Niassa Carnivore Project

Mitigation of negative human impacts on large carnivore populations in Niassa National Reserve, northern Mozambique:

Annual Progress Report
February 2008

Second male leopard (LECM02) radio-marked in Niassa National Reserve (K. Begg)

Prepared For:
Sociedade para a Gestão e Desenvolvimento
da Reserva do Niassa
Moçambique

By:

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1.0 Introduction and Justification

Reporting period:	**July – December 2007**
Researchers:	**Colleen Begg & Keith Begg**
Research Assistant:	**Euzebio Waiti (Mbamba village)**
Duration of project:	**July 2007-December 2010**

The Niassa National Reserve (NNR) is located in northern Mozambique on the border with Tanzania (Fig 1). One of the largest protected areas in Africa, it encompasses an area of approximately 42 000 km^2 located within the Eastern Miombo woodland eco-region. NNR supports a large and diverse complement of herbivore and carnivore species, albeit at relatively low densities at present. In addition more than 25 000 people are resident across the reserve in approximately 40 villages.

Large carnivores are amongst the most difficult species to conserve, as they tend to occur at low densities, range widely and conflict directly with human interests. Yet, in a very real sense their presence can be an ecological indicator of the "health" of the ecosystem and their successful conservation in an area can deliver broader biodiversity benefits as umbrella or flagship species. These species are of international conservation concern particularly African wild dogs (Critically Endangered) and lions (Vulnerable). Recently more attention has also been given to leopard, which are listed on Appendix I of CITES which means trade is strictly regulated. In NNR the large carnivores (lion, leopard and spotted hyaena; African wild dogs) also provide critical revenues for communities and management through eco-tourism and sport hunting (lions and leopards). They may also play an important, but largely unappreciated cultural role. However, the costs to the communities living with carnivores may become considerable (injury, loss of life, stock loss etc) particularly if the carnivore populations increase in response to recovering prey populations and improved protection as is expected in the NNR.

Research between 2003-2006 (Begg & Begg 2004, 2007a, b, c, d) has indicated that the NNR supports a viable population of lions in the region of 800-1000 individuals and more than 450 African wild dogs. Leopard and spotted hyaena are also relatively common but little is known of the specific threats, prey and movement patterns of these two species in NNR. Potential threats to the large carnivores in NNR include retaliatory killing as a result of human-carnivore conflict, snaring, the trophy hunting of underage individuals (leopard and lion) and various disease risks. For example preliminary research has shown that there have been at least 75 lion attacks in NNR in the last 30 years with 11 people killed and 17 injured in the past 6 years alone.

The Niassa Carnivore Project aims to build on the data already collected on lions (Niassa Lion project 2004-2006) and African Wild Dogs (2004-2006) and extend the ecological research and surveying to leopards. It will use target specific, pragmatic research to develop indicators of the status of the large carnivores in NNR,

and monitor and manage the main threats (retaliatory killing, trophy monitoring of underage animals, disease risks). Particular attention will be given to understanding human-carnivore conflict and disease in NNR and finally developing and testing appropriate, pragmatic and sustainable solutions that can be implemented by Niassa communities. This project will take place in close collaboration with SRN, local communities and professional hunters. In addition selected NNR/ SRN staff and community scouts will be trained in all the relevant techniques and detailed survey protocols will be provided to NNR, along with all the required equipment to ensure monitoring is sustainable and ongoing and not researcher driven. In NNR we have a unique opportunity to secure these populations and develop mitigation strategies before a crisis develops and support for conservation initiatives is eroded. In addition, NNR has the potential to make a significant contribution to the global conservation of all these carnivores due to the large size and remoteness of the protected area.

This report presents initial progress that has been made in 2007 towards achieving the objectives. The data presented here are preliminary and have not yet been comprehensively analysed. Detailed results of the trophy monitoring of lion and leopard in 2007 are presented in a separate detailed report and only summarized here.

2.0 Objectives

Our goal is to ensure that by 2010 viable populations of the large carnivore populations (lion, leopard, spotted hyaena, African wild dog) are secured in NNR and their status and threats are effectively and systematically monitored by SRN staff.

The broad objectives of the project over the next three years are to:

1. Use targeted research and surveying to further investigate large carnivore status, density and ecological requirements (with particular emphasis on leopard) and develop indicators and survey protocols that can be used for ongoing monitoring by SGDRN.
2. Extend and refine the MOMS community-monitoring program to provide ongoing assessment of human-carnivore conflict and status of special species with 80% coverage of the NNR villages by 2010.
3. Examine the local contexts of large carnivore attacks (humans, livestock) and identify, and test locally derived, practical solutions with the active participation of specific local communities.
4. Continue to assess and minimize the levels of disease risk (canine distemper, rabies, canine parvovirus) to carnivores (particularly African wild dogs and lions) through analysis of blood samples and management of the domestic dog population.
5. Continue to assist SRN with the development and implementation of sport hunting guidelines and trophy monitoring systems for lion and leopard to ensure sustainable hunting.
6. Ensure monitoring is sustainable (not researcher driven) and consistent by providing appropriate training, equipment and detailed surveying protocols to SGDRN
7. Disseminate the findings, mitigation strategies and protocols to inform broader national and regional carnivore conservation strategies wherever possible.

