1 INTRODUCTION

1.1 Definition

For the purpose of this study, bushmeat can be viewed as all undomesticated animal products utilised for human consumption and use. This includes meat as well as other products such as ivory, skin, hooves and horns. The term encompasses products from terrestrial as well as aquatic species such as abalone.

In the past numerous studies regarding the bushmeat phenomenon in central, western and eastern Africa have been conducted (Bailey & Groff, 2003; Summers, 2003; Barnett, 2000). Up to date, no known published studies have been concluded in the southern part of Africa. A priority exists for wildlife and nature organisations in South Africa to build an inventory on the existing situation regarding bushmeat in South and southern Africa.

With the help of the Bushmeat Crisis Task Force (BCTF), based in the United States of America, an Information Management and Analysis Project (Bushmeat IMAP) is currently in its infant stages (http://www.bushmeat.org/IMAP/). The Bushmeat IMAP aims to improve information sharing and decision making related to addressing the bushmeat phenomenon by organizing published documents, unpublished reports, project descriptions, and newly gathered data from the field into a system of databases and GIS (Geographical Information System) resources, useful for prioritising conservation and development solutions.

The Bushmeat IMAP survey instrument is designed to identify and assess areas across Sub-Saharan Africa with high numbers of threatened, endangered, or endemic species presently being subjected to unsustainable bushmeat hunting, in addition to identifying and assessing bushmeat markets. These *Bushmeat Hotspots* offer the greatest opportunity for the decisive action facilitated by the IMAP process. This project presents an opportunity to track important related trends, and to learn more about the relationship of unsustainable hunting, illegal hunting and trade, and commercial bushmeat trade to other issues such as transfrontier crossing points for bushmeat, roads, logging concessions, human settlements, human health, and political instability. Through this research, critical information concerning the nature of the bushmeat phenomenon in Africa can be made accessible to the conservation community, field project personnel, funding organizations, concerned citizens, and key decision makers.

The initial idea with this study was to investigate the bushmeat phenomenon as it occurs throughout the whole of South Africa and create an inventory of what is currently the situation in our conservation areas and national parks. This critical information would then be provided to the Bushmeat Task Force's IMAP so that the current situation regarding the bushmeat phenomenon in southern Africa could be better understood and analysed. Unfortunately many obstacles and setbacks were encountered along the way as will be discussed in further chapters of this report and therefore the study was focussed on KwaZulu-Natal only. With the help of officials from Ezemvelo – KwaZulu-Natal Wildlife's anti-poaching unit, a record of the existing situation regarding the bushmeat phenomenon in the conservation areas of KZN was established.

1.2 Literature Review

This is new research and therefore the literature is mainly limited to studies conducted in other parts of the African continent (Bailey & Groff, 2003; Summers, 2003; Barnett, 2000). In order to establish the correlation and relationship between the bushmeat phenomenon in southern Africa compared to other regions of the continent, findings of this particular study was measured against results of existing literature.

"The term *bushmeat* is taken from a translation of the French term for meat derived from wildlife – *viande de brousse* – that has provided both a source of protein and income for subsistence communities for thousands of years. This trade has recently evolved into an illegal, commercial, unsustainable enterprise that is compromising wildlife populations across Africa. The overriding concern about the bushmeat trade is its lack of sustainability – even non-commercial exploitation in many cases has been found to be unsustainable." (Bailey & Groff, 2003:2). Therefore the bushmeat crisis can be described as the unsustainable, illegal, commercial trade in wildlife that poses a significant threat to wildlife populations and human communities dependant upon them. The bushmeat issue is extremely complex as it involves aspects of economic development, land tenure, food security, human health, socio-cultural systems and wildlife conservation issues. Driving forces behind the bushmeat trade are intricately connected to economic and social development needs (Bailey & Groff, 2003).

According to a statement made by Dr. Michael Hutchins, Chairman of the Bushmeat Crisis Task Force (BCTF) Steering Committee (as cited in *BULLETIN,* 2001) populations of African primates as well as other species are being hunted at an unsustainable rate and the risk of local and regional extinction of several species are very real. "…also known as bushmeat, has apparently already caused the extinction of the *Miss Waldron's Colobus Monkey*" (*BULLETIN,* 2001:14).

Bailey and Groff (2003), believe that basic human needs – both nutritional and economic – drive the bushmeat trade. The average human requires 50g of protein per day or roughly one-quarter kilogram of meat per person per day. In central Africa, 2.5 million metric tons of meat (roughly equivalent to 10 million cattle or 500 million blue duikers) would be required for the 30 million consumers that live there (Bailey & Groff, 2003). Many species are taken throughout central Africa, and livestock are not typically a viable alternative in the forests. In West Africa, "Empty Forest Syndrome" is common, as much of the wildlife has been hunted out of the forests. This syndrome is beginning to occur in central Africa, as more forested areas are targeted by hunters. In east and southern Africa, people turn to bushmeat in times of economic hardship or when "fast cash" is needed (Bailey & Groff, 2003). It is found that the occurrence of bushmeat hunting coincides with the dry season drought months, as vegetation is less dense and wildlife searching for water is easier to locate and hunt (*TRAFFIC Dispatches*, 2000). During times of economic hardship, droughts and famine, bushmeat is relied upon to an even greater extent. The trade in bushmeat for human consumption is a key contributor to local economies throughout the developing world (Brashares, Arcese, Sam, Coppolillo, Sinclair and Balmford, 2004).

