Tanzania Wildlife Research Institute

Proceedings of the first Tanzania Carnivore Monitoring Workshop

29th April, Impala Hotel, Arusha

Editors:

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1. AGENDA

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8:15-9:00	Registration	All participants
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9:05-9:15	Introduction	All participants
9:15-9:20	Welcome address	Director General, TAWIRI
9:20-9:35	Opening speech	Chief Ecologist, TANAPA
9:35-9:50	About TAWIRI	Director of Research, TAWIRI
9:50-10:20	The use of GIS in biodiversity monitoring	Lara Foley/ Dr. Scott Harrison
10:20-10:40	*Tea break*	*All participants*
10:40-11:10	The Tanzania Bird Atlas Project	Neil Baker
11:10-11:40	The importance of disease in carnivore conservation	Chief Veterinarian TANAPA Dr. Cassandra Nunez
11:40-12:00	Carnivore Biodiversity and its Conservation	Dr. Sarah Durant
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13:00-14:00	*Lunch Break*	*All participants*
14:00-14:15	Introduction to working groups	Dr. Sultana Bashir
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16:30-17:00	Closing speech	Director General, TAWIRI
19:30-22:00	Reception/Cocktail Party	All participants

2. SUMMARY

The first Tanzania Carnivore Monitoring Workshop was held in Arusha on 29th April 2003 to launch the new Tanzanian Carnivore Programme within TAWIRI. The programme is funded by the Darwin Initiative and aims to help Tanzania build capacity for carnivore conservation through the establishment of a national Carnivore Centre at the headquarters of the Tanzania Wildlife Research Institute (TAWIRI) in Arusha. The Centre will have four key national functions: 1) to establish and monitor the current distribution of all carnivore species; 2) to monitor individually recognised cheetahs and wild dogs; 3) to train Tanzanian wildlife professionals in carnivore monitoring techniques; and 4) to increase national awareness of carnivore conservation issues. The ultimate objective is to develop an action plan for carnivore conservation in Tanzania, prioritising action to conserve threatened species and help safeguard the country's carnivore biodiversity. The workshop was attended by 59 participants from various stakeholder groups including the government wildlife sector, academic institutions, major tour operators, professional hunting companies and wildlife lodges. All the participants at the workshop had considerable experience and knowledge of the wildlife sector in Tanzania. The morning session consisted of a series of papers introducing the purpose and proposed work of the Carnivore Centre. In the afternoon, participants were divided into working groups to discuss their views on the Centre and their needs and wants from the Centre. All the working groups were unanimous about the need for more information on wild carnivores, training and public education and in their desire to participate actively in the Centre's activities, particularly through training and data collection. There were differences between groups on specific information and training requirements and in the ways in which they felt they could contribute to the Centre's activities, based on differences in the kinds of expertise and the major concerns of different stakeholder groups.

3. INTRODUCTION

The first Tanzania Carnivore Monitoring Workshop was held in Arusha on 29th April 2003 to launch the new Carnivore Programme within TAWIRI. It aimed to disseminate information about the Programme's aims and activities to key stakeholders and to obtain feedback. The programme seeks to help Tanzania increase its capacity for the long-term conservation of carnivores through the establishment of a Carnivore Centre at the headquarters of the Tanzania Wildlife Research Institute (TAWIRI) in Arusha. The Centre will collect data on carnivores from a wide range of sources and manage this information in a national database. It will initially have a special focus on two species of large and easily individually identifiable carnivores that are particularly threatened: cheetahs and wild dogs.

The workshop was attended by 62 participants from various stakeholder groups including TAWIRI, TANAPA, the NCA, academic institutions, major tour operators, professional hunting companies and wildlife lodges. The active participation of individuals from these groups is key to the success of the Carnivore Programme. All the stakeholders at the workshop have considerable and varied experience and knowledge of the wildlife sector in Tanzania. Unfortunately, due to limited resources, only the larger safari and hunting companies were invited to this initial meeting. But it is hoped that, with extra funds, similar workshops where a wider section of the wildlife private sector can be invited can be held in the future.

The workshop was opened by the Guest of Honour, Mr Lejora, Chief Ecologist from TANAPA. After the opening speech, the morning session of the workshop consisted of a series of papers introducing the purpose and proposed work of the Carnivore Centre. In the afternoon participants split into working groups to address their needs and wants from the Centre. Dr. Charles Mlingwa, the Director General from TAWIRI, gave the closing address.