3.0. Study Area

NNR is located within the Eastern Miombo Woodland eco-region (WWF 2001), which is characterised by geological stability over a long time period, a long dry season, flat topography interrupted by monolithic granite inselbergs (Plate 1), sluggish drainage on the plateau, old nutrient poor soils, frequent fires, and relatively low levels of large herbivores with episodic high levels of insect and small mammal herbivory. The drainage is dominated by the Ruvuma and Lugenda Rivers, which are large sand bed rivers with strong perennial flow. The central watershed between these two rivers feeds numerous seasonal rivers as well as an extensive seasonally inundated wetland network (SRN, 2005). Timberlake et al (2004) recognized five broad vegetation groups within NNR: forest, riverine, deciduous woodland, dambos or wetlands and granite inselbergs. NNR supports the full complement of herbivores (excluding black rhino and possibly roan antelope) and carnivores expected in the region, albeit at relatively low densities at present. In addition approximately 25 000 people live inside the designated protected area in more than 40 villages, Plate 2). Shifting subsistence agriculture is the primary land use and main economic activity (Cunliffe 2005). Cattle are absent due to tsetse fly (Glossina spp.), the vector for the disease trypanosomiasis, but smaller livestock, primarily goats and chickens, and domestic dogs are present in the larger villages.

NNR experiences a marked seasonal climate and can be divided into two main seasons, the hot-wet season from mid-November until the end of April and a prolonged dry season that may last up to six or seven months (May to November). During the hot-wet season precipitation averages between 250-350 mm per month (800-1200 mm a year), but it varies on a west-east gradient with higher rainfall in the west than the east. The climate is tropical with temperatures ranging from 15 –30 ^{0} C during the hot season (hot-dry and hot-wet) and 10-20 ^{0} C in the cold-dry season.

3.1. Intensive Study Area

While monitoring and surveying include collation of data from the entire reserve, intensive ecological research is focused in a specific study area situated along the Lugenda River in concession block "L5" between the Mbamba village and Msangezi River, as was the case between 2003 and 2006 (Fig 2). This area incorporates approximately 40 km of the Lugenda River bounded by the Mbamba Village in the west and the Msangezi River in the east extending 15 km inland (approx 600 km ^{2}) and incorporates Mbamba village (Fig. 3.) and borders Nkuti village. At this stage all animals are radio collared within this intensive study area, which represents a combination of habitats: miombo woodland, inselbergs, riparian thicket and forest, acacia open woodland, open mixed woodland, dambos and wooded grassland. We liaise closely with villagers, fishermen and honey-gatherers from these villages to gain a better understanding of human–carnivore conflicts, snaring levels and local perceptions of carnivores. One of our research assistants and three community scouts (MOMS) come from these villages.

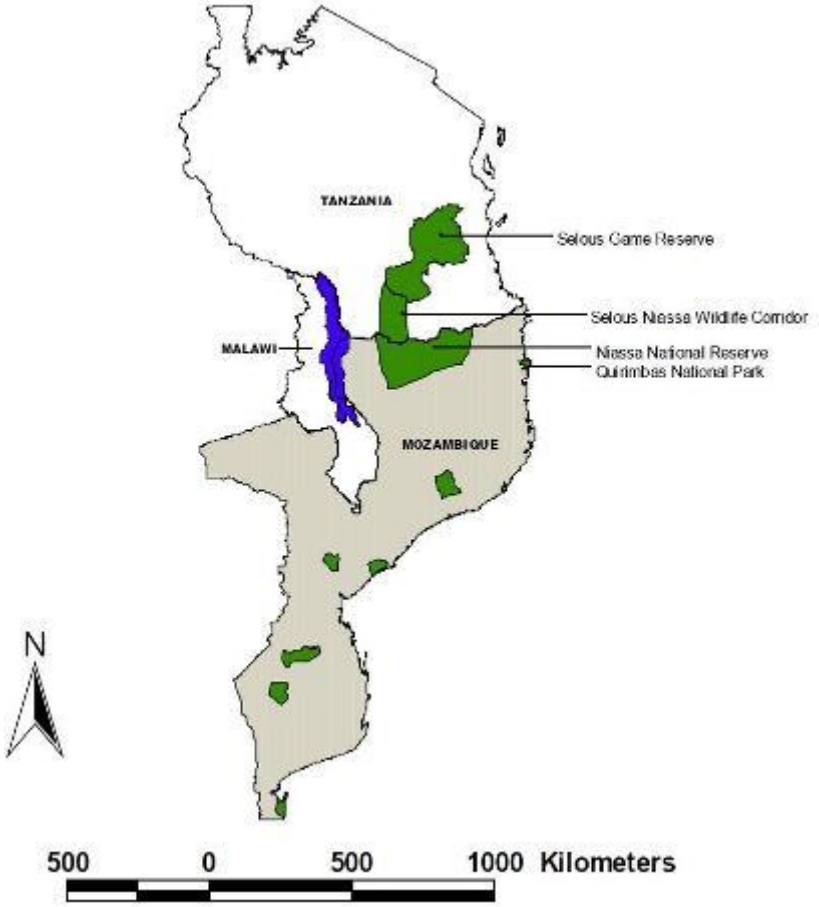

Fig 1: Regional map showing linkage between the Niassa National Reserve, Mozambique and Selous Game Reserve, Tanzania through the Selous Niassa Wildlife Corridor.