In recent years, environmentalists and United Nations bureaucrats have become increasingly alarmed by the practice of hunting and selling wild animal meat, or bushmeat, in central and western Africa (Summers, 2003). The market for bushmeat has been booming, ranging from $20 million to $200 million in African nations, but critics claim that it is decimating endangered species – including gorillas, chimpanzees, lions, hyenas, hippopotamuses, and many others – and depleting the food supplies of some of the poorest people in the world. A newly released TRAFFIC report (Barnett, 2000) indicates that most wildlife populations outside protected areas in the east and southern Africa region are being greatly impacted by the illegal killing of wildlife for meat – the so-called use and trade of bushmeat. The two-year study shows that wildlife, traditionally viewed as a dietary

supplement, has become a key source of food and legal tender in the drive for human survival in the region.

Brashares *et al.* (2004) suggest that efforts to manage the bushmeat trade are built on the premise that bushmeat consumption is driven by protein limitation. It is, thus, assumed that increases in livestock and agricultural production will reduce human reliance on wild sources of food. Agriculture must be built up significantly to alleviate pressure on the overexploited wild resources. Brashares *et al.* (2004) agree that more immediate plans to enhance the sustainability of wild protein sources are required. "Increasing the size, number and protection of wildlife reserves in the region may not offer a long-term solution to concerns over human livelihoods and protein supply, but it is likely to offer the most immediate prospects for slowing the region's catastrophic wildlife decline." (Brashares *et al.,* 2004:1182).

A large segment of wildlife products are traded on foreign markets. Wild species are traded internationally in many forms in order to produce a wide variety of products including: medicines, food, ornaments, clothing, pets and collector items, ornamental plants, manufacturing and construction materials (Roe, Mulliken, Milledge, Mremi, Mosha & Grieg-Gran, 2002).

Milner-Gulland (2002), views bushmeat hunting as being deeply embedded in general economy, widely distributed geographically, often found in areas with few legal controls, involves a range of people including hunters, dealers, vendors and consumers, and supplies both subsistence needs and commercial markets with complex commodity chains leading to big cities and across national borders.

In Southern Africa the bushmeat trade is also emerging as Ezemvelo Kwazulu–Natal Wildlife Media Release (December, 2002) clearly states. "Ezemvelo KZN Wildlife staff in the Kosi Bay area report a significant increase in the number of young animals and birds being offered for sale on roadsides in the region. The animals include both vervet and samango monkeys, fish eagles and small antelope. There is also a reported increase in the bushmeat trade in the area, much of the meat being offered apparently coming from Mozambique".

Ape Alliance (1998), makes the statement that the major limitations on the bushmeat market in the past were the difficulty in gaining access to forests and the subsequent transportation

of meat to urban markets, but general improvements in infrastructure has meant that the increasing demand from insatiable and growing urban markets can be met. The rapidly growing timber industry has been a major factor in fuelling and facilitating the bushmeat trade in the following ways: "…forestry employees hunt to provide for their own needs; commercial hunters operate in the forest to supply the needs of forestry workers and to trade outside the forested region; forestry infrastructure including roads, vehicles and camps, are used by hunters to gain access to new areas and to export bushmeat from the forest to urban centres" (Ape Alliance, 1998:1). Furthermore, "In recent years the trade in bushmeat has grown exponentially as the great wild forests of Africa have become more accessible to humans – largely due to logging, which is opening up large tracts with dirt roads." (Reid, 2004).

Bushmeat also poses various health risks as Reg Hoyt from the Philadelphia Zoo commented at the Bushmeat Crisis Task Force Curriculum Development Workshop, held at the Southern African Wildlife College in August 2002: ". During hunting and butchering of any animal, there is a high potential for blood-to-blood contact. When hunters dress a primate carcass, they expose themselves to the risk of diseases that can jump between humans and other primate species. Several researchers have recently reported a high level of emerging infectious diseases that may affect human populations through the bushmeat trade. One particularly compelling disease risk is SIV and other lentiviruses, diseases similar to HIV in primates". According to Hoyt (2002), the bushmeat trade can also be linked to other infectious diseases such as Ebola. In late 2001, an Ebola outbreak began in Gabon and Republic of Congo. In the period between March 2002 and August 2002, a total of 92 human cases have been identified, with 69 deaths. Media reports linked the outbreak to the consumption of primate meat by a family in Gabon. Tsoumou (2003) also reported on an outbreak of the Ebola Virus in the Democratic Republic of Congo In February 2003. Officials believe "…the outbreak was caused by people eating infected bushmeat". The Ebola virus kills up to 80% of humans it infects and can survive even in an animal corpse (Reid, 2004). "Ebola is transmitted to humans who eat poorly cooked bushmeat, via their stomach membranes. It can also be contracted by hunters from the blood or bodily fluids during the slaughter and butchering of wild animals."

Wilkie & Godoy as cited by Milner-Gulland (2002), make the comment "...we are describing the problem, its magnitude and the species involved. But that is not enough – we need to

move from description to prediction, and to testing our theories in the real world. Only then can we make progress"(p.1-2).

Shirley Glyn, Executive Director of Jane Goodall Institute, South Africa, regards the rising demand, lack of alternative options for income generation, absence of protein substitutes, opening of old growth forest, lack of capacity to enforce or legitimise existing laws, and the unrestricted ability for anyone to enter the commercial bushmeat trade as the driving factors threatening wildlife and biodiversity conservation across West and Central Africa. A lack of employment opportunities in areas surrounding protected areas is a contributing factor to the trade in bush meat and any effort to increase employment opportunities will be viewed as advantageous (Pillinger, 2003). An illicit bushmeat trade has far greater reaching effects than is presently believed. "It involves people residing in relatively impoverished areas where drought, unemployment, rapidly expanding human populations, access to illegal weapons and a lack of effective enforcement could easily allow the illicit trade to become unmanageable with a negative effect on protected wildlife areas and tourism." (Pillinger, 2003:3). Rose (2004) furthermore comments on the underlying factors and issues involved, "…Conservation in the face of poverty, illness, war, etc., demands experts in human welfare and health, peacekeeping and conflict resolution, crime prevention and law enforcement, commercial contract negotiation and compliance assurance, food production, political ethics and morality, financial transparency, spiritual renewal, etc, etc - all these are human factors domains. Business, applied social science, organization development, law and medicine, cultural ethics, politics and finance, theology and religion -these are the fields that must carry on the major part of the conservation effort from now on"(p.4).

