangered with only 3299 individuals in 257 packs estimated for East Africa (IUCN/SSC, 2007 a) and 6371 individuals in 750 packs estimated for Southern Africa (IUCN/SSC, 2007 b). Areas of more than 10 000 km² are required to support viable wild dog populations and areas of this extent are becoming increasingly rare. Wild dogs have disappeared from much of their former distribution range. Twenty five of the 39 known

former range states no longer support wild dog populations and the species is virtually eradicated from West Africa, and greatly reduced in Central and North-east Africa (Fanshawe *et al.* 1997). .

The Selous-Niassa Transboundary Conservation Area (TBCA) may still provide sanctuary to a large percentage of the global African wild dog (*Lycaon pictus*) population. Thanks to the efforts of the Niassa Carnivore Project working in collaboration with SRN (The Society for the Development of the Niassa Reserve - the management authority of Niassa National Reserve), good wild dog population estimates are available for Niassa National Reserve (Begg & Begg 2007). Information is also available on the density of wild dogs in Selous Game Reserve, which is primarily based on a study conducted during the 1990s (Creel & Creel, 2002). However, very little is known about the status of wild dogs in SNWC. A few wild dog sightings have been reported for the area, but the extent of their distribution within the corridor is unknown. Nor do we know whether or not these sightings are just dispersing packs or actual resident packs.

Similarly, little is known of the status of other large carnivores in SNWC, particularly lion, leopard and spotted hyaena. These carnivores have significant economic, cultural and ecological importance. However, the impact of human-carnivore conflict with the associated loss of livestock, livelihoods and sometimes life should not be underestimated.

In order to get an indication of the status of wild dog and other large carnivores within the SNWC area, a short-term survey was conducted over the period August 2009 to February 2010. This report describes the methodology and results of this survey, and provides recommendations for future activities to secure and monitor the carnivores in this area.

2. SURVEY TECHNIQUE AND DATA COLLECTION

In order to get an indication of the status of large carnivores within the SNWC area, various information relating to wild dog and other large carnivores was gathered over the period August 2009 to February 2010. This was done through questionnaire surveys and collating opportunistic sightings that had previously been reported. These methods are described in more detail below:

2.1. QUESTIONNAIRE SURVEYS

Questionnaire surveys were conducted in 15 of the 29 corridor villages. The selected villages reflect a broad distribution across the entire corridor area (Figure 3). To compensate for the low literacy levels, allow for a greater number of questionnaires to be answered and to minimise inaccurate or ambiguous information a simple set of questions were asked. The following information was collected:

- All wild dog sightings observed over the last few years. This included date, location (name of area, direction and number of hours walk from the village), pack size and make up (accurate count or estimate), prey species and the presence of den sites;
- Sightings of other large carnivores observed by villagers in area and the frequency of these observations;
- Carnivores responsible for killing or injuring livestock, humans and bee apiaries; and
- Perceptions/attitudes of communities toward large carnivores.

The questionnaire also included picture plates of the various large carnivores that are known to occur in the area or could potentially occur in the area. A few carnivores that don't occur in the area were also included on the picture plates. These were used to gauge the reliability of the respondents' answers. The questionnaires were conducted primarily with village members that spend a fair amount of time traversing in the field.

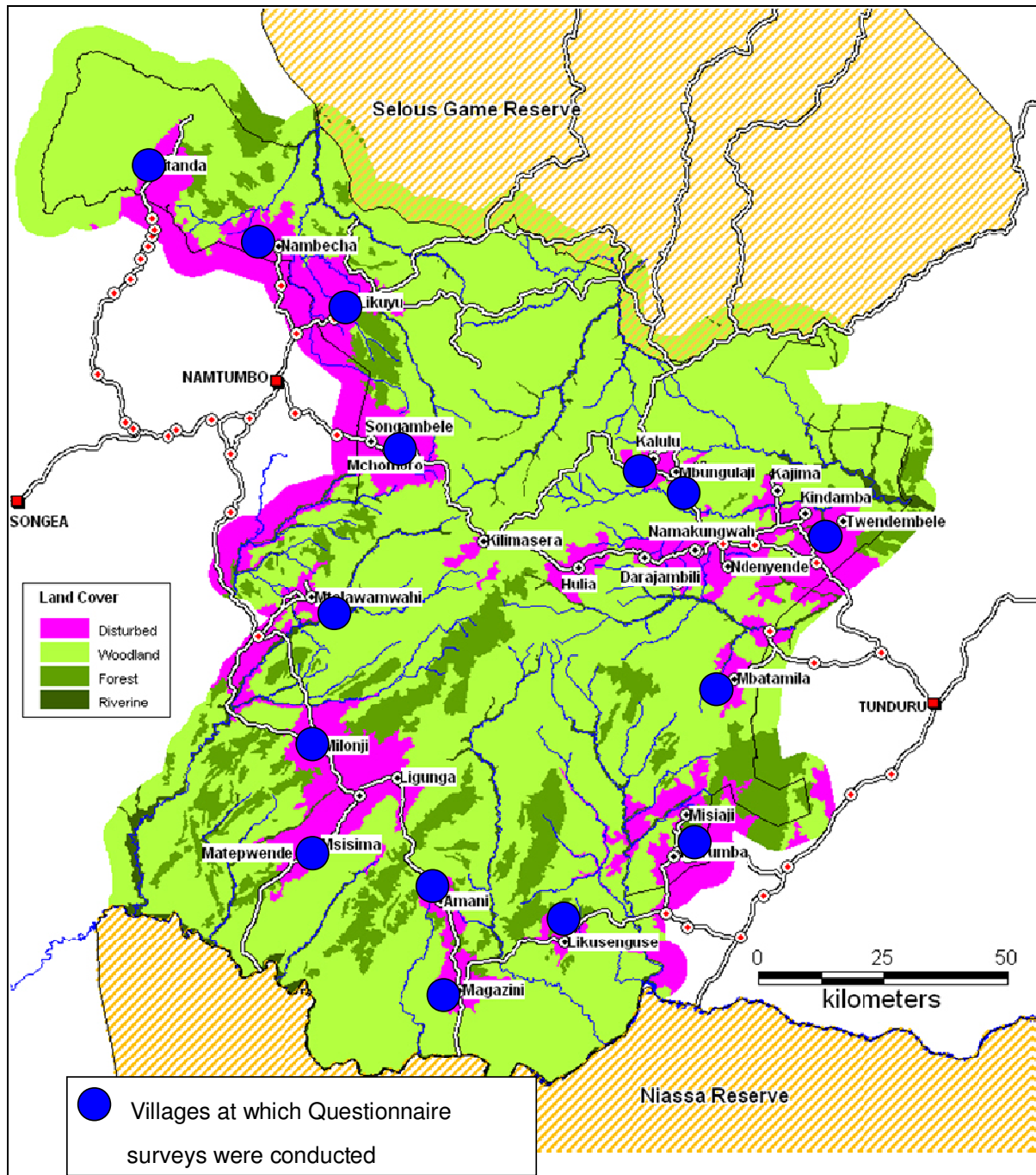


Figure 3: A map of the Selous-Niassa Wildlife Corridor area displaying the villages at which questionnaire surveys were conducted

A total of 113 people participated in the questionnaire. These included: village game scouts; beekeepers; farmers; fisherman; hunters; timber harvesters; teachers; a village game scout cook; village chairmen; village committee members; village elders; villagers; village natural resources chairpersons; and a village accountant. The number of participants from each village is summarised below.

Table 1: Summary of number of participants at each of villages visited

Village	Number of Participants
Amani	4
Kitanda	5
Likusanguse	7
Likuyu	6
Magazini	12
Matepwende	11
Mbatamila	6
Mbungulaji	7
Mchomoro	7
Milonji	6
Molandi	7
Mtelawamwahi	9
Nambecha	11
Rahaleo	7
Twendembele	8
TOTAL	113

2.1. OTHER SIGHTINGS DATA

Additional information regarding wild dog sightings was also gathered from patrol datasheets housed at the Namtumbo District Natural Resources Office, Tunduru District Natural Resources Office and the two southern Selous Game Reserve Sector offices. Sightings reported by geologists working in the corridor area and one of the authors of this report were also collected.