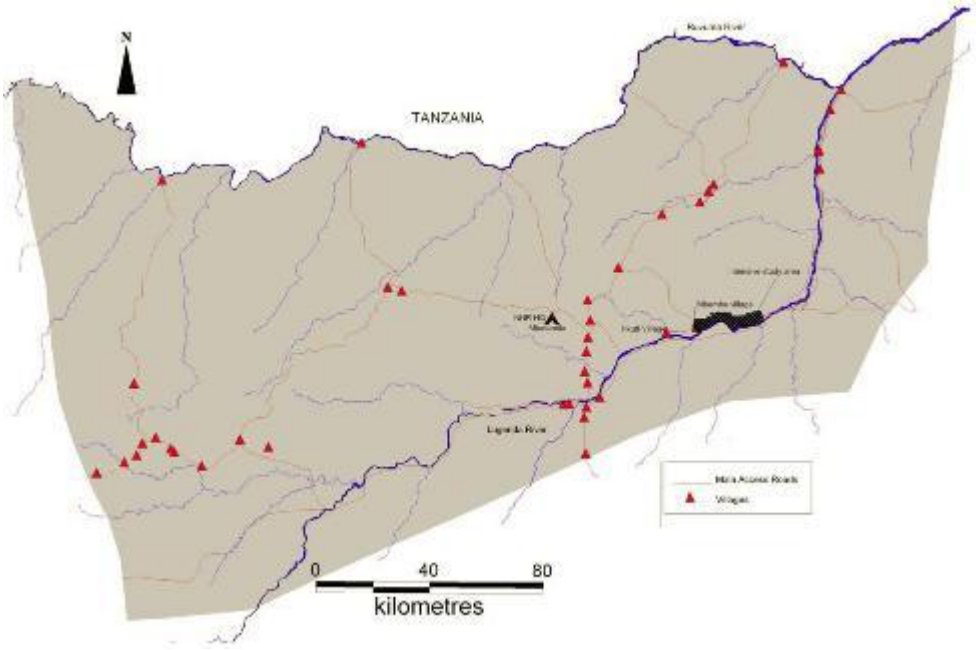

Fig 2: Niassa National Reserve (42 000 km^2) in northern Mozambique showing the location of the intensive study area in the south-eastern Lugenda River Valley.

Plate 1: Typical Niassa landscape showing the Lugenda River, Lipumbula Inselberg and open woodland habitat with some plains areas. Mbamba Village can be seen in the far right corner

Plate 2: Mbamba Village in the intensive study area, home to approximately 1000-1500 people (approx. 300 homesteads)

4.0. Overview of methods (detailed methods will be provided in final report)

Objective 1: Targeted ecological research

- Lion & hyaena call-up survey to be completed in July 2008 to compare with 2005 data (age structure, density distribution) and training of selected personnel. A 10-min tape of sounds know to attract lions (feeding sounds and prey distress calls, hyaena whoops) is played back at full volume at calling stations (each set 10 km apart) along roads throughout NNR.
- Relative density of all carnivores, with particular emphasis on leopard will be determined through remote camera trapping (n = 15 trap stations, 30 camera traps, Plate 3). For leopard, individuals are identified through spot patterns and their density calculated through capture/ mark/ recapture analysis.
- Additional lions (4-6) and leopards (6-10, Plate 4) radio-marked with a combination of VHF (Telonics) and GPS radio-collars (Vectronics) and followed to determine home range, density, movement patterns and validation of visual aging cues for hunters.
- Standard carnivore measurements, body condition and tooth wear noted from all captured animals.

Objective 2: Community Monitoring System

- In close collaboration with SGDRN (Agostinho Jorge and Mbumba Marufo) the "MOMS" community scout program will be extended through annual training and reporting workshops.
- MOMS community scouts provide regular information on the opportunistic sightings of carnivores in villages and vital information on incidents of human-carnivore conflict. This is a paper based system where the data are owned by the community scouts. It is based on the MOMS system initially developed in Namibia (Stuart-Hill et. al. 2005)
- MOMS community scouts may also be used as extension officers to disseminate information and provide local expertise in mitigation strategies once these have been developed.

Objective 3: Identify and implement practical mitigation methods.

- A simple, but more detailed questionnaire will be used to collect information on the specifics of the more recent (2000-2007) carnivore attacks.
- Data on lion movements in Mbamba Village will be collected through following radio-marked lions and by using camera traps. During March 2008 (main crop harvesting season) detailed information on the movement of lions and their prey species (particularly warthog and bushpig) will be collected in and around the Mbamba village croplands ("mashambas").
- A list of practical, cost effective mitigation strategies that are considered to have a reasonable chance of success in NNR (and/or are already being employed by Niassa residents with some success) will be compiled. It is likely that mitigation methods will fall into two main categories (not mutually exclusive):

i. Decreasing attacks by minimizing contact between human and carnivores through changes in behaviour and by the use of improved physical barriers.

ii. Increasing the tolerance of carnivores by reducing tension e.g. follow up of grievances, provision of effective communication networks, elimination of man-eating lions; participation in decision making processes and improvement of economic benefits e.g. revenue distribution from sport hunting and ecotourism, increased employment, insurance schemes; and improving education (highlighting cultural and conservation importance of carnivores (education).

- The primary focus of this project will be on development of the Category (i) mitigation strategies with recommendations and guidance provided to SGDRN staff for Category (ii) mitigation strategies. We strongly support the use of protection methods that are already in use by communities, but that can hopefully be further refined to increase effectiveness.
- Once identified, a few techniques will be tested in individual fields of target villages (Mbamba and other villages to be decided possibly Macalange or Negomano) with the active participation of the villagers and communities concerned. One-on-one extension work with individual farmers is considered essential.

Objective 4: Disease, inadvertent and targeted snaring -monitoring and mitigation

- Blood samples will be taken from all immobilized lions and leopards captured in leopard traps for disease analysis (canine distemper, parvovirous, rabies). Techniques and analysis will be determined in conjunction with SRN, Dr Mike Kock (WCS Field Veterinary Programme) and Dr Rosie Woodroffe (wild dog specialist).
- A survey and registry of the number of domestic dogs in NNR will be completed by December 2009 to compare with 2006 results. In collaboration with SGDRN, a decision will be reached about the future of the domestic dog population in NNR with domestic dogs either removed or vaccinated.
- If possible, nutritional surveys will be completed in Mbamba village (following similar techniques used in Tanzania) to assess the importance of bush-meat in the diet. This information will be used to assess the extent of snaring activities and possible solutions.
- Further investigations into the trade in leopard skins from NNR will be made.

