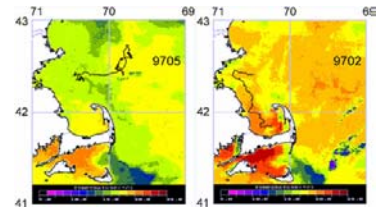




REPÚBLICA DE MOÇAMBIQUE
Ministério da Agricultura

NATIONAL CENSUS OF WILDLIFE IN MOZAMBIQUE



Final Report

December 2008



Executive Summary

Project Objective

The general objective of this Project was to conduct a country-wide wildlife survey and census, to contribute to the preparation of a strategy for the management of wildlife at the national scale, and to the prevention or mitigation of human-wildlife conflicts.

Aerial Survey

The 2008 survey covered 56 strata that were surveyed with transects and had a combined area of 537041 km². Systematic, parallel transects were positioned across each stratum in flattish country, with the position of the first transect in each stratum determined randomly. Transects were orientated north-south. The spacing between adjacent transects in the same stratum was 15 km. The survey was flown during the period 24 June to 25 August 2008. The calibrated widths of the transects averaged 341 m at a flying height of 350 feet above ground level. Sampling intensity was 2.35 %. Search intensity averaged 0.89 minutes km⁻².

Four large mountainous strata that were going to be sampled with block counts were not surveyed for logistical reasons. The population estimates for the 56 strata were combined with the estimates from areas of Mozambique where the wildlife has been sampled from the air during the previous five years to give population estimates for Mozambique as a whole. The area surveyed during 2008 and the areas that had already been surveyed totalled approximately 80 % of Mozambique's land area. For simplicity, the estimates of the total number of each species in this area are referred to here as the national population estimates, but the estimates, at least for some species, would probably be greater if data were available for the unsurveyed 20 % of the country.

Crocodiles seen during the transect surveys were recorded, although only large ones (longer than 2 m) were likely to be seen from the air. Special surveys of hippos and large crocodiles were undertaken by flying along sections of some of Mozambique's major rivers, namely the lower Rovuma River, the Save River and the section of the Zambezi River between Tete town and Mutarara.

The following table gives the national population estimates of the large species of wildlife and domestic livestock, together with the confidence intervals for the means. No correction factors have been applied to compensate for any animals missed by the observers and so, especially for smaller or cryptic species, these figures will represent minimum estimates. Maps were prepared to show the density distribution within Mozambique of the major wildlife species, domestic cattle and goats, and various human activities (settlement, cultivation, vegetation clearance, logging, charcoal production and fishing). Owing to the special interest in elephant map distribution, the map from the aerial survey was combined with other documented presence/absence information to produce a distribution map for elephant.

Long-term trends in the distribution of wildlife in Mozambique were determined by comparing the current distributions of the wildlife with their distributions prior to the 1970s (Smithers & Lobão Tello, 1976), although the different methods by which the two sets of maps were compared do complicate the comparisons..

Population Estimates

Species	Portuguese name	Estimate	95% Limits
Baboon (groups)	Macaco-cão	2425	1820 - 3030
Buffalo	Bufalo	5717	2678 - 8756
Duiker grey	Cabrito cinzento	45246	42245 - 48246
Eland	Elande, Pacala ou Tuca	9382	5597 - 3168
Elephant	Elefant	22144	16393 - 27894
Giraffe	Girafa	125	25 - 340
Hartebeest	Gondonga, Nameriga, Ecoce	5107	3742 - 6473
Hippopotamus	Hipopótamo	8388	3896 - 12879
Impala	Impala	11677	1932 - 21422
Kudu	Cudo	15764	12952 - 18575
Nyala	Inhala	3435	1923 - 4947
Ostrich	Avestruz	1566	511 - 2621
Reedbuck	Chango	12293	9923 - 14664
Rhinoceros black	Rinoceronte de lábio preênsil	1	-
Rhinoceros white	Rinoceronte de lábio direito	20	-
Roan antelope	Matagaica ou Palapala cinzenta	525	30 - 1775
Sable antelope	Palapala	32393	21799 - 42987
Warthog	Facocero	18880	15734 - 22025
Waterbuck	Piva, Inhacoso ou Namedouro	9956	4188 - 15723
Wildebeest	Cocone ou Boi-cavalo	2031	1090 - 2972
Zebra	Zebra	7480	5801 - 9159
Cattle	Gado bovino	593476	504243 - 682708
Goat	Cabrito	501762	437088 - 566436
Crocodile (large)	Crocodilo	1511	561 - 2462