4. THE CARNIVORE CENTRE

4.1 Carnivore Biodiversity and its Conservation

Carnivores are facing a critical period in their evolutionary history. Currently 24% of all carnivore species are 'threatened'. They are often persecuted or hunted by people, whilst their position at the top of the food chain means that they are often the first to disappear when habitats come under threat. However carnivores are charismatic and hence are important economically as they attract visitors and tourist revenue. They are also good indicator species as an ecosystem that can support carnivores is likely to be 'healthy'. Finally, carnivores are important for regulating prey numbers and populations of prey species often increase in the absence of carnivores. However despite all these factors, carnivores continue to decline from a variety of human induced causes, such as poisoning and trapping, illegal or unsustainable hunting, disease and habitat destruction and loss of prey. People often do not like carnivores, particularly as carnivores come into conflict with people more than any other taxa:

- Large carnivores have the potential to kill people.
- Carnivores like to eat the things people like.
- Carnivores carry rabies and other diseases.
- People like to kill carnivores for their fur or their scent, and carnivore parts are often in demand for medicinal use.

Tanzania is critically important for carnivore biodiversity. The country is home to 35 species of carnivores- nearly half of Africa's carnivore species - and a survey of carnivore biodiversity in Africa pin-pointed Tanzania as containing some of the most critical areas of carnivore biodiversity in the continent (Mills et al. 2001). Tanzania holds important populations of five threatened species: The African Wild Dog (*Lycaon pictus)*, Spotted Neck Otter (*Lutra maculicollis*), Cheetah (*Acinonyx jubatus*), African Lion (*Panthera leo*), Spotted Hyaena (*Crocuta crocuta*) and Striped Hyaena (*Hyaena hyaena*).

However despite Tanzania's rich carnivore biodiversity there is at present no national monitoring plan for carnivores, and hence the status of each species is unknown. Until such a plan is in place it is impossible to plan for the long term conservation of carnivores in Tanzania. Monitoring is needed to assess current trends, identify major threats, plan responses to threats and to assess effects of conservation action. There are a number of different means of monitoring wildlife:

- Species distribution
  Use: to identify range contractions or expansions.
  Range changes can then be related to environmental and/or human factors
- Ecological monitoring
  Use: to monitor changes in habitat that might impact species of concern.
  Can be used to predict possible threats.
- Population monitoring
  Use: to identify changes in population size.
  Can be related to management strategies, ecological variables and human activities.
- Demographic monitoring (e.g. births and deaths)
  Use: to identify changes in birth and death rates.
  Can provide an early warning of threats to populations.
- Individual monitoring
  Uses: to identify changes in reproductive and death rates at an individual level and to monitor ranging patterns.

Can provide early warning of threats to populations and an indication of the source and consequences of any threats.

The simplest form of monitoring, that of monitoring species distribution, can be done using presence/absence data, where the presence or absence of a species in a particular location is recorded. Whilst these data are relatively straightforward to collect, they can be used for a number of purposes such as to:

- Identify range contractions or expansions.
- Relate range changes to environmental and human factors through GIS analysis.
- Help leverage political and financial support for in depth surveys and analysis when dramatic declines in distribution are detected

Such data are similar to those collected by the Bird Atlas Project which have been used with great success. The Carnivore Centre proposes to collect similar data using a **Carnivore Atlas Project** – a national programme to assess the distribution of all carnivore species across Tanzania.

4.3 The status of cheetahs and wild dogs

Cheetahs and wild dogs were once widespread across Africa, with cheetahs extending through to Asia. Both species are now globally threatened, with populations declining across Africa. However, Tanzania holds globally significant populations of both species. Cheetahs and wild dogs help attract visitors to Tanzania's wildlife areas.

Cheetahs

Cheetahs are now largely restricted to southern and eastern Africa, with Namibia holding the single largest population, and other important populations in Botswana, Zimbabwe, Kenya and Tanzania. There is one small remnant population of Asian cheetahs in Iran. The global population estimate is between 10,000 and 15,000 cheetahs, of which around 1,000 occur in Tanzania. Tanzania holds one of the largest single protected population of cheetahs in the Serengeti National Park.

Cheetahs always occur at low densities, mainly due to competition with larger carnivores such as lions and spotted hyaenas. Cheetah females are solitary or with dependent cubs whilst male cheetahs can form coalitions of two or three males (usually brothers). Cheetahs have large home ranges (home ranges of 800km^2 in Serengeti) and suffer from significant cub mortality due to predation by lions and spotted hyaenas. Cheetahs also lose a proportion of their kills to these predators. Competition with larger carnivores is exacerbated when the cheetah's ranging patterns are restricted by being confined to small and isolated reserves.

Wild dogs

Wild dogs are now almost entirely restricted to large protected areas in east and southern Africa. The global population of wild dogs is estimated at 5,700, of which 1,800 occur in Tanzania, making the country home to a third of the world's wild dogs. The single largest population of wild dogs in the world is in Tanzania's Selous Game Reserve and adjoining Mikumi National Park. This reserve is estimated to hold 1,000 wild dogs.