Figure 4: Photograph of seven wild dogs observed in the northern sections of the SNWC

3. ANALYSIS OF RESULTS AND DISCUSSION

3.1. WILD DOGS OF THE SNWC

3.1.1 Distribution and density

A total of 193 different wild dog observations were gathered during the survey period, with every village sampled reporting sightings of wild dog activity. In order to get an idea current wild dog distribution and activity nodes, only data from the 2007, 2008, 2009 and 2010 sightings were analysed. Of the 193 wild dog observations, 145 (75%) of these occurred over this period (Figure 5). These recent sightings are likely to have a high degree of reliability.

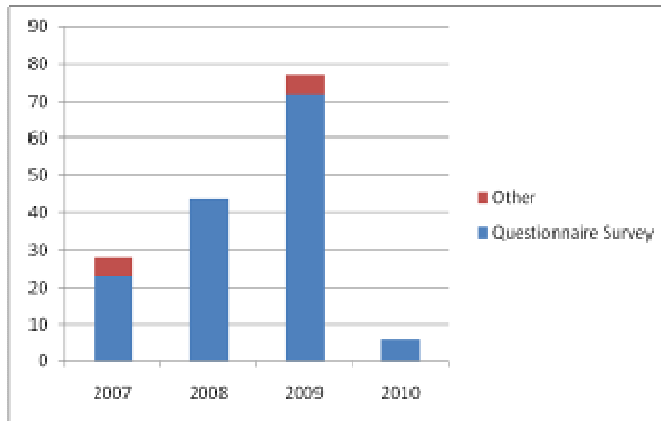


Figure 5: Source of wild dog sightings data. Note: the 2010 data reflects only the few villages surveyed at the beginning of 2010.

By making use of the estimates of walk time and direction from the village provided by each respondent for each of the sighting localities, the observations were plotted on a map (Figure 6). The relative pack size of each sighting is indicated along with the six confirmed den sites that were observed in 2008 and 2009. From this visual illustration we are able to see that wild dogs have been observed throughout the entire corridor area, with “hotspots” of activity occurring near Magazini, Matepwende, Mtelawamwahi and Twendembebe.

Pack size varied from individual wild dog observations to packs of up to 25 and 30 dogs with 78% of the sightings of more than three individuals. The data of actual/accurate counts indicate that the average pack size is 5, however, when including data from both actual counts and estimate counts in the analysis the average pack size is 8. Thirty-five percent of these observations were considered a mix of adult and young dogs (Figure 7). It should also be noted that wild dogs were observed throughout the year (Figure 8).

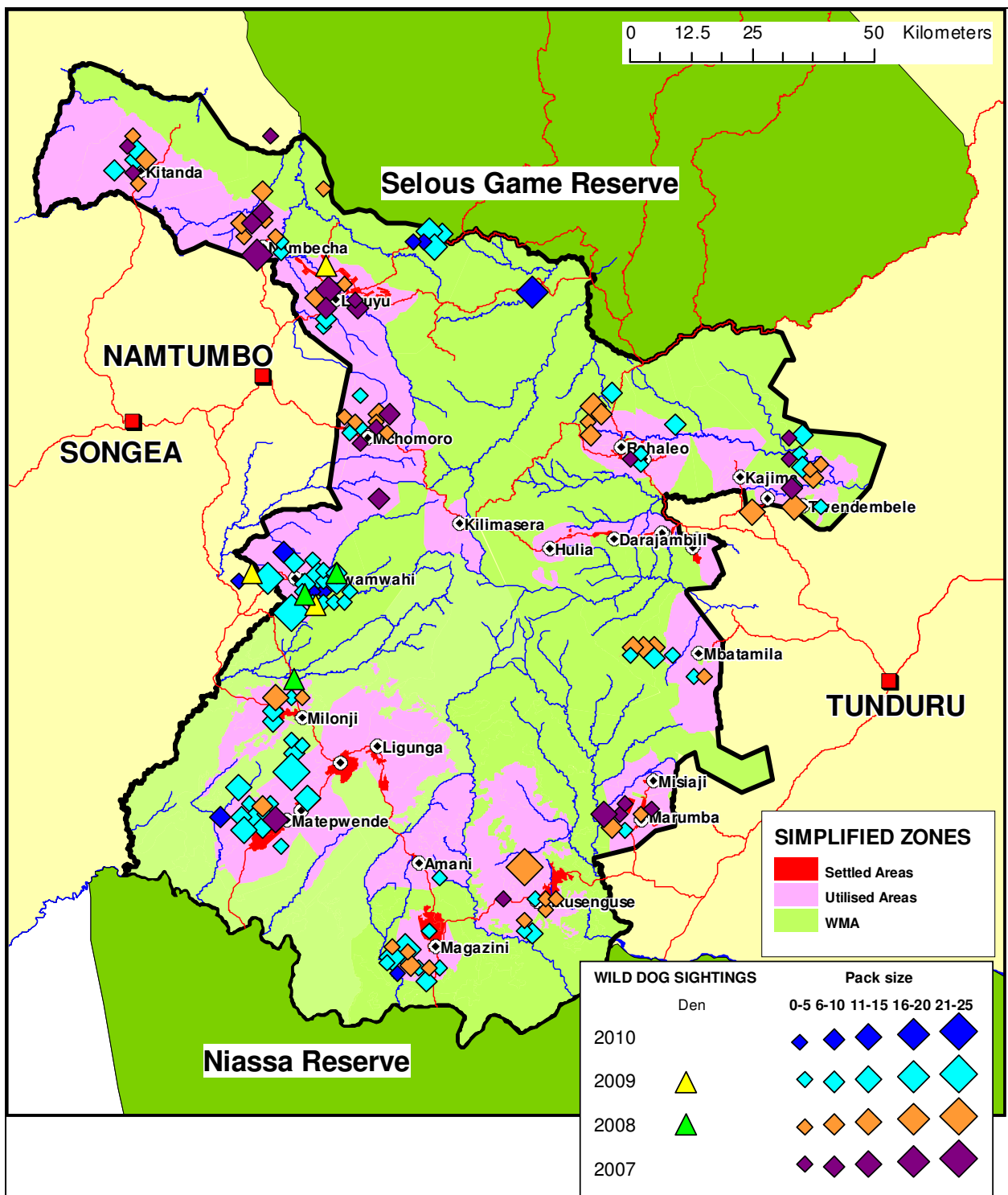


Figure 6: Wild dog sightings reported for 2007, 2008 and 2009. Sightings from 3 villages for January to March 2010 have also been included, along with den observations from 2008 and 2009. The various colours represent the different years and the size of the icons represents pack size (Note: the data points are estimates of sighting locality and not precise GPS locations).