According to Reid (2004), urbanised Africans buy ape meat as a reminder of their cultural identity and because they like the taste better than the cheaper chicken, beef or lamb on offer.

Intimidation and corruption also regularly feature when it comes to the control of the bushmeat phenomenon. In Giant's Castle Game Reserve in the uKhahlamba-Drakensberg Park, members of the nearby amaHlubi community, after being found with a slaughtered eland, threatened conservation field rangers with death. The crowd also threatened to burn the ranger's vehicles if they did not leave. Giant's Castle Game Reserve was established more than 100 years ago to protect the eland (Gowans, 2005).

During the Bushmeat Crisis Task Force Curriculum Development Workshop held at the Southern African Wildlife College in August 2002, the delegates identified a list of bushmeat and bushmeat related issues. The following is a condensed version of the list:

Socio-Economic Issues

- Poverty
- Unemployment
- Market demand
- Cultural traditions
- Illiteracy
- International trade

Biological Issues

- Disease spread

Conservation Issues

- Illegal Hunting
- Habitat destruction
- Species extinction

Political Issues

- Lack of Legislation
- Political Instability

Brashares *et al.* (2004) remarks that fish supply and wildlife declines are unrelated to other potential explanatory factors, including annual rainfall, land and water temperatures, political cycles, oil prices, and gross national product.

Hoyt (2002) believes that to achieve goals of collaboration and information sharing to support and identify solutions to the bushmeat crisis, the underlying bushmeat issues should be identified and analysed. The core of the project is a geographic information system (GIS) for storing and analysing spatial data relevant to bushmeat hunting and trade.
The Bushmeat Crisis Task Force views the creation of a *Bushmeat Hotspots Map* as an integral element in the analysis and identification as well as prioritising of funding and protection for critical areas (*BULLETIN,* 2001).

Up to date no formal published study regarding bushmeat has been done in South Africa. During December 2002 and May 2003 Ezemvelo KwaZulu-Natal Wildlife commissioned a consultant to investigate the possibility of an illicit bushmeat trade in the areas adjacent to Mkhuze-, Ndumo- and Tembe Game Reserves. After visiting the three areas, an illicit bushmeat trade was confirmed (Pillinger, 2003).

According to Pillinger (2003) the number of animals snared in Mkhuze Game Reserve was seen as a concern, but the management of the reserve believed that the situation was under control and that the reserve could sustain the poaching pressures. The number of bushmeat occurrences in Ndumo and Tembe were however viewed with concern.

The following is a synopsis of the Pillinger (2003) report:

- Bushmeat was sold on the borders of and in the immediate areas surrounding the game reserves. It could not be substantiated if the bushmeat was only emanating from these areas or other protected areas as well.

- A commercial bushmeat trade was also identified on the Mozambique / KwaZulu-Natal border.

- There is a greater demand for bushmeat now than ever before. An Increase in the demand for bushmeat may be contributing to a decline in wildlife populations both within and adjacent to protected areas, thereby presenting a serious threat to conservation.

- There is a need for a legal trade in game meat, but communities must be made aware of the dangers of over exploitation, which could result in unsustainable populations and potential extinction of species.

- A very high illicit gathering and trafficking of plants, bark and herbs takes place in areas adjacent to the protected areas. It is feared that this practice will soon spread to the protected areas as well.

- The South African Police undertook an investigation during 2002 at the request of Ezemvelo KwaZulu-Natal Wildlife. The objective was to investigate illegal bushmeat activities and monitor illegal border crossings along the Usuthu River. During the investigation, little poaching was noticed, but a number of Mozambican nationals were seen crossing the Usuthu River illegally. The report also noted the transportation of bushmeat across the border. Continued damage to the fence also leads to animals leaving the reserve and subsequently being hunted and killed.

- Tembe Elephant Park has a very limited number of hunting and snaring incidents. This is possibly due to the fact that limited numbers of people live on its borders; hunters have to travel long distances to hunting areas and in addition the game reserve has a low carrying capacity which limits any hunting success. The reserve is also fortunate with a very dedicated and active anti-poaching officer.

- Bushmeat markets are located in southern Mozambique on the international border and sell bushmeat on a regular basis. These sites are located at Kwa Phuza and Manhoca. Bushmeat sold at these sites have however emanated from hunting areas inside Mozambique.

- A large number of illegal weapons are available in Mozambique and as a result Hippos are being targeted for their meat in Mozambique as well as in South Africa.

Apart from the Pillinger Report (2003), no formal published study regarding the bushmeat phenomenon in southern Africa has been conducted up to date. In order to understand the current situation regarding the bushmeat phenomenon in southern Africa, it is crucial to create an inventory of what is currently the situation in our conservation areas and national parks. This study aims to provide a better comprehension of the existing status of the bushmeat phenomenon in KwaZulu-Natal as a starting point for future studies to be conducted in the region.

