



Niassa Lion Project

ANNUAL REPORT 2011



TWO OF THREE CUBS BORN DURING 2011 IN THE STUDY AREA

In collaboration with:



RESUMO EXECUTIVO

Desde 2003, o Projecto Carnívoros no Niassa (NCP) tem estado a trabalhar na Reserva Nacional do Niassa (NNR) com enfoque sobre a conservação de carnívoros. A nossa missão é de garantir a presença de leões e outros carnívoros de grande porte na NNR, ao promover a coexistência entre os carnívoros e as pessoas, e ao mitigar directamente as ameaçadas induzidas pelos seres humanos. Trabalhamos em estreita colaboração com a autoridade de gestão Moçambicana (SRN), com as comunidades locais e outros parceiros de conservação. Os carnívoros de grande porte figuram entre as espécies mais difíceis de conservar e a necessidade de soluções práticas, de base e geradas localmente nunca foi tão importante, uma vez que as populações de carnívoros continuam em declínio em todo o mundo. Actualmente, os leões estão classificados como vulneráveis pelo IUCN, com uma tendência de declínio populacional e os especialistas estimam que a dimensão da população seja inferior a **40 000** com um intervalo estimado entre 23 000 a 39 000. Em África, somente seis zonas de conservação do leão apoiam actualmente 1000 leões, estes são os redutos para a conservação de leões, e a Reserva do Niassa é uma delas. Além disso, o Niassa apoia pelo menos 350 cães selvagens africanos e crê-se que esta população, com as suas ligações à Reserva de Caça de Selous, através do Corredor de Fauna Bravia Selous Niassa, seja a segunda maior população de cães selvagens restante no mundo.

Os carnívoros de grande porte actuam como indicadores preciosos do estado da NNR como um todo. A sua posição no topo da cadeia alimentar, grande alcance e necessidades de presas, densidade populacional relativamente reduzida e sensibilidade ao conflito entre seres humanos e fauna bravia torna-os num barómetro ou indicador da “saúde” da NNR. Garantir os carnívoros de grande porte irá garantir de grande forma a própria NNR com todo o valor que traz para a conservação da biodiversidade. No entanto, os custos para as comunidades que vivem com os carnívoros podem ser consideráveis através da perda de vidas e gado devido a ataques de carnívoros. A mitigação destes conflitos deve ser uma prioridade. Um declínio nos carnívoros de grande porte também pode resultar em subsequente perda de potenciais receitas resultantes do turismo para a gestão da conservação e comunidades. Pragmaticamente, estas receitas são cruciais não só para apoiar a gestão da conservação, tal como o combate à caça furtiva, mas também para oferecer benefícios e incentivos reais resultantes da conservação para as 40 comunidades (35000 pessoas) que vivem dentro da zona protegida.

O NCP tem uma abordagem de investigação e monitoria com quatro vertentes; envolvimento, ensino e orientação comunitária e mitigação directa das ameaças. As grandes metas para 2011 foram a) consolidar aquilo que aprendemos, disseminar as nossas constatações e concluir os projectos em aberto e b) desenvolver e garantir a Fase II do Projecto Carnívoros Niassa (2012-2016). A este respeito, a SRN concluiu um relatório técnico com uma análise mais detalhada dos dados de investigação como precursor da publicação de dados em revistas científicas da área. Em 2011, foram distribuídos 865 dos livros de histórias sobre Conservação no Niassa em 42 escolas de 39 aldeias nos Distritos de Mecula, Mavago e Mueda dentro da NNR, juntamente com as orientações para os professores. Além disso, foram distribuídos e afixados mais de 100 posters de “Comportamento Seguro” em unidades sanitárias e escolas de 34 aldeias. O Kit de Ferramentas para o Conflito entre Seres Humanos e Leões, um manual prático com pormenores sobre formas de reduzir o conflito com leões, foi concluído e distribuído a projectos em toda a região.

A monitoria de longo prazo da população de leões na zona de estudo intensivo continuou. A densidade de leões tem estado estável ao longo dos últimos 6 anos com 2-3 leões/100 km², mas não aumentou e houve uma mortalidade significativa e rotatividade nos machos, sugerindo imigração e não

recrutamento. Em 2011, foram vistas duas fêmeas com crias novas (3 crias + 2 crias). Esta é a primeira vez, desde 2006, que se viram crias na zona de estudo intensivo. Em 2011, foram imobilizados dez leões para colocação de coleiras em novos indivíduos na zona (5) ou substituição das coleiras (5) e, pela primeira vez, foram colocadas duas coleiras satélite nos machos para avaliar melhor os seus movimentos e relação com as manadas de búfalos com coleiras de satélite na zona, em colaboração com o projecto de búfalos da NNR. Um destes leões com coleira foi morto numa armadilha para búfalos.

O programa de monitoria comunitária iniciado em 2006 pela SRN continua a ser apoiado pelo NCP. Em Novembro teve lugar o 6º seminário anual de formação para monitores comunitários. Em 2011, uma mulher foi morta e um homem ferido num ataque de leão em Mavago, o leão foi destruído. Além disso, os monitores comunitários reportaram 29 incidentes de carnívoros a levarem animais domésticos, com 14 incidentes com leopardos (primariamente galinhas, quatro cabras), 11 incidentes com hienas (4 cabras, 5 galinhas e 1 pato) e 2 incidentes com leões (galinhas e patos). Um levantamento de caprinos e currais de caprinos nas aldeias do distrito de Mecula revelou que embora 87% dos 158 donos de cabras inquiridos estavam a utilizar um curral para caprinos, somente 26% dos currais de caprinos usados era à prova de predadores, 27% dos currais eram completamente ineficazes e 48% seriam eficazes com poucas modificações no telhado e porta. A maioria dos currais estava construída para guardar os caprinos e não para impedir a entrada de carnívoros. Foram identificados três tipos de currais eficazes contra ataques de leões e leopardos. Continuamos a disseminar o programa de “cercas vivas” para reduzir o contacto entre as pessoas e leões, em colaboração com a equipa de direcção da NNR. As três vedações experimentais na aldeia de Mbamba foram monitorizadas e mantidas, e tiveram lugar quatro reuniões com a comunidade. Um avanço importante foi a decisão da comunidade em plantar a “cerca viva” de Mbamba como uma vedação em redor dos campos da aldeia de Mbamba (dentro da defeituosa vedação contra elefantes) em vez de plantar vedações individuais em redor de cada machamba. Esta decisão é apoiada pelas equipas de gestão do NCP e da NCP, uma vez que se espera que esta vedação física desencoraje os agricultores a abrirem novas machambas na floresta circundante.

O NCP acredita que o envolvimento, extensão e ensino da comunidade são partes essenciais do programa de conservação. Em 2011, o NCP contratou um agente de extensão a tempo inteiro proveniente da Aldeia de Mecula. A equipa de extensão visitou todas as aldeias dentro da NNR, com visitas de seguimento a aldeias no distrito de Mecula para fornecer informação sobre comportamentos seguros, auxiliar na construção de currais eficazes para caprinos e realização de inquéritos. Este ano, o NCP organizou dois grupos escolares no nosso acampamento de campo para actividades de dois dias e uma noite: o Clube de Fauna Bravia de Mecula (4 professores, 5 crianças) e Escola de Mbamba (4 professores, 5 crianças). Para todas estas crianças e adultos, foi a primeira vez que subiram em inselbergs, que viram um leão e interagiram com a fauna bravia de forma positiva. Estas viagens reconfirmaram a nossa opinião de que desenvolver uma relação positiva entre a zona protegida e os residentes da NNR, longe do stress da vida da aldeia e do conflito entre seres humanos e fauna bravia é essencial para os esforços de conservação terem êxito. A 3ª edição dos Dias de Diversão Anual para Conservação de Leões teve lugar na aldeia de Mbamba no princípio de Novembro, em colaboração com Paula Ferro (concessão Luwire), Zoológico de Houston e professores da escola de Mbamba. Também participaram neste evento professores vindos do distrito de Mecula juntamente com o pessoal da SRN. Os pontos mais altos foram as três peças, altamente eficazes, apresentadas pelas crianças da escola de Mbamba à sua comunidade para ilustrar is comportamentos seguros, efeitos do fogo e importância da devolução das coleiras ao NCP. Como reacção directa aos dias de diversão para o Leão em Mbamba,

uma coleira de um leão apanhado numa armadilha em 2009 que tinha sido escondida na casa de uma pessoa foi devolvida ao NCP e todos os dados GPS armazenados dentro foram recuperados.

A monitoria e mitigação das ameaças aos carnívoros continuam a ser um enfoque do NCP. As armadilhas para obtenção de carne de caça são a maior ameaça para os leões e outros carnívoros de grande porte na NNR. As armadilhas largas e de cabos são utilizados pelos aldeãos para fornecer carne e rendimento para os caçadores locais. Estas armadilhas não só reduzem as presas para o leão como também apanham leões e outros carnívoros. Quanto sabemos, entre 2005 e 2011 (7 anos) no todo morreram ou desapareceram 27 leões da zona de estudo intensivo de somente 800 km². cremos que um mínimo de 52% foi morto por armadilhas. Em 2011, mais dois leões machos com coleira foram mortos em armadilhas (as duas coleiras foram recuperadas), um leão foi ferido numa armadilha, mas sobreviveu e uma cria de 8 meses foi morta por infanticídio durante um ataque para controlar a alcateia depois de o macho adulto ter sido morto numa armadilha. Pela primeira vez uma comunidade na Reserva do Niassa reportou um leão vivo numa armadilha e o leão foi imobilizado, num esforço coordenado entre a direcção da SRN, o NCP e a concessão do Luwire, a armadilha foi removida e o leão libertado com êxito e revisto dias mais tarde.

Através de um extenso inquérito a 34 aldeias (1200 entrevistas), obtivemos uma melhor compreensão do consumo de carne de caça. A maioria das pessoas entrevistadas tinha comido feijão (88%) e peixe (86%) pelo menos uma vez uma vez na última semana. Quase metade dos entrevistados tinha comido carne de caça (47%) e ovos (44%), enquanto menos de 40% dos entrevistados tinha comido galinha-do-mato, galinha ou cabrito. Em média, come-se peixe e feijão cerca de 3 vezes por semana enquanto a carne de caça é consumida 1,1 vezes por semana (0-4) similar ao consumo de galinha. Na Reserva do Niassa come-se por semana um mínimo de 1700kg de carne.

A potencial ameaça de doenças continua a ser uma preocupação. Foram retiradas mais 15 amostras de sangue de leões imobilizados e envidas para Onderstepoort para análise e despiste de doenças (36 amostras no todo até a data). Estas amostras foram testadas para despiste da cinomose canina, parvovírus canino, calcivírus felino e vírus carona felino. Todos os testes foram negativos. No entanto, um inquérito aos cães domésticos revelou que o número de cães domésticos dentro da NNR aumentou de 144 em 2006, para 583 em 2011. Em 2006, constatou-se a presença de cães domésticos em 16 aldeias, mas em 2011, foram registadas 28 aldeias com cães. Mais seis aldeias tinham poucos cães em 2010, mas estes foram mortos por carnívoros ou por doença. Estes cães não são vacinados e dados os elevados níveis de contacto entre os carnívoros e os cães domésticos nas aldeias, o potencial de surtos de doenças está a aumentar. Continuamos a motivar a gestão destes cães domésticos através de vacinação ou esterilização.

A monitoria independente de todos os carnívoros de grande porte caçados para troféus continuou. Em 2011, foram levados 20 leopardos como troféus com 75% dos troféus de caça desportiva entre 3-4 anos de idade calculada através do desgaste dos dentes. Estes leopardos provavelmente tinham 4 anos de idade com lascas visíveis nas arestas do esmalte e somente dois leopardos tinham mais de 4 anos de idade com desgaste óbvio em todos os dentes. Além disso, oito leões foram levados como troféus. Em 2011, atingimos a nossa meta de menos de 20% dos troféus de leão com menos de 6 anos de idade, com 87,5% dos troféus considerados aceitáveis. Desde 2006 nenhum leão com menos de 4 anos de idade foi levado como troféu. Os operadores e a SRN foram felicitados pelos seus esforços. Esta continua a ser uma das poucas zonas em África onde o mínimo de seis anos de idade é aplicado rigorosamente.

Embora estejamos a fazer progressos, os leões e outros carnívoros actualmente não estão em segurança na NNR, estão a ameaçar as ameaças e a mortalidade combinada e a retirada ilegal não são sustentáveis. Continuamos profundamente empenhados em apoiar a conservação dos carnívoros na Reserva do Niassa e Moçambique, em colaboração com a autoridade moçambicana de gestão da reserva (SRN) e o Ministério do Turismo. Consideramos a NNR como uma das zonas protegidas mais significativas restantes em África e a zona protegida mais importante em Moçambique. Acreditamos que estamos a fazer progressos e pretendemos continuar com os nossos esforços de conservação na NNR, em colaboração com as autoridades moçambicanas e as comunidades locais. O enfoque da próxima fase do Projecto Carnívoros no Niassa será investigar e testar formas para reduzir o uso de armadilhas para carne de caça, através do desenvolvimento de meios de subsistência alternativos para os caçadores locais e formação em habilidades, desenvolvimento de fontes de proteína alternativas e aplicação da lei. As nossas iniciativas em curso para “cercas vivas” e abrigos seguros, e de monitoria das ameaças por doença, caça desportiva e densidades de carnívoros continuará em colaboração com a autoridade de gestão da NNR. No âmbito do nosso compromisso com a conservação na NNR, temos a felicidade de ter sido atribuída ao Ratel Trust (TRT) a proposta de concessão para L5-Sul, a zona de estudo intensivo do NCP desde 2003. Esperamos avançar em 2012 com a construção de um Centro de Ambiental e de Formação Vocacional para os residentes do Niassa, testar e implementar soluções para as armadilhas para carne de caça em colaboração com a comunidade de Mbamba (o nosso parceiro legal nesta concessão) e a equipa de direcção da NNR. Continuamos convencidos de que o ensino ambiental e uma formação vocacional localmente relevantes sejam uma prioridade tanto para adultos como crianças no Niassa para garantir que a conservação ofereça benefícios tangíveis aos residentes do Niassa enquanto oferece soluções para o conflito entre os seres humanos e os carnívoros.

EXECUTIVE SUMMARY

The Niassa Carnivore Project (NCP) has been working in Niassa National Reserve (NNR) since 2003 with a focus on carnivore conservation. Our mission is to secure lions and other large carnivores in NNR by promoting coexistence between carnivores and people and directly mitigating human induced threats. We work in close collaboration with the Mozambican management authority (SRN), local communities and other conservation partners. Large carnivores are among the most difficult species to conserve and the need for practical, locally derived grass roots solutions has never been higher as carnivore populations continue to decline across the world. Lions are now classified by the IUCN as vulnerable with a declining population trend and experts estimate the population size as **less than 40 000** with an estimated range of 23 000 to 39 000. Only six lion conservation areas in Africa currently support more than 1000 lions, these are the strongholds for lion conservation and Niassa Reserve is one of them. In addition, Niassa supports at least 350 African wild dogs and this population, with its linkages to the Selous Game Reserve through the Selous Niassa Wildlife Corridor is believed to be the second largest wild dog population left in the world.