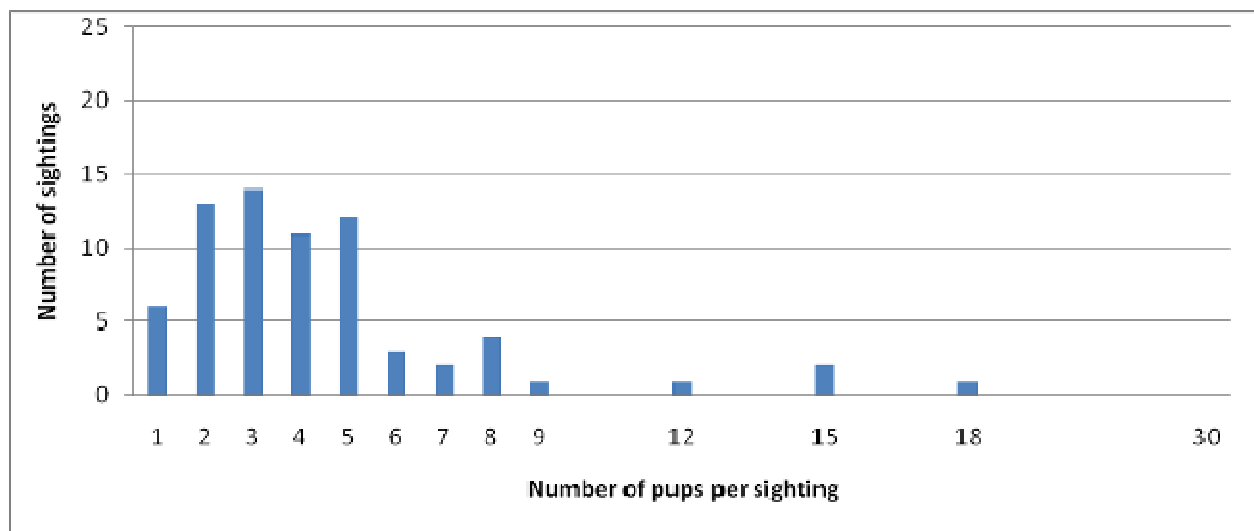
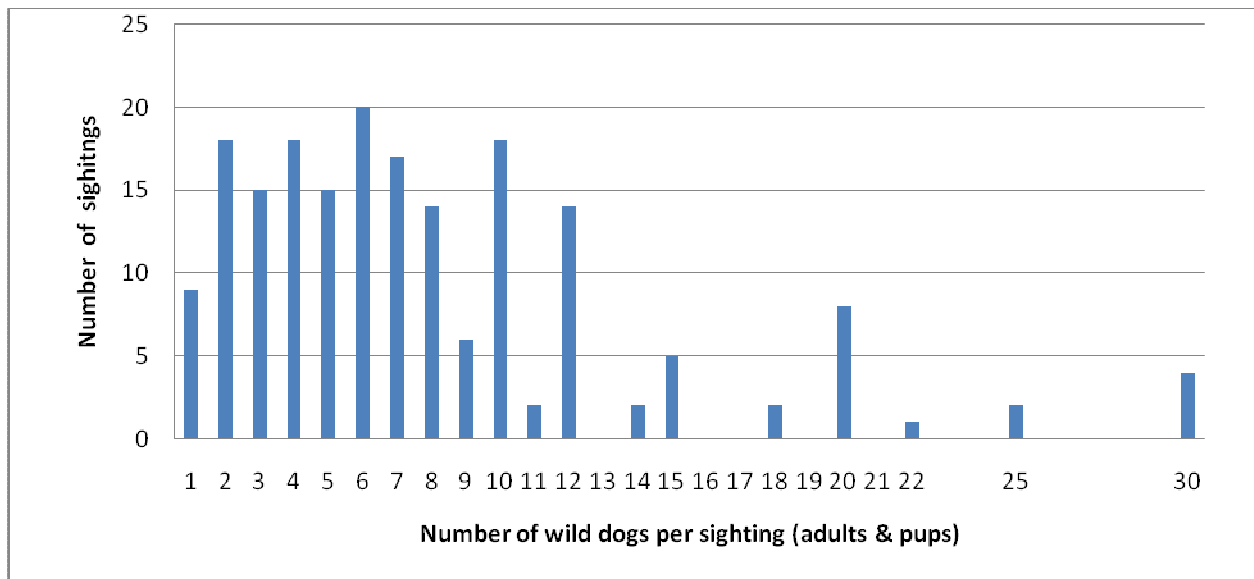


Figure 7: The number of wild dogs (adults & pups) per sighting; and number of pups per sighting (51% of sightings were reported to be accurate counts, while the remainder were estimates)

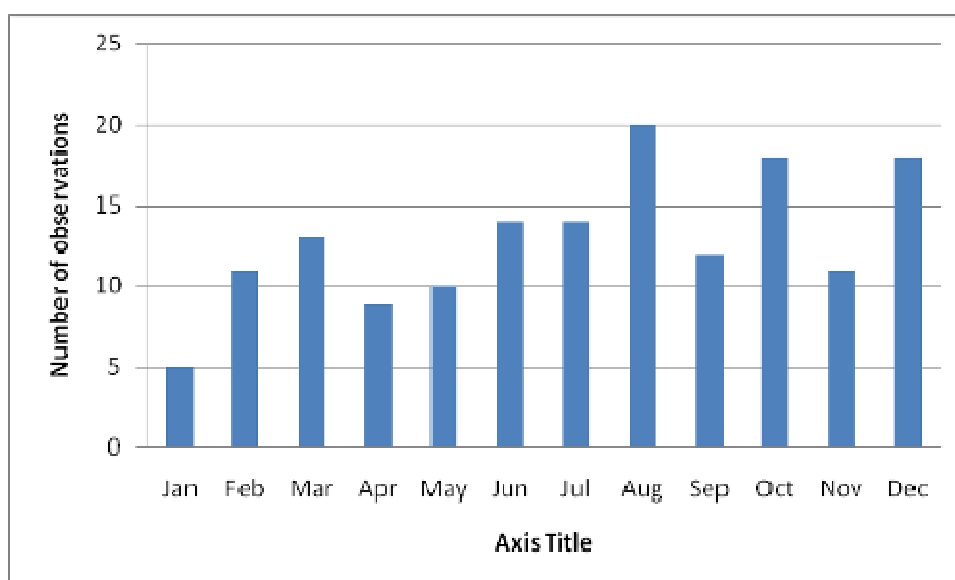


Figure 8: The number of wild dog observations per month

Wild dogs range widely with average home ranges across study sites of 450 – 800 km² with naturally low populations of 1-2 adults / 100 km². The extent to which wild dog populations spread beyond Selous Game Reserve and Niassa National Reserve boundaries was unknown, but several sightings outside these areas have suggested that the population between Selous and Niassa may be contiguous (Begg & Begg, 2007). Although wild dog distribution data collected during the survey is biased toward observer activity areas, the information collected indicates that a transboundary population does indeed exist, extending from Selous Game Reserve, through the SNWC and down to Niassa National Reserve.

However, sightings of wild dog in an area does not necessarily mean the wild dogs are resident. The presence of resident packs can be confirmed by observations of den sites, packs consisting of adults and yearlings, sightings of packs consisting of more than three individuals and sightings of wild dogs throughout the year. All these criteria are met in SNWC, thus the **survey data conclusively shows that wild dogs are actually resident and breeding within SNWC.**

Density estimates are difficult without visual identification of individual packs. However, a coarse estimate can be determined by breeding records and distribution of packs in an area. A minimum of three packs are present as three distinct den sites were observed in 2009 (Figure 9). Visually, given an average home range size of 450-800 km² and sightings of packs of more than 3 individuals in 2008 and 2009, we can conservatively estimate that a further 8-10 resident packs are present (Figure 9). This would suggest a resident wild dog population of at least 11-13 packs in the SNWC or a population of 55-105 wild dogs (based on an average of 5-8 wild dogs/pack). This translates into a density of 0.3 - 0.6 adults/100km². This would need to be verified by further surveys but is likely to be a minimum estimate given the low coverage of the survey.

This estimate excludes wild dogs that may occur in parts of the central area of the SNWC as this section was not thoroughly surveyed during the study due to time constraints and the lack of villages in this area. While it has been suggested that ungulate numbers are lower in the central areas of the SNWC, there is no reason to suggest that wild dogs are absent, as it supports similar habitats and lower human population density. The protected areas of Selous Game Reserve to the north and Niassa National Reserve to the south could act as sources for additional dispersing wild dogs, further highlighting the potential of this area for wild dog conservation. Table 2 and Table 3 show how the SNWC estimates compare with other areas that support wild dogs.