2 RESEARCH DESIGN AND METHODOLOGY

2.1 Problem Definition, Aims and Objectives

No formal published study regarding the bushmeat phenomenon in southern Africa has been conducted up to date. No inventory concerning the specific targeted species exists and no data has previously been available to analyse the trends associated with this phenomenon in South Africa. South Africa is a country with rich biodiversity but without proper knowledge of the bushmeat phenomenon, management of our natural resources cannot be optimised. It was therefore proposed that a study be done to analyse and investigate areas in Kwazulu-Natal where bushmeat are slain and traded. Through the utilisation of a GIS data model bushmeat related issues such as poverty and unemployment were then analysed.

The general aim of the study was to compile a database of all relevant bushmeat information in Kwazulu-Natal and create a GIS model to reveal important correlations and gaps in knowledge, identify threats, and prioritise solutions for the conservation and development communities.

Specific Objectives included the following:

- Establish bushmeat contacts network.
- Compilation of database with relevant bushmeat information.
- Creation of GIS data model.
- Utilisation of GIS model in analysing bushmeat related issues.
- Creation of Maps and Reports on findings.
- Making Recommendations where appropriate on further studies and policies.

2.2 Research Design

The research process in this study followed the quantitative research paradigm of the continuous kind and lead to the development of a GIS data-model to analyse and explain the bushmeat phenomenon and bushmeat-related issues and trends. Design classification consists of an empirical study, utilising primary (new) and secondary (existing) data. The data ranges in format (numeric, textual, cartographic) and all are included in a GIS. The degree of control or structure in design is medium.

Mouton (2001) argues that key research queries to be made will include questions of meaning and explanation; questions of theoretical linkages and coherence between the theoretical propositions; questions related to the explanatory and predictive potential and conceptual models. He elaborates by stating that model-building mainly occur through inductive and deductive strategies.

In this study a variation on inductive reasoning, namely analogical reasoning was employed. This comprised of the creation of a model of a specific phenomenon on the basis of its similarities to other phenomenon - In this case, bushmeat hotspots and the related issues surrounding the bushmeat crisis such as logging, poverty and unemployment.

Science cannot make progress without theories and models. The aim of this study was to explain the phenomenon of bushmeat through the construction of a bushmeat hotspot GIS model. The successful model provide casual accounts of the world, allows one to make predictive claims under certain conditions and simplifies our understanding of the problem at hand. There are certain limitations and weaknesses associated with this design process. The main sources of error in model building relate to the assumptions that are made specifying the model, the quality of the empirical data against which the model will be fitted and the correct use of statistical and mathematical procedures (Mouton, 2001).

In this specific study, the assumptions regarding the related issues against which the bushmeat crisis was measured, were identified and verified. The utilization of a GIS in the analysis of the data reduced the likelihood of mathematical miscalculations, the possibility of operator error could however not be ruled out completely. Longley, Goodchild, Maguire & Rhind (2001) makes the statement that to most scientists, precision refers to the number of significant digits used to report a measurement, but it can also refer to a measurement's repeatability. In this study a high degree of precision signifies that the GIS procedures utilised stayed constant, even though these procedures may have been incorrect. The prime difficulty in this study was the creation of a high-quality dataset to utilize during the analysis process – garbage in, garbage out (GIGO). It was therefore of crucial importance to maintain data accuracy, precision and integrity to minimize the margin of error and ensure quality of the results. One must however keep in mind that a GIS model is a representation of the real world and "...it is impossible to make a perfect representation of the world, so uncertainty about it is inevitable" (Longley *et al.*,2001:124).

2.3 Research Methodology

This study only includes the comments and responses of conservation specialists and bushmeat policing agencies. It is however recommended that a later study be conducted to include participation from these communities. The main focus of this study was thus aimed at bushmeat occurrences within protected areas or conservancies.

It was initially anticipated that this study would include the whole of southern Africa, but due to the lack of response from participating conservationists, the study area was reduced to the Kwazulu-Natal province. The success of this study will guide the way to more comprehensive projects taking into consideration more provinces and broadening the focus to the occurrence of bushmeat outside of conservancies as well.

The study consisted of four distinctive phases.

Phase 1: Information Gathering

Information were collated and collected in the following manner:

- **Literature Review**
  During the first stage of the project, an international and regional literature search were conducted to identify published and "grey literature" pertaining to any bushmeat and bushmeat-related issue in specifically southern Africa.

- **Consultations and Field Research**
  The completion and accomplishment of this segment can be viewed as one of the most significant factors in the success of the project. At this point various key role players in the conservation field were identified and consulted to establish a network of co-operation. All existing information relating to bushmeat and bushmeat-related issues in KwaZulu-Natal were collated. The information varied in format and included media such as databases, maps, reports, graphs, statistics etc.

Phase 2: Data capturing and cleaning

- **Data capturing and Database creation**

  The next step consisted of the compilation of a database from all the collated data. This included primary data from the *Consultation and Fieldwork* phase as well as secondary data from the *Literature Study*. Due to the fact that a variety of data formats were collated from different sources, the end product of this segment consisted of a range of databases. These databases were then utilized in the creation of a GIS data-model in an ensuing phase of the project.

- **Other relevant information**

  All other secondary data to be utilized during the analysis stage of the project will were gathered and inspected. This included data capturing or conversion from different sets of data to conform to the database model. Typical datasets utilized in this step were layer data such as roads, towns, suburbs, conservancies, and demographic data. Environmental data such as land-cover, dominant vegetation type, geology, hydrology etc. also formed part of this segment of the project.