The large carnivores act as valuable indicators of the status of NNR as a whole. Their position at the top of the food chain, large range and prey requirements, relatively low population densities and sensitivity to human - wildlife conflict make them a barometer or indicator of the “health” of the NNR. Securing the large carnivores will go a long way to securing NNR itself with all the value this brings to biodiversity conservation. However, the costs to communities living with carnivores can be considerable through the loss of life and livestock due to carnivore attacks. The mitigation of these conflicts must be a priority. A decline in the large carnivores may also result in a subsequent loss of potential revenues for conservation management and communities from tourism. Pragmatically, these revenues are critical not only to support conservation management such as anti-poaching but also to provide real benefits and incentives from conservation for the 40 communities (35000 people) living inside the protected area.

NCP has a four-pronged approach of research and monitoring; outreach and education, mentoring and training and direct mitigation of threats. The broad goals for 2011 were a) to consolidate what we had learned, disseminate our findings and complete outstanding projects and b) to develop and secure Phase III of the Niassa Carnivore project (2012-2016). In this regard, a technical report with more detailed analysis of research data has been completed for SRN as the precursor to publishing the data in peer reviewed journals. In 2011, 865 of the Niassa Conservation storybooks were distributed to 42 schools across 39 villages in the Mecula, Mavago and Mueda Districts inside the NNR, along with teacher guidelines. In addition more than 100 “Safe behavior” posters have been distributed and displayed in 34 villages at clinics and schools. The Human-Lion Conflict Toolkit, a practical manual with details of ways to reduce conflict with lions, was completed and distributed to projects throughout the region.

Long term monitoring of the lion population in the intensive study area continued. The lion density has been stable over the past 6 years at 2-3 lions / 100 km² but has not increased and there has been significant mortality and turnover in males suggesting immigration not recruitment. In 2011, two females were seen with new cubs (3 cubs + 2 cubs). This is the first time cubs have been seen in the intensive study area since 2006. In 2011, ten lions were immobilized either for collaring of new individuals in the area (5) or replacement of collars (5) and for the first time two satellite collars were placed on males to better assess their movements and relationship with satellite collared buffalo herds in the area, in collaboration with the NNR buffalo project. One of these collared lions has already been killed in a buffalo snare.

The community monitoring program initiated in 2006 by SRN continues to be supported by NCP. The 6th Annual training workshop for the Community monitors was held in November. In 2011, a woman was killed and a man injured in a lion attack in Mavago, the lion was destroyed. In addition, community monitors reported 29 incidents of carnivores taking domestic livestock, with 14 leopard incidents (primarily chickens, four goats), 11 hyaena incidents (4 goats, 5 chickens and 1 duck) and 2 lion incidents (chickens and ducks). A survey of goats and goat corrals in villages in the Mecula district revealed that while 87% of the 158 goat owners surveyed were using a goat corral only 26% of the goat corrals being used were predator proof, 27% of the corrals were completely ineffective and 48% would be effective with a few modifications to the roof and door. Most of the goat corrals are built to keep goats in but not to keep carnivores out. Three corral designs have been identified as effective against lion and leopard attacks. We continued to scale up the “living fences” program to reduce contact between people and lions in collaboration with NNR management team. The three experimental fences in Mbamba village were monitored and maintained and four community meetings were held. An important development was the community decision to plant the Mbamba “living fence” as a boundary fence around the entire Mbamba village fields (inside the defective elephant fence) rather than planting individual fences around each field. This decision is supported by NCP and NNR management teams as it is hoped that this physical boundary will deter farmers from cutting new fields in the surrounding woodland.

NCP believes that community outreach, extension and education are essential parts of the conservation program. In 2011, NCP hired a full time extension officer from Mecula Village. The extension team visited all villages inside NNR, with repeat visits to villages in the Mecula district to provide information on safe behaviors, assisting with building effective goat corrals and doing surveys. NCP hosted two school groups in our field camp this year for one night and two days of activities: the Mecula Wildlife Club (4 teachers, 5 children) and Mbamba School (4 teachers, 5 children). For all these children and adults it was the first time they had climbed an inselbergs, seen a lion and interacted with wildlife in a positive way. These trips reaffirmed our view that developing a positive relationship between the protected area and NNR residents away from the stress of village life and human-wildlife conflict is essential if conservation efforts are to be successful. The 3rd Annual Lion Conservation Fun days were held in Mbamba village in early November in collaboration with Paula Ferro (Luwire concession), the Houston Zoo and the Mbamba school teachers. Visiting teachers from the Mecula district also attended this event along with SRN staff. The highlights were the three, highly effective plays put on by the Mbamba school children for their community illustrating safe behaviors, effects of fire and importance of returning collars to NCP. As a direct response to the Mbamba Lion Fun days, a collar from a lion snared in 2009 that had been hidden in someone’s house was returned to NCP and all the GPS data stored on board were recovered.

Direct monitoring and mitigation of threats to carnivores remain a focus of NCP. Bushmeat snaring is the single biggest threat to lions and other large carnivores in NNR. Wire and cable snares are used to provide meat for villagers and income for local hunters. These snares not only reduce lion prey but lions and other carnivores are caught as by catch. In total, 27 known lions have died or disappeared from the intensive study area of only 800 km² between 2005 and 2011 (7 years). A minimum of 52% are believed to have been killed by snares. In 2011, two more radio collared male lions were killed in snares (both collars recovered), one lion was injured in a snare but survived and an 8 month old cub was killed by infanticide during a pride take over after the adult male was killed in a snare. For the first time a community in Niassa Reserve reported a live lion in a snare and in a coordinated effort between SRN management, NCP and the Luwire concession, the lion was immobilised, the snare was removed and the lion was successfully released and re-sighted days later.

Through an extensive survey of 34 villages (1200 interviews), we gained a better understanding of bushmeat consumption. The majority of people interviewed had eaten beans (88%) and fish (86%) at least once in the past week. Nearly half of those interviewed had eaten bushmeat (47%) and eggs (44%), while less than 40% of those interviewed had eaten guinea-fowl, chicken or goats. On average, fish and beans were both eaten about 3 times a week while bushmeat was consumed 1.1 times a week (0-4) similar to the consumption of chickens. A minimum of 1700kg of meat is eaten each week in Niassa Reserve.

The potential disease threat remains a concern. A further 15 blood samples were taken from immobilized lions and sent to Onderstepoort for disease analysis (36 samples in total to date). These samples were tested for canine distemper, canine parvovirus, feline calcivirus, and feline corona virus. All tests again came back negative. However, a domestic dog survey revealed that the number of domestic dogs inside NNR has increased from 144 in 2006, to 583 in 2011. In 2006, 16 villages were found to contain domestic dogs, but by 2011, 28 villages were recorded to have dogs. Six additional villages had a few dogs in 2010 but they died from carnivores or disease. These dogs are not vaccinated and given the high levels of contact between carnivores and domestic dogs in the villages, the potential for a disease outbreak is increasing. We continue to motivate for management of these domestic dogs either through vaccination or sterilization. Independent monitoring of all large carnivore sport hunted trophies continued. In 2011, 20 leopards were taken as trophies with 75% of the sport hunted trophies between 3-4 years of age from tooth wear. There leopards were likely to be 4 years old with noticeable chipping on the enamel ridge and only two leopards were older than 4 years of age with obvious wear on all teeth. In addition, eight lions were taken as trophies. In 2011, we reached our target of less than 20% of lion trophies to be under the age of 6 years, with 87.5 % of the trophies considered acceptable. No lions under the age of 4 have been taken as trophies since 2006. Operators and SRN are to be commended for their efforts. This remains one of the few areas in Africa where the six year age minimum is rigorously enforced.

While we are making progress, lions and other carnivores are not secure in NNR at present, threats are increasing and combined mortality from legal and illegal off-take is not sustainable. We remain deeply committed to supporting the conservation of carnivores in Niassa Reserve and Mozambique in collaboration with the Mozambican reserve management authority (SRN) and the Ministry of Tourism. We consider NNR to be one of the most significant protected areas left in Africa, and the most important protected area in Mozambique. We believe we are making progress and intend to continue with our conservation efforts in NNR in collaboration with Mozambican authorities and local communities. The focus of the next phase of the Niassa Carnivore Project will be to investigate and test ways to reduce bushmeat snaring through developing alternative livelihoods for local hunters and skills training, development of alternative protein sources and law enforcement. Our ongoing “living fences” and safe shelters initiatives, and monitoring of disease threats, sport hunting and carnivore densities will continue in collaboration with the NNR management authority. As part of our commitment to conservation in NNR, we are delighted that The Ratel Trust (TRT) was awarded the concession tender for L5-South, NCPs intensive study area since 2003. We hope to move forward in 2012 with the building of an Environmental and Skills training Centre for Niassa residents, testing and implementing solutions to bushmeat snaring in collaboration with the Mbamba community (our proposed legal partners in this concession) and the NNR management team and continuing with our other programs.

OVERVIEW OF MAIN ACHIEVEMENTS AND ACTIVITIES (2003-2011)

1. Completion of the first biodiversity survey of Niassa carnivores with 24 carnivore species identified, including a viable but relatively low population of lions (2003).
2. Lions identified as a research and conservation priority for NNR by SRN (the management authority of NNR; 2004) and NNR is identified as a priority Lion Conservation Area in Southern and eastern Africa (IUCN Cat Specialist Group 2006) on the basis of data provided by the Niassa Lion Project.
3. NCP collaborates with National Government on the development of a National Lion Conservation Strategy and Action Plan (2009) based on survey of the status of lions in Mozambique (2008) and National Wild dog and Cheetah Action Plan.
4. Human-lion Conflict Toolkit detailing more than 30 practical solutions to reduce conflict is produced and distributed to all lion projects in the region by NCP and Rufigi Man-eating project (2010-2011) based on collaborative workshop funded by NCP for 10 conservation projects and 18 fieldworkers and researchers.
5. In collaboration with SRN, a community scout program (MOMS/ SMOG) is initiated in 2006 to monitor human wildlife conflict and status of special species. The community monitor team now consists of 19 monitors from 17 villages and is funded and mentored by NCP but managed by SRN. A three year strategy for further development of the SMOG system was completed by NCP (2009).
6. Niassa Lion sport hunting regulations are developed by the Niassa Carnivore Project and implemented in collaboration with SRN and Niassa tourism operators (2006). This system includes a points system for assigning quotas based on lion age. Niassa Reserve becomes the only sport hunted area in Africa where a mandatory six year age limit for lion trophies is strictly enforced and receives the Markhor Award from CIC (2008) in part due to the lion regulations and points system. Since the Points system and monitoring was instituted the percentage of underage lions taken as trophies has reduced from 62% to 14% with no lions under the age of four taken since 2006.
7. A two morning festival of conservation games and activities in Mbamba village was initiated in 2009. The Lion Conservation Fun days have now become a highly successful annual event run by NCP in partnership with the Houston Zoo, Mbamba teachers, and Paula Ferro. They consist of two mornings of races, games and craft activities with conservation theme. The aims are to engage children in conservation, build tolerance through knowledge, and make conservation fun. In future visiting school and teacher groups from other villages will also attend.
8. The first and only Wildlife Club was initiated by two teachers in Mecula Village and NCP were asked to be the patrons. Activities include field visits to NCP and Mbatamila HQ, DVD documentary film evenings, spreading information on human wildlife conflict and solutions, sale of a leopard calendar.

9. A detailed questionnaire survey of lion attacks on humans and livestock in NNR was completed detailing 89 lion attacks on people between 1970 and 2010. These data allowed us to assess the main risk factors for lion attacks (sleeping outside, walking alone at night) and to design and implement targeted education materials including a Safe behaviours poster that has been distributed to schools and clinic inside NNR, as well as to protected areas across Mozambique with the support of the Ministry of Tourism.
10. Targeted research provides long term monitoring of the status and density of lions, spotted hyaenas and leopards in NNR (2005-2011) call-up and camera trapping surveys and individual recognition in intensive study area. This information is provided to the NNR management authority. NNR is the only protected area in Mozambique where this type of information is available. The lion population in Niassa Reserve shows an increasing trend between 2005 (693(577-810) and 2008 (871 (730-1013).
11. The Niassa conservation storybook commissioned by NCP, and written and illustrated by Afra Kingdon (2010). It is a fictional story that through the adventures of a small village girl touches on many of the many conservation challenges facing Niassa Reserve. Issues to be targeted in the story were identified by NCP, SRN and Niassa teachers and include human-carnivore conflict, disease from domestic dog, fire, safe behaviours safe shelters, and snaring. In 2011, 900 copies were distributed to all schools inside NNR after three teacher meetings and with teacher guidelines.
12. Traditional bamboo and log fences are tested as successful at reducing bush pig and warthog incursions into machambas but labour intensive to implement. *Commiphora africana* is identified as an effective “living fence” alternative that will reduce bushpig and warthog damage and at the same time reduce attraction of lions into fields. Test fences are planted in Mbamba village (2009) with new fences planted in an additional four villages in collaboration with NNR management team and traditional leaders. The Mbamba community decides to plant the “living fence as a perimeter fence around their mashambas in partnership with NCP and four traditional chiefs.
13. Ongoing serological (disease) analysis from lion blood samples monitors the disease threat. To date 36 lions have been tested and currently all tests are negative for canine distemper, canine parvovirus, feline calicivirus, and Corona virus. NCP conducts a regular survey of domestic dogs by visiting all villages in NNR (2006, 2007, 2011), has supported to two vaccination campaigns (2007, 2008) and development of a strategy for NNR management authority (canine distemper, rabies) (2009) in collaboration with Dr Rui Branco. Increasing numbers of domestic dogs in NNR remain a conservation concern.
14. NCP Research identifies bushmeat snaring as a major threat to lions and other carnivores in NNR based on data collected on lion mortality, hunting activity, meat preference and bushmeat consumption. Data suggests that more than 2.5 tons of bushmeat are being eaten each week inside NNR (2011) and an estimated 40 lions at least killed and injured in snares each year.

Potential solutions are identified that include provision of increased domestic meat protein and alternative income for local hunters.

- 15.** NLP has provided 10 GPS units, 2 computers, 1 scanner, 2 cameras, 2 binoculars, predator call up system, predator cages and solar equipment worth \$130 000 (through WCN Solar project) to SRN to support conservation in Niassa Reserve.
- 16.** Agostinho Jorge, interned for two season with NCP team, and co-supervised by C. Begg is completing his MSc degree at Kwazulu-Natal University (2012) on the costs and benefits of leopard off-take (legal and illegal) and density.
- 17.** Our team consists entirely of 7 local staff from Niassa villages, who receive on the job training in radio tracking, data entry, GPS use etc. Three have obtained drivers licenses and one is completing a computer course. All have received on the job training in GPS use, data collection, radio tracking, logistics, communications, community outreach etc.

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SECTION A: OVERVIEW AND METHODS

MISSION STATEMENT

The Niassa Carnivore Project serves to secure and conserve lions and other large carnivores (leopard, spotted hyaena and African wild dog) in Niassa National Reserve, northern Mozambique by promoting coexistence between carnivores and people and directly mitigating threats. We acknowledge the costs to Niassa communities who live with carnivores while recognizing the potential of these carnivores to provide substantial ecological, cultural and economic benefits to Niassa Reserve and Mozambique. This mission is being achieved through direct mitigation of threats particularly human-carnivore conflict, targeted pragmatic research to understand threats, development of locally based monitoring systems, mentorship and training of local conservationists and community outreach (education and awareness).