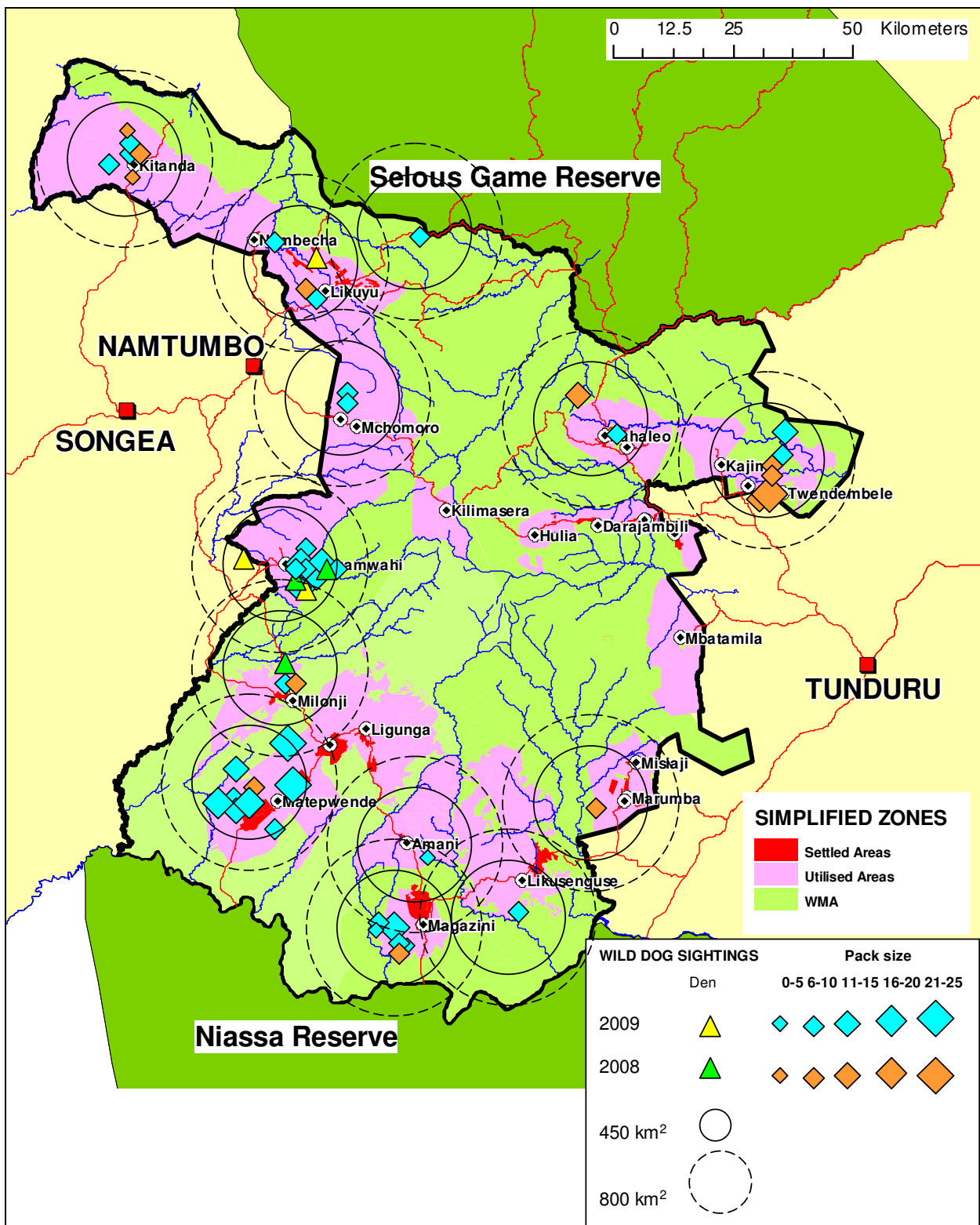


Figure 9. Hypothetical wild dog home ranges of 450 km² & 800 km² plotted around 2008 and 2009 wild dog pack sightings (of packs that had more than 3 dogs and that consisted of adults and juveniles dogs) to assess distribution and density of wild dogs in SNWC.

Table 2. Home ranges of wild dogs in various wooded study sites across Africa (adapted from Woodroffe *et al.* 2004, Begg & Begg, 2007)

Study Site	No. of packs	Home range size in km ² (range)
Selous Game Reserve, Tanzania	11	433 (156-846)
Niassa National Reserve, Mozambique	39	Unknown
Hwange National Park, Zimbabwe	4	423 (260-633)
Moremi Game Reserve, Botswana	9	617 (375-1050)
Kruger National Park, South Africa	20	553 (150-1110)

Table 3. Population densities of wild dogs in study areas across Africa including an estimate for SNWC, from this study (adapted from Woodroffe *et al.* 2004, Begg & Begg, 2007)

Study Site	Population density (adults/100km ²)
Selous Game Reserve, Tanzania	4.0
Niassa National Reserve, Mozambique	Est 0.8 - 1.1
Selous Niassa Wildlife Corridor, Tanzania	Est 0.3 – 0.6
Hwange National Park, Zimbabwe	1.5
Okavango Delta, Botswana	3.5
North-central Botswana	0.5
Zambezi valley complex	2.0
Kruger National Park, South Africa	0.8-2.0

It is estimated that there are approximately 800 dogs in Selous Game Reserve with a density of 4 adults/100 km² (Creel & Creel, 1996), with pack size ranging from three to 20 adults (3–44 including yearlings and pups) and the average number being between 8-11 (Creel & Creel, 1995). In Niassa National Reserve, 39 packs have been identified representing a minimum of 336 individuals at a density of 0.8 individuals / 100 km² with an average pack size of 7 individuals (Begg & Begg, 2007).



Figure 10: Photographs of a pack of 16 wild dogs observed in the Mbarang'andu River, northern SNWC (March 2010)

3.1.2 Prey Type

African wild dogs are known to be generalist predators that mostly hunt medium sized antelope and typically their prey are impala, kudu, Thompson's gazelle and wildebeest (Woodroffe *et al.* 2004). Thompson's gazelle do not occur in the SNWC, and very few impala and kudu are present. Wildebeest numbers are so low that there is some suggestion that they are virtually locally extinct. In Niassa National Reserve the most common prey species are impala, reedbuck, bushbuck, waterbuck and kudu.

According to the Namtumbo District Game Officer (I. Ndomondo pers comm.) and observations by one of the authors, medium to large sized ungulates are present throughout the SNWC. However, they are more abundant in the northern and southern sections of the SNWC in and around large rivers. These observations are supported by the 2009 aerial census (TAWIRI, 2009).

During the questionnaire survey 42 prey record observations were reported with reedbuck, sable and duiker being the most common. The relative percentage of each of these observations is displayed in Figure 11. Only one domestic species (goat) was reported as prey and this represented only 2% of the total prey recorded.

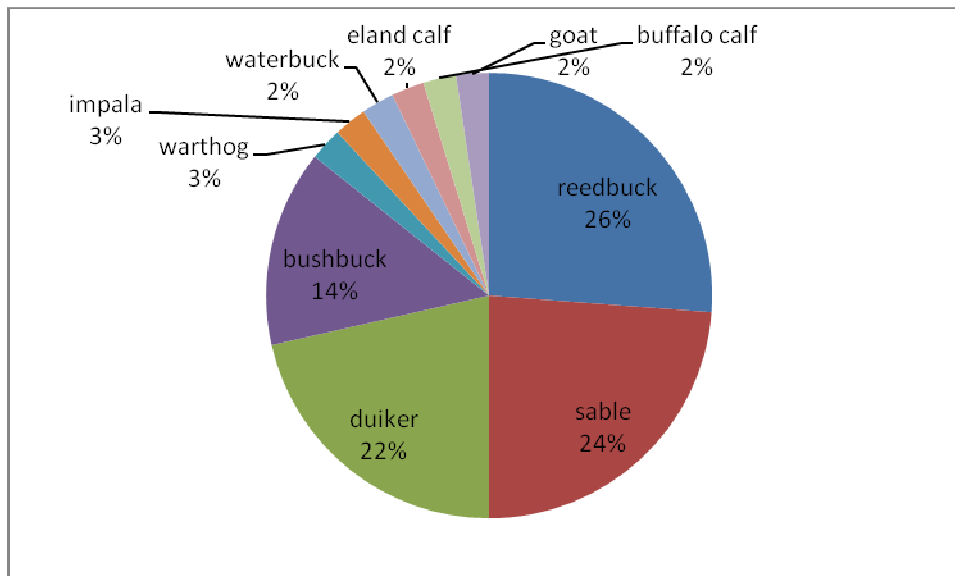


Figure 11: Prey of African Wild Dog based on sightings reported during the questionnaire surveys (n = 42)

3.1.3 Threats to wild dogs

The wild dogs within the SNWC are exposed to several threats. These include: disease; habitat loss; snares; competition with lions and hyaenas; road traffic; and direct persecution as a result of human-wildlife conflict. Each of these threats is discussed below.