Long-term Changes in Distribution

The **buffalo** was found across Mozambique pre-1970s, but now its distribution is much more limited. It has apparently disappeared from southern Mozambique, except for a reintroduced population in Limpopo NP and a few animals near the Mozambique/South Africa border. In central Mozambique, buffaloes were seen during 2008 only in the vicinity of Marromeu Reserve. In western Tete and northern Mozambique, the buffalo is not longer widespread, but appears to be largely confined to western Magoe, Niassa Reserve and the Chipanje area.

Significant numbers of large **crocodiles** were seen along the Rovuma, Zambezi and Save Rivers, but there are many lakes, dams and rivers in Mozambique where large crocodiles could live, but which were not surveyed.

Prior to the 1970s, the **eland** was found across Mozambique, but it has largely disappeared from southern Mozambique and has a much reduced distribution in central and northern Mozambique. Approximately 70 % of the estimated population is in Niassa Reserve.

Prior to the 1970s, the **giraffe** was confined to southern Mozambique, west of 34° E, but it is confined to Limpopo NP, where the species was reintroduced.

Prior to the 1970s, the **hippopotamus** was found widely distributed across Mozambique wherever there was suitable habitat. It was found across northern Mozambique, along the Zambezi Valley, in Gorongosa NP and Marrromeu Reserve, along the Save and Limpopo Rivers and in southern Inhambane and Gaza provinces. During 2008, the hippopotamus was still found in Maputo Elephant Reserve, along the Save River (particularly within Zinave NP), in Gorongosa NP, along the Zambezi River and the shores of Lake Cabora Bassa, and along the Rovuma and Lugenda Rivers in the north.

Prior to the 1970s, the **impala** was found throughout Mozambique, but with few records for southern Inhambane province and Zambezia and Nampula provinces. During 2008, the distribution in southern and central Mozambique was broadly similar to that recorded earlier, but in northern Mozambique none were seen except in Niassa Reserve.

Prior to the 1970s, the **kudu** was found across Mozambique. But by 2008 the kudu was largely absent from Inhambane, Zambezia and Nampula provinces. Sightings of kudu during the 2008 survey were often close to the borders of conservation areas.

A provisional map of the distribution of **lion** in Mozambique was prepared, showing districts where lions were noted in the DNTF records as responsible for conflict, and protected areas where recent surveys recorded their presence

During 2008, the **ostrich** was confined to the Limpopo/Banhine/Zinave complex of national parks and the areas around them in southern Mozambique.

There used to be two species of **rhinoceros** in Mozambique, the white rhinoceros and the black rhinoceros. By 1970, the white rhinoceros, which was never found north of the Zambezi River, had become nationally extinct and had been reintroduced (introduced?) to Maputo Elephant Reserve and Gorongosa NP. The black rhinoceros was sparsely distributed across central and northern Mozambique and western Tete. By 2008, there were a small, reintroduced population of white rhinos in Limpopo NP; and a lone rhinoceros seen in northern Mozambique during 2008 survey can only have been a black rhinoceros.

Prior to the 1970s, the **sable antelope** was widely distributed across Mozambique, except for south-eastern Gaza and Inhambane provinces. During 2008, it was still present in central and northern Mozambique and Limpopo NP (where it was reintroduced). The 2008 survey estimated that there were 32393 (± 33 %) sable antelopes in Mozambique, with approximately 15000 animals outside the previously surveyed areas, in the coutadas of central Mozambique and in the area south of Niassa Reserve.

Prior to the 1970s, the **wildebeest** was found in northern Mozambique, in Gile Reserve and Gorongosa NP, in the Save Valley, Banhine and Zinave NPs and along the border with Kruger NP. During 2008, there were two small, discrete subpopulations, the larger one in Niassa Reserve and a small one in Limpopo NP.