Wild dogs always occur at low density. They are extremely social, and live in packs ranging from 2-30 dogs, but usually only the dominant pair in a pack breeds. They have large home ranges of up to 600km^2. Like cheetahs, wild dogs also suffer from competition with lions and spotted hyaenas, and frequently lose their kills to these species, and are sometimes killed by lions. Again, as with cheetahs, this competition is exacerbated when their ranging patterns

are restricted. They are also vulnerable to disease due to their extreme sociality, which facilitates transmission of infection between individuals.

Monitoring cheetahs and wild dogs

Monitoring of both species is vital to establish estimates of minimum population size, which are crucial for conservation planning. Long-term monitoring and estimates of population size are also necessary to identify important areas for cheetah and wild dog conservation and actual and potential threats to populations. Lastly, monitoring is essential to assess the effectiveness of any actions implemented for the conservation of these species.

Because cheetahs and wild dogs always occur at low density and are hence are difficult to find, it is impossible to assess their population status through standard methods of monitoring such as transect counts. As these species are also extremely wide-ranging, distribution maps can be misleading – the reported presence of wild dogs in several different areas may be due to a single wild dog pack. Instead, these species are best monitored by individual recognition. This is made easy in the case of both species by distinctive markings that are unique to each individual. Cheetahs can be individually recognised by their spot patterns and wild dogs by their tan and white markings.

The realisation that cheetahs and wild dogs need a long term monitoring plan based on individual recognition, led the Serengeti Cheetah Project to launch a pilot Cheetah Watch Campaign in November 2000. This campaign used leaflets to encourage tourists to send in their photographs of the cheetahs that they see on safari. These photographs are being used to test whether information gathered in this way is sufficient to monitor the Serengeti plains population of cheetahs. Since its launch, photographs of nearly 400 different cheetah groups have been received, of which over 200 have been matched to date. The method is a potentially low cost method of monitoring cheetahs in the long term and has obvious potential for application to wild dogs.

4.3 The Tanzania Carnivore Programme

The Tanzania Carnivore Programme is a collaboration between the Tanzania Wildlife Research Institute (TAWIRI) and the Zoological Society of London (ZSL). The programme is supported through the Darwin Initiative scheme, funded by the UK government. It has four key objectives:

- To collect and manage information on carnivores across Tanzania;
- To train Tanzanian wildlife professionals in carnivore monitoring and identification techniques;
- To provide a Carnivore Unit with facilities for students and wildlife professionals to learn about carnivores and their conservation;
- To assist TAWIRI fulfil its mandate to build capacity for wildlife research.

The programme's ultimate goal is to develop a National Plan for Carnivore Conservation in Tanzania.

The Carnivore Centre

The programme is building a Carnivore Centre at TAWIRI headquarters in Arusha that will act as a repository for the carnivore database. The Centre will employ three full time research staff, and will compile newsletters for distribution to all stakeholders and interested parties. It will also provide facilities for specialist training in carnivore monitoring techniques, and a room for talks and seminars. Wherever possible it will promote education and outreach programmes about carnivore conservation. The Carnivore Unit will be a part of the Centre.

Collecting information on carnivores across Tanzania

The initial focus of the Tanzania Carnivore Programme is to establish distribution maps for all carnivore species in Tanzania through the Carnivore Atlas Project and to gather more detailed information on Cheetah and Wild Dog, two species of endangered carnivore, through the Cheetah and Wild Dog Watch Campaigns.

The Carnivore Atlas Project

The Carnivore Atlas Project is modelled on the successful Bird Atlas Project (see Appendix 1.4). The project will establish a network of individuals interested in contributing information, circulate maps, carnivore check sheets and sighting sheets to participants and provide regular feedback through a project newsletter. The project will send out a species checklist for Tanzania's 35 species of carnivore and sighting sheets for more detailed location information on rare species. The data contributed will provide information on presence/absence information for all carnivore species as well as more detailed information on the rarer carnivores. Potential problems in the data include lack of coverage, particularly in more remote parts of the country. However, where coverage is lacking we hope to use the Centre to leverage additional funding for more in-depth surveys.

The Cheetah and Wild Dog Watch Campaigns

The Carnivore Centre is building upon the experiences of the Serengeti Cheetah Project's pilot Cheetah Watch Campaign to develop expanded and improved monitoring programmes for both cheetahs and wild dogs through the Tanzania Cheetah and Wild Dog Watch Campaigns. We are producing leaflets for distribution to visitors in all wildlife areas of Tanzania. The leaflets request visitors to send in photographs of their cheetah and wild dog sightings to help us build up a database of individuals through which we can monitor individual cheetahs and wild dogs and thus, over time, entire populations. Such information on individual wild dogs and cheetahs will allow calculation of minimum population size and, through information on young animals, information on the reproductive rates of populations. The data can also provide rudimentary information on ranging patterns, particularly where driver guides, who can often provide accurate locations, help their clients fill in the sheets. Copies of the leaflets can be obtained from the Centre on request (please email carnivores@habari.co.tz).