Disease from domestic dogs

Dogs pose a threat to wild carnivores by transmitting canid diseases. As reservoirs for rabies, canine distemper and parvovirus they were partly responsible for the almost extinction of the African wild dog in areas of the Serengeti-Mara ecosystem (reviewed by Woodroffe, 1999). Rabies has also been identified as the cause of the loss of five packs in Botswana (McNutt cited in Woodroffe *et al.* 2004) and was implicated in the deaths of 11 wild dogs introduced into Namibia (Woodroffe *et al.* 2004).

Domestic dogs were also implicated as the source of the 1994 canine distemper epidemic among Serengeti lions (*Panthera leo*) (Roelke-Parker *et al.*, 1996), where approximately 1000 lions (one third of the entire Serengeti lion population) and some spotted hyaenas died as a result.

Severe rabies outbreaks were also reported in February 2005 in the Nipepe District, Niassa Province, northern Mozambique. By the end of June 2005, eight people had died and more than 500 domestic dogs had to be destroyed (Begg & Begg, 2007). A second rabies outbreak was reported in Quirimbas National Park, Cabo Delgado Province during the same year (Begg & Begg, 2007).

Although records of rabies outbreaks within SNWC area could not be obtained at the time of this report, the questionnaire survey did identify 17 reports of people who had died of rabies after having been bitten by jackal within the SNWC. The exact dates of these incidents is unknown but some incidents were reported to have occurred in 2003, 2007, 2008 and 2010. Out of interest it is estimated that in Tanzania between 1000-2000 people die of rabies every year - Report by Ministry of Water and Livestock development, Tanzania National Parks.

The SNWC is an unfenced system, and many villagers keep domestic dogs. The exact number of domestic dogs present within the SNWC is unknown, but an indication of the number of dogs present in each of the surveyed villages was gathered. It is suggested that on average 31 dogs are present per village but numbers varied from 8 to 120 dogs per village (Figure 12). This would suggest that there are at least 200-300 domestic dogs inside the Selous-Niassa Wildlife Corridor.

This presence of dogs within the SNWC and the reports of several human deaths being related to rabies, suggest that rabies is prevalent within the SNWC and thus could pose a very real threat to the wild dog population and human population within the area. Some villagers reported that the Agricultural Department does occasionally vaccinate dogs against rabies. Nonetheless, the population of domestic dogs is likely to increase in future with additional veterinary care and the increasing human populations. Occasional vaccination campaigns are unlikely to have an effect on the spread of rabies. Research has shown that annual vaccination campaigns need to reach 70% of the domestic dogs in order to prevent disease outbreaks 95% of the time (Cleaveland *et al.* 2006).

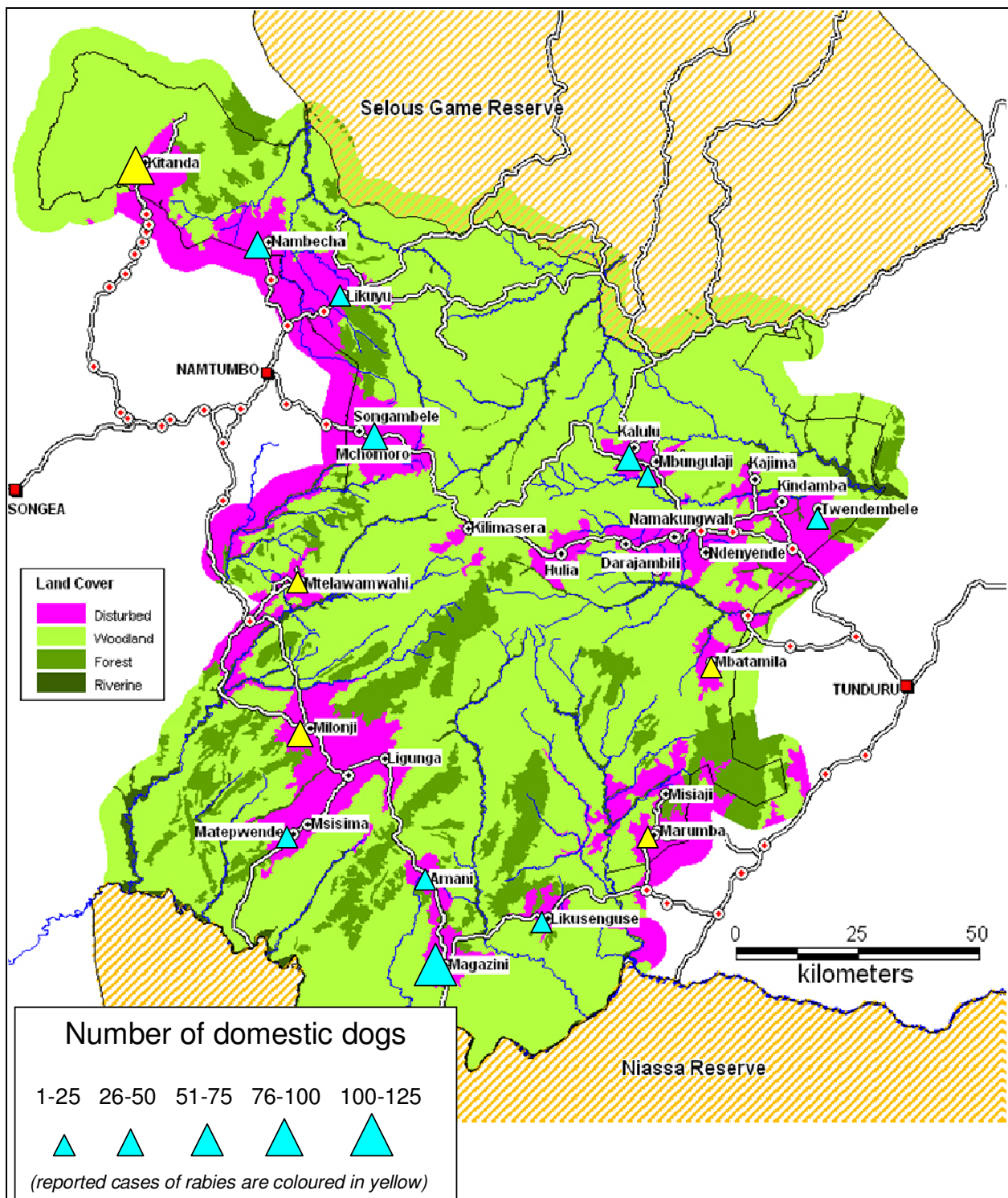


Figure 12: An index of the number of domestic dogs present in each of the surveyed villages, and where cases of rabies have been reported.

Habitat loss

The SNWC supports 29 villages and over 86 000 people. With ongoing population growth there is a high demand for land for agriculture, settlements and harvesting of natural resources such as timber etc. It is estimated that there is an annual disturbance/deforestation rate of 0.5% within the SNWC (Games, 2010). Although projects such as the SNWPC Project and other NGOs are working towards reducing the loss of natural areas, the reality is that much land is still currently being disturbed and degraded, and thus over time will pose a very real threat to the wild dog population within the corridor.

Snares and Poison

Use of wire and rope snares by local communities to catch various ungulate species is widespread and relatively common in the SNWC. The use of poison to kill wildlife such as elephants for ivory, crocodiles and other predators is also on the increase.

Fortunately wild dogs rarely scavenge and are therefore at less risk from snares and poison baits than other carnivores. However, in areas with large numbers of snares it can still be problematic as wild dogs are caught inadvertently. For example, this has been reported as a problem causing mortality of this species in Zimbabwe (P. Lindsay pers. com) and in Zambia (K. Leigh pers. com). Similarly, in cases where an entire water body is poisoned to kill other species, it is potentially a problem for wild dogs and other large carnivores.

Persecution as a result of human-wild dog conflict

People perceive carnivores to be a threat because they have the potential to kill people, eat domestic livestock, spread disease and compete with people for food (meat, fish, honey). As a result people tend to persecute carnivores regardless of their density, numbers or actual threat to the person or livestock (Ginsberg, 2001; Sillero-Zubiri & Switzer 2004).