Prior to the 1970s, the **zebra** was found throughout most of Mozambique, although scarce in Maputo and Inhambane provinces. During 2008, there was a northern subpopulation in and near Niassa Reserve, a small population along the border with Kruger NP and Limpopo NP, and a few in the Magoé area.

The study of the long-term trends in Mozambique's wildlife revealed that:

- most wildlife species now have a much more restricted distribution than they did 40+ years ago;
- many species occur at relatively high density in conservation areas and at low density (if at all) outside protected areas;

- a significant proportion of the national populations of many of the larger species of wildlife are in Niassa Reserve and its adjacent hunting areas; and
- the Limpopo NP is a relatively new national park, where many species of wildlife have been reintroduced and which contains almost the entire Mozambican population of some wildlife species, for example giraffe and white rhinoceros.

Elephant

The number of elephant carcasses seen during the 2008 survey was relatively low, which suggested that elephants within the survey area had not been subjected to heavy poaching recently.

The 2008 survey covered a large area of Mozambique where the wildlife had not been surveyed previously and thus the survey provided better quality data than was previously available. As a consequence, the number of elephants 'definitely' in Mozambique has increased by more than 2000 animals. The number of elephants 'definitely' or 'probably' in Mozambique has increased from 16475 during 2006 to 22144 during 2008. The improved quality of the data for estimating the number of elephants in the country may have implications for changing the CITES export quota for Mozambique: Furthermore, DNTF records reveal that 85 elephants were killed in response to human-elephant conflicts during July 2006 to September 2008. This figure is equivalent to approximately 40 elephants per year, which is similar to Mozambique's current export quota. But if some of the elephants killed on problem animal control were included in the export quota, the value of the benefits that local people received from elephants hunted in their districts could be increased.

It is proposed that there are probably six **elephant subpopulations** in Mozambique.

Maputo Elephant Reserve: where there is a long history of human-elephant conflict; and where Futi corridor will facilitate movement between Maputo Reserve and the Tembe Elephant Park in South Africa after removal of the fence that demarcates Tembe Park's northern boundary.

Southern Inhambane province: only footprints were seen here during the 2008 survey, but there have been frequent reports of human-elephant conflicts in these districts during recent years.

Limpopo/Gaza: the elephant was recently reintroduced to Limpopo NP and, with sections of the fence along parts of the Mozambique/South Africa border having been removed, the Limpopo population is contiguous to the elephant population in Kruger NP. The Kruger elephant population is contiguous to elephants in south-eastern Zimbabwe, including Gonarezhou NP. Hence, elephants entering Mozambique from Zimbabwe between the Limpopo and Save Rivers should be seen as part of Mozambique's Limpopo/Gaza subpopulation.

Zambezi Valley, Tete province and central Mozambique: elephant distribution here extends from Zumbo in the west, to the Zambezi delta in the east. However, whether this distribution is continuous is uncertain. The area includes Gorongosa NP and Marromeu Reserve. Elephants in the western Magoe region are contiguous to elephants in Zimbabwe's Zambezi Valley population. When further information is available on numbers and distribution, it is possible that, at least for management purposes, more than one subpopulation will be recognised here.

Northern Mozambique: subpopulation occupies northern Mozambique, including Niassa Reserve and adjacent hunting areas and Quirimbas NP. It overlaps the Mozambique/Tanzania border and is contiguous to elephants in southern Tanzania. This subpopulation is the largest in Mozambique (15087 elephants \pm 21 %).

Gile: no elephants were seen here during the 2008 survey, but possibly some elephants live in the vicinity of Gile Reserve and, if so, this subpopulation is now geographically isolated. This small subpopulation is surrounded by human settlement and cultivation and likely

human-elephant conflict will continue around the reserve until the human and elephant populations are separated, either by the elimination of the elephants, or by the implementation of a land-use plan that might include fencing some or all of the reserve boundary.

Conservation of Large Riverine Species: Hippopotamus and Crocodile

The removal of hippos and large crocodiles from areas where they cause conflicts is often recommended. The unstated assumption that viable populations of these species exist in protected areas needs to be tested, because many protected areas on Mozambique have major rivers as one of their boundaries. Hence, hippos or crocodiles living in rivers that form the boundaries of protected areas are still likely to cause conflicts with people. It is recommended that national conservation strategies for the crocodile and hippopotamus should consider the scope for the conservation of viable populations of these species in rivers or lakes well inside protected areas, instead of only along the borders of protected areas.