Objective 5: Trophy monitoring & hunting guidelines

- To collaborate with individual Professional Hunters (PH's) to validate visual aging cues for leopard and lion will continue.
- All operators are provided with simple datasheets to record critical information on each lion and leopard hunt.

- Trophy monitoring of lion and leopard trophies is conducted annually in October and November of each year. All skulls are measured and individual trophies aged according to tooth wear, pulp cavity closure and, in lions, mane development and nose colouration.
- Trophy monitoring results are reported to PHs and operators through meetings and newsletters each year before the hunting season begins.
- An incisor or premolar is removed from each trophy for digital dental radiographs (X-rays) of the pulp cavity to provide an additional indication of age that will be tested for correlation with visual aging criteria such as body length and mass (leopards), mane development, nose pigmentation (lions).
- These data will be used to validate visual aging criteria for lions and leopards to assist professional hunters and provide a baseline measure of trophy quality against which future quotas can be assessed.
- For leopard trophies, a 1cm. x 1 cm. piece of skin will be taken for DNA analysis to determine the sex of the animal and for phylogeographic studies (in collaboration with Prof. C. Matthee, Stellenbosch University, RSA).

Plate 3: Remote camera station along a path in riparian habitat showing two cameras set at each site to record both left and right hand coat patterns of leopards and other carnivores

Plate 4: A "walk through" leopard drop door cage trap set in riparian habitat, which can also be set with additional baits or scent to attract leopard.

5.0 Progress towards achieving Objectives

5.1. Targeted ecological research

5.1.1. Radio-collaring

Lion

- To date (since 2005), three males lion and two females have been radio collared with a combination of GPS and VHF radio collars.
- In this reporting period, two new lionesses from two prides (F-Pride (4 females), M-Pride (6 individuals) were collared with VHF collars and the collars on two male lions radio-marked since May 2005 were replaced.
- In 2008 VHF collars will be replaced with GPS collars now that sufficient funding has become available
- A lioness from the "L" pride that had been collared since November 2005 was discovered to have died in Nov 2007 and her collar and skull were recovered. Her death appears to be from natural causes, as a dead porcupine was found close by. One of her canines was completely broken off, in an old injury, perhaps precipitating her death. It is not yet known what has happened to her two cubs, which would be approximately 15 months old.
- Identification of all individuals in the study area continues through photographic ID cards. This information will used to determine the density of lions in the intensive study area to validate call-up survey results.
- This season, identification pictures have been taken of all individuals from the F-pride (Plate 5), however individuals from the M-Pride remain elusive. These identification pictures will be compared with other images taken of lions in the intensive study area between 2004-2006 to develop a history of lions in the area.

Leopard

- The first two leopards have been caught and collared with VHF collars using drop door cage traps Both were young adult males weighing 42kg and 38kg respectively. This is considerably smaller than several of the leopards taken as trophies in 2007 (estimated at 53kg; see report on trophy monitoring). This is the first year that leopard hunts and trophies have been comprehensively monitored and the third year of skull measurements and aging.

Adult female

Subadult female-01

Subadult Female-02

Subadult Female-03

Plate 5: Identification pictures of F-Pride members comprising one adult female and three subadult females, note the different whisker patterns in the subadults and the distinctive notch out of the ear in the adult female.

5.1.2 Camera trapping

- Remote camera trapping has been initiated in the reserve this year. 30 camera traps at 15 camera stations were set at 1 km intervals for 42 days in riparian habitat. The main goal is to identify individual leopards and quantify leopard density in the area. In addition the relative density of all carnivores and prey species can be assessed and compared to data collected using other techniques (spotlight counts, track plates), in different habitats (riparian, mixed open woodland, Miombo woodland) as well as between hunted and non-hunted areas) and over time.
- To date the camera traps have recorded 28 mammal species, excluding local fishermen. This includes pictures of 12 carnivore species (Plate 6) ranging in size from the slender mongoose to lion.

- In addition the camera traps have captured images of at least six individual lions (all known) as well as pictures of 3 females as yet unidentified.
- At one camera station, F-pride lions made a kill close to a camera trap, and took a bite out of one of the cameras!).

a) Bushy tailed mongoose

b) African Civet

c) Large spotted genet

d) Water Mongoose

Plate 6: Various small carnivore species recorded by remote camera traps during the first photo trapping exercise

Plate 7: Radio-collared male leopard ("Nantusi") and a large un-collared male photographed with the use of camera traps in the study area.