Two full time research assistants have been employed by the Centre, thereby increasing our capacity to process photographs more quickly and provide feedback to contributors. We have also installed a software programme that automates the cheetah matching, which will also enable us to process photographs more quickly. Finally we are developing a feedback system to acknowledge the contribution of people who send us photos and information through the following web sites: www.wcs.org/cheetahs and www.wcs.org/wilddogs. The former is up and running. The feedback will provide information on individual animals seen where such information exists.

Training and capacity building

The programme has a strong training and capacity building element. As well as providing training for its three scientific staff, it will also provide training for Tanzanian wildlife professionals and students on carnivore monitoring techniques and GIS as well as facilities and supervision for graduate students. It will also respond informally to all requests for information wherever it can, and is open to any other requests for training.

Assisting TAWIRI fulfil its mandate

The programme has an important additional objective to assist TAWIRI fulfil its mandate by contributing to wildlife research and monitoring, aiding capacity building and disseminating information to all organisations, stakeholders, private companies and the general public with an interest in carnivores and their conservation.

5. WORKING GROUPS

Facilitator: Dr. Sultana Bashir

Background

The afternoon session of the workshop was designed to engage participants in the activities of the Centre. For this participants were divided into four working groups. Because of time constraints and the divergent interests of different sectors of the wildlife community, groups were divided according to different professional interests, each with a facilitator. Thus, Group 1 included representatives of TANAPA, NCA and academic institutions; Groups 2 and 3 comprised mainly representatives of tour operators and a few researchers, while Group 4 consisted mainly of representatives from hunting companies. Members of TAWIRI were asked to distribute themselves evenly between the groups with no more than two people per group. The names of participants allocated to each of the four working groups and of the individual group facilitator(s) are given in Appendix 2.

The main objective of the working groups was to obtain participants' views on the following:

- the potential benefits and value of the Carnivore Centre to them either as individuals or as part of an organization or institution;
- how different stakeholders could participate in the Carnivore Centre's activities; and
- how to establish effective channels of communication between the Carnivore Centre and all major stakeholders.

Specifically, each working group was asked to discuss the following topics:

1. What information needs do you have on wild carnivores in Tanzania?
2. What training needs do you have in relation to carnivores?
3. What public outreach/education needs do you have in relation to carnivores?
4. Do you want to participate more actively in the Centre's activities, and if yes, then how would you like to contribute specifically?
5. What mechanisms could be developed for more participatory two-way communication between the Centre and yourselves?

The outcome of the discussions held by each working group is discussed below, with specific responses detailed in Table 1.

Main Outcomes of Working Group Sessions

All the groups perceived value in the establishment of the Carnivore Centre in Arusha with its stated goals. All the groups were also unanimous about the need for more information on wild carnivores, training and public education and in their desire to participate actively in the Centre's activities, particularly through training and data collection, with some participants even being prepared to collect biological samples if provided with the appropriate kits by the Centre. There were also useful suggestions on how best to achieve effective communication between the Centre and its major stakeholders, notably through a website and e-mail group.

As expected, there were differences between groups on their specific information and training requirements and in the ways in which they felt they could contribute to the Centre's activities, based on differences in the kinds of expertise and the major concerns of different

stakeholder groups. Some of these differences are discussed separately below and further details can be found in Table 1.

Group 1, which consisted mainly of members of TANAPA, NCA and academic institutions, highlighted the need for a wide range of materials for public education and outreach targeted at a variety of audiences including local communities, school children, tourists and the mass media. They also suggested a number of different types of educational and outreach methods including public meetings, video shows, carnivore conservation clubs, websites and exhibits at major events such as at trade fairs.

Groups 2 & 3, which mainly comprised representatives from safari companies, had various ideas about the types of information, educational and public outreach materials and activities that could be developed by the Centre as well as about the specific kinds of training required, such as in small carnivore identification, for different types of people, for example driver guides, tourists, village scouts, etc. It was also suggested that educational and other information materials could be disseminated through the Tanzanian Tourist Board, the Tanzanian Association of Tour Operators and at the annual Arusha Trade Fair. Additionally, **Group 3** said they had discussed the possible design and development of a newsletter in greater detail than reported and that they would be happy to provide further inputs on this to the Carnivore Centre.

Group 4 had several useful comments and suggestions on data collection. This group included mainly representatives from professional hunting companies many of whom are already collecting data on larger carnivores and have their own databases. This Group felt very strongly that while there was need for data on carnivores**, poor data** are worse than **NO** data and that therefore there should be a list of specific questions that the Carnivore Atlas Project of Tanzania is attempting to answer. They also suggested the acronym CATZ for this project.

Group 4 also felt that standardized data collection forms were critical and that perhaps different forms could be developed for different groups reflecting varying levels of expertise, for example, the experience of a hunting guide versus that of a tourist, as well as for different information needs such as separate forms to record species sightings data and human activities such as poaching, livestock and so on. They suggested that it was better to focus on one type and/or method of regular data collection and to do that properly than to ask people to use multiple methods or to collect 'everything' every day.