Wild dogs pose no threat to humans, in some areas they have been known to take livestock, although this is a fairly rare occurrence. In and around the Maasai Mara National Reserve (Kenya), wild dogs ignored livestock, and Samburu and Maasai herders interviewed in northern Kenya indicated that wild dogs rarely caused problems (Woodroffe *et al.* 2004). A study of wild dog depredation on commercially raised livestock in Zimbabwe found that the dogs took fewer cattle than the farmers believed (26 cattle from a herd of >3,000, over a two year period, cf. 52 losses attributed to wild dogs; Rasmussen 1999). Wild dogs hunting in livestock areas outside Selous Game Reserve, were never observed to kill livestock in six years of observation (Creel & Creel 2002). No records of wild dogs killing goats have been recorded in Niassa National Reserve although they killed chickens on two occasions. Nevertheless wild dogs can become a severe problem for sheep and goats, with multiple animals being killed in a single attack (Woodroffe *et al.* 2004).

In the SNWC, only one confirmed incident of wild dog killing livestock was reported during the questionnaire survey. This was a goat that was taken at Mandela Village (a hamlet of Likuyu Village). Wild dogs were reported to having taken two small calves and a sheep, however upon closer investigation the participants admitted that they did not actually see which wild animal had killed these individuals. There was also no indication that villagers had ever directly persecuted wild dogs as a result of loss of livestock or for any other reason. In fact, the villagers perception of wild dog on average was more positive in comparison with other large carnivore species (this is discussed in more detail below). Thus the threat of direct persecution as result of human-wild dog conflict is currently negligible.

Competition with lions and hyaenas

It has been well documented that wild dog numbers are negatively correlated with lion and hyaena densities across Africa. Competition between these predators may take the form of exploitation competition (eating the same prey) or interference competition (wild dogs chased off kills) as well as the killing of wild dog pups (Creel & Creel 2002).

It was not possible to obtain an indication of the density of lions and hyaenas in the SNWC from the data obtained. Although the frequency of lion and hyaena observations were recorded during the questionnaire survey, along with all the wild dog sightings, this snapshot data is insufficient to estimate lion and hyaena densities but simply indicates that they are also present in the corridor area. It is important to note that all villages surveyed reported the presence of lions and hyaenas (see section 3.2). However, a specific survey for lions and hyaenas (call-up survey) would be needed to assess the density of these two large carnivore species. The questionnaire data is also biased, as hyaena were reported to be seen more frequently than lions, but the hyaena sightings were primarily in the form of observations in the village

itself. These sightings are likely to be of the same one to two hyaena's that daily patrol the villages looking for scraps and do not represent a reliable indication of relative density.

However, it is interesting to compare data on large carnivore densities from Selous Game Reserve and Niassa National Reserve. In Niassa National Reserve the estimated lion density is 1-3 adult lions / 100 km², and this density is unlikely to be negatively impacting the wild dogs (Begg & Begg, 2007). In Selous Game Reserve, the high density of wild dogs (40 adults/1000 km²) is associated with weak competition from lions and spotted hyaenas (Creel & Creel 1998) even at a lion density in northern Selous Game Reserve of an estimated 8 -13 lions/100 km² (Creel & Creel 1997). When comparing the aerial census data for Niassa National Reserve with that of the SNWC, the prey densities within the SNWC are lower than that in Niassa National Reserve, thus it is unlikely that the SNWC will have higher lion and hyaena densities. Even if it did, it is highly unlikely the SNWC supports the hyaena and lion densities of Selous Game Reserve, where even their relatively high numbers of lion and hyaena are not impacting on wild dog populations. It is therefore unlikely that competition from hyaena and lion poses a threat to wild dog within the SNWC. It is also important to recognise that the negative impact of lion and hyaena densities on wild dog numbers is an entirely "natural" effect and should not be seen in the same light as human induced threats (disease, snaring, habitat transformation etc.) as it is unlikely to be "managed".

Road traffic

In some areas, wild dogs have been reported to be killed on roads (Mikumi National Park and elsewhere outside of protected areas in Tanzania; and in Hluhluwe-iMfolozi Park, South Africa). Fortunately the conditions of the roads within the SNWC do not allow for high speed traffic. Currently the threat that road traffic poses to wild dogs is low, however the road linking Songea and Tunduru which cuts through the corridor in an East-West direction is due to be upgraded. This will result in increased speeds and car volumes and may result in road traffic being more of a notable threat.

3.2 OTHER LARGE CARNIVORES IN THE SNWC

Although the primary focus of the survey was to determine the status of wild dogs within the SNWC, information on other large carnivores was also gathered.

The survey revealed that other commonly seen large carnivores seen in the SNWC include:

1. Lion *Panthera leo*;
2. Leopard *Panthera pardus*;
3. Spotted hyaena *Crocuta crocuta*;
4. Side-striped jackal *Canis adustus*; and
5. Honey badger *Mellivora capensis*.

Sightings of these species were reported at all villages. The frequency at which villagers observed each of these species varied (Figure 13). Side-striped jackal and spotted hyaena were most frequently seen, as they were regularly seen and heard in and around the villages at dawn, dusk and at the night (59% of respondents reported observing seeing jackal on a weekly basis and 40% reported seeing hyaena on a weekly basis). 48% percent of respondents reported seeing lion every few months and 51% reported seeing leopard every few months. Honey badgers were observed less frequently, with 41% having reporting seeing them on a yearly basis and 33% having never observed them.

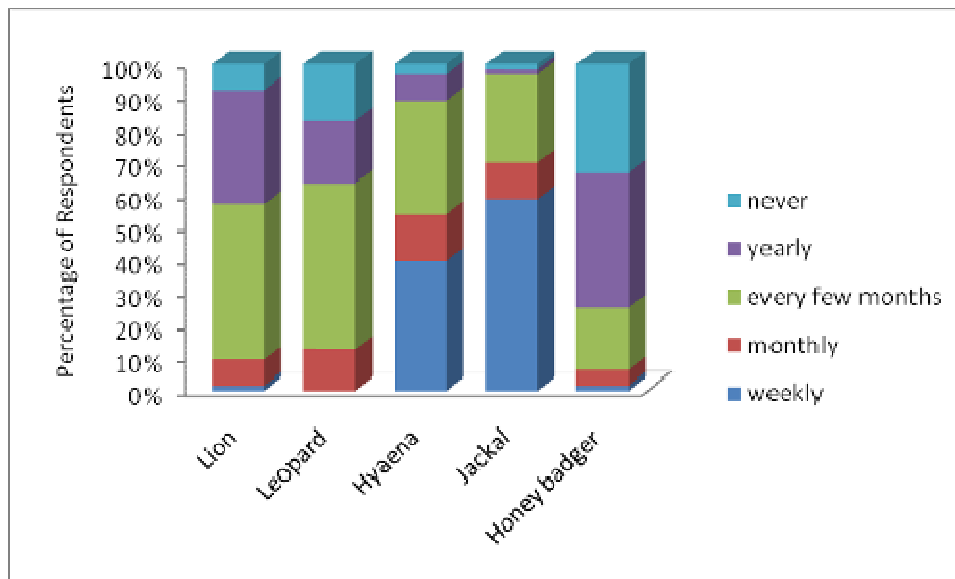


Figure 13: The frequency at which villagers observed lion, leopard, hyaena, jackal and honey badger.

Thirty-three of the participants suggested that they have seen black-backed jackal in the area. However, we were unable to determine whether this is just a misidentification or whether they do in fact occur in the area. According to the Tanzania mammal atlas project database, the closest records of black-backed jackal are just south of Udzungwa National Park on the Selous Game Reserve border (about 160 km away) and along the coast line between Mafia Island and Lindi (about 200 km away). A recent small mammal survey conducted in the area, also made reference to villagers mentioning having seen black-backed jackal but the authors of that report are of the opinion that it is out of its distribution range and thus most likely a misidentification (TAWIRI, 2010).

At Twendembele Village within the Tunduru District, cheetah *Acinonyx jubatus* were reported by the participants. These sightings were verified by discussions of spoor, call, habitat and time of activity and it is believed that these sightings are genuine. The presence of cheetah within the SNWC is exciting, as cheetah were thought to have been locally extinct in the area. The last positive sighting south of the Selous Game Reserve but still within the Tanzania borders dates back to 1957 (Gros 2000). No cheetah have been confirmed in Niassa National Reserve despite ongoing questionnaire surveys. A few cheetah are occasionally observed in the northern sections of Selous Game Reserve. The frequency of these observations is estimated at one cheetah sighting every two years (Gros, 2000).