5.1.3 Density, movement patterns and prey

Lion

- Between October and November 2007, 22 lions were seen in the intensive study area (1000 km^2) through call-up and remote camera trapping techniques. This represents a minimum density of 0.02 adults & subadults / km^2. This is still substantially lower than lion densities in other protected areas. The 2005 call-up survey of NNR estimated lion density to be between 0.01 and 0.03 adults / km^2 dependent on habitat. This call-up survey will be repeated in July 2008 using exactly the same techniques.
- Home ranges of three male lions are plotted in Fig.4. An estimated home range of 420 km^2 for LICM03 and 350 km^2 for LICM01 has been calculated. More in depth analysis of seasonal and yearly movements have not yet been done.
- Data for females is still sparse, and the exact make up of lion "prides" in the intensive study area is still uncertain as while the radio-marked females have not been seen together, their home ranges overlap substantially (Fig. 5) and the same adult male has been seen with all groups as well as with another female this year. The preliminary positions of four females are provided in Fig 5.
- In NNR, small groups of lions (2-4) are commonly seen hunting and resting together but the entire group is seldom seen all together. Research in other areas has suggested that this type of social structure is a feature of low prey density (small prey animals) or human disturbance and needs to be carefully monitored.
- It is of concern to us that no adult male lions over the age of six have been identified in the study area over the last two years. Both the pride males are less than six years old and are known to visit hunting baits in concessions along the south bank of the Lugenda River. This suggests that the lion density is still low, with little competition for territories. Baiting and hunting pressure on the south bank of the Lugenda may well be forming a "sink" for the source population on the north bank (non hunted area) as has been observed in other areas (Hwange National Park, Zimbabwe). This requires more investigation.
- To date 57 prey records for lions have been collected representing 19 prey species (Fig. 3). The data suggests that four species represent more than 50 % of the prey items: bushpig (16%), warthog (12%), buffalo (12%) and bushbuck (11%). It is likely that smaller prey items have been overlooked (Fig. 4). More data are needed from the radio-marked lions to counter this bias.
- It is of interest that the most common prey items, bushpigs and warthogs are both considered significant crop pests and neither species are eaten by the majority of Niassa residents who are Muslim. Four of the kills were made in the village mashambas (fields): 3 warthogs 1 bushpig.

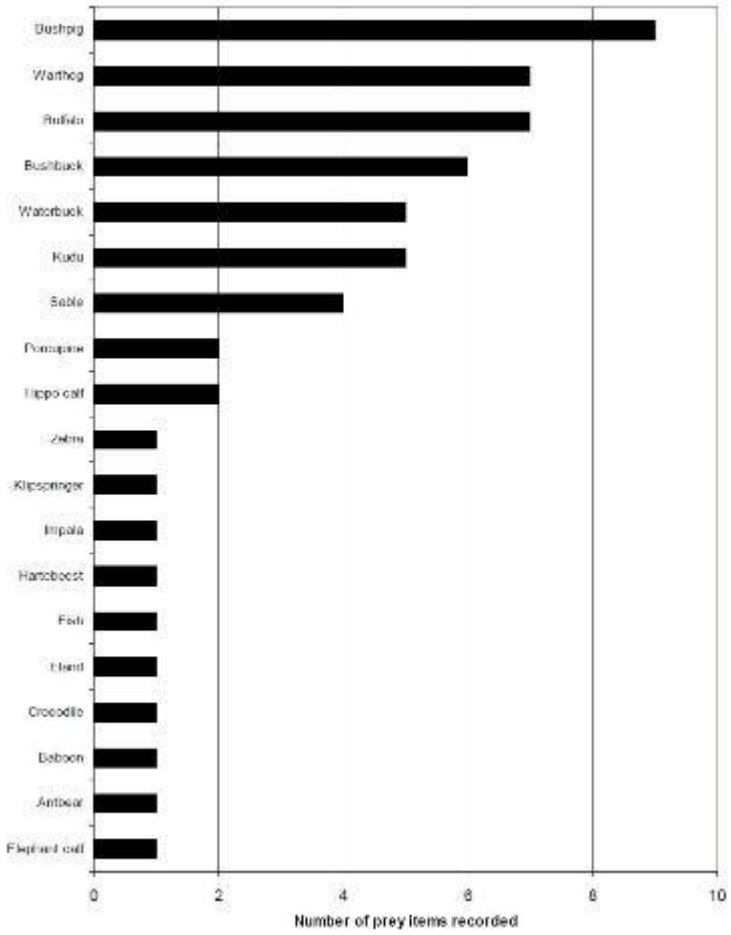

Fig 3: Prey items of lions in NNR recorded from opportunistic observations (n = 57)

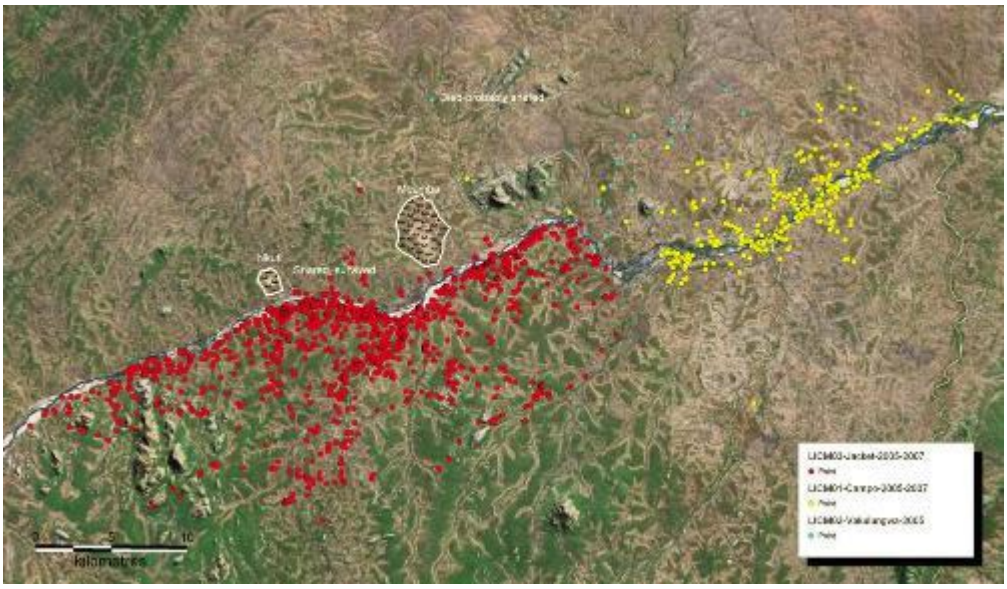

Fig.4. Home ranges of three male lions in the intensive study area in the eastern Lugenda River valley. Two of these lions have been radio-collared for three years with a combination of VHF and GPS radio collars both to assess movement patterns and to validate visual aging cues (nose colouration, teeth wear and mane development). Note the use of the Lugenda River as a territorial boundary although both males do cross the river during the dry season.