Crocodile Conservation

One recommendation for resolving human-crocodile conflict is the removal of large crocodiles from waters in rural areas where they are causing conflict. While this is a valid means of dealing with human-crocodile conflict, it is the large crocodiles that form the breeding population. Hence, the removal of all large crocodiles would probably prevent future recruitment to that population. Thus, the consequences of removing all large crocodiles from a population would, in the long term, be similar to removing all crocodiles. It is recommended that a national conservation strategy for crocodile should consider the long term consequences, of removing large crocodiles from populations, for conservation of the species in Mozambique.

Species Diversity

There appeared to be five principal areas where the species richness of wildlife was relatively high:

- northern Mozambique (Niassa Reserve, the Chipanje area and the surrounding lands, including Quirimbas NP);
- western Tete province (north and south of Lake Cabora Bassa);
- central Mozambique (Gorongosa NP, Marromeu Reserve and coutadas 6, 7 and 9 to 15);
- the area encompassing Limpopo, Banhine and Zinave NPs and adjacent lands; and
- Maputo Elephant Reserve.

Areas Proposed for Aerial Survey during 2009

It is proposed that two high-diversity areas – northern Mozambique excluding Niassa Reserve and the Chipanje area; and western Tete province – are surveyed during 2009, in order both to fill the gaps in the existing survey coverage and to provide additional information, gathered with more intensive surveys, on the species and densities of wildlife in these two areas

DNTF Records of Conflicts

The DNTF keeps records of human-wildlife conflict and these records were used by this Project to provide a description of human-wildlife conflict in Mozambique. During the 27 months from July 2006 to September 2008 inclusive, 265 people were reported killed and 82 injured during conflicts with wildlife. Crocodiles, lions, elephants and hippos were responsible

for most deaths, but crocodiles killed 66 % of the people for whom the responsible species was reported.

Crocodile, elephant and hippopotamus were the species most frequently shot in response to conflicts. Elephant and hippopotamus were shot more often in relation to the number of their human victims than the other species, presumably reflecting that elephant and hippopotamus were shot not only in response to attacks on people, but also in response to crop-raiding. One leopard was recorded killed, although the records did not include any incidences of leopards killing or injuring people, or killing domestic livestock.

Structured Interviews with Local People

Project staff visited 32 selected districts throughout Mozambique and conducted approximately 60 structured interviews with local people and officials. The districts were selected because the DNTF records showed that human-wildlife conflicts were commonly reported in them.

The interviews sought to determine which wildlife species occurred in the district, whether these were resident there and their movements, the conflicts that they caused and the temporal trends in their numbers and conflicts. Interviewees were asked to rank the major wildlife species according to their belief of the number and intensity of the conflicts that each species caused. The interviews were intended to determine the local people's perceptions of human-wildlife conflicts. Interviewees were asked to list the measures that they took to prevent or mitigate human-wildlife conflicts, and to suggest appropriate responses to conflicts.

Conflicts caused by elephants or crocodiles were usually considered by local people to be the most serious of the human-wildlife conflicts that they encountered. In districts where both crocodile and hippopotamus were ranked as problem species, most interviews noted that crocodiles caused more serious conflicts than hippos. In just a few districts were lions perceived to cause the most serious problems. Conflicts caused by buffalo and leopard were relatively unimportant compared with the conflicts caused by other species

The interviewees reported that elephant and hippopotamus were often responsible for serious crop damage and were difficult to deal with. Both species sometimes killed or injured people, and elephant occasionally damaged houses. Crocodile and lion sometimes killed or injured people and domestic livestock. Crop-guarding was often mentioned as the activity at the time when some people were killed by elephants or lions.

Interviewees often believed that the elephants causing conflicts in their district came from nearby National Parks or Game Reserves, While some of their beliefs were probably correct, some were not so: for example, recent surveys have revealed that there are no elephants resident in Banhine NP. Interviewees in Cabo Delgado believed (probably correctly) that the elephants in their district were resident there. Conflicts caused by elephant, hippopotamus and crocodile were perceived as having increased in frequency during the last five years by all interviewees.