ADMINISTRATION AND COLLABORATION

The Niassa Carnivore Project is administered by The Ratel Trust, a conservation trust. We are in the process of setting up a local branch of the Ratel Trust in Mozambique to facilitate carnivore conservation in Mozambique. NCP does not work in isolation but believes strongly in collaboration. We support a small Mozambican field team and collaborate closely with the Management Authority of Niassa Reserve (SRN) and the National Government of Mozambique as well as with local communities and tourism operators (ecotourism and sport hunting) to complement existing conservation programs. NCP provides support for SRN activities that support carnivore conservation (community monitors, anti-poaching vaccination of domestic dogs) and runs its own research, monitoring and mitigation programs to complement SRN activities. Our goal is to support SRN conservation activities by providing data, financial support, equipment, mentoring, advice as well as active engagement on the ground.

PROJECT TEAM



Project Leaders:
Team

Colleen Begg & Keith Begg	
Euzebio Waiti	(Research and Monitoring)
Batista Amadi	(Research and monitoring)
Alberto Mussoma	(Camp cook, guard and supplies)
Pedro Sandali	(radio communication, camp, monitoring)
Oscar Muemedi	(Extension and outreach)
Joaquim Aussi	(Extension and outreach)
Francisco Laini	(apprentice- all aspects)



PROJECT OBJECTIVES (2007-2011)

NCP has a holistic approach to conservation that includes, research and monitoring, education and outreach, direct mitigation of threats and mentorship and training, these are reflected in our nine objectives for Phase II (2007-2011). A detailed report on research data is provided in a Technical report (2007-2011).

- Use targeted research and surveying to understand and monitor large carnivore status, density, movement patterns, and prey.
- Examine the local contexts of large carnivore attacks and identify and implement practical solutions to human-carnivore conflict to reduce loss of human life and livelihoods and retaliatory killing throughout NNR and Mozambique with the active participation of local communities.
- Assess inadvertent snaring and bush-meat consumption to understand level of lion off take and identify possible solutions and areas for further research added as an objective in 2009).
- Assess the levels of disease risk (canine distemper, rabies, canine parvovirus) to carnivores (particularly African wild dogs and lions) through analysis of blood samples and advise SRN on management of the domestic dog population.
- Facilitate the extension of the MOMS (Management orientated monitoring system) community-monitoring program in collaboration with SRN to provide ongoing assessment of human-carnivore conflict and status of special species with 80% coverage of the NNR villages and to ensure local communities are engaged in carnivore conservation (see Annual reports, Jorge and Begg 2009).
- Assist SRN with the development and implementation of sport hunting guidelines and trophy monitoring systems for lion and leopard to ensure sustainable sport hunting (Technical report - summarised results of Points system).
- Initiate environmental education and extension work in Niassa communities to build a relationship between wildlife and people based on accurate ecological information and successful mitigation methods (Annual report))
- Facilitate sustainable and consistent monitoring by providing appropriate training, mentorship, equipment and detailed surveying and monitoring protocols to SRN (the management authority of NNR) (Annual reports and DVD of questionnaires)
- Disseminate the findings, mitigation strategies and protocols to inform broader national and regional carnivore conservation strategies wherever possible (Annual reports)

OVER VIEW OF PROJECT PROGRAMS

NCP has a four-pronged approach of research and monitoring; outreach and education, mentoring and training and direct mitigation of threats.

TARGETED PRAGMATIC RESEARCH AND MONITORING

Sound scientific research underpins all our activities, as we believe that only with a good local understanding of the issues can effective conservation be achieved. However it is not our intention to do in-depth ecological studies of lions, leopards, wild dogs or spotted hyaena in Niassa. Large carnivores, particularly lions have been extensively studied in a wide variety of habitats across their range. Through collaboration with the African Lion Working Group, IUCN Cat Specialist Group and IUCN Canid specialist group as well as through a wide network of colleagues and scientific papers we are able to utilise data collected elsewhere and apply it in Niassa. We are happy to mentor, advise and facilitate post graduate ecological research on large carnivores in NNR (by Mozambican post graduates) if SRN deems this a priority and will assist with funding if this is directly related to mitigation of threats.

At present NCPs research is specifically targeted at providing essential information needed to mitigate threats, providing baseline information against which the success of conservation activities can be measured and developing reliable indicators that can be used to sustainably monitor the carnivore populations over time. We know that there are many ecological and socio-ecological questions that can still be researched that would add to our knowledge of carnivore densities inside and outside NNR, population dynamics and ecological functioning but given the urgency of the situation in NNR we do not believe this should be NCPs focus at present. Action is needed now to secure the Niassa Reserve carnivore populations and indeed, Niassa itself

Our research and monitoring activities include:

- Radio-marking of selected lion and leopard in the intensive study area with a combination of GPS and VHF radio collars to understand mortality, visual aging cues, movement patterns, turnover, and density.
- Surveying domestic dog population inside NNR
- Remote camera trapping to determine relative densities and turnover of leopards in hunted and non-hunted areas and movements of animals around village fields.
- Call-up surveys to assess the trend in lion and hyaena numbers throughout NNR.
- Annual monitoring and assessment of all lion and leopard sport hunted trophies to assess aging cues, off take and trophy quality etc.
- Ongoing disease analysis from blood samples taken from wild carnivores.
- Analysis and monitoring of past and present human-carnivore conflict, bush-meat use, domestic livestock production.
- Testing of effectiveness of mitigating methods (educational materials, living fences, points system) through questionnaire surveys and comparison to baseline data.

DIRECT MITIGATION OF THREATS – FINDING AND IMPLEMENTING SOLUTIONS

Finding pragmatic locally based solutions to decrease threats to lions and other carnivores is the main focus of the project.

Current mitigation activities include:

- Development of visual aging cues for leopard and lion; determination of lion quotas based on trophy age.
- Direct improvement of goat corrals to make sure they are predator proof
- Promotion and education about safe behaviours and practical ways to prevent lion and leopard attacks.
- Planting of “living fences” to reduce incursions of warthogs and bush pigs into fields and Financial support for vaccination of domestic dogs to reduce disease threat
- Development of human- lion toolkit to assist managers with finding the right solution to reduce conflict.
- Building tolerance and good will for conservation efforts through extension work and community outreach.

Our future focus will be on mitigating bush meat snaring through developing alternative protein sources, alternative livelihoods and skills training. We remain committed to assisting NNR with the domestic dog threat should they require assistance with development of a vaccination program or other management strategy.

Table 1: Ranked threats to large carnivores in Niassa National Reserve – 2009. Note these are adjusted as more data is collected and mitigation measures are put in place

Threat	Ranking	Comments
Inadvertent snaring and poisoning	High	Snare set for meat and problem animals (bush pigs)
Targeted snaring for skin trade	Medium	Mainly for leopard, some lion
Human –Conflict / Retaliatory killing	Medium	Loss of life, injury and stock losses
Sport hunting of underage leopards	Medium	The majority of leopards taken as trophies are younger than 4 years
Disease – rabies and canine distemper	Medium	Potential threat due to 200-300 domestic dogs in NNR
Sport hunting of underage lions	Low	Potential threat if monitoring and SRN Lion regulations – Points System not upheld
Road casualties	Low	Particularly African wild dog
Traditional medicine	Low	All species, trade in lion bones needs to be monitored

ENVIRONMENTAL EDUCATION, AWARENESS AND COMMUNITY OUTREACH

Extension work, community outreach, environmental education and awareness are an essential part of reducing threats to carnivore in NNR. Environmental education is particularly important as it builds goodwill for conservation, disseminates information on solutions and knowledgeable people are more likely to tolerate carnivores, and behave in a way that reduces conflict. It also puts conservation in the hands of individuals and takes away the excuse “ we didn’t know” . However, NCP believes it must be developed with local participation and be locally relevant for it to be effective. It must not only focus on children but also the adults that are currently engaged in unsustainable activities. Our education and outreach activities include:

- Development of education materials to be used as additional resources by teachers i.e. Niassa Conservation storybook, workbook, posters etc
- Extension work and community meetings to promote and assist with mitigation measures
- Regular meetings with Mecula District teachers to spread information on human-carnivore conflict, ways to protect self.
- Rehabilitation of the Mbamba school
- Dissemination of information on Niassa, carnivores and NCP to a broader Mozambican and international audience through the e-newsletters, web pages, scientific papers, public presentations, film, photography and popular articles.

MENTORSHIP AND TRAINING

NCP provides training and mentorship to both NNR staff and local NCP staff. Our activities include:

- Identifying and training local villagers as field assistants (GPS use, driving skills, radio tracking, basic car maintenance, trapping etc)
- Mentoring and funding A. Jorge through his Masters degree.
- Providing financial support for NNR staff to attend training sessions, workshops, run sub projects wherever possible, training NNR on survey techniques (fishing, trophy monitoring, call-up).
- Providing SRN with equipment and skills needed to continue with monitoring activities (camera traps, GPS, computers, binoculars, call-up equipment, predator traps).

STUDY AREA

Surveying and monitoring of the status and threats to large carnivore populations in NNR and implementation of successful mitigation measures and outreach activities occurs throughout the protected area. Research on threats and testing of mitigation measures is focused in a study area (800 km² situated along the Lugenda River in concession block “L5-South. The study area borders two sport hunting concessions on the south bank of the Lugenda River (L8, L7) with ecotourism concessions to the west (L4) and east (L5-north). It includes Mbamba village, which supports approximately 2080 people (410 households). The southern boundary of the intensive study area is a 30 km stretch of the Lugenda River, which is the most intensively fished area along the 350 km of the Lugenda River contained within NNR. The river provides a critical protein and income source for several communities. The intensive study area therefore represents many of the larger challenges faced by NNR but it is not sport hunted.

SECTION B: 2011 PROGRESS AND ACTIVITIES

Please note this report does not provide in-depth analysis of results, this is simply a summary of progress and activities achieved in 2011. Further analysis of research results is provided in the Technical Report 2012.

OBJECTIVE 1: USE TARGETED RESEARCH AND SURVEYING TO INVESTIGATE, AND MONITOR LARGE CARNIVORE STATUS AND DENSITY.

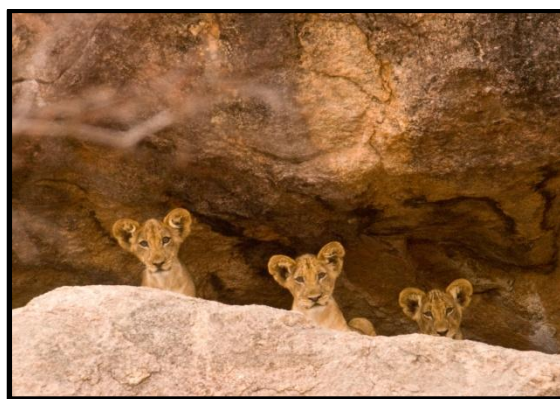
Radio-collaring and density

- The lions in the intensive study area (800 km²) have been monitored since 2005 using individual recognition of individuals (scars, freckle patterns) and wherever possible radio collars.
- Lion density is calculated each year as the total number of adult lions per 100 km² of the study area in November of that year as there is substantial turnover during the year with immigration of new individuals and deaths of residents in snares. The adult lion population in the intensive study area has been stable over the past 6 years at 2-3 lions / 100 km² but has not increased and there has been significant mortality and turnover in males suggesting immigration not recruitment (See Technical report, 2012). The sex ratio in the intensive study area is approximately 1 male: 1.6 females.
- Two females were seen with new cubs (3 cubs + 2 cub). This is the first time cubs have been seen in the intensive study area since 2006. Two of the cubs were born to a four and a half year old female in the F-Pride (LICF03) that was born in 2006. The two cubs were born in November/December 2010 at the start of the wet season but were only visually seen in 2011.
- In June 2011, two new males moved into the study area and became the new pride males for the F-pride. The previous male was killed in a snare in 2010. A paw from a cub was found and we believe that one of the cubs was killed during the takeover. The second male cub is doing well.



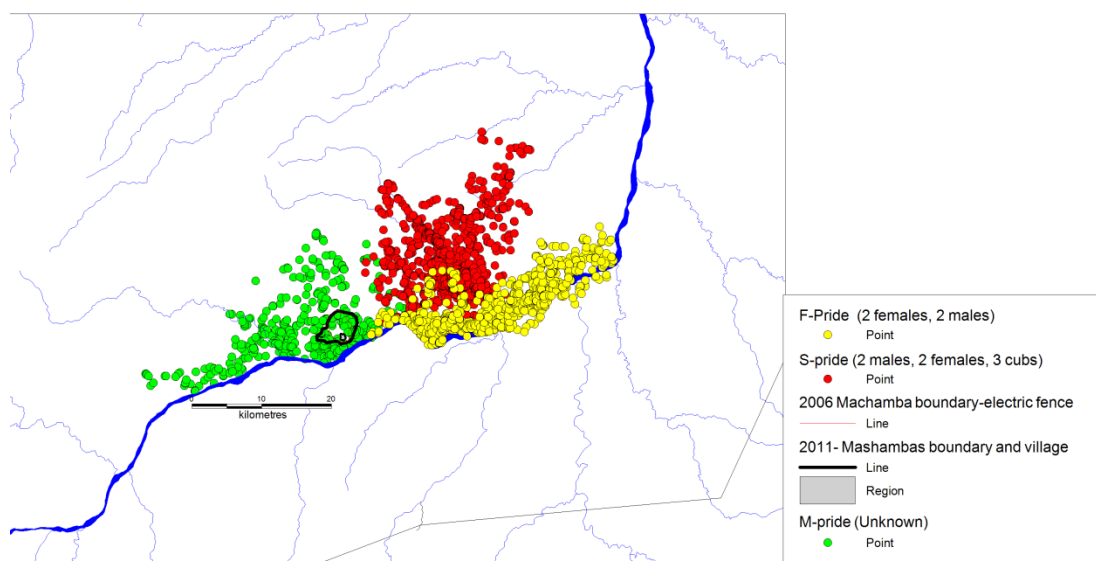
Paw of an 8 month old cub found in the open. No carcass was ever found. We assume this was infanticide.

- Three cubs were born to a newly collared young female in the S-pride (two females, 2 males), these were first seen in September 2011 and they will be closely monitored.



Four cubs in the intensive study area, born to females in two different prides.

- In 2011, 10 lions were immobilized either for collaring of new individuals in the area (5) or replacement of collars (5). For all lions in the intensive study area the Lugenda River is a territorial boundary although they do cross on accession on the late dry season.