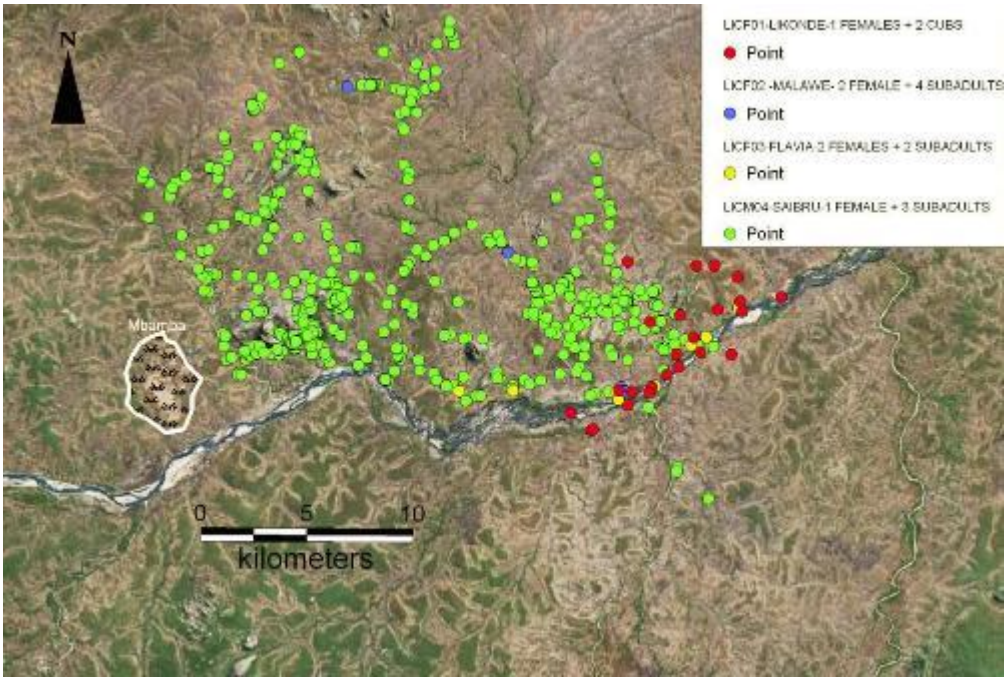

Fig 5: Positions recorded to date of female lions radio-marked in the intensive study area in the south-eastern Lugenda valley.

Leopard

- Preliminary data collected on the home ranges of these two leopards suggest they overlap substantially and that these two males make good use of both the riparian and mountain habitats.
- Using camera traps, opportunistic observation and trapping we have so far identified six individual leopards in an intensive study area of 30 km^2 including both the radio-collared individuals and another a large male (Plate 6). The study area will be extended as we more radio collar additional leopards.

African Wild Dog

- In March 2007 a detailed wild dog report was prepared for SGDRN. This report analysed the data collected by the Niassa Wild dog on status and threats over a three-year period (2004-2006) a suggested a way forward.
- Opportunistic sightings of wild dog packs from the research team, professional hunters, ecotourism operators and MOMS community scouts are collated each year into a wild dog database. In 2007 these included more than 40 sightings from information gathered by community scouts trained and funded by this project.
- At least four packs have been recorded with young pups in the 2007 season, all during September to October.
- C. Begg attended the regional Discussion Group on African wild dogs at the Society for Conservation Biology (SCB) conference in Port Elizabeth, South Africa. K. Begg attended the

Regional Strategy for Wild Dogs and Cheetah in Botswana (3-8 December 2007) to provide detailed information on the Niassa wild dog population.

5.2 Community Monitoring System

- The Niassa Carnivore Project supports the MOMS community scouts program both financially and through mentorship. The goal is to have a community scouts in more than 80% of Niassa villages by 2010. The community scouts currently collect information on sightings of special species (including leopard, lion, African wild dog and Spotted hyaena), human-wildlife conflict and fishing.
- In September, the annual reporting and training MOMS workshop was held in Mbatamila, lead by Mbumba Marufo (SRN Community Officer) and Agostinho Jorge (SRN monitoring and tourism).
- The first year of information collected by the five community scouts were analysed and problems addressed.
- In addition, five additional community scouts from the villages of Macula, Matondevela, Ntimbo and Mussoma were identified by traditional leaders and trained in MOMS.
- With more than 40 wild dog sightings with details of pack size, location, date and time having been collected by the first 5 community scouts (trained in 2006) it is now clear that the MOMS system already represents an essential part of the long term monitoring system of wild dogs in NNR and this will increase substantially as more and more scouts are trained.
- This year all community scouts were presented with certificates at the end of the workshop and provided with MOMS community scout caps, T-shirts and backpacks.