Group 4 also expressed strong concern about the long-term use of any data, biological samples and other information collected by the Carnivore Centre. They felt strongly that carnivore research needs to be linked to management, for example, by providing inputs to help set quotas. Such inputs would include a better understanding of carnivore population dynamics, habitat changes (eg the impacts of bee-keeping, agriculture, tobacco farming, etc.) and the ranging patterns of carnivores through collaring.

Additional comments made by **Group 4** included the following:

- The difficulty of aging harvested animals as teeth don't work and lion nose colour is likely to vary across different regions.
- Pamphlets must recognise local languages.
- Training and information exchange must recognize local community structures, i.e. the elders.
- Databases should be linked to GIS for visual representation of data.

Table 1. Benefits & Value of the Centre to you as an Individual or as an Organization or Institution

GROUP 1	GROUP 2	GROUP 3	GROUP 4
1.1 Information Needs			
Carnivore species diversity, distribution, population trends/dynamics & disease interactions.	Information materials for general and more specialized tourists and for guides.	Secure on-line information centre (passwords) for recent sightings.	Data on distribution of carnivores, especially outside SNP & NCA.
Carnivore socio-biology, ecological & socio-economic values.	*S*pecific research findings & project information on carnivores especially for guides.	Website with detailed information on all carnivores for use by guides or in training.	Ideally, population sizes of carnivores, but the group realises that this may be difficult for *the* CMC to provide.
Carnivore-human interactions.	Posting of carnivore sightings and information about relevant projects/research at lodges.		Wall identification chart of carnivores for professional hunters to refer to and check their sightings.
1.2 Training Needs			
Carnivore identification.	Individual identification of cheetah & wild dogs and taking photographs suitable for individual identification, to enable drivers *to* use themselves and also 'guide' their clients if required.	Use meeting room at CMC as a guide training facility.	
Carnivore population monitoring techniques.	Provision of GPS equipment and training, e.g. through rentals from the Carnivore Centre & GPS training to guides.	Stratified training, e.g. for: • Trip leaders • Driver guides • Village/Game Scouts • Community Education, e.g. film	
Carnivore management techniques including disease management.	Small carnivore identification for Carnivore Atlas Project.		
1.3 Public Outreach & Education			
Leaflets & posters, songs & poems, videos for video shows	Need information on carnivores for safari companies for both guides & agents that they in turn can provide to clients.	Provision of information materials for communities.	
Website	Posters, leaflets and website addresses should be made available at lodges, park gates & airlines.		
Programmes for schools, video shows, public meetings, etc.	Need library at Carnivore Centre to provide access to scientific papers & reports as well as more general information & maybe access to internet sites providing information on carnivores.		
	Need education & dissemination of information to general public/local communities through radio, tv, videos, opportunity to visit carnivore areas and public lectures at the Centre.		

Table 2. Increased Participation In The Carnivore Centre's Activities

GROUP 1	GROUP 2	GROUP 3	GROUP 4
Information gathering & dissemination through reporting of research findings and preparing articles for the mass media.	Data collection, eg through resident guides who are an important source of information and could fill out data forms, or answer questionnaires and send in observations of interesting behaviour.	Must be two-way system.	Could collect biological samples (eg parasites, DNA, etc.) if kits provided.
Would attend relevant workshops.	Participation in Wild Dog & Cheetah Watch Campaigns through guides & encouraging clients to participate.	Facilitate training at CMC.	Could provide inputs to data collection and management as hunting companies are already dealing with carnivore databases and know how much data scouts and guides can be expected to collect.
Could help provide training.		Help with production of information, e.g. pictures, website development.	
		Collect & provide data.	

Table 3. Channels Of Communication Between You And The Carnivore Centre

GROUP 1	GROUP 2	GROUP 3	GROUP 4
Electronic media	TATO	Newsletter both on-line & hard copy.	Newletters, both on-line & hard copy, including summary reports of progress.
Newsletter	E-mail network linked to websites.	E-mail, also for submitting data.	E-mail group
Workshops & meetings		E-mail groups.	
Visits to the Centre, telephone, e-mail, etc.			

APPENDIX 1

SUMMARIES OF PRESENTATIONS NOT COVERED IN MAIN TEXT

A1.1 Welcoming address
Mr Lejora, Chief Ecologist, TANAPA

At the official opening of the workshop, the guest of honour, the Chief Ecologist at TANAPA, stressed the importance of the Carnivore Programme. Research and monitoring of wildlife resources, provides the necessary scientific information needed to determine the best ways to utilise these resources sustainably for the benefit of Tanzanians.