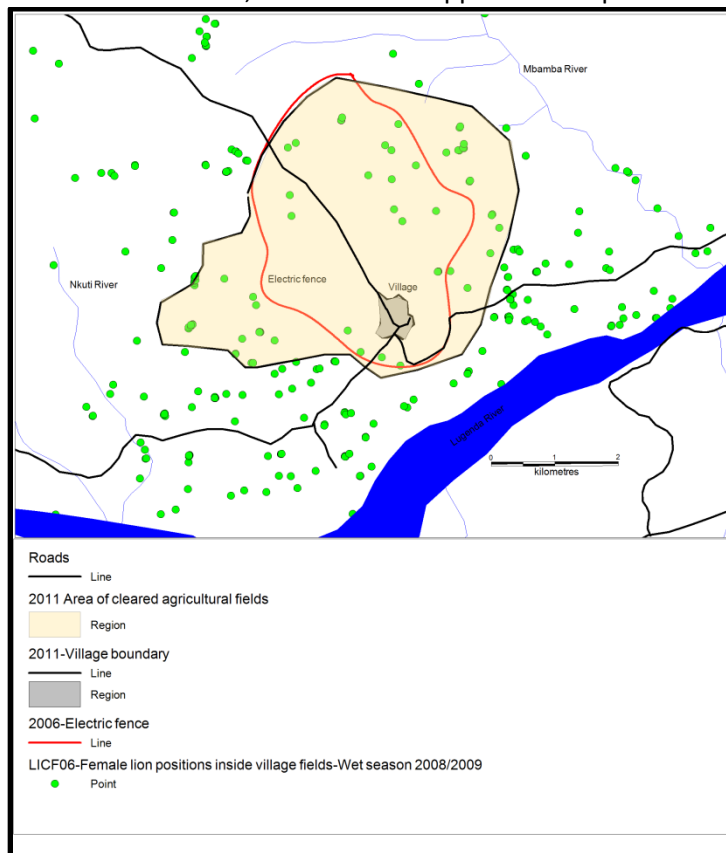
Positions of individuals in three prides in the intensive study area along the Lugenda River in L5-South. Pride composition varies from year to year as many individuals are snared and turnover is high.

- The data from the M-pride is from 2009 (recently recovered from a collar) while the data for the other two prides is up until 2011. We currently do not have any individuals in the M-pride collared as 2 collared individuals in this pride (1 female, 1 male) have been snared and 2 collared individuals have disappeared and are believed to be dead.
- Movement patterns and home ranges have been analysed in more detail and the results are available in the technical report (NCP, 2012). The mean home ranges of Niassa lions are four times larger than those recorded in Selous Game Reserve ($207.2 \pm 16.0 \text{ km}^2$ vs. 48.5 km^2 ; Brink 2010; kernel analysis 90% utilization). Core areas follow the same pattern ($64.2 \pm 7.8 \text{ km}^2$ vs. 12.7 km^2). This difference becomes easier to visualize when you consider that in 2010, a 800 km^2 intensive study area in Selous Game Reserve supported 112 adult lions

while an area of the same size in NNR only supported 22 adult lions. This is likely to reflect low prey biomass and illegal off-take of both prey and lions in bushmeat snares.

Wet season movement of lioness in Mbamba village

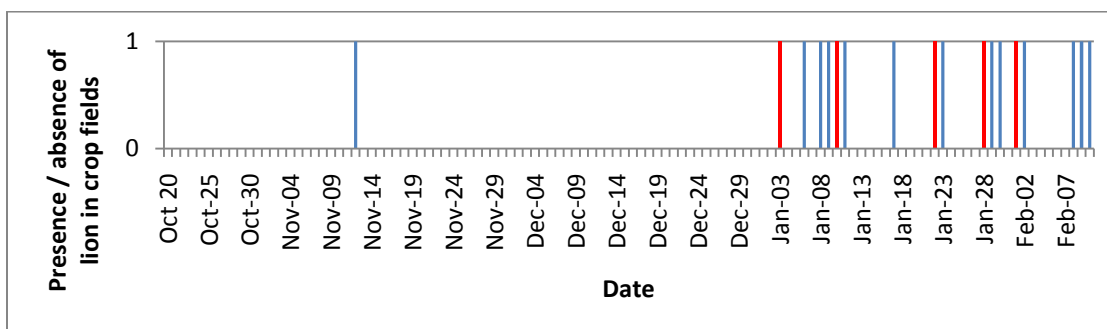
- The GPS collar of a lioness killed in 2009 in a snare in Mbamba village was returned to the project in November 2011 (more than 2 years later) one week after the Mbamba Lion Fun days in a direct response to community outreach. The lion died in February 2009 and was stored in the village. While the collar was no longer working the data stored on board was recovered.
- These data are extremely valuable as they provide our first data on the movements of a lion in and around Mbamba village during the wet season. While this has been a goal of the project since 2005, it has proven difficult to get this data as so many of the collared lions have died in snares around the village. Four lions from the village pride have been collared, 2 are known to have been snared, and 2 have disappeared and presumed dead.



Movement of the female lion in the agricultural fields between October 2008 and February 2009.

- The lioness in M-Pride (originally 6 individuals but current size of pride is unknown) was collared on 20 October 2008 and died on the 10th February 2009 (3.5 months) and 114 days of data are therefore available. Between 20 October and 15 December her collar took four positions a day (04:00; 10:00; 16:00; 22:00). From the 16 December, 8 positions were taken per day as it was predicted that movements in the village fields would increase during this period.

- Data shows she visited the village fields on only 18 of those 114 days (11%). However, there were almost no visits to the fields in October, November and December with a substantial increase in visits in January and the first week of February (41.5 % of the 41 days collared).

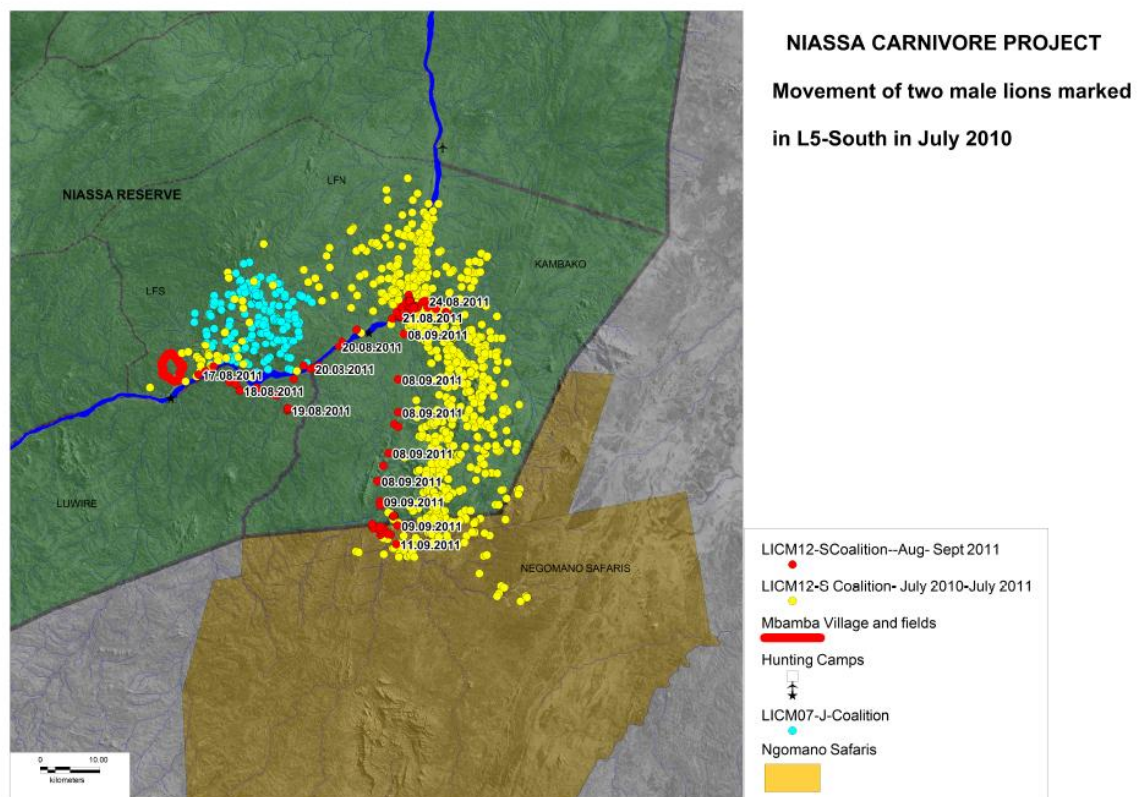


Changes in the movements of lion inside the agricultural fields from date of collaring (Oct 20 2008) to date of snaring (Feb 10 2009), where presence (1) was at least one GPS location recorded within the agricultural fields in a 24 hr period and absence was no GPS points recorded. The red lines show days on which the lioness appeared to be on a kill due to a clustering of GPS positions (greater than 24 hours).

- In addition, GPS location clusters suggest that they made a kill in the fields on at least 5 occasions in January and February. These data corroborate the data collected from questionnaire surveys and monitoring in the fields during the crop growing wet season by NCP staff. Field assistants reported three prey items killed by lions in the fields during this same period (2 warthogs, 1 bush pig). In 2008, lions were observed in Mbamba mashambas on 15 occasions between January and April.
- During the wet season, warthogs and bush-pigs are major crop pests in the agricultural fields. Lions are attracted into the field due to high “prey catchability”. These data provide direct evidence for the need for the living fences to reduce attraction of lions into village fields in the wet season (see section on Mitigation).

Satellite Collars

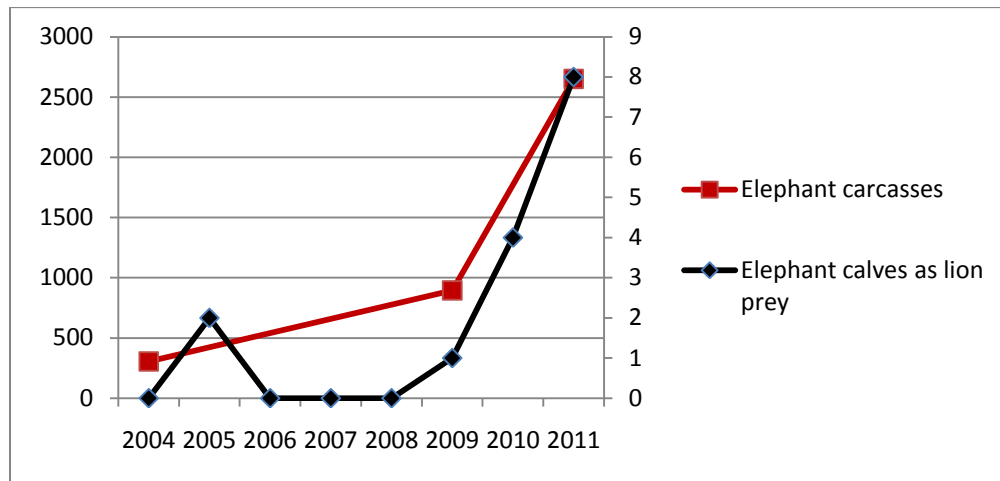
- In July 2011 we replaced two GPS collars with 2 Vectronics satellite collars on male lions in two male coalitions inside the study area for the first time.
- These data will be analysed in collaboration with the NNR Buffalo project (Thomas Prin) to investigate the movements of lions in response to the movements of collared buffalo herds in the area.
- Both collars worked well. One lion was snared after three months and the collar cut, however we gained valuable data on the movements of these two nomadic lions outside the reserve boundaries.
- The other satellite collar is on a pride male resident in the intensive study area (male coalition of 2) and is working well at the moment (7 months) with regularly updates sent to our email address.
- While these collars are very expensive, they may prove the only answer in Niassa where there are still limited opportunities to aerial track and little access in the wet season. In 2011, we were only able to radio track from the air 4 occasions despite finding and Avgas being available.



Movements of nomadic male lions outside the Reserve boundaries over a year period showing their movements outside the protected area boundary into a hunting concession. The radio-marked male was snared in September 2011 in a hunting concession.

Prey

- Overall 22 prey species have been identified for lions in NNR ($n = 142$). The four most common prey species eaten overall are warthog (19%), elephant calves (11%), bush pig (18%) and buffalo (12%). If the elephant calves are removed from the analysis (as these are a new prey item linked to poaching see below), 60% of lion prey is comprised of only four species (warthog, bush-pig, buffalo and waterbuck). 12 species have only been recorded 1-2 times.
- Between 2004 and 2008, only two elephant calves were recorded as lion prey, however between 2009 and 2011 this has increased exponentially. In addition lions have been observed feeding on elephant carcasses on 14 occasions (Fig. 5).
- In the past 3 years, at least 25 elephants have been killed for ivory in concession L5-South alone and on several occasions, NCP staff and other researchers and professional hunters have seen orphaned elephants wandering in the bush. These are easy prey for lions that would normally not have access to calves that are defended by their mothers. Elephant carcasses also pull lions in as scavengers. In the last two years in the intensive study area, ten lions have been darted on elephant carcasses and four of these lions have since proved to be residents but were pulled in by the elephant carcasses.



Increase in number of elephant calves recorded as lion prey items in Niassa Reserve between 2004 and 2011, as a direct result of increased elephant poaching. The number of elephant carcasses in 2011 is estimated from the preliminary SRN 2011 Aerial census data from NNR (these data are as yet unconfirmed).

- Funding was provided to SRN in two tranches (April and June 2011) to continue to provide support and training for the SRN community monitor program (MOMS –Management Orientated Monitoring System/ SMOG). This program was initiated in 2006 by SRN in collaboration with NCP.
- To date 20 community scouts from 18 villages collect information on human-carnivore conflict and are provided with a monthly stipend to support their work. The MOMS program is coordinated by SRN staff based at the Reserve Headquarters at Mbatamila.

- In 2011, community monitors reported 29 incidents of human-carnivore conflict with 14 leopard incidents (primarily chickens, four goats), 11 hyaena incidents (4 goats, 5 chickens and 1 duck) and 2 lion incidents (chickens and ducks).
- One lion attack was reported in NNR in 2011. In October, a lion killed a 22 yr old woman and attacked another man in Mavago village, in the far west of NNR. The woman was attacked when walking from her house to her field in an open area surrounded by thick bush. She was alone with her 3 year old child who survived the attack. The male lion was shot by the community with a firearm from the police and assistance from Agriculture office. Another man was injured during the hunt to kill the lion. Due to the difficulties in killing the lion and nature of the attack, the community believes this was a spirit lion attack due to discord between the woman and a previous husband. A traditional healer was called in to ensure the bullets killed the lion and no further attacks were experienced.
- In a collaborative effort, NCP extension team and SRN Community Scout Manager visited the village, and district to pay respects to the woman's family (with a gift of food and a black capulana) and to find out the details of the attack. This is essential to prevent retaliatory attacks.
- The lion was skinned and the body dumped in the bush. The skull was recovered by NCP but the teeth had been extracted for traditional medicine.
- The 6th Annual Training workshop was held in November in Mecula lead by Mbumba and the Meu, NNR community officers. This included a 3 day special workshop organised by SRN lead by Mike le Grange on resolving human-wildlife conflict including conflict with lions and other carnivores. During this course community monitors were shown various techniques for resolving human-elephant conflict as well as information on reducing human-carnivore conflict through effective goat corrals, living fences and safe behaviours. NCP staff members, Joaquim Auassi and Euzebio Waiti attended as part of their training.