Phase 3: Data Procedures

- **GIS Data model creation**

  A real-world model was created from the different database entities by utilizing the layer-based approach. Because of the precise nature of the representation method, storage efficiency, quality of cartographic output and availability of functional tools for operations such as map projection, overlay and analysis the decision was made to utilise a vector data model.

  Entities included in the model:

  - Bushmeat Occurrences - Points
  - Demographic data (Enumerated Areas data) - Areas
  - from the 1996 and 2001 National Census
  - Conservation / Protected Areas - Areas
  - Metropolitan areas, Cities, Towns and Suburbs - Areas

– Water bodies	- Areas
– Rivers	- Lines
– Topography	- Lines (Contours)
– Roads	- Lines and Networks

- **Information Analysis**

  In this step, mathematical procedures were utilised to give meaning to the data in order to answer questions regarding the related bushmeat issues. Spatial analysis was utilised to turn the data into useful information.

  Longley, Goodchild, Maguire & Rhind (2001) explains spatial analysis in the following manner:

  "Spatial analysis:

  – Is the crux of GIS, the means of adding value to geographic data, and of turning data into useful information;
  – Is a set of methods whose results are not invariant under changes in the locations of the objects being analysed;
  – Can reveal things that might otherwise be invisible – it can make what is implicit explicit." (p. 278).

  "Effective spatial analysis requires an intelligent user, not just a powerful computer." (p. 278).

  During the analysis phase Mkhuze- as well as Ndumo Game Reserve and surrounding areas were identified as the areas with the highest bushmeat occurrences in KwaZulu-Natal. Further analysis was therefore done on these specific areas and the demographic composition of the population in these areas.

2.4 Project Parameters

- **Organizational parameters**

It was difficult to create a network of responsible persons in the various Provinces and conservation departments to work with on this issue. In most cases the particular conservation departments did not have officials designated to this issue. Some of the issues are listed below.[1]

- Organizational bureaucracy in the various Provincial conservation departments. This is seriously hampering investigations into the Bushmeat phenomenon in southern Africa.
- Lack of field officers monitoring the situation in the field. This is a serious problem and leads to incorrect data and statistics.
- Apathy from most conservation departments. This was not a general problem, but it was found that awareness and attitude varied from province to province and also from conservation department to conservation department.
- Organizational restructuring within the various conservation departments. Key conservation officers were retrenched during the investigation period and this led to tasks sometimes not being completed.

- **Data Constraints**

One of the biggest constraints during the investigations and implementation of this project was the lack of suitable data. No study regarding the Bushmeat phenomenon

[1] Personal Conversations:
Baard, E., Western Cape Province, Research and Scientific Work. Personal Communication - January 2004.
Hiseman, R., Western Cape Province, Conservation Service Officer. Personal Communication - January 2004.
Kritzinger, C., Western Cape Province, Conservation Service Officer. Personal Communication - January 2004.
Gildenhuys, P., Western Cape Province, Environmental Crime Unit. Personal Communication - January 2004.
Scholtz, M., South African National Parks. Personal Communication - January 2004.
Snelling, S., South African National Parks. Personal Communication - January 2004.
Potter, R., Ezemvelo KZN Wildlife, Anti-poaching Unit. Personal Communication - January 2004.
Davies, A., Ezemvelo KZN Wildlife, Anti-poaching Unit. Personal Communications - January 2004 – January 2005.
Van Tonder, F., South African Police Services, Endangered Species Unit. Personal Communication - February 2004.
Pott, R., Mondi Forests, Conservation Service Officer. Personal Communication - March 2004.

has been conducted before in southern Africa therefore no baseline data was available. The following complications were encountered during the investigation and analysis phases of the project:

- An original database had to be created from the start as no previous data were recorded for Bushmeat occurrences.
- Obtaining the data also proved a huge constraint as previously mentioned. Because of this constraint it was decided to focus the study only on KwaZulu-Natal, as they had some data available.
- Data obtained were not always compatible and many conversions had to be made before analysis could continue.
- Data obtained from Ezemvelo – KZN Wildlife was in many instances not complete and data had to be updated and cleaned.
- Metadata for all datasets were in many instances not complete and this hindered the process of conversion.
- Several times during the project, it was necessary to retract to previous procedures and make modifications in the database files before continuing with further steps.

- **Geographic Constraints**

As previously mentioned the initial study was intended for the whole of South Africa. Various problems encountered along the way, led to the decision to focus the study mainly on KwaZulu-Natal.

The following geographic information sets the parameters for the project:

Map Units:	Meters
Projection:	World Mercator, WGS 84, central Meridian 31° E
Captured Scale:	1: 1 250 000

- **Budget Constraints**

The biggest budgetary constraint encountered during the progress of the project was the fact that data necessary for analysis are very expensive. This hindered the freedom of the project, but also focused the project in a specific direction. With a limitless budget it would be possible to incorporate may different datasets into the equation and as a result the analysis procedures would probably have been much more complicated. The resultant information would also not necessarily have been especially meaningful or of better quality.

Normally, the computer hardware and software necessary for analysis and output also proves to be one of the biggest expenses. In this instance however, existing software and hardware were applied and only the production of maps proved to be an additional expense.

2.5 Data

As previously mentioned, one of the biggest constraints were the fact that no baseline data was available to conduct this study. Ezemvelo KZN Wildlife had limited raw data acquired by their anti-poaching unit for the past few months. It was decided that the study should be focused on conservation areas within KwaZulu-Natal.