He pointed out to participants the role that carnivores play in ecosystems through their role at the top of the food chain. Carnivores are among the most fascinating animals in the wilderness, and because of this attract foreign currency through tourism. This means carnivores are economically important to Tanzania, and the income generated contributes to poverty alleviation to our people. Thus, by supporting the conservation of carnivores, the programme is contributing to Tanzania's national vision of the eradication of poverty by 2025. Mr Lejora stated that he was pleased to see that TAWIRI and ZSL are working together to monitor these very important group of animals, to enable scientific information to be collected to guide management authorities for decision making and he thanked the Darwin Initiative and ZSL for supporting this programme.

Mr Lejora went on to note that human beings are competing with carnivores for available space and dwindling resources and as a result many carnivores are threatened. If we are to continue realising the economic and ecological benefits of our wildlife we need information on their distribution and abundance so that we can develop sound conservation and management plans. Mr Lejora underscored the importance of stakeholder involvement in the programme by insisting that the current wildlife policy advocates for stakeholders involvement in wildlife conservation. He therefore urged participants to contribute fully during the workshop.

A1.2 The Tanzania Wildlife Research Institute
Dr. George Sabuni, Director of Research, TAWIRI

The Tanzania Wildlife Research Institute (TAWIRI) was established in 1980 by the Act of Parliament of the United Republic of Tanzania No. 4 of 1980 under the name "Serengeti Wildlife Research Institute", later changed to the Tanzania Wildlife Research Institute (TAWIRI) in 1999 through an Act of Parliament (No. 10).

TAWIRI is mandated to carry out and co-ordinate wildlife research in the United Republic of Tanzania with the overall objective of providing scientific information and advice to the government and wildlife management authorities on sustainable conservation, management and utilization of wildlife resources. Thus the specific objectives of TAWIRI are:

- To carry out research and documentation on wildlife.
- To co-ordinate and supervise all wildlife research in the country.
- To provide opportunities for training and education of Tanzanians on wildlife in the country.
- To collaborate with local and foreign institutions on wildlife research.
- To advise the government and wildlife management authorities on sustainable conservation including utilization of wildlife resources in the country.

A1.3 The Use of GIS in the Tanzania Carnivore Project

Lara Foley, Tarangire Elephant Programme
Scott Harrison, University of Oxford

A Geographic Information System (GIS) is a valuable tool that is increasingly being used in wildlife research and conservation. It is a computerized method of displaying and analyzing spatial (geographic) data that would be traditionally displayed as paper maps (Fig. 1). A GIS stores data in separate layers, allowing users to easily query and analyze data. The three parts to a GIS are databases, maps, and computers. Databases have the capacity to organize data in a standardized way, and provide tools to sort, query, and summarize data. Maps provide a 2-dimensional picture of 3-dimensional features on the ground. Computers are the obvious choice for storing and processing all this information due to their large memory capacity and ability to handle complex computations.

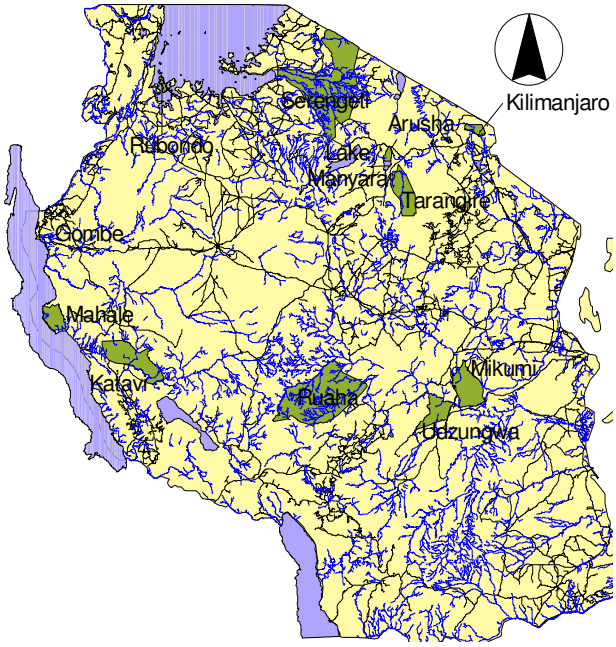

Fig 1. GIS depictation of the parks, major towns and rivers in Tanzania

Data used in a GIS can come from a variety of sources: paper maps, aerial photographs, satellite images and field collections. Paper maps can be digitized (traced with a specialized mouse) into a computer for a digital copy. Aerial photographs cover large areas, which are useful to interpret land cover types and geographic features such as mountains and canyons. Satellite images offer pictures of large landscapes, and can also provide more detailed information with specialized sensors for temperature, rainfall, heat emissions, and vegetation cover. Data such as animal locations, habitat types, village boundaries, and human population can be collected in the field or from existing sources and added to the database.