6th Annual Training workshop for community monitors (MOMS/ SMOG) run by SRN/ NNR community team and supported by NCP

- Reduce livestock predation by carnivores (lions, leopards, hyaenas and African wild dogs) by building effective goat corrals
- Detailed information on costs of goat predation by leopards in four villages in NNR has been collected by A. Jorge and is presented in his thesis.
- We completed a survey of goats and goat corrals in the Mecula district to monitor goat numbers and identify effective local design (July / August). 87% of the 158 goat owners surveyed were using a goat corral however only 26% of the goat corrals being used were predator proof, 27 % were completely ineffective and 48% would be effective with a few modifications to the roof and door. Many of the goat corrals are being built to keep goats in but not to keep carnivores out.
- Three designs have been identified as effective against lion and leopard attacks. The critical elements are the space between the poles, the roof and the door. The goat corral must have a log roof rather than a thatch roof which is easy for the leopards to break through. The added advantage of building a goat corral on stilts (off the ground) is they are easy to keep clean and the droppings can be collected to be used as fertilizer for vegetable gardens.



“High tech” goat corral made from planks in eastern section of NNR where there is access to planks, nails and corrugated iron.



Traditional effective corral in, using local poles and no commercial materials. This design is effective where there is a log roof



Effective design if it is well maintained has a strong door and log ceiling.



Ineffective corral built to keep goats in not keep carnivores out



Ineffective goat corral but it has been built inside a bamboo fence around the living quarters which offers some protection



Poorly constructed goat corral with a thin thatch roof and open door

- A villager reported 20 goats killed by lions during the day in the fields outside Nkalapa village in western Niassa. The owner owns more than 35 goats and has three goat corrals, two effective and one partially effective. However, the goats were preyed on during the day when they were allowed to forage unattended. The remaining goats ran away and could not be recovered. Apparently the

group of four lions killed the goats, one after the other, eating a small amount and then moving on to the next goat. It was impossible to verify this report. NCP extension officers provided information on ways to improve the goat corrals and need for a day time herder to monitor goat movements. This was reported to Agriculture office.

- There is a growing problem with unattended goats (no shepherds) eating crops of other people in the village. Villagers affected by unattended goats are killing them using a mixture of plastic, cotton, food and old hair extensions.



Goat poison made from plastic, food, cotton and old hair extensions.

- In October NCP initiated a trial incentive based system for NCP extension officers to encourage them to convince people to improve their goat corrals. This will be continued in 2012. The challenge is to encourage proactive behaviour before there is a problem carnivore visiting the village. Extension officers (Joaquim and Oscar) receive a financial bonus for every goat owner they can convince to improve their goat corral (before and after pictures, GPS, goat owner name). In this voluntary program, goat owners are asked if they would like assistance to improve their goat corral. NCP provides practical assistance for transporting building materials using the vehicle and providing practical advice on how to build an effective goat corral. The goat owner has to build and maintain the corral and cut the poles himself. Assistance will only be provided for corrals that protect at least 10 goats to encourage goat owners to combine goat herds and reduce the number of logs needed to build a goat corral. Goat corrals last at least 6-8 years if constructed effectively. Three goat corrals protecting more than 40 goats have already been improved. These goat corrals provide examples of effective corral design in a village. In future we hope to provide additional incentives to livestock owners to encourage them to livestock owners to protect their livestock.

Living fences program to reduce lion attacks and snaring of lions in villages and fields

- Lions are attracted into village fields / machambas during the wet season by the concentrations of potential prey (primarily bush-pigs and warthogs) that enter the fields to prey on crops. Reducing the number of bush-pigs and warthogs in fields will reduce a significant crop pest and thereby increase food security; decrease lion movements in fields where they come into close contact with people and therefore potentially reduce attacks and will reduce the number of lions caught in snares

set in the fields to catch crop pests. Our data on the number of lions being snared in Mbamba village illustrate the urgent need to reduce the movement of lions around the village.

- The Living fences program initiated in 2009 uses a thorny “living fence” or hedge to keep out crop pests. Cuttings of *C. africana*, an indigenous shrub that is being used in other areas to form significant barriers around fields and homes, are planted.

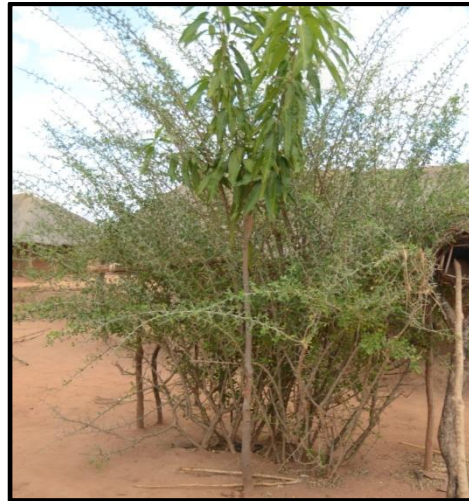


Introduction of the Pao Piku fence into Mbamba village into 2009. At a community meeting, it was decided that Chefe Ngongo would receive the first cuttings for a fence. This experimental fence is maintained and monitored by NCP.

- Two experimental fences were planted in 2009 around maize and rice field in Mbamba village to test their effectiveness. One has been growing for two seasons (2009/2010 & 2010/ 2011), the other was planted in 2010/ 2011 season. In addition a small stand of *C. Africana* was planted inside the village in dry conditions and provided with some water at regular intervals by the homeowner to compare growth. These fences are maintained and monitored by NCP.



Fence planted two years ago 2009/2010. The fence has been pruned in height to encourage side growth.



Experimental fence grown in village with water, also planted in 2009/2010, not pruned. This fence has grown quickly as it has not suffered from weeds or flooding

- All Mbamba fences were checked and weeded in June 2011 by NCP. All three fences coppiced well but a number of problems were encountered and solutions discussed:
- Fences planted in black cotton soils get drowned in water for several months and do not coppice well as they rot before they become established. This can be resolved by planting these cuttings on mounds and maintaining these mounds until the cuttings have become established. Communities know how to do this as they are doing the same for Manioc cuttings. Once established the plants do not seem to be affected by high water content.



Fences planted in 2010/ 2011 wet season should variable growth. Fences planted in low lying areas that are inundated with water did not grow well, while those planted in dry, high lying areas showed significant growth in the first season.

- Fences are now becoming well established and people are cutting path ways through them to get into fields, this provides an entry for the bush-pigs and warthogs. We are developing simple styles so people can go over not through. Gates are less effective as they are simply left open.



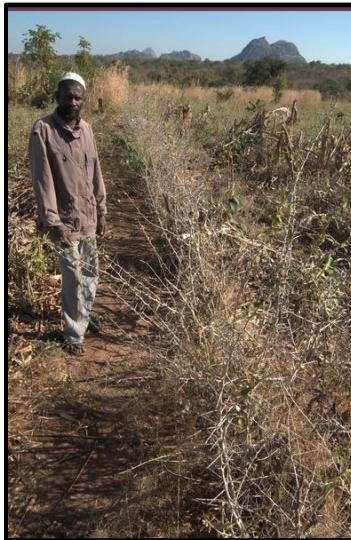
Pathway cut into fence to allow people to get through.

- In the first season of growth the fences need to be weeded otherwise they become choked and overshadowed by grass during the wet season. They coppice, but don't grow fast as they could and are vulnerable to fire in the first season before they become established. This needs to be the responsibility of the field owner not NCP. Community meetings have been held to communicate this. These are not NCP fences. The boundary fence is going to be more complicated as it needs to belong to someone. We will be discussing this in further community meetings in November.



First year of growth showing new fence clogged with grass and weeds.

- In 2010, three fences were planted in Mecula. Mucoria and Lisongile by SRN field staff. The fence in Mecula did not coppice as it was not planted for 2 months and cuttings were too dry. The other two fences in Lisongile and Mucoria coppiced well.



Mucoria fence planted by SRN 2010/2011 –
coppiced well with significant growth in
height

- The living fences program has been included in the SRN Human wildlife conflict training program developed by Mike le Grange for SRN/ NNR and in November 2011 all community monitors were introduced to the “living fence” program and other techniques to reduce conflict with carnivores.
- Four community meetings were held in Mbamba village in 2011 to inform the community about the progress in the program, discuss problems, decide on a way forward, and interact with other villages and SRN.
- The living fences program was explained and demonstrated to the District Administrator, members of Niassa Provincial Government, teachers and local leaders in Mbamba on the Day of the Environment celebration in June 2011.



June 2011- Day of the Environment: Euzebio and Keith presented and explained the Mbamba living fence program to visiting district Administrator and local dignitaries

- At a community meeting in October 2011, the Mbamba community agreed that they wanted to continue with the living fence program as they believed it would reduce human-wildlife conflict. There was significant support from all stakeholders (women, elders, traditional and administrative leaders and youths).
- An important development was the community decision to plant the living fence as a boundary fence around the entire Mbamba village fields (inside the elephant fence) rather than individual fences around each field. This decision is supported by NCP and NNR management teams as it not only will resolve problems of access in the fields but will also provide a physical boundary to opening of new fields.
- The challenge was to determine who was responsible for planting and maintaining the fence (particularly the weeding needed in the first two years of growth). It was agreed that each of the four traditional chiefs would be responsible for mobilizing their followers to plant a section of fence around the boundary of their fields starting in areas where wildlife conflict was high. This fence would be extended each year until it eventually became a complete fence around the village. The intention is for the fence to form one of a system of barriers around the village (including an electric elephant fence) to reduce human-wildlife conflict. The current boundary of the village mashambas is 16km. NCP agree to provide a truckload of fence cuttings from Pemba for each Chief in November of 2011.
- NCP Field Assistant Batista Amadi organised a team of 10 local workers to cut *C. African* cuttings from established fences in Pemba for 2011 plantings. These cuttings were provided free of charge by landowners in Pemba who needed their fences trimmed.
- In November, 2011 in collaboration with the NNR management team, 2 full Bedford truck loads as well as 2.5 landrover/ landcruiser loads of cuttings were transported from Pemba to Niassa Reserve (350 km one way, 2 days). The SRN /NNR living fence program received 1.5 truck loads of cuttings for their fences in four villages, NCP and Mbamba village receive half a Bedford load

and 2.5 landcruiser loads for the boundary fence initiative. The Mbamba Village cuttings were divided into 4 equal piles and delivered to the start points of the boundary fence determined by each of the traditional chiefs.

- Over a period of three days in the last two weeks of November (before the rains arrived), the cuttings (double row) were planted by 60 men under the leadership of the 4 chiefs as a community boundary fence. On average each person planted 12-20 m of double fencing over a two day period (4 hours a day to avoid the heat) and 1.8 km of double fencing was planted in three sections. In addition the experimental fences were maintained with the gaps replanted. The planting is constrained by the small window of time available to plant. It has to be planted just before the rains arrive.





The 2011 NCP Living fence program. Cuttings were cut in Pemba 9 (a), loaded onto NCP vehicle and SRN truck (B, c) and transported the two –three days to Niassa Reserve. Cuttings were provided for free and in return Pemba residents had their hedges trimmed for free (d). In Mbamba the cuttings were planted as a boundary fence in early November (e).

- We consider it a significant achievement that no payment was provided by NCP for planting the fence; this was a community initiative with significant buy in from the community for the living fence program. The young, strong men refused to work for free and eventually all the planting was completed by older men. There are ongoing problems engaging men in the 16-25 age group in village activities and this group has been identified as a problem group by the elders.
- A follow-up community meeting was held on the 24 November 2011. In recognition of the effort and community spirit of the men who planted, and as an incentive for future community engagement in proactive conservation activities, NCP provided a thank you gift of Manioc/ cassava cuttings to the Chiefs for distribution to the men who had planted the fence with the amount of manioc/ cassava cuttings provided dependent on the metres of fence planted in each section. This gift was directly related to conservation and increasing food security.
- NCP and NNR community Officer, Mbumba Marufo, organized a joint meeting in Mbamba village in November 2011. The aim of this meeting was for the Mbamba traditional leaders to present their living fence program to traditional leaders from other villages, to discuss challenges encountered, and find solution. After a group meeting facilitated by Mbumba, the visiting village elders were taken to the Mbamba living fences by the Mbamba elders to discuss progress that had been made. This was a very productive and positive meeting. Individual fences were planted by the SRN team in three additional villages in 2011.

OBJECTIVE 3: INITIATE ENVIRONMENTAL EDUCATION AND EXTENSION WORK IN NIASA COMMUNITIES TO BUILD A RELATIONSHIP BETWEEN WILDLIFE AND PEOPLE BASED ON ACCURATE ECOLOGICAL INFORMATION AND SUCCESSFUL MITIGATION METHODS

Extension program to assist village communities with safe shelters, goat corrals, living fences on an ongoing basis

- Community outreach and education of adults and children about safe behaviours, fences, safe shelters is an essential component of this project. To secure lions in Niassa we need to not only find solutions to mitigate threats but also have a longer term view to scale up what we have learned, spread the messages, and increase tolerance.
- A 2011 objective was to initiate an extension program to reach all 40 villages in NNR on ongoing basis. The aim is for a team to regularly visit villages in NNR to respond to human-conflict events, distribute education material, provide assistance on goat corrals, living fences and reducing human-carnivore conflict and provide a trusted contact human carnivore conflict resolution. This team works in collaboration with NNR community officers.
- In 2010, a second hand land cruiser was purchased with funding provided by WCS. This vehicle has been refurbished for work as an extension / education vehicle. In June 2011, NCP hired Joaquim Auassi as NCPs extension officer. Joaquim is a local Mecula resident with a Grade 12 education and two years experience from Marrupa Ecotourism College. His mother is a highly respected traditional healer and Joaquim is well placed to interact with communities as he has lived in Niassa his whole life, speaks Swahili, Makua, Yao and Portuguese fluently, has an appreciation of the spiritual aspect of village life and has the education needed to collect information. Accompanying Joaquim is NCP field assistant Oscar Muemedi who has worked for NCP since 2003. Oscar is also a Mecula resident, he has obtained a drivers license and good mechanical knowledge on the job as well as survey skills.
- In 2011, the extension team visited all villages in NNR in this dry season at least once, and with regular visits to villagers in the Mecula district. They completed a goat survey, bushmeat survey, domestic dog survey and distributed all the school books and posters. During initial visits they were accompanied by either Keith Begg or Colleen Begg to ensure effective training. Their responsibilities include monitoring of the *Commiphora* fences in all villages other than Mbamba during the wet season.

Environmental Education materials

- In 2009-2010 a Niassa conservation storybook was commissioned by NCP, and written and illustrated by Afra Kingdon. This book includes information on goat corrals, fences, safe shelters and safe behaviours to protect against carnivore attacks.
- In 2011, 865 storybooks were distributed to 42 schools across 39 villages in the Mecula, Mavago and Mueda District inside NNR. Simple teacher guidelines on how to use this storybook in lessons have been distributed to teachers as well as 5 waterproof boxes. Additional books were distributed to local and district leaders.