For all human-wildlife conflict, the commonest response of the local people was to inform the government authorities. Some people attempted to reduce crop-raiding by elephant and hippopotamus by block farming, using rope barriers to deter crop-raiders, guarding fields, or using noise and fire to drive off crop-raiders. In some districts, attempts were made to trap lions. The interviewees never mentioned the killing of problem animals as a current measure to mitigate human-wildlife conflicts, possibly because they themselves did not attempt to kill large animals in response to conflicts.

Killing – either of problem individuals, or in the form of culling to reduce the number of that species in the district – was the most popular suggestion for the most appropriate way of responding to human-wildlife conflicts, regardless of which species caused the conflicts. A few people suggested relocating elephants or lions to national parks or game reserves. Fencing was often suggested as a response to human-hippopotamus conflict, or at least the

crop raiding dimension of it. The installation of water pumps was sometimes suggested as a response to human-crocodile conflicts, to enable people to obtain water without having to collect it directly from rivers or lakes inhabited by crocodiles.

Nearly all interviewees believed that they received little benefit from wildlife, except occasionally in the form of bush meat (in those districts where interviewees admitted that hunting of small animals occurred), or meat from animals killed in response to human-wildlife conflicts.

Human-Crocodile Conflict

- Crocodiles killed more people each year in Mozambique than did all the other species of wildlife combined;
- attacks on people by crocodiles occurred in more districts of Mozambique (46 districts) than did attacks by any other wildlife species; and
- the number of people killed annually by crocodiles has increased during the past decade.

Human-Elephant Conflict

- Elephants killed or injured fewer people each year in Mozambique than did crocodiles, with elephants being responsible for 15 % of human deaths and 7 % of injuries caused by wildlife;
- attacks on people by elephants were concentrated largely in parts of northern Mozambique;
- crop-raiding by elephants was more widespread (reported in 46 districts) than were elephant attacks on people (22 districts);
- elephants raided crops more frequently during March-October than during other months of the year;
- elephants were killed in response to conflicts more frequently during March-October (the period when crops ripen and are harvested) than during other months of the year;
- the number of elephants killed in response to conflicts was greater than for any other species of wildlife, with elephants forming 31 % of problem animals killed; and
- the number of elephants killed annually in response to conflicts increased during the last decade.

A long term response to human-elephant conflict is the development of land use plans, to consider the possibility of creating areas where elephants can be sustainably managed to provide benefits for the local communities without competing with people for the same resources.

Human-Lion Conflict

- Lions attacked people in relatively few districts of Mozambique (6 districts);
- lions killed or injured fewer people each year in Mozambique than did crocodiles, with lions being responsible for 12 % of human deaths and 24 % of injuries caused by wildlife;
- although, in terms of their attacks on people, lions were less of a problem than crocodiles, this was true only at the national level;
- in the districts where lion attacks on people were recorded, there were an average of 7.3 attacks per district over 27 months, which was twice the number of attacks by crocodiles (average of 3.7 attacks on people per district);
- lions attacked people more frequently during March-August than during other months of the year;
- the number of people killed by lions apparently increased during the last decade;

- lions were the major predator of domestic livestock, being responsible for killing 81 % of the cattle and 62 % of the goats recorded killed, as well as killing some sheep, chickens and domestic dogs; and
- the killing of domestic animals by lions was a more widespread conflict (reported in 12 districts) than lion attacks on people.

Human-Hippopotamus Conflict

- Hippos attacked people in relatively few districts of Mozambique (8 districts);
- hippos were responsible for 6 % of human deaths and 12 % of injuries caused by wildlife;
- crop-raiding by hippos was a more widespread conflict (reported in 28 districts) than hippo attacks on people;
- crop-raiding by hippos occurred throughout the year;
- people living in the vicinity of large rivers or lakes regarded human-crocodile conflicts as a more serious problem than human-hippo conflicts; and
- the number of hippos killed annually in response to conflicts increased three-fold during the last decade.

Land use planning is required to determine where hippos could be conserved outside conservation areas and where hippos were incompatible with the needs of people and therefore should be removed. Strong low barriers will exclude hippos from crops.