5.3. Human –carnivore conflict

5.3.1 Identify and implement practical mitigation methods.

- No conflict with large carnivores was recorded in Niassa villages in 2007.
- A male lion, originally collared in the hunting concession Luwire in 2005, has crossed the Lugenda River and is a regular visitor to Mbamba village croplands presumably in search of prey such as warthogs. He will be fitted with a GPS collar this year and his presence in the mashambas during the wet season will be monitored by research assistant, Euzebio Waiti.
- In addition, during March (the peak conflict period) camera traps will be placed in the fields to assess the timing and frequency of visits to the mashambas by all species, particularly bushpig and warthog that are the primary prey of lions.

5.3.2 Disease and snaring - monitoring and mitigation

Snaring

- A further 3 incidents has confirmed a trade in leopard skins inside the reserve. A snare set specifically for a leopard (Plate 8) was discovered in our study area and a snared leopard severely wounded a poacher in one of the hunting concessions. Two leopard skin trophies were also stolen from a hunting concession this season. Conversations with Niassa residents suggest the current selling price for a leopard skin from NNR is between Mt900 to Mt1500 ($40). This requires more attention.
- The history of the collared male lion "Jacket" (LICM03; Fig 5) is of particular interest. Jacket was marked in a hunting concession opposite the intensive study area in May 2005. He was subsequently snared (wire snare) in Nkuti village. He managed to remove his collar in the struggle to get out of the snare but survived, although he was in poor condition and subsequently lost most of his mane through stress. He was re-collared in November 2005 and his snare wound treated but he then disappeared and no further signal was heard from his collar. In October 2007, Jacket was photographed by a camera trap with an unidentified female, having now crossed the Lugenda River. He was subsequently recaptured and collared in an old cropland near Mbamba village. From conversations with Mbamba residents it appears he is regularly seen in the mashambas and will provide interesting data on lion movements around this village.
- To date we have records of five snared lions, two within the intensive study area. In addition, in 2007 a lioness was observed in the Luwire photographic concession (opposite the intensive study area) with a snare around her front right paw.

Plate 8. Local snare set specifically for leopard in tree, with Hyrax (Dassie) bait hung in palm frond basket. This provides additional confirmation of a trade in leopard skins inside the Niassa Reserve.

Disease

- Blood and skin samples have been taken from four lion and two leopard and will be analysed for disease markers (canine distemper, canine parvovirus)
- A five-year action plan to minimize the risk of disease transmission from domestic dogs to human and wildlife population will be prepared during 2008 by Rui Branco (a newly qualified Mozambican vet supported and mentored by the Niassa Carnivore Project).
- At the SRN 2008 Planning Meeting held in October it was decided that in accordance with the 2005 Community Policy, no domestic dogs will be allowed in NNR and the current dog population will eventually be removed in a way to cause minimal stress to dog owners.
- In 2008, Rui Branco (supported and mentored by the Niassa Carnivore Project and SRN) will:
    - Prepare a registration booklet for all dog owners currently in NNR and complete a detailed inventory of how many domestic dogs are currently in NNR.
    - Vaccinate 90-100 domestic dogs in the Mavago area in the west of NNR.
    - Train community scouts to collect and register detailed information on dogs and possible disease outbreaks or disease symptoms in domestic dogs and other susceptible wild animals
    - Complete an educational campaign showing the risks of rabies to people and conveying the message that domestic dogs are not allowed in NNR for both human health and conservation reasons.

5.4 Trophy monitoring & hunting guidelines

- A detailed report on the monitoring of lion and leopard trophies in the 2007 hunting season is provided in a separate report prepared for SRN (Begg and Begg 2008b). A summary is provided here.

Lion

- Assessment of the development of manes, nose darkening and teeth wear in two young radio-collared male lions in the intensive study areas continued. Both lions were re-immobilized to attach new collars in October 2007. They were both marked in May 2005 when they were an estimated 3 years old and are now estimated to be an estimated 5 years old.
- Annual data on gradual nose pigmentation (Fig 6), tooth wear and mane development is used to validate visual aging cues in Niassa that can be used by Professional Hunters to age lions before they are taken as trophies.
- An effective quota of 12 lions in five hunting concessions was available in 2007 and all these lions were purchased by sport hunting operators, however off take was 67% (8 lions).
- Four lions were over the age of six years and considered acceptable trophies; the remaining four were neither acceptable trophy in terms of age or mane development. No lions under the age of four were taken as trophies.

- All the lions over the age of six showed noses more than 50% black, narrow pulp cavities closed at the base and full manes with hair filling in between and behind the ears i.e. no Mohawk.
- There has been a steady decrease in the number of underage lions taken as trophies since the initiation of the Niassa Lion Project in 2004 and implementation of the Niassa Points System in 2006 (50% in 2007 compared t0 75% in 2004).