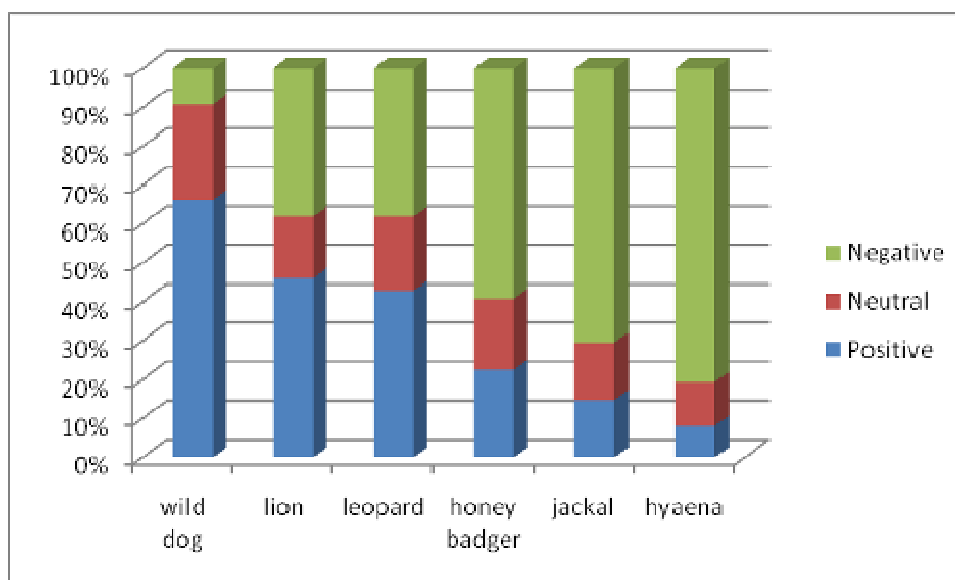
3.3 HUMAN CARNIVORE CONFLICT

Typically livestock species within the SNWC include cattle, goats, sheep, ducks and chicken (Table 4). The number of cattle is relatively low in most villages, due to the presence of tsetse fly which is a vector for the disease *trypanosomiasis*. Small livestock species such as goats and chickens are the most numerous and widely spread.

Table 4. The number of livestock species reported to occur in each of the survey villages

Village	Cattle	Sheep	Goats	Chicken	Ducks
Amani	-	3	1200	3000	-
Kitanda	70	25	250	2000	-
Likusenguse	11	3	253	3004	-
Likuyu	-	75	1000	3000	-
Magazini	20	-	200	800	-
Matepwende	2	-	300	1500	-
Mbatamila	1	66	409	3748	20
Mbungulaji	-	45	50	2000	1000
Mchomoro	2	2000	400	1500	-
Milonji	2000	25	500	6000	-
Molandi	122	12	732	2000	-
Mtelawamwahi	-	50	120	100	-
Nambecha	5	20	500	1000	-
Rahaleo	-	60	2500	60000	300
Twendembele	-	-	-	1200	25

The villagers attitudes towards the five carnivore species differed between species, but were primarily polarised as either positive or negative, with little middle ground (wild dog 66% positive, lion 46% positive, leopard 42% positive, honey badger 22% positive, jackal 15% positive, hyaena 8% positive). These data are displayed in Figure 14. These data can be used as baselines against which future conservation activities can be measured.

**Figure 14.** The community's perception (negative, neutral or positive) of the wild dog (n = 65) lion (n = 63), leopard (n = 63), honey badger (n = 49), jackal (n = 61) and hyaena (n = 62).

The positive attitudes towards wild dogs were primarily related to them being perceived as chasing away lions, and the negative attitudes came from hunters who reported that wild dogs chase away all the wild game making hunting impossible. Only one confirmed case of wild dog preying on livestock, a goat, was reported.

The largely negative attitude toward the other carnivore species was related to them killing or injuring livestock, and on occasion killing or injuring villagers. The relative percentage that each carnivore was perceived responsible for attacking livestock, bee apiaries and humans is illustrated in Figure 15.

It was surprising to note that although lions were reported to have killed 18 people and injured a further four people in the past 30 years (Table 5), approximately 48% of the participants still had a positive attitude towards lions with 60% of respondents seeing lions in either a neutral or positive light. This may be a reflection of a large percentage of participants being village game scouts, who, through their training had been educated on the importance of conserving wildlife and may thus have been reluctant to voice a more negative opinion. Or it could be related to sport hunting in the area, given that lions and leopards are hunted and thus of value to the villagers while hyenas are not. It would be interesting to investigate this further given the largely negative perception of hyena, jackal and honey badger.

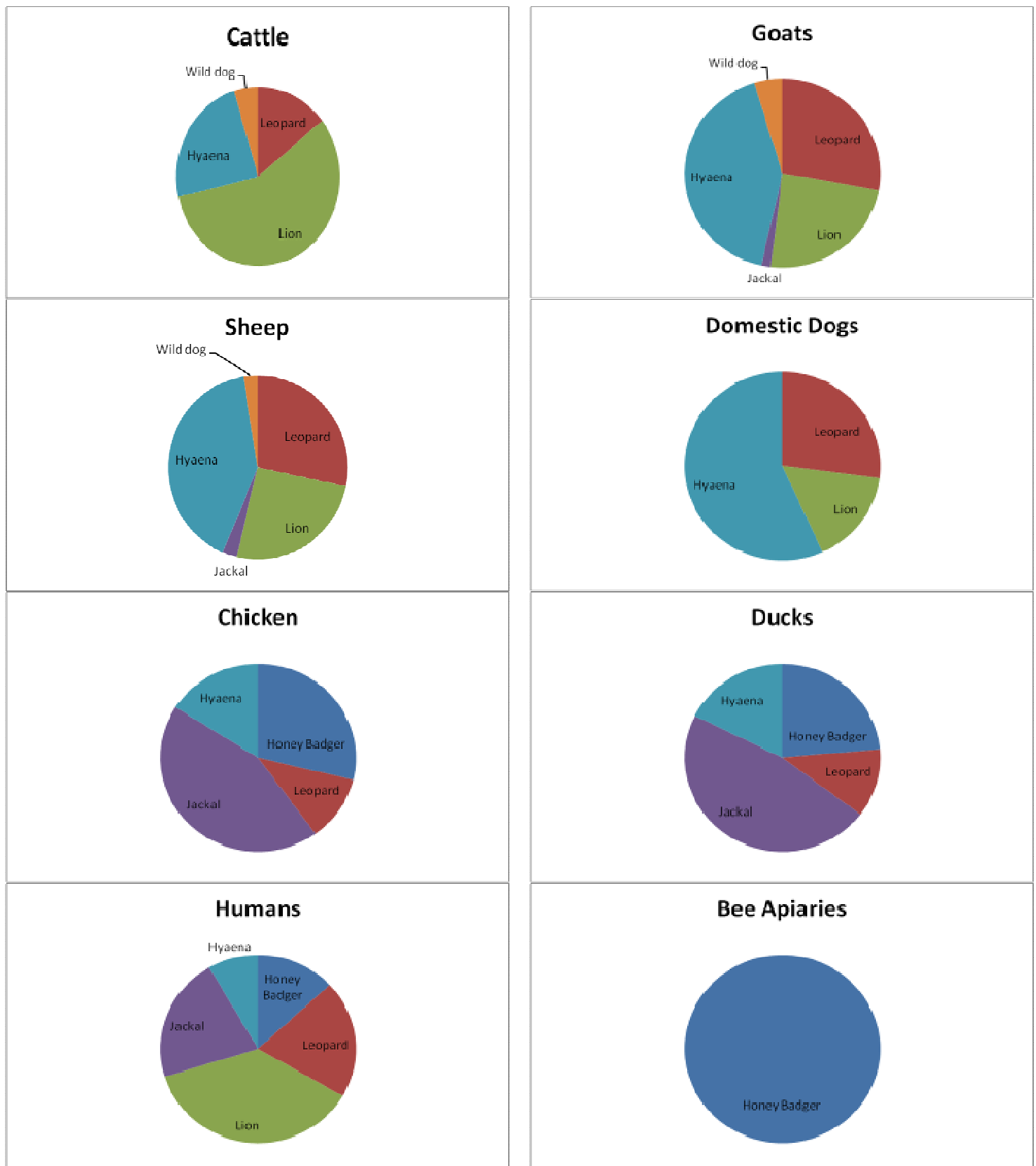


Figure 15: An illustration of the relative percentage each carnivore is responsible for attacking livestock, beehives and humans based on the perceptions of the village communities