2.5.1 General Data Requirements

The following datasets were utilised during the study:

- **Incidents Register Oct03 to Oct04 – Access Database**

This dataset was compiled by utilizing the monthly Incidents Register from Ezemvelo – KwaZulu-Natal Wildlife listing each month's criminal incidents reported in the KwaZulu-Natal conservation areas. The original Incidents Register was in a Microsoft Word format. The data was then converted to an Access database. The Access Database consists of the following fields:

- Count
- Region
- Reserve / Zone
- Date
- Year
- Month
- Section
- Investigating Officer
- Incident
- Method
- Species
- Confidence / Action
- Exact Locality
- Police Station
- CAS Number
- Court

- **Police CAS file data – paper format.**

  Data relating to Bushmeat occurrences were also obtained from the SAP. This data was originally in paper format and then captured into an Access database with the same fields as the Incidents Register Oct03 to Oct04 – Access Database discussed above. Even though many fields were left blank because of incomplete data, the exact same fields were chosen so that the Police Access database could be combined with the Incidents Register Oct03 to Oct04 to create one complete Incidents Register.

- **Incidents Register – Microsoft Access Database.**

  This Access database was created by combining the Police CAS database with the Incidents Register Oct03 to Oct04 database.

- **ENPAT (Environmental Potential Atlas) 2002** data for Provincial and nature conservation area boundaries – ArcGis Shape file. Shape files with Provinces and conservation areas (Polygons).

- **SRTM (Shuttle Radar Topographical Mission) 2003** data for Topographical Model – Raster format, converted to Vector and then to Topographical model.

- **MAPIT 2003** data for Towns, Roads and water bodies – ArcGis Shape files. Shape files of features. (Polylines, Polygons and points).

- **Census 2001** data for demographics of areas – ArcGis Shape file (Polygons).

- **Bushmeat Occurrences – ArcGis Shape file.**

  The Bushmeat Occurrences Shape file was constructed from the Incidents Register Access Database by creating a theme of the locations where Bushmeat incidents occurred (Points).

  As previously indicated, the initial database was designed in Microsoft Access. The Bushmeat occurrences were then extracted and the data imported into MapInfo to create a table. In MapInfo the various points were then geocoded and then translated to an ESRI Shape file to be utilised in ArcGis for further analysis and map compilation. Changes to the database were made in Microsoft Access and Microsoft Excel before importing the complete and rectified data into MapInfo and ArcGis.

- **Bushmeat Related Occurrences – ArcGis Shape file.**

  This is a shape file constructed from the Incidents Register Access Database by creating a theme of the locations where Bushmeat related incidents occurred (Points).

  As previously indicated, the initial database was designed in Microsoft Access. The Bushmeat related occurrences were then extracted and the data imported into MapInfo to create a table. In MapInfo the various points were then geocoded and then translated to an ESRI Shape file to be utilised in ArcGis for further analysis and map compilation. Changes to the database were made in Microsoft Access and Microsoft Excel before importing the complete and rectified data into MapInfo and ArcGis.

2.5.2 Data Lineage and Metadata

- **Existing Data**

For more information regarding the Metadata and Lineage of the Enpat Data, refer to the **2002 ENPAT Datasets**.

For more information regarding the Metadata and Lineage of the SRTM Data, refer to http://srtm.usgs.gov for more information.
For more information regarding the Metadata and Lineage of the MAPIT Data, refer to the **2003 MAPIT Datasets**.

For more information regarding the Metadata and Lineage of the Census 2001 Data, refer to the following document:

Statistics South Africa
Census 2001
Metadata
Geography hierarchy and attributes
Report No. 03-02-25 (2001)
Statistical Support and Informatics
Division Geography

- **New Data**

As previously mentioned, the Incidents Register Oct03 to Oct04 – Access Database data was obtained on a monthly basis from Ezemvelo – KwaZulu-Natal Wildlife. Initially it consisted of Microsoft Word Reports with data written under the following headings:

- Region
- Date
- Reserve / Zone
- Section
- Investigating Officer
- Incident

- Confidence
- Exact Locality
- Police Station
- CAS Number

The Police CAS files were obtained from the SAP in printed, paper format. Information on these reports documented Bushmeat occurrences with reference to dates, locations, CAS numbers, Police Stations, Courts and incidents. In most cases the information on these reports are incomplete.

From the Police CAS files and the Ezemvelo – KwaZulu-Natal Wildlife Incidents Register, a complete Incidents Register Access Database was created. The original Access Database was altered in such a way so that the following fields were created:

- Count
- Region
- Reserve / Zone
- Date
- Year
- Month
- Section
- Investigating Officer
- Incident
- Method
- Species
- Confidence / Police Action
- Exact Locality
- Police Station
- CAS Number
- Court

The original Access Database was incomplete and data was checked and rectified. For the purpose of ease of analysis in later phases of the project, the following fields were edited:

- Incident

  Records of the original incident field contained numerous responses as documented by the various field-, conservation- and police officers. To simplify matters the following incidents were selected to represent the data in the database:
  - Poaching – meaning animal carcasses were found or individuals arrested after illegally killing animals inside or outside the conservation areas.
  - Illegal Fishing – meaning to illegally fish in or around the conservation areas.
  - Illegal Trade – meaning trading with Bushmeat at a Bushmeat outlet or butchery.
  - Possession of Bushmeat – meaning being caught with Bushmeat on the person.
  - Attempted Poaching - meaning live animals were found in snares or individuals being caught trying to poach animals inside or outside conservation areas.

- Methods

  From the original Incident field, the method utilised to obtain the Bushmeat was in most cases very clear. The following methods were selected to represent the data in the database:
  - Hunting with dogs
  - Hunting with Firearms
  - Poison
  - Snare
  - Fishing Nets
  - Spear Fishing
  - Unknown Method

- Species

  Records of the original species field contained numerous responses as documented by the various field-, conservation- and police officers. In some instances the same species was listed with various spellings as well as various common names. To simplify matters the following species were selected to represent the data in the database:
  - Unknown – meaning the specific species was not mentioned or was unidentifiable by the field-, conservation-and police officers.
  - Rhino – this term was used where no distinction was made between a White and Black rhino.