The key concept of a GIS is the ability to store spatial information in layers. This enables the user to separate elements such as roads, rivers, vegetation types, human population, and animal locations. These elements can be displayed together or can be displayed and analyzed separately to see how one factor influences another. This tool will be useful for the Tanzania Carnivore Programme as it will allow us to investigate how distance from roads, protected areas, agriculture, and villages affects the distribution and abundance of carnivores. Changes in carnivore ranges can be analyzed and displayed against changes in human population and activities such as mining, agriculture, and deforestation. The programme can then use this information to identify threatened populations of carnivores and create a conservation action plan based on this assessment.

A1.4 The Tanzania Bird Atlas Project

Neil Baker, Tanzania Bird Atlas Project

The Bird Atlas Project is a world wide programme that seeks to monitor global bird distribution using a network of volunteer contributors. Contributors to the scheme complete bird check sheets for the areas where they live or visit and send these in to a national database where the data are compiled and stored. For the purposes of the scheme areas are

divided up into half a degree grid squares and participants tick off each bird species in each square for each month. Provided sufficient coverage is obtained, the data provided under this scheme can be used to monitor variation in bird distribution and changes in migration timing. This information can be used to detect range collapses and responses to long term climate change.

During 1980 the East African Natural History Society instigated a bird distribution atlas project for East Africa. However coverage for Tanzania remained poor until the 1990s. Today the Tanzania scheme has a wide network of contributors. Up until May 2002, 500,450 records of bird species were entered on the national database and 212,432 non-duplicated plots were available for mapping. In addition there were a total of 20,006 breeding season records and 9,089 egg month records. Although some areas are still poorly covered, coverage is improving every year. An approximate key to current coverage can be obtained by mapping the distribution of common and widely distributed species such as the Yellow vented Bulbul (Fig. 2). The data generated by this wide network of contributors to the bird atlas projects has provided information vital to the long-term conservation of birds in Tanzania.

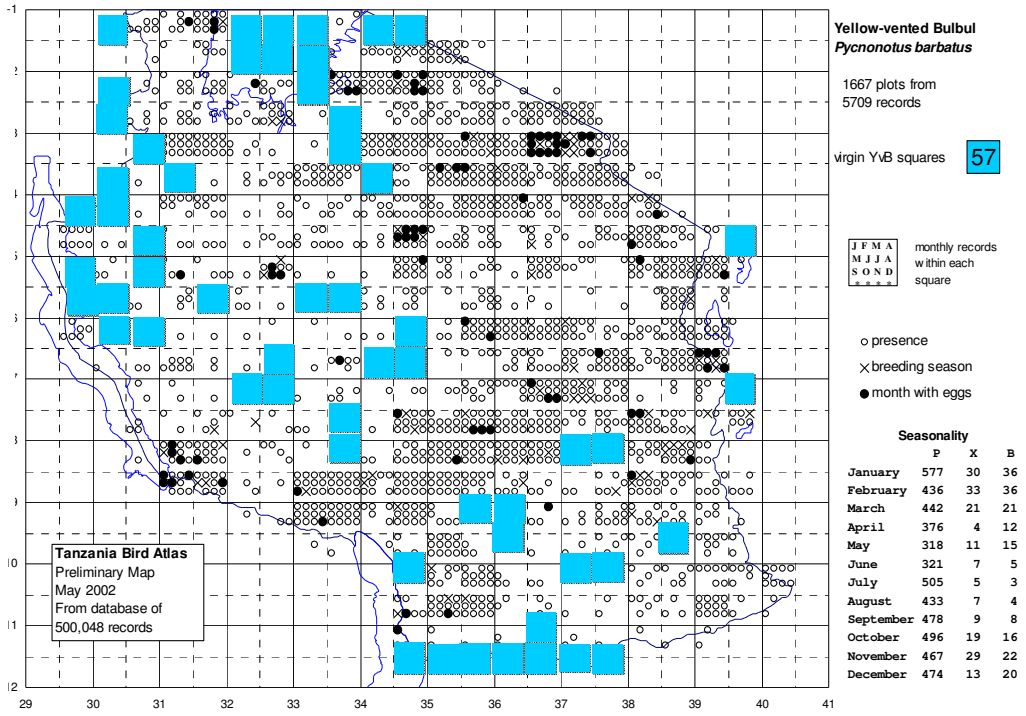

Fig 2. Distribution of the Yellow Vented Bulbul across Tanzania

A1.5 The importance of diseases in carnivore conservation

Titus Mlengeya, Chief Veterinarian, TANAPA
Dr. Cassandra Nunez, Serengeti Carnivore Disease Project

Diseases occur in wildlife with variable impact in susceptible species and can have knock on effects for other species within an ecosystem. For example the Rinderpest pandemic in 1890 caused massive die offs of ungulates, wild and domestic, resulting in a reduction in large carnivore numbers. Carnivores play an important role in the ecosystem as they can regulate populations of their prey species and are important indicators of the health of an ecosystem. They also have economic importance in attracting tourism to protected areas. Nonetheless carnivore survival is threatened due to illegal or unsustainable utilisation, habitat loss, persecution and disease. Diseases such as canine distemper and rabies have been shown to

affect threatened carnivore species such as lions and Ethiopian wolves, and potentially play an important role in carnivore conservation.