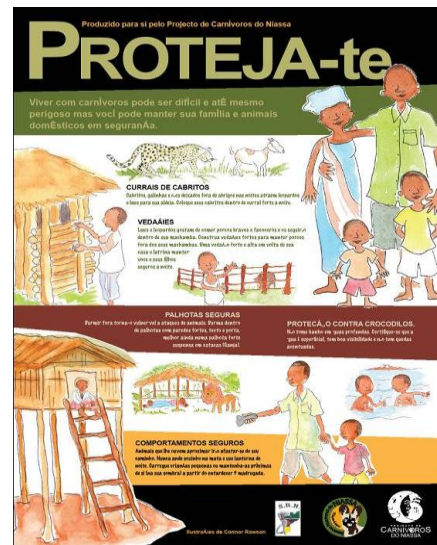


Joaquim distributing storybook to all schools inside NNR

- Two presentations on the poster and storybook were given in the three district capitals (Mecula, Mavago and Negomano) to administrators, Frelimo party official, local government officials, regulo, and Chefe de Postos.
- The safe behaviour poster has been printed and was endorsed by the Ministry of Tourism and SRN. 1000 posters have been printed. To date more than 100 posters have been put up in 46 villages at clinics and schools.
- An additional 500 posters were delivered to the Ministry of Tourism for distribution to other protected areas in Mozambique and 100 posters were delivered to Veronica Bower for a human-wildlife conflict project in Lichinga and surrounds.



Euzebio explaining the safe behaviour poster to children in Mbamba Village (Image: S. McConnell)



“Protect Yourself” from carnivore attacks by sleeping in safe shelters, planting fences etc

- A similar poster based on the NCP poster is being developed by the Rufigi man-Eating Project (same illustrator and designer) to spread information to communities on ways to protect yourself from lion attacks. Cross project collaboration to increase effectiveness and sharing of resources is a goal of NCP.
- In collaboration with SRN, A well known Mozambique music group, Massukos has produced a song about Acha, the heroine of the book and the need to protect the environment and take responsibility for protecting yourself. This song is song in the local language CYao and is on their newest commercial CD. It has been well received in communities as part of the educational program. The lead singer of Massukos was born in Niassa province and is an environmental advocate.

Field visits

- NCP hosted two school groups in our field camp this year for one night and two days of activities: the Mecula Wildlife Club (4 teachers, 5 children) and Mbamba School (4 teachers, 5 children). NCP is the patron of both the school and the wildlife club. For the Wildlife Club, members wrote an essay on the importance of the protected area. The writers of the 5 most original and thoughtful essays (judged by Paula Ferro and Colleen Begg) were invited to visit NCP.
- Neither the children nor the teachers had ever been into a wilderness area in Niassa. They had spent all their time in the villages but had never seen hippo, lion, leopard, elephant, buffalo, waterbuck, impala, kudu, warthog etc in a non conflict situation. They climbed an inselberg, sat quietly to listen to the bush, used binoculars, learned how a GPS and radio collar works and met NCP staff.
- These trips reaffirmed for us that it is essential that Niassa adults and children are able to experience if they are to appreciate that they live in a protected area and why there are so many rules. This should not only be the privilege of tourism visitors.

- One of our future initiatives is to build an Education centre in L5-South that will provide adult education classes and field trips for children and adults as well as skills training for adults to develop alternative livelihoods. This centre will provide a tangible benefit of conservation to Niassa residents. Conservation is impossible without developing a relationship between people and wildlife accompanied by practical solutions



Mecula Wildlife Club watching a pod of 30 hippos for the first time



Mbamba school teachers and students on the top of an inselberg spotting game and drawing a map of their area.

Lion Conservation Fun Days

- The 3rd Annual Lion Conservation Fun days were held in Mbamba village in early November. This year, the Mbamba teachers were very involved in developing activities and spent two days in NCP camp before the event developing the program with NCP.
- Once again expert assistance was provided by Paula Ferro (Luwire) with additional assistance from Nilton Cuna (SRN community officer), and Madyo Couto (SRN) and the NCP team. Activities included painting of flags to make a conservation banner, animal kites, bat and mosquito

running game, team building puzzle and numerous running games (mango and spoon, three legged, sack race).

- This was the second year NCP has partnered by Houston Zoo for the Lion Fun days. At the same time, children across the world play similar games and raise funds for the Mbamba conservation days. A DVD of Houston Zoo activities was shown to the Mbamba community to show that similar activities take place with children in other areas.
- The highlight of the 2011 Conservation Fun days were two plays produced by the Mbamba School children lead by two Mambas teachers that were produced for the entire village. These plays highlighted the negative effects of too many fires, the importance of sleeping in safe shelters to prevent carnivore attacks and importance of returning collars to NCP when lions are snared. The lessons in these plays were messages from the Mbamba school trip to NCP.
- A visiting teacher group from Mecula also took part in the Fun days. We hope that visiting teacher groups will continue to come to Mbamba to extend the influence of the Fun days.
- We believe that considerable progress was made this year as the teachers and school children were very engaged in the activities and began to take ownership of the activities particularly through the theatre.
- As a direct result of the Mbamba lion Fun days, a collar from a lion snared in 2009 that had been stored in someone's house was returned to NCP and the data was recovered.



(c) Madyo Couto

Mbamba Lion Conservation Fun days –November 2011:

OBJECTIVE 4: ASSESS INADVERTENT SNARING AND BUSH-MEAT CONSUMPTION TO UNDERSTAND LEVEL OF LION OFF TAKE AND IDENTIFY POSSIBLE SOLUTIONS

Mortality of lions in snares

- Bushmeat snaring is the single biggest threat to lions and other large carnivores in NNR. Lions are not targeted but are caught as by catch in wire and cable snares set for large animals to provide meat for villagers and income for local hunters.
- An intensive lion collaring program in an intensive study area of 800sq km was initiated in 2010. The aim is to collar all lions in the study area to monitor mortality. In 2011, seven male lions and three females have been collared. Two of the male lions have snare injuries. In addition three of the male lions collared between 2010 and 2011 have been killed in snares.
- The turnover in pride males (4 takeovers in 7 years for one pride) may be affecting recruitment of this population through infanticide.
- In 2011, two radio collared male lions were killed in snares (both collars recovered), and one lion was injured in a snare but survived. A neck wound on the lion snared in 2010 has healed and he has been collared. An 8 month old cub was killed by infanticide during a pride take over after the adult male was killed in a snare.
- For the first time a community in Niassa Reserve reported a live lion in a snare and in a coordinated effort between NCP, Niassa Reserve management and Luwire hunting concession, the lion was immobilized, the snare was removed and the lion was successfully released. The snare was set for a buffalo in the fields in Cuchirange Village. The village was commended for reporting the snared animal. In addition two collars from lions snared in bush meat snares have been returned to NCP . This is a direct result of ongoing extension work to please return collars to NCP if a lion is killed.



Male lion caught in wire snare set for buffalo around his waist



Lion after being released. Green ring around waist in antibiotic ointment (W. Ebersohn).

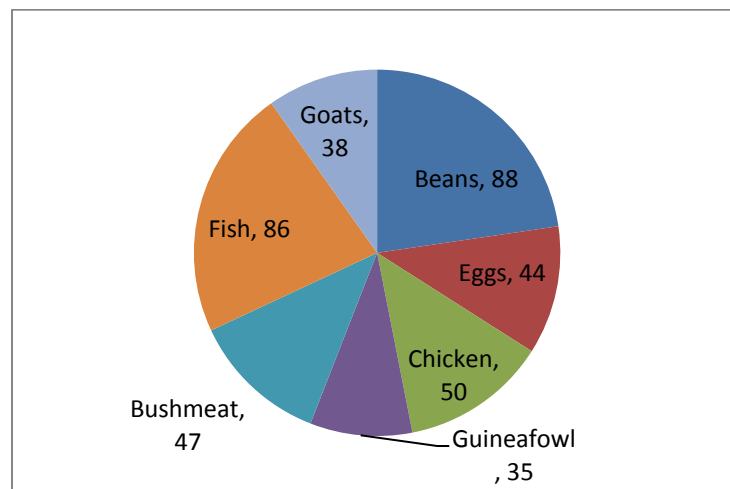
- In total 27 known lions have died or disappeared from the intensive study area of only 800 km² between 2005 and 2011 (7 years). This is a minimum estimate as we only began an intensive radio collaring effort in 2010 because we were concerned about the levels of mortality. This is also an area that does not have the added off-take of males from sport hunting. A minimum of 41% of deaths are known to have been from snaring with an additional 11% of the unknown deaths believed to be from snaring due to the proximity of the lions to the Mbamba village. Snaring is therefore likely to have resulted in 52% of the deaths.
- NCP is working with Margaret Kossmala (PhD student at University of Minnesota) to model the snaring and mortality of lions in Niassa based on human density and lion density. We hope that this will clearly illustrate the effect of snaring and allow us to initiate discussions on ways to increase food security and alternative income generating activities for local hunters.

Domestic livestock

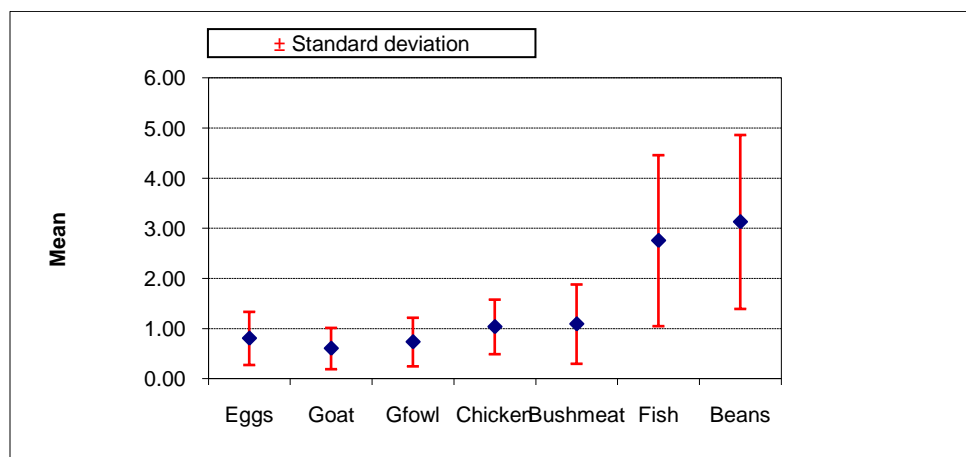
- NCP has been investigating ways to increase domestic livestock production to offset demand for bushmeat. A simple survey of problems encountered by villages when breeding domestic livestock (chickens, goats, ducks, guineafowl, pigeons, rabbits and turkeys) was completed and is being assessed. The four major problems identified by community members are disease (particular in chickens and rabbits), theft, human-carnivore conflict (honey badgers, leopards) and lack of income to buy domestic stock to start the program.
- Possible ways to increase domestic stock production that we are investigating and will be part of a Phase III program are a) micro-lending to offset start up costs using small groups (5 members) and allow stock purchase, chicken vaccination program with community vaccinators (provides alternative income as well as reduces Newcastle disease, and Guinea fowl breeding with assistance to build coups and runs with payment in chicks to seed new owner. These programs will be developed in collaboration with NNR management and through the Environmental and skills training centre.
- Domesticated guineafowl have been identified as a potential source of animal protein in NNR. They are currently present in 6 villages inside NNR and are highly valued because they are large, produce two large clutches of chicks a year, and do not die of diseases. However, the females are not good mothers and many chicks are taken by raptors in the first few weeks of life.
- In a trial program, NCP partnered with a guineafowl owner in Nkuti village to test possible ways to improve domesticated guineafowl breeding and is experimenting with different coup and enclosure design. In 2011, NCP provide materials (chicken wire fencing, transport and advice) while the owner built the enclosure and agree to provide 10 chicks as payment for the enclosure materials which will be used to seed another guineafowl breeders

Bushmeat consumption

- To find solutions to the threat of snaring we need to understand the drivers of bushmeat consumption and identify possible solutions. In 2010, we initiated surveys to understand local hunting techniques, bushmeat preference, prices and consumption (Begg & Begg, 2012, Technical report).
- In 2011 a second questionnaire survey was completed in July / August and was focused on the relative consumption of different protein sources. This was a broad survey (n = 1228 interviews, n = 34 villages; range 4-318 interviews per village) conducted across all three districts in NNR. Only one question was asked: “On how many days in the past week have you eaten a meal with beans, eggs, fish, chicken, and guineafowl, bushmeat or goat meat?”. The survey was completed in the mid dry season as this is the period of highest bushmeat consumption. Bushmeat was not divided into different types and included all wild species except for guineafowl. Guineafowl were assessed separately because different snares are used to catch them and domesticated guineafowl potentially provide an alternative source of protein. This survey provides a simple indicator of bushmeat consumption that can be used to track bushmeat consumption over time and in different seasons.
- Interviews were conducted by our community extension team, Joaquim and Oscar. The question was asked in whatever language was most appropriate Cyao, Kiswahili, Makua. No names were taken and interviews were preceded by an explanation of why the question was being asked (to assess food availability and food shortages)
- The majority of people interviewed had eaten beans (88%) and fish (86 %) at least once in the past week. This highlights the importance of the Lugenda River and other tributaries for communities in NNR and the negative consequence if the fishery were to collapse. Nearly half of those interviewed had eaten bushmeat (47%) and eggs (44%), while less than 40% of those interviewed had eaten guineafowl, chicken or goats. On average, fish and beans were both eaten about 3 times a week while bushmeat were consumed 1.1 times a week (0-4) similar to the consumption of chickens.

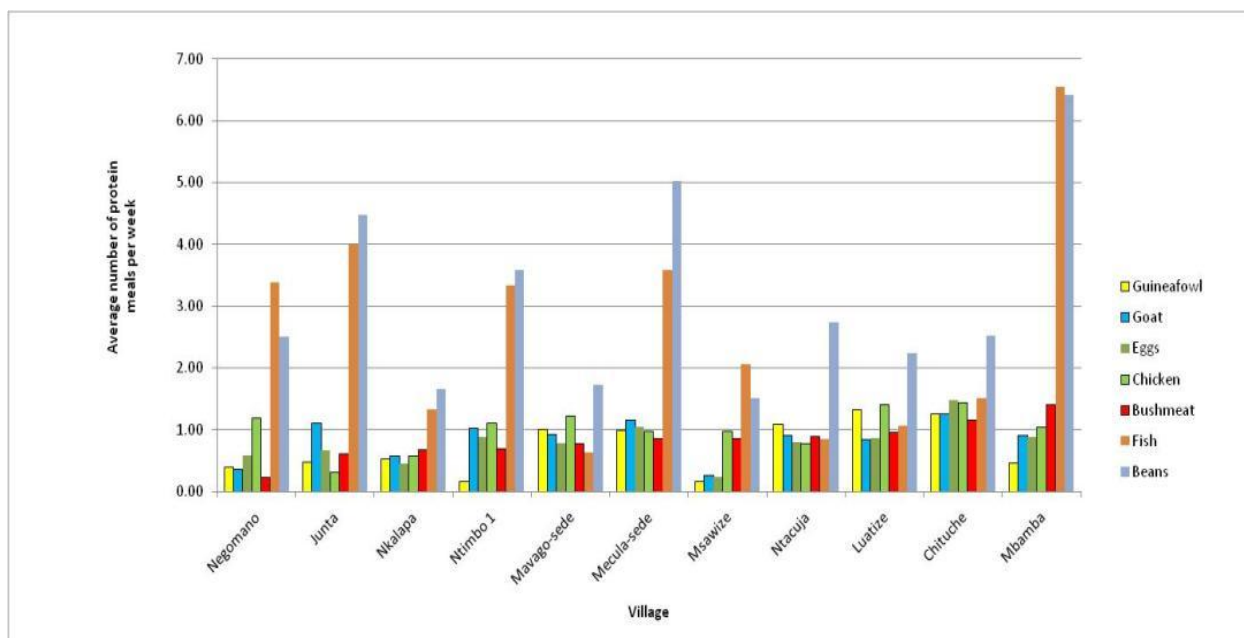


The percentage of people (n=1128) that had eaten each food type at least once in the preceding week of the survey in July/ August 2011.