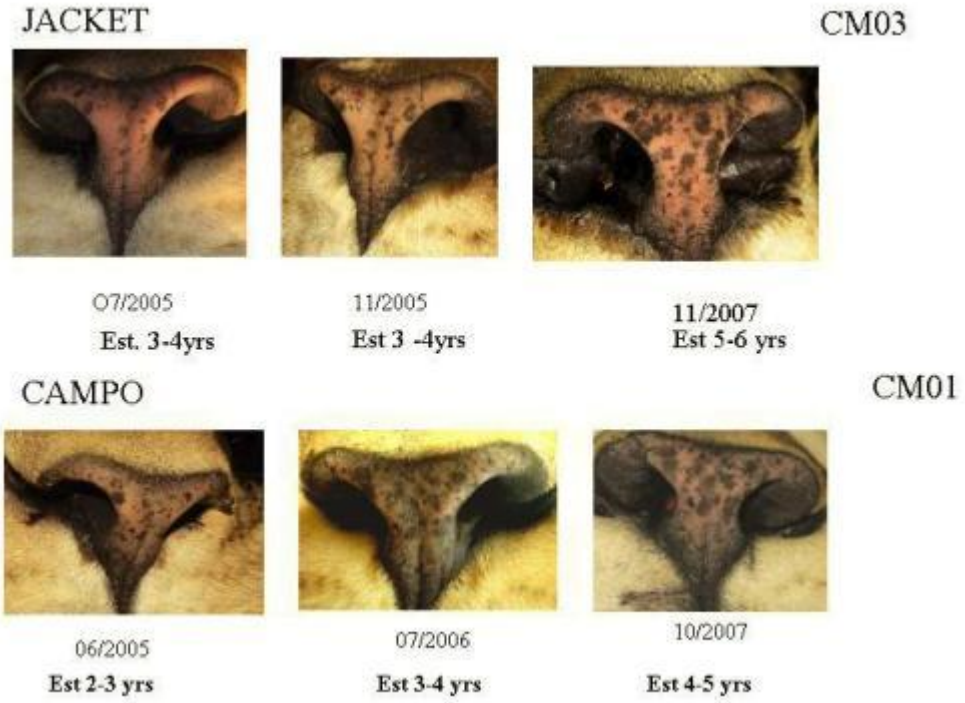

Fig. 6: Noticeable darkening of the noses of two radio-collared young adult lions in NNR over a three year period

- By plotting where lion trophies have been taken since 1998 (n = 63) it is apparent that lion hunts are concentrated in a narrow band along the Lugenda River. Of particular concern is the heavy concentration of lion hunts around river boundaries between concessions. If Professional hunters wish to find high quality trophies we recommend they need to bait further a field and utilise more of their concessions.

Leopard

- Leopards are on Appendix 1 of CITES and trade is strictly regulated. Trophy monitoring is therefore essential. Data on tooth wear will again be used to provide an indication of age in the leopard trophies and will eventually be correlated with weight, size and other physical characteristics. The aim is to develop visual aging characteristics that PHs can use to improve their assessment of leopard trophies.
- 2007 was the second year of leopard trophy monitoring in NNR and the first year PHs were required to fill in a simple questionnaire for each leopard taken as a trophy.

- All trophies were placed in an age category (< 2 years, 2-4 years, >4 years) based on tooth wear of known aged leopards in other areas. The aging of these trophies is preliminary, as the aging criteria still need to be ground-truthed for NNR.
- In 2007, 18 leopards were taken as trophies from five hunting concession within NNR, an off take of 94% of the approved quota.
- Two females were taken as trophies (both admitted by the PHs concerned) and four of the 16 male trophies were very young showing no wear on the canines and no noticeable chipping of the enamel ridge. Three of the trophies were of old animals.
- While aging of the trophies from tooth wear suggests that many leopards hunted in NNR are below four years of age, a minimum age limit cannot be instituted in NNT at present as reliable visual aging cues have not yet been developed and tested

6.0 Main goals for 2008

- At least three lion and four leopards will be radio-marked with GPS collars.
- A call-up survey of NNR on available roads following the same methods used in 2005 will be conducted both to compare density and age structure of the lion to 2005 estimate and to provide training to SRN/ NNR staff in survey techniques.
- A list of mitigation methods currently used by villagers in NNR to protect themselves and their fields from wildlife, particularly carnivores will be compiled.
- Camera trapping will continue in riparian, open woodland and Miombo woodland as well around Mbamba village in the wet season.
- Five additional community scouts will be identified and trained and the 10 current scouts will attend a report back meeting in Mbatamila.
- Results on trophy monitoring will be presented at the annual operators meeting in May 2008 and results will be disseminated to Professional Hunters.
- An in-depth questionnaire survey will be initiated to collect detailed information on circumstances surrounding carnivore attacks since 2000.
- Mozambican Agostinho Jorge (SRN Employee- Honours Graduate from Eduardo Mondlane University) will spend three months with the project gaining experience in research and surveying techniques.
- Mozambican Vet, Rui Branco (supported by this project) will provide a registry of domestic dogs in NNR and vaccinate current dog population.

7.0. Niassa Carnivore Project Reports: 2007-2008

Begg, C.M. & Begg, K.S. 2007a. Monitoring of lion and leopard trophies in Niassa National Reserve, Mozambique. Unpublished report prepared for SRN, Maputo

Begg, C.M & Begg, K.S. 2007b.Niassa Wild Dog Project: Status and Conservation 2004-2006. Unpublished report prepared for SRN, Maputo

Begg, C.M. & Begg, K.S. 2007c. Trophy monitoring in Niassa National Reserve, Mozambique, Lion, leopard, Buffalo, Hippo and Crocodile. Unpublished report prepared for SRN, Maputo

Begg, C.M., Begg, K.S. & Muemedi, O. 2007d. Preliminary data on human-carnivore conflict in Niassa National Reserve, Mozambique, particularly fatalities due to lion, spotted hyaena and crocodile. Unpublished report prepared for SRN, Maputo.

8.0. Selected References

Cunliffe, R., Serra, A., Manual, J., Nandja, B, and Rigava, N. 2005. An assessment of the Negomano Community, Niassa Reserve, October 2004. Unpublished Report prepared for SRN, Maputo.

Stuart-Hill, G., Diggle. R., Munali, B., Tagg, J. & Ward, D. 2005. The Event Book System: a community based natural resource monitoring system from Namibia. Biodiversity & Conservation **14**:2611-2631.

Timberlake, J., Golding, J. & Clarke, P. 2004. Niassa Botanical Expedition, June 2003. Unpublished report prepared for SRN, Maputo