Wild carnivore diseases are mostly caused by viral pathogens, often with an ability to co-infect different species. Some diseases, such as rabies, also pose a risk to human health. Carnivores have a particularly high risk of contracting disease due to their susceptibility to diseases carried by domestic dogs and cats and due to their large home range. The major diseases affecting carnivores in Tanzania are rabies, canine distemper virus, Parvovirus and hydatidosis. Such diseases pose a particular risk to endangered species, which are already vulnerable to population disturbance due to their low density. Because of this it is important to monitor different carnivore species in order to detect possible disease outbreaks to assess their virulence and impact, and to plan interventions when necessary.

The Serengeti Carnivore Disease Project

The Serengeti Carnivore Disease Project is a long-term project seeking to understand diseases affecting carnivores in the Serengeti ecosystem. The project focuses on disease surveillance, ecological studies of domestic dogs and wild carnivores and targeted domestic dog vaccination programmes. The domestic dog vaccination programmes are targeted at controlling disease in wild carnivores and aim to achieve vaccination coverage of 70% of the dog population. In addition the project engages in public health education to reduce the possibility of contracting human infection from dogs, including post exposure treatment of bites. Information on the distribution of disease is gathered on domestic dog populations, wildlife and humans. The project is conducting additional investigations into the ecology and social organisations of some key species in order to learn more about the ecology and maintenance of disease in the Serengeti ecosystem. Bat-eared foxes are one such species, as they are thought to be key sources for rabies infection and hence are often used as indicators for the presence of rabies in wildlife. Lions are also a focus due to their previously recorded susceptibility to the Canine Distemper Virus (CDV). In 1994 one third of the lion population died due to a CDV epidemic.

A1.6 Closing Speech
Dr. Charles Mlingwa, Director General, TAWIRI

The Director General of TAWIRI, Dr. Charles Mlingwa made the closing speech, in which he pointed out that the participants all made good presentations which highlighted our understanding of the Tanzania Carnivore Programme and how stakeholders can contribute to the success of the project. He thanked all the presenters for their willingness to give presentations for the workshop. Dr. Mlingwa also thanked participants for their active participation during the group work and urged project implementers to heed their deliberations during project implementation. He went on to point out that any achievements of the programme will be of mutual benefit to all stakeholders. A continuous collaboration between TAWIRI and the stakeholders in achieving this mutual benefit is vital. He therefore urged participants to maintain this collaboration.

Finally, Dr. Mlingwa took the opportunity to thank the Darwin Initiative of the UK government for their financial support to this project. He pointed out that this is the second TAWIRI project to be funded by the Darwin Initiative, the first one being a project that led to the drawing up of the New Wildlife Research Agenda in Tanzania.

APPENDIX 2

The Facilitators and Composition of each Working Group

GROUP 1: Facilitated by Titus Mlengeya, Chief Veterinarian, TANAPA & Victor Runyoro, NCAA

1. Titus Mlengeya, TANAPA
2. John Shemkunde, TANAPA
3. I. Lejora, TANAPA
4. Victor Runyoro, NCAA
5. A.N. Songorwa, SUA
6. Mr Chambega, MWEKA
7. J. Kahurananga, AWF
8. J. Nyahongo, Serengeti Hyaena Project
9. J. Kabigumila, UDSM, Zoology Department
10. Mr Muhairwa, ?

GROUP 2: Facilitated by Georgie Harrison, University of British Columbia & Meggan Craft, Serengeti Lion Project

1. A&K
2. Kudu Safaris
3. Bushbuck
4. Leopard Tours
5. Sokwe
6. Nomad
7. Sunny Safaris
8. Thompson Safaris
9. Tanzanian Photographic Safaris
10. Meggan Craft, Serengeti Lion Project
11. Georgie Harrison, University of British Columbia
12. Ms. A.E. Lyaruu, COSTECH

GROUP 3: Facilitated by David Moyer, Wildlife Conservation Society-Tanzania

1. Kibo
2. African Environments
3. Ranger Safaris
4. Simba Tours
5. Roy Safaris
6. Marc Baker
7. Dennis Ikanda
8. Nature Discovery
9. African Wildlife Expeditions
10. David Moyer
11. Mr Shani?

GROUP 4: Facilitated by Scott Harrison, University of Oxford

1. Serena Lodges
2. TAHI
3. Sopa
4. Conservation Corps
5. TGT, Wenget Windrose & Friedkin Conservation Fund
6. Tanzania Big Game Safaris
7. Cullman & Hurt
8. Scott Harrison

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