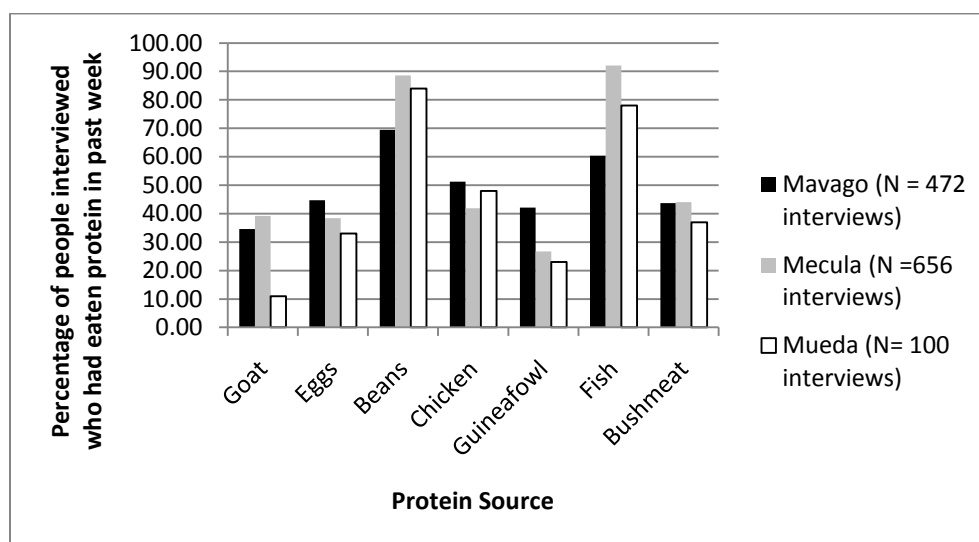
Comparison of the mean number of times people had eaten different forms of protein in the preceding week, showing the importance of fish and beans in the diet of Niassa Residents.

- A comparison of 11 villages within NNR where we conducted more than 30 interviews (to minimize the bias of small sample sizes) shows similar patterns of consumption (Fig 8) with the extremes provided by high bushmeat consumption in Mbamba village in our intensive study area and very low bushmeat consumption in Negomano. Low bushmeat consumption may reflect decreasing prey base around the village. Snaring becomes more difficult as prey declines.



Average number of times per week different protein sources was eaten in 11 villages inside Niassa Reserve. Villages are ranked in order of increasing bushmeat consumption. Only villages where more than 30 interviews were conducted were used for this analysis. Bushmeat refers to all types of meat from wild animals that are eaten except guinea fowl which are considered separately.

- There were no significant differences in the average number of times different protein types were consumed per week in villages from the three districts inside NNR (Mavago, Mueda and Mecula; ANOVA, $F=7.37$). In all three districts, beans and fish provide the staple protein source, Bushmeat and chickens are eaten at least once a week, and eggs, guinea fowl and goats were eaten the least often (about once every 1-2 weeks). As expected given the proximity of villages to the Lugenda River, fish are more commonly eaten in villages from the Mecula district (five times a week) and Mueda District (three times a week) compared to Mavago (once a week). The data suggest that Mueda has fewer goats than Mavago or Mecula, as these are seldom eaten (0.2 times per week).



A comparison of the relative consumption of different types of protein across villages in three different districts inside NNR.

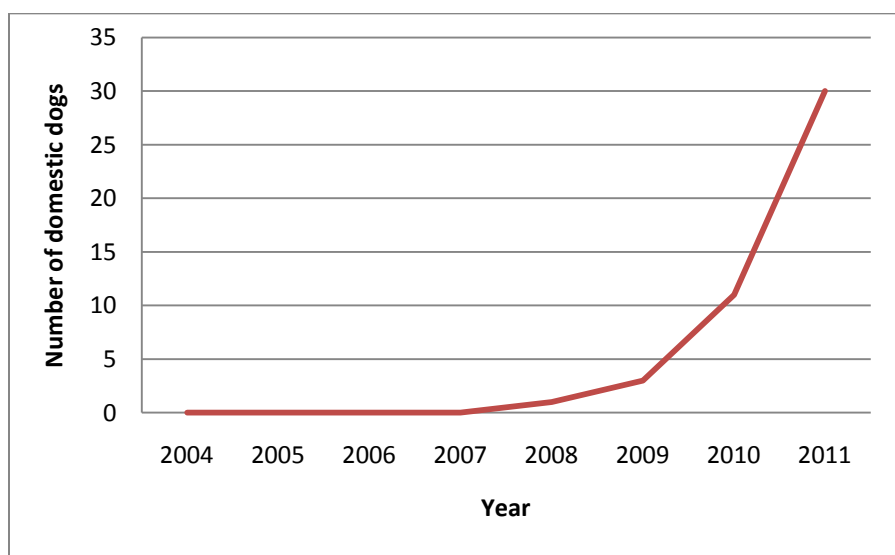
Table 1: Differences in consumption of different protein types in three districts inside Niassa Reserve. Data is presented as the mean number of times each protein type was consumed in the previous week

District	Number of interviews	Number of villages	Mean number of times consumed per week						
			Goats	Beans	Chicken	Guinea fowl	Fish	Eggs	Bushmeat
Mavago	472	10	0.78	2.03	1.10	0.86	1.33	0.81	0.91
Mecula	656	17	0.86	4.95	0.95	0.53	5.03	0.82	1.14
Mueda	100	6	0.24	3.55	1.34	0.76	2.85	0.80	1.23
Grand Total			0.78	3.714	1.04	0.68	3.4	0.8	1.1

- The main aim of this survey was to provide a relatively simple, repeatable indicator of bushmeat consumption that could be used to track changes in bushmeat consumption over time in different villages and districts in NNR.
- For interest sake, a very rough calculation of the amount of bushmeat consumed per week in NNR can be calculated. One portion of bushmeat weighs on average 200-300g (hand measurements are used to designate a portion and these were weighed) and one portion feeds a household for a meal. We do not know how many households there in NNR and this is difficult to assess because of polygamy: one man may have up to five wives. However, there are 8000 adult men in Niassa Reserve and this provides a minimum estimate of the potential number of households. If bushmeat is eaten on average 1.1 times (range 0-4) per week then this amounts at least 1760-2640 kg of meat eaten per week by these 8000 people and their families. This is 1.8-2.6 tons of bush meat being taken out of the bush each week.
- A lion eats about 5-7kg of meat a day or 35 -49kg of meat per week. This is the same amount of meat eaten by at least 36-54 male lions in a week.
- Our data (Begg & Begg 2012, Technical report) suggests that lions are not at the carrying capacity predicted from available prey biomass (2009 census results, 2011 results are not yet available) and this is likely to be due to illegal off-take. In addition, it is likely that bushmeat snaring is significantly affecting the prey biomass itself.
- Bushmeat is an increasing threat due to the increasing human population and increasing food security issues. This survey reflects bushmeat consumption in the dry season, the season of highest bushmeat consumption so this is likely to represent a maximum value. On the other hand, some people may have lied and underestimated their bushmeat consumption which will mean this is a minimum estimate for this time period. A similar survey is currently being completed in the wet season of 2012 to provide an indication of seasonal changes in bushmeat consumption. However it is clear that the current level of bushmeat consumption is not compatible with conservation and must be affecting all the wildlife in NNR.

OBJECTIVE 5: MONITOR THE DISEASE THREAT TO CARNIVORES IN NNR

- A further 15 blood samples were taken from immobilized lions and sent to Onderstepoort for analysis (36 samples in total). These samples were tested for canine distemper, canine parvovirus, feline calcivirus, and feline corona virus. All tests again came back negative. No lions have been identified as dying from disease in the study area.
- However, the disease threat particular rabies and canine distemper from the presence of growing population of domestic dogs in NNR remains a concern. In 2011 we completed a second domestic dog survey across all villages in NNR to compare with 2006 data
- In 2011 a survey of domestic dogs was completed to compare with 2006 data. During the survey all the Niassa Villages were visited. In total 583 dogs (185 males, 178 females, 190 puppies) were counted from 125 owners across all 46 villages in Mecula, Mavago and Mueda districts.
- The number of domestic dogs inside NNR has increased from 144 in 2006, to 583 in 2011. In 2006, 16 villages had domestic dogs, in 2011, 28 villages currently have dogs and 6 additional villages (Gomba, Matondevela, Naulala2, Mucoria, Cuchiranga and Chamba) did have a few dogs in 2010 but they died from carnivores or disease.
- The number of domestic dogs in Mbamba village has been monitored since 2004. The first dog arrived in 2008, and the domestic dog population has increased to 30 dogs in 2011, with an associated increase from 1 to 10 owners. The dogs are primarily kept to protect fields from baboons. It is imperative that the disease status of lions continues to be monitored in the intensive study area given the high levels of contact between people and lions in the Mbamba village. It is hoped that the living fence program will reduce this contact in future.



Exponential increase in the domestic dog population in Mbamba village, in eastern NNR.

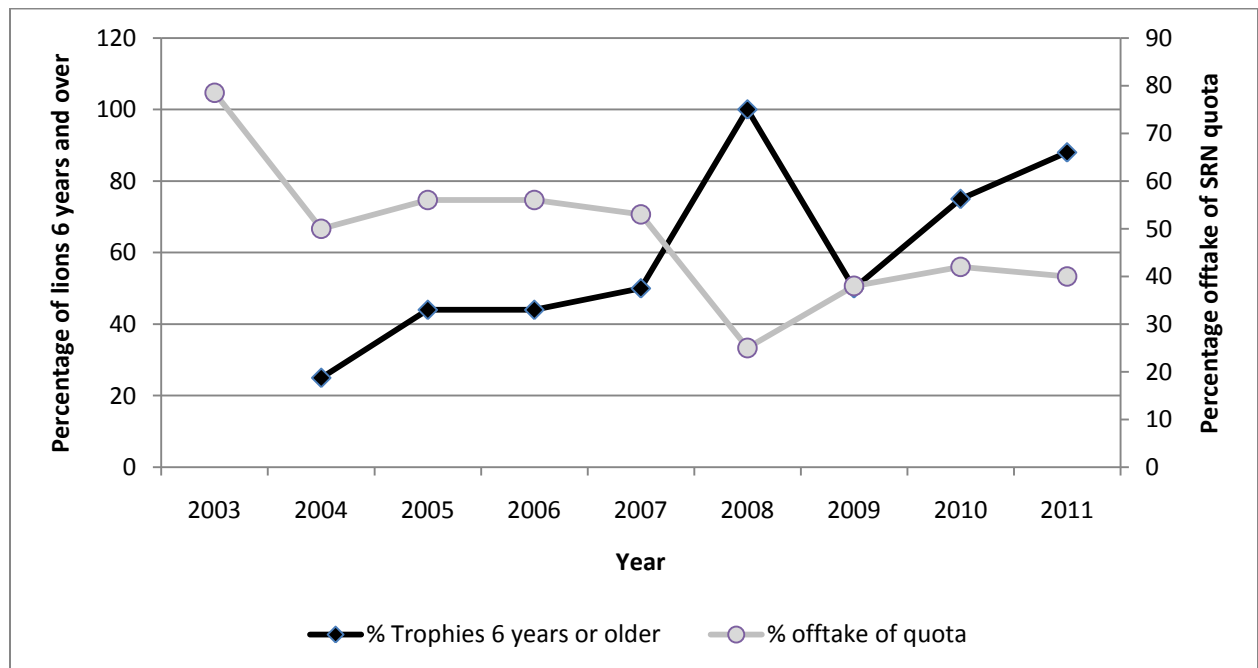
- This increase in the domestic dog population raises concerns about the increase in disease risk as the domestic dogs are reservoirs for canine distemper, parvovirus and rabies that can affect large carnivore populations. There is currently no routine vaccination campaign inside Reserve. Governmental vaccination campaigns are intermittent. NCP continues to urge SRN to make a decision regarding the presence of dogs inside the protected area – vaccination, castration, removal. The domestic dogs are also increasingly being used for hunting.

OBJECTIVE 6: MONITOR SPORT HUNTING OF LIONS AND LEOPARD IN NNR AND ENSURE IT IS SUSTAINABLE

- In collaboration with Panthera, NCP developed a pamphlet providing guidelines on the information to be collected from all lion and leopard trophies. This follows the information that has been collected by professional hunters in Niassa since 2006. These have been widely distributed across the region through Panthera and are given to every carnivore sport hunting client in Niassa.
- C. Begg attended the Panthera lion sport hunting workshop in Johannesburg (June 2011). The aim of the workshop was to bring scientists working on sport hunting together to reach consensus on the way forward for lion sport hunting given the possible uplisting of lion to the Endangered Species Act in the USA.
- C. Begg attended the SRN 2011 operators meeting in May 2011 and presented the 2010 sport hunting monitoring and aging data to all operators as well as selected government officials. Questionnaires, details of the information required and the pamphlets were distributed to all operators before the hunting season began in June. Email communication has been maintained with all the concession holders. Full details are required for all leopard and lion hunt even if no trophies are taken.
- NCP continues to provide independent assessment and aging of all lion and leopard trophies for SRN. In 2011, all lion and leopard trophies were assessed, aged and measured.
- In total 120 leopard trophies have been aged and measured in Niassa Reserve by NCP. In 2011, 20 leopards were taken as trophies inside the Reserve an additional leopard was aged from the Kambako courtada. The majority of leopards appeared to be between 3-4 years of age from tooth wear (75%) with three leopards likely to be 4 years old with noticeable chipping on the enamel ridge and only 2 leopard older than 4 years of age with obvious wear on all teeth and the enamel ridge worn flat. All leopards showed some tooth wear and no leopard trophies were believed to be two years or younger which is an improvement on other years. This was the first year the SRN leopard regulations were in effect (decrease in quota for sub-adults or females). The oldest leopard was taken by the client Paul Gregory with Jamie Wilson as the professional hunter (R3) with the second

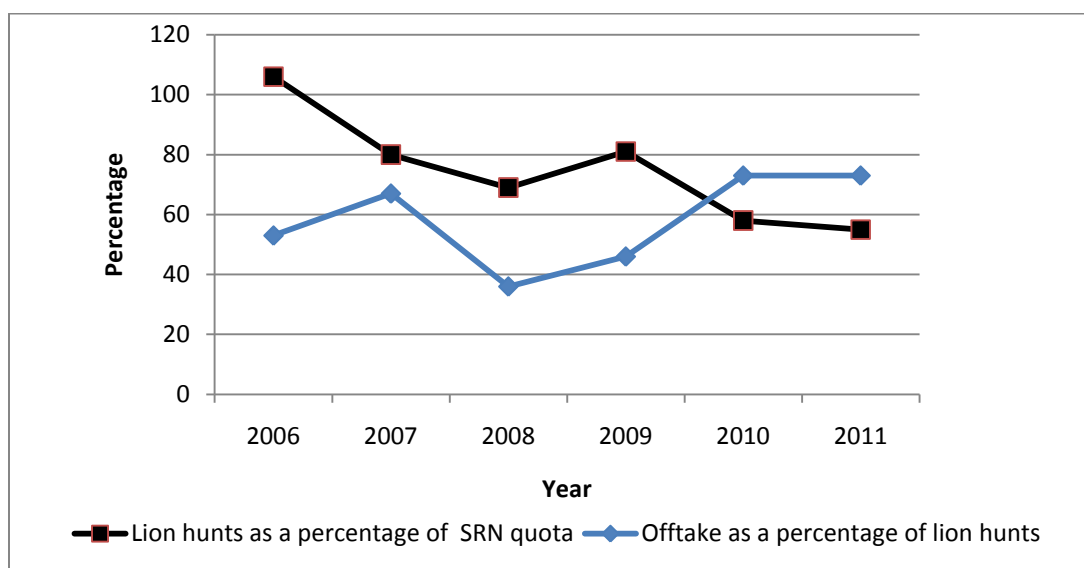
oldest leopard taken by A. Dillon with Paul Davies as the PH (SAfrique; L1). Only one leopard hunt was unsuccessful. In 2011 it took an average 6.5. days to find a leopard trophy (range 2-10). All leopards were taken n bait with an average of 6 baits set (range 1-9).