Table 5: Human-lion incidents reported during the questionnaire survey

Year	Village	Description
1978	Kitanda	injured an adult
1980s	Kitanda	killed an adult
1980s	Likusanguse	killed an adult
1982	Twendembebe	killed an adult
1984	Milonje	killed an adult
1996	Molandi	killed an adult
1999	Amani	killed an adult
2002	Rahaleo	killed a child
2004	Matepwende	killed an adult
2005	Matepwende	killed an adult
2005	Likusanguse	killed an adult
2005	Milonje	killed an adult
2006	Likusanguse	killed an adult
2007	Likusanguse	killed an adult
2007	Magazini	killed an adult
2008	Likusanguse	killed an adult
2008	Likuyu	injured an adult
2008	Matepwende	killed an adult
2008	Mchomoro	injured an adult
2008	Milonje	killed an adult
2008	Njenga (near Molandi)	killed an adult
2009	Likuyu	injured an adult

4. RECOMMENDATIONS AND CONCLUSION

The results of this preliminary survey have confirmed the importance of the SNWC for carnivore conservation efforts. The presence and regular sightings of all the top predators (wild dog, lion, leopard, spotted hyaena, and cheetah) as well as some of the medium sized carnivores (side striped jackal and honey badger) are an indication of the general good ecological “health” of the corridor despite ongoing concerns over habitat degradation, disease, increasing human populations and associated snaring and poisoning. It indicates that there are still sufficient prey and habitat to support a wide variety of wildlife and the ecosystem has remained largely intact.

In particular, the results of this survey suggest that the SNWC is vitally important in terms of linking the globally significant wild dog population in Selous Game Reserve with the wild dog population in Niassa National Reserve. Not only does it link these two populations, but several packs are also resident within the SNWC suggesting it to be one contiguous transboundary wild dog metapopulation. This population of African wild dogs is likely to be second largest population remaining in Africa and of global conservation significance. The verified sightings of cheetah that was believed to be locally extinct in the area are of particular importance. However, potential threats to these populations are serious and need to be addressed if the carnivore populations are to be secured. In light of the above, the following recommendations are suggested:

REGULAR MONITORING AND REVIEW OF THE STATUS OF LARGE CARNIVORES

- ❖ It is recommended that regular assessments (1-3 years) be conducted to monitor the status of wild dogs and other large carnivores within the SNWC. This will involve the annual collation of opportunistic sightings and regular assessment of indicators (see below). The necessary data can be collected through the Management Orientated Monitoring System (MOMS) that was initiated in 2009 once it is fully operational within the SNWC area. Additional information can also be collected by requesting hunting and other operators within the SNWC to participate in the MOMS system.

- ❖ The data (species sightings, and human wildlife conflict) should be extracted from the paper based MOMS datasheets that are submitted to the District on a quarterly basis and digitally captured at regular intervals. In order to facilitate this process a database (in the form of an excel spreadsheet) will be produced by the authors of this report and given to the Namtumbo and Tunduru District Natural Resource departments along with mini-training session on how it works and how data should be analysed. It should be noted that the biggest challenge in maintaining this database will be to ensure that MOMS datasheets are regularly completed, submitted and the data digitally captured on an ongoing basis. Thus measures will have to be put in place to ensure this takes place. The information that was collected during this survey will form the baseline data within the database. The database will house the following information:
 - Source (name, village, camp);
 - Type of record (spoor, visual, faeces, verbal - from someone else);
 - Number of animals & was the number an estimate or a count;
 - Date;
 - Year;
 - Time (specific, or day, night, morning, afternoon, dawn);
 - Habitat (riparian, miombo woodland, riparian, grassland, dambo, village);
 - GPS (decimal degrees);
 - Location (nearest village, distances from river etc);
 - Prey;
 - Activity;
 - Perception of wild dogs (positive, negative, neutral);
 - Comments; &
 - Reliability (each record will be graded on reliability and accuracy from 1-3. 1 = full information provided, 2 = some information missing, and 3 = incomplete, presence or absence record only).
- ❖ On an annual basis, the data should be simply summarised and analysed using indicators to monitor the status of the carnivore populations (specifically African wild dog) over time. Ongoing monitoring and regular analysis is considered essential, particularly given the rapid changes in human populations and infrastructure. It will allow for carnivore populations to be tracked over time and hopefully identify emerging threats before they become critical. These indicators can be compared to the 2009 baseline provided by this study and similar data that is being collected in Niassa National Reserve, Mozambique. Indicators that can be used are:
 - Number of observations per species/ year;
 - Average pack/ group size;
 - Number of breeding records / year;
 - Human-carnivore conflict events per species (Livestock and deaths and injuries to people);
 - Number of carnivores killed for Problem Animal Control;
 - Average number of goats/ cattle per village; &
 - Number of domestic dogs per village.

- ❖ A summary report should then be sent to the Wildlife Division, Tanzania Wildlife Research Institute (TAWIRI) and to the Co-ordinators of the Southern and East African Regional Cheetah and Wild Dog Strategy (Dr N. Purchase – cheetah@mweb.co.zw and M. Ogada - ordecai@ogada.co.ke).

DOMESTIC DOGS

- ❖ Disease (particularly rabies and canine distemper) is a potentially serious threat to the SNWC carnivore populations, particularly for wild dogs due to the large number of domestic dogs present within the SNWC. It is also a serious human health issue. It is therefore recommended that the disease threat and potential mitigation measures be investigated further. This should include:
 - A once off survey of all domestic dogs within the SNWC and nearby surrounding areas.
 - Annual monitoring of domestic dog numbers included as part of the MOMS system with all MOMS scouts counting the number of domestic dogs in their village in July (or any particular month) of each year. These data can then be used to monitor trends in domestic dog populations.

- Collation of records of all rabies related incidents and outbreaks in the SNWC area (any information on canine distemper and canine parvovirus should also be noted).
 - An assessment of the status of vaccination programmes within the SNWC and the potential to sustainably implement an effective (annual vaccination of 70% of domestic dogs) rabies vaccination programme for SNWC domestic dogs.
 - Initiation of an education campaign about the risks of rabies, the need for vaccination of domestic dogs and appropriate treatment for dog bites.
- ❖ Investigate ways to limit or reduce the number of domestic dogs in the SNWC. This may be challenging, as many villagers use domestic dogs to act as deterrents of crop and livestock-raiding wildlife and for hunting.

HUMAN-CARNIVORE CONFLICT

- ❖ The survey provided interesting insights into the perceptions of people towards the different carnivore species. Given the presence of all the large carnivores in the SNWC it is essential that human-carnivore conflict particularly lion attacks be closely monitored and conflict mitigated wherever possible.
- ❖ More information is needed on why there are such differences in the perceptions of people towards lion and leopard, compared to hyaena, jackal and honey badger. It is important to understand why lions in particular are tolerated and hyaenas despised despite lion attacks as this will have bearing on future conservation efforts. Is it because lions are perceived to be important for income generation through ecotourism and sport hunting or is it because of a cultural spiritual significance of lions as has been shown in other areas? This may provide insight into conserving the other carnivores.
- ❖ Education and outreach on responsible and safe behaviours and ways to reduce carnivore attacks on livestock and people are essential (sleeping in safe shelters, goat and cattle corrals, not walking alone at night).
- ❖ Livestock losses can be minimized and largely avoided through the use of simple, effective corrals and this should be encouraged as soon as possible. The levels of retaliatory killing of carnivores in response to livestock losses or attacks on people are unknown but the extremely negative perception of some carnivores is of concern.

CHEETAH

- ❖ It is recommended that a more detailed investigation be undertaken to determine the status of cheetah within the SNWC area. This could include the use of camera traps and spoor transects in areas where cheetahs have been sighted in the past and ongoing monitoring of sightings.

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