- Black Rhino
- White Rhino
- Elephant
- Hippo
- Warthog
- Bush Pig
- Crocodile
- Giraffe
- Wildebeest
- Buffalo
- Zebra
- Red Duiker
- Blue Duiker
- Grey Duiker
- Nyala
- Eland
- Impala
- Reedbuck
- Kudu
- Bushbuck
- Suni
- Waterbuck
- Hyena
- Leopard
- Lion
- Serval
- Monkey
- Baboon
- Porcupine
- Tortoise
- Fish – where no specific fish species were mentioned.
- Shad
- Patagonian Tooth fish
- Prawns

- East Coast Rock Lobster
- Crayfish
- Crab
- Abalone
- Rock Python
- Birds – where no specific bird species were mentioned.
- African Grey Parrot
- Vulture

- Confidence / Police Action

  Records of the original confidence field contained numerous responses as documented by the various field-, conservation- and police officers. To simplify matters the following Police Actions were selected to represent the data in the database:
  - No data entry –were no Police Action is listed.
  - Incident – when an incident was merely documented.
  - Arrest – when an arrest was made.
  - Investigation – when a specific incident was investigated.
  - Warning – where the perpetrators were simply let off with a warning.

The Microsoft Access Database was then exported to MapInfo and a separate table was created for the Bushmeat Occurrences and the Bushmeat Related Occurrences. These tables were geocoded to the exact locations, reserves / zones and regions and then converted to ArcGis Shape files for further analysis.

The Bushmeat Occurrences file contains all incidents with criminal activities directly linked with the Bushmeat phenomenon such as illegal hunting, fishing, the selling of Bushmeat etc.

The Bushmeat Related Occurrences are incidents that can be related to the Bushmeat trade. The following were included as incidents that relate to the Bushmeat phenomenon:

- Illegal Entry – this refers to illegal entry in a conservation / protected area.

- Damage to fence – refers to conservation / protected area fence to let animals / poachers through.
- Arson / Fire – this was included because poachers sometimes use fire as a method to chase animals into their snares or to wards dogs.
- Illegal Encroachment – it is suspected that the inhabitants of these settlements utilise Bushmeat for subsistence survival.
- Illegal Harvesting – it is suspected that the illegal harvesting of plants are connected to Bushmeat.
- Illegal Trade / Smuggling – it is suspected that the illegal trade / smuggling of plants are connected to the Bushmeat trade.
- Suspicious Activities – these activities includes sightings of people and tracks in conservation areas.
- Possession of Illegal Plants – here once again it is suspected that the illegal trade in plants is connected to the Bushmeat trade.
- Shots Fired – in and around conservation / protected areas.
- Dogs in Protected Areas – this usually means that poachers utilizing dogs are in the vicinity.
- Illegal Immigrants – it is suspected that illegal immigrants utilise Bushmeat for subsistence survival.
- Poacher Attacked – this was one incident were a poacher was attacked by a buffalo.
- Illegal Boats – usually means that illegal fishing also takes place.
- Possession of Firearms – in these instances the firearms were possessed illegally and could be utilised for hunting purposes.

Final Analysis and map compilation were done in ArcGis 8.2.

2.6 IT Considerations

- **Hardware**

  The following Computer Hardware were utilised in the execution of the project:

  – Stand-alone Personal Computer: Pentium IV, 2.40 GHz, 520 MB Ram, 38-Gigabyte Hard Drive.

- 52X Speed CD-Rom.
- Hewlett Packard CD-Writer+8920.
- 21" Colour Monitor – LG Flatron F900B.
- Maps produced on A3 Colour printer - OKI C9300(PS).

- **Software**

  The following Computer Software were utilised in the completion of the project:

  - Microsoft Access 2000
  - Microsoft Excel 2000
  - ArcGis 8.2
  - MapInfo 7.5
  - The Report was written by utilising Microsoft Word 2000.
  - A digital copy of the project and maps were also created with Hewlett Packard CD-Writer software.

2.7 Models

2.7.1 Extents

The area to be analysed was KwaZulu-Natal province in South Africa. An overview of the whole area was first given and then the data was split onto smaller regions focussing mainly on the problem areas – Ndumo and Mkhuze Conservation areas.

The extents of KwaZulu-Natal is:
Latitude: 27° S to 31° S
Longitude: 29° E to 33° E

2.7.2 Analysis Requirements

- Problem Definition: To identify the areas in KwaZulu-Natal with high bushmeat occurrences and analyse the bushmeat occurrences within these areas.