Human-Buffalo Conflict

- Reported human-buffalo conflicts were concentrated in districts that included Limpopo NP, or were adjacent to Limpopo NP or South Africa's Kruger NP; and
- at the national level, the buffalo appeared to be a minor conflict species, being responsible for the death of one person (0.5 % of people killed by wildlife) and injuries to seven people (9 % of recorded injuries). Eleven buffaloes were killed (4 % of large animals killed in response to conflicts), with three of them apparently killed in response to crop damage.

Although the DNTF records suggested that the buffalo was a minor conflict species, it has the potential to cause conflicts that would not be noted in the DNTF records. This is because buffalo and domestic cattle often share diseases, for example, foot and mouth disease, corridor disease, brucellosis and bovine tuberculosis.

Human-Hyaena Conflict

- Reported human-hyaena conflicts were in districts adjacent to Zimbabwe's Gonarezhou NP, or South Africa's Kruger NP; and
- at the national level, the spotted hyaena was a minor conflict species, with no reports of people killed or injured by hyaenas during the 27 months of records, and hyaenas being responsible for killing two cattle (1 % of cattle reported killed by wild animals) and 12 goats (9 % of goats reported killed). No hyaenas were reported killed in response to conflicts.

Human-Leopard Conflict

- The leopard was a minor conflict species, with no reports of people or domestic livestock being killed or injured by leopards during the 27 months of DNTF records. But one leopard was killed in response to a conflict.

Human-Wildlife Conflict generally

- Conflicts are common in the districts that border South Africa's Kruger NP and Zimbabwe's Gonarezhou NP;
- local people throughout Mozambique believed that they received no benefits from the wildlife in their district, except occasionally when they received meat from animals shot in response to human-wildlife conflicts, or when they obtained small species in the form of bush meat;
- not surprisingly, local people believed that the elimination of problem species, or at least a reduction in their numbers, was the most appropriate way of dealing with human-wildlife conflicts;
- local people believed that human-wildlife conflicts were becoming more frequent;
- the available data also suggested that conflicts generally have increased during the past decade (although the completeness of the dataset is uncertain);
- it is possible even now that many conflicts are not reported to DNTF; and
- more information is needed about the circumstances in which conflicts occur.

If large animals in Mozambique are to survive outside conservation areas, then probably the benefits to the local people of living with wildlife must exceed the costs of living with wildlife *and* the benefits of living without wildlife.

6.3.10 Kudu

Prior to the 1970s, the kudu was found across Mozambique (Smithers & Lobão Tello, 1976). But this was no longer the case during 2008, with the kudu now largely absent from Inhambane, Zambezia and Nampula provinces. Sightings of kudu during the 2008 survey were often close to the borders of conservation areas. However, kudus are often difficult to see from the air and their distribution may well be wider than is shown in the map.

6.3.11 Lion

A provisional map of the distribution of lion in Mozambique was prepared for this project (Map 44). This map shows districts where lions are present, having been noted in the DNTF conflicts records as responsible for human-lion conflict, or having been seen during recent aerial or ground surveys within protected areas (Craig, 2006; Dunham, 2004a; Garnier *et al.*, 1999; Whyte & Swanepoel, 2006). While this map shows areas where lions are known to occur, the absence of a record cannot always be taken to indicate that lions are absent. However, a more complete map has been produced recently by the DNAC (Chardonnet *et al.*, 2008). This suggests that lions occur across northern Niassa and Cabo Delgado provinces, in western Tete province, throughout the coutadas and Gorongosa NP and Marromeu Reserve in central Mozambique, in Gaza province, north-east Inhambane province and along the northern side of the Save River (Map 45). Comparison of the two maps implies that there are no contradictions (in other words, there are no conflicts reported in places where the DNAC believes that lions do not occur). Instead, the comparison suggests that either there are many districts where lions occur but do not cause conflicts, or that there are many districts that do not report conflicts with lions even though such conflicts occur. The latter option seems more likely.

6.3.12 Nyala

Prior to the 1970s, the nyala was found throughout southern Mozambique, as far north as the Zambezi Valley, in areas of suitable habitat (Smithers & Lobão Tello, 1976). During 2008, it was recorded across northern Gaza and Inhambane provinces, in and around the Limpopo/Banhine/Zinave complex of national parks. It was absent from the southern parts of these provinces, and in central Mozambique it was recorded only from Gorongosa NP.