- Data on leopard densities, turnover and cost benefit analysis of sport hunting leopards has been analysed in detail by Agostinho Jorge as part of his Master's Thesis and is in prep for two scientific papers. This includes NCP data on aging, location, camera trapping data in L5-South and L7 and 2008 and 2009.
- Eight lions were taken as trophies in 2011 with one additional lion taken in the Kambako Courtada. One lion was wounded (L2) and not recovered. All, except one, of the lions were six years old and over. One of the lions was in the 4-6 age category. According to the Niassa Points system for assigning quotas, two of the concessions received an increase in quota for 2012, with all other quotas remaining the same. Provisional lion quota recommendations were prepared according to SRN points system and were sent to SRN in January 2012 to be sent to operators in time for the hunting shows. Based on trophy quality all quotas should remain the same for 2012 except for Block R3 and L3 which should receive an increase in quota from two to three lions due to all their trophies being over 6 years of age.
- In 2011, we reached our initial target of less than 20% of lion trophies to be under the age of 6 with 87.5 % of the trophies acceptable and no lions under the age of 4 taken as trophies since 2006. Operators and SRN are to be commended for their efforts. This remains one of the view areas in Africa where the six year age minimum is enforced.



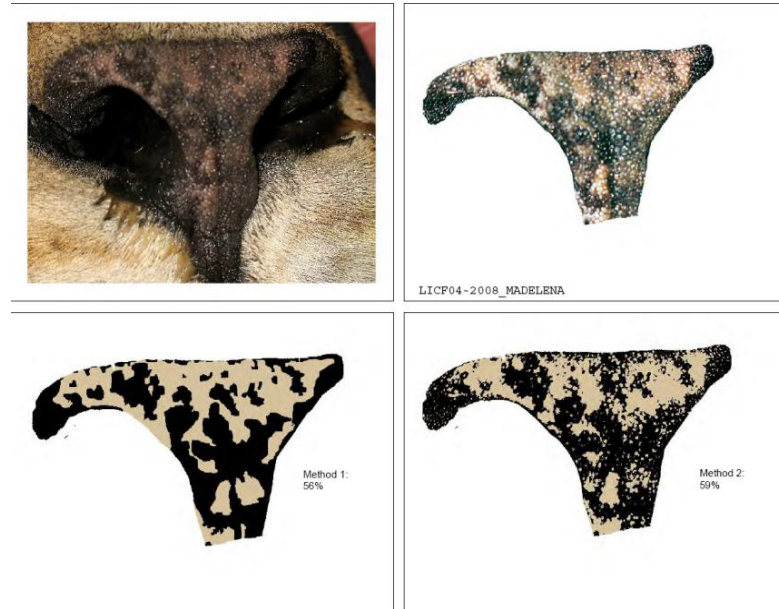
Effects of the Niassa Points System showing data on the off take and number of acceptable lion trophies between 2003 and 2011. Note trophy monitoring was initiated in 2004, and the Points system was used to determine lion quotas in 2007. Note that changes in off take are not entirely due to Niassa Points System as economic downturn have also affected marketing of hunts.

- In many areas, trophy off-take as a percentage of the quota is used as an indication of the status of lions. When off-take declines it is said to reflect a declining lion population. However, this is only true if effort remains constant. Many operators do not sell all their lion hunts for a variety of reason including the global economic downturn, poor marketing and lack of effort. The number of lion hunts conducted as a percentage of the SRN quota has declined between 2006 and 2011 (see below) perhaps representing the economic downturn. However the proportion of successful lion hunts has increased. The argument that the six year age minimum is resulting in too many unsuccessful hunts which hurts business is clearly not true. The decline in off-take is more likely to be due to the economic downturn than the SRN lion regulations. It is a pity that no data is available on lion hunts prior to 2006. In addition the number of days to a lion kill, and the proportion of the safari completed before a kills is made have not changed significantly.
- While the points system has been successful it remains obvious that constant monitoring and independent auditing of lion trophies remain essential to ensure the regulations are followed.

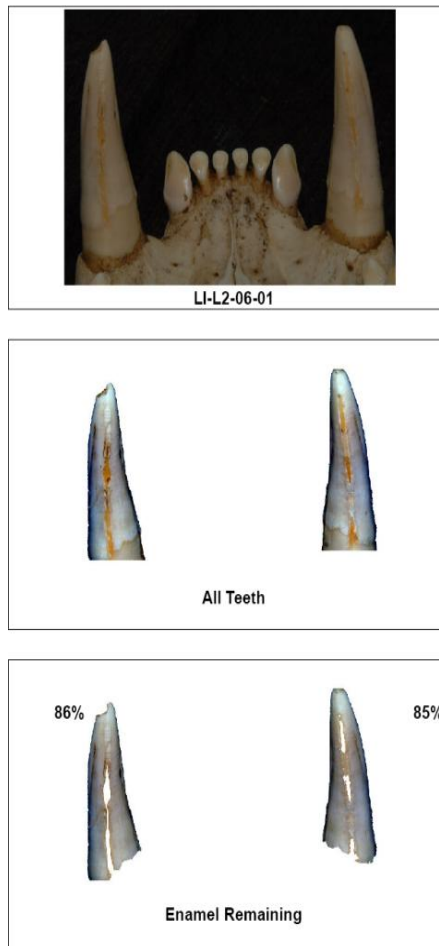


The change in the number of lion hunts conducted over time as a percentage of the assigned SRN quota and the percentage of successful lion hunts (See Research report 2012).

- NCP is collaborating with Panthera and Kathy Zeller to standardize analysis of nose pigmentation and teeth wear on canines. An additional 10 nose pictures were taken from captured lions this year to add to the data base. In addition monitoring of nose darkening and mane development over time in collared lions continues



GIS analysis of nose pigmentation to determine percentage pigmentation, analysed by K. Zeller (Panthera) using the same method used by Whitman et al 2004 and a more a automated method.



Example of the GIS analysis of the percentage chipping of the canine area and enamel ridge. Analysis done by K. Zeller (Panthera).

LICM12-SAMORA



Changes in nose pigmentation and mane development in the same male lion over a one year period.

OTHER ACTIVITIES

- Three presentations on NCP activities and Niassa were done in the USA – WCN Wildlife Expo, Houston Zoo, Genentech Off Site PostDoc retreat.
- Provided funding to MITUR for translation of National Lion Strategy and Action Plan document and Mozambican lion survey developed in 2009 with assistance for Cat Specialist Group so that it can be sent to Council of Ministers for ratification.
- A complete Solar system worth more than \$130 000 has been set up in the Reserve head quarters, sponsored and provided by WCN Solar project in collaboration with NCP. This system provides power to the office blocks, as well as scout camp. This has made a huge difference to the working conditions in Mbatamila camp.
- NCP continues to mentor, support and supervises Agostinho Jorge through his postgraduate Masters degree. He is currently writing up his research on leopards at Kwazulu Natal University and thesis will be handed in March 2012. His thesis looks at the costs and benefits of illegal and legal off take of leopards in NNR as well as the sustainability of leopard sport hunting given leopard densities.
- NCP received funding support for satellite email system and solar panels in their field camp from WCN donors which has greatly increased efficiency and ability to communicate with donors, scientific community, and Mozambican management authority. We are now able to rapidly respond to poaching events.



- Our application to open a local branch of the Ratel Trust In Mozambican was submitted to Department of Justice in May with support from SRN and MITUR. We are still awaiting a decision and are working with a Mozambican lawyer to resolve this.
- The Ratel Trust tendered for the L5-South concession (800 km²), our intensive study area since 2005 in February 2011. This will provide the site for the planned Environmental and Skills training centre. TRT won the bid for the concession and is currently negotiating a contract for a 25 year lease of the concession. This will secure the future of the project as well as allow us to work in partnership with the Mbamba community and NNR management to secure the area for conservation, social development and environmental education.
- Our web presence has improved and we are in more regular contact with donors due to the solar internet connection available in camp. A website is currently being developed. It should go

live in March –April 2012. A Facebook page is active (Niassa Lion Project) and C. Begg was invited to write a blog on Niassa for Safari Interactive magazine.

- Three donor visits to the project were accomplished in 2011.
- We continued with our active membership of African Lion working Group and IUCN Cat specialist Group.

2011 YEAR REVIEW (BASED ON 2011 NCP WORKPLAN'AND FUNDING PROPOSALS)

Of the 40 activities identified in the 2011 work plan, 92.5% of the activities have either been completed (75%) or partial progress was achieved (18%). Two activities are still planned but no progress was achieved in 2011 (see comments) and no activities have been discarded.

Objective	Activity	Complete	Partial progress	Still planned	Discarded	Comments
Assess inadvertent snaring and bushmeat consumption	Radio-mark and monitor lions in intensive study area to monitor mortality					10 lions captured and radio marked
	Expand on bushmeat survey –bushmeat consumption					Dry season survey complete, wet season survey being done .
	Identify possible solutions and planned activities					Environmental and skills training centre proposal, guineafowl breeding, employment-community guardians
Assess status of lion population	3 rd Lion- hyaena call up survey					Postponed to 2012 due to logistical challenges- AJ not able to help so only one team
	Continue to monitor lion population- movement patterns, mortality					10 lion radio collared- two satellite collars, collars recovered with village movement data.
Living fences program and goat corrals	Monitor experimental fences (3) and SRN fences					Identified problems with flooding and gates cut into them. Double plant first experimental fence to assess effectiveness
	Survey of Mbamba community –safe shelters, human- ;ion incidents, goat corrals					Completed – no human-carnivore incidents, goats counted and goat corrals assessed.
	Plant additional three fences in Mbamba					Community decided to plant boundary fence - 4 chiefs each planted a portion
	Assist SRN with procuring fence					Provided cuttings of 1,5 Bedford trucks from Pemba.

Objective	Activity	Complete	Partial progress	Still planned	Discarded	Comments
	cuttings					Transport provided by SRN, diesel and cuttings provided by NCP
	Report back to Mbamba of fences and human-carnivore conflict 2 meetings					Four community meetings, combined meetings with NNR team and visiting chiefs from other villages
	Conduct a survey of goats and goat owners in Mecula District					Complete for villages- Mussoma-Mecula, have not done Matondevela. Gomba Nualala.
Support SRN SMOG/ MOMS community agent program	Provide funding					Full funding provided
	Monitor implementation and provide guidance and support where needed					Ongoing
	Donate computer for data entry					Computer and screen were donated but in all the bumping up to NNR, it wouldn't work, lose connection, need to be repaired in Lichinga
Engage with sport hunters and SRN to reduce unsustainable sport hunting	Complete analysis of 2010 lion and leopard sport hunting					No special report written but summary in Annual report, plus lion quota recommendations and presentation of results at operators meeting
	Report back on 2009 results at operators meeting and hunters meeting					Reported back May 2011 meeting
	Monitor 2011 trophies					All blocks visited and all trophies measured and seen
	Maintain regular contact with sport					

Objective	Activity	Complete	Partial progress	Still planned	Discarded	Comments
	hunters and SRN					
	Publish results on points system and lion sport hunting regulations comments					Still not complete, in the process. Still planned. GIS analysis of teeth and noses competed in collaboration with Kathy Zeller- Panthera
Develop Environmental awareness and education	Print and Distribute safe behaviour poster in NNR					Delivered to all schools and clinics in NNR
	Poster available to wider Mozambican community					250 posters provided to NITUR for distributed in all Mozambican protected areas
	Train Euzebio Waiti t to report back to Mbamba					Ongoing- Joaquim – extension officer all presenting to community, all staff presented at Mbamba lion fun days
	Complete and print workbook and ABC capulana					ABC capulana designed by Afra Kingdon, not printed as very expensive to print and funding not yet available,. Workbook not complete, initial work not satisfactory for NNR needs, still working on it with assistance from Houston Zoo. Delayed.
	Distribute storybook to all schools in NNR with teacher guidelines					900 storybooks distributed to 34 books with teacher guidelines and waterproof boxes were possible
	Questionnaire survey to assess effectiveness of education material					Books only delivered in August 2011, questionnaire survey delayed until 2012 so that there has been a year with book. Preliminary questionnaire developed will be developed further with Mecula Director of Education.
	Initiate village to village extension work					Joaquim Auassi hired as extension officer, all villages in NNR visited in 2011
	Annual Mbamba lion conservation					Very successful in partnership

Objective	Activity	Complete	Partial progress	Still planned	Discarded	Comments
	fun days					with Houston Zoo
Support and guide program to disease risk	Motivate for vaccination and reduction in domestic dogs					2011 -domestic dog survey of all villages completed showing exponential increase in dog population,
	Disease analysis from carnivores					Ongoing – 24 samples in total from lion all negative, Whatman papers from trophy hunted a carnivores to be analysed. 2010
Mentor and train Mozambican conservationists	Drivers license for Batista					Lichinga problem with Licensing department, can drive and spent 5 months there but no licenses issue
	Continue to mentor and supervise A, Jorge					MSC thesis to be handed in March 2012
	Opportunities for A . Jorge to be involved.					
Fund raising, marketing and development of project	Sign an MOU with SRN for next phase of project					Future of SRN not secure, signed an interim MOU for 2011, at this point unclear who to sign new MOU with, in process
	Set up local branch of TRT in Mozambique					Papers were submitted in April 2011, still waiting for reply
	Complete technical report					
	Submit tender for L5-South					Tender awarded to TRT , further documents submitted and in the process of negotiating 25 yr lease contract.
Increase awareness	Encourage implementation of National wild dog, lion and cheetah conservation strategies.					Paid for translation of Conservation strategies into Portuguese before presentation
	Collaborate with SNWC					Collaborated with river survey of Ruvuma –River – mapping,

Objective	Activity	Complete	Partial progress	Still planned	Discarded	Comments
						advice,
	Print and distribute Human-lion conflict toolkit					Human-Lion Conflict Toolkit completed, distributed as pdf to ALWG and other organisations
	Develop website					In progress. Web site designer identified as well as two volunteers for content, will be live in March 2012

ACKNOWLEDGEMENTS

Principle sponsors:



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