6.3.13 Ostrich

During 2008, the ostrich was confined to the Limpopo/Banhine/Zinave complex of national parks and the areas around them in southern Mozambique.

6.3.14 Reedbuck

Prior to the 1970s, the reedbuck was found in most parts of Mozambique where there was suitable habitat (Smithers & Lobão Tello, 1976). During 2008, its distribution was less widespread, with most records of it coming from conservation areas, but its range still stretched from Maputo Elephant Reserve in the south to Niassa Reserve in the north.

6.3.15 Rhinoceros

There used to be two species of rhinoceros in Mozambique, the white rhinoceros and the black rhinoceros (Smithers & Lobão Tello, 1976). But by the time of Smithers & Lobão Tello's (1976) study, the distribution of both was greatly reduced. The white rhinoceros, which was never found north of the Zambezi River, had become nationally extinct and had been reintroduced (introduced?) to Maputo Elephant Reserve and Gorongosa NP. Occasionally, white rhinos entered Mozambique from South Africa's Kruger NP. By the time of Smithers & Lobão Tello's (1976) study, the black rhinoceros was sparsely distributed across central and northern Mozambique and western Tete (although it may once have occurred throughout

most of Mozambique). By 2008, there were a small number of white rhinos in Limpopo NP, where some animals were released and others have emigrated from Kruger NP. The lone rhinoceros (species unspecified) seen in northern Mozambique during the 2008 survey can only have been a black rhino and is likely to be one of a very small number in Mozambique.

6.3.16 Roan

Prior to the 1970s, the roan antelope was sparsely distributed in western parts of southern Mozambique, in central Mozambique and western Tete and northern Mozambique (Smithers & Lobão Tello, 1976). During 2008, it was even more sparsely distributed, but records of a few animals from just south of Niassa Reserve, western Magoé, north of the Zambezi delta and Limpopo NP (where the roan was reintroduced).

6.3.17 Sable

Prior to the 1970s, the sable antelope was widely distributed across Mozambique, except for south-eastern Gaza and Inhambane provinces (Smithers & Lobão Tello, 1976). During 2008, it was still present in central and northern Mozambique and Limpopo NP (where it has been reintroduced). The 2008 survey estimated that there were 32393 ($\pm 33\%$) sable antelopes in Mozambique, with approximately 15000 animals outside the previously surveyed areas, in the coutadas of central Mozambique and in the area to the south of Niassa Reserve.

6.3.18 Warthog

Prior to the 1970s, the warthog was widely distributed across Mozambique, except in parts of southern Mozambique (Smithers & Lobão Tello, 1976). During 2008, it was still found in and around Niassa Reserve in northern Mozambique, in the Zambezi and Rift Valleys in central Mozambique, including Gorongosa NP and Marromeu Reserve, and in the Limpopo, Banhine and Zinave NPs in southern Mozambique.

6.3.19 Waterbuck

Prior to the 1970s, the waterbuck was widely distributed across Mozambique, but by the 1970s it was largely absent from southern Mozambique, except for occasional immigrants from Kruger NP (Smithers & Lobão Tello, 1976). During 2008, there were significant populations in Gorongosa NP, Marromeu and Niassa Reserves, and small numbers in the Magoé area, Maputo Elephant Reserve and Limpopo NP (where the waterbuck was reintroduced).

6.3.20 Wildebeest

Prior to the 1970s, the wildebeest was found in northern Mozambique, in Gile Reserve and Gorongosa NP, in the Save Valley, Banhine and Zinave NPs and along the border with Kruger NP (Smithers & Lobão Tello, 1976). During 2008, there was a small national population existing as two discrete subpopulations, the larger one, comprising 75% of the population, in Niassa Reserve and a small one in Limpopo NP (where the wildebeest was reintroduced).

6.3.21 Zebra

Prior to the 1970s, the zebra was found throughout most of Mozambique, except that it was largely absent from Maputo and Inhambane provinces (Smithers & Lobão Tello, 1976). During 2008, there was a northern subpopulation in or near Niassa Reserve, a small population along the border with Kruger NP and Limpopo NP (where the zebra was reintroduced) and a few in the Magoé area.