- Problem Boundaries: First the whole of KwaZulu-Natal will be analysed and then Ndumo- and Mkhuze Game Reserves will be investigated in more detail.
- Entities:
  - Bushmeat Occurrences – Points
  - Bushmeat Related Occurrences – Points
  - Topography – Raster Model
  - Water bodies – Polygons
  - Rivers – Polylines
  - Roads – Polylines
  - Towns – Points
  - KZN Regions – Polygons
  - Provinces – Polygons
  - Conservation Areas – Polygons
  - Demographic Areas – Polygons

- States of Entities
  - Bushmeat Occurrences
    - Count
    - Region
    - Reserve / Zone
    - Date
    - Date Year
    - Date Month
    - Section
    - Investigating Officer
    - Incident
    - Method
    - Species
    - Police Action
    - Exact Locality
    - Police Station
    - CAS Number
  - Bushmeat Related Occurrences
    - Count
    - Region

- Reserve / Zone
- Date
- Date Year
- Date Month
- Section
- Investigating Officer
- Incident
- Method
- Species
- Police Action
- Exact Locality
- Police Station
- CAS Number

-	Water bodies	- Name
-	Rivers	- Name
-	Roads	- Road Name - Road Type
-	Towns	- Town Name
-	KZN Regions	- KZN Region Name
-	Provinces	- Province Name
-	Conservation Areas	- Conservation Area Name
-	Demographic Areas	- Race - Total Population - Age 0-4 years - Age 5-9 years - Age 10-14 years

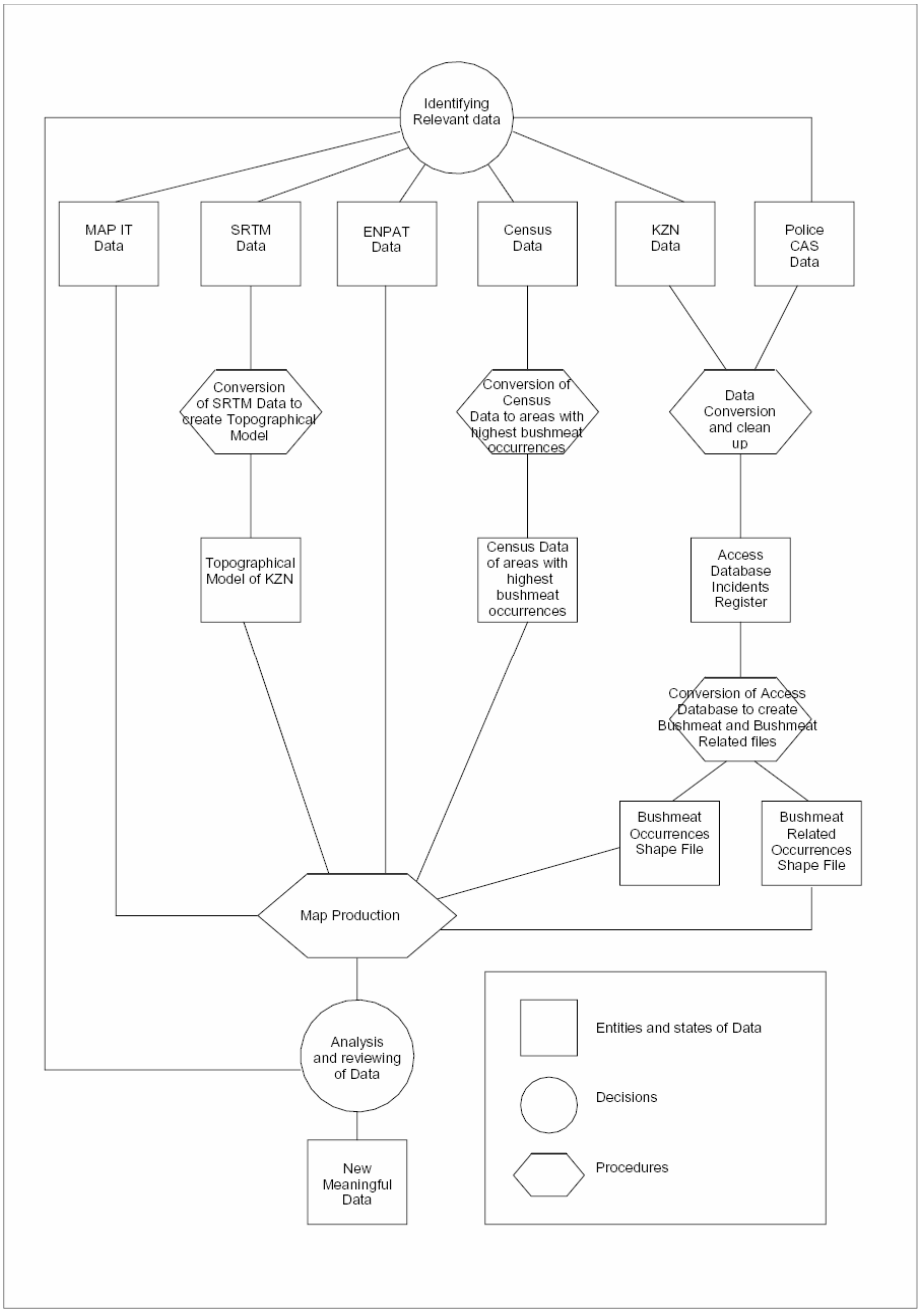
- Age 15-19 years
- Age 20-24 years
- Age 25-29 years
- Age 30-34 years
- Age 35-39 years
- Age 40-44 years
- Age 45-49 years
- Age 50-54 years
- Age 55-59 years
- Age 60-64 years
- Age 65-69 years
- Age 70-74 years
- Age 75-79 years
- Age 80-84 years
- Age > 85 years
- No Income
- Income Group R1 - R4,800
- Income Group R4,801 - R9,600
- Income Group R9,601 - R19,200
- Income Group R19,201 - R38,400
- Income Group R38,401 - R76,800
- Income Group R76,801 - R153,600
- Income Group R153,601 - R307,200
- Income Group R307,201 - R614,400
- Income Group R614,401 - R1,228,800
- Income Group R1,228,801 - R2,457,600
- Income Group > R2,457,600
- Not applicable institutions
- Total Households

A real-world model was created with the different entities by using the layer-based approach. The Topographical model forms the base. The overlaying data layers were placed as follows (from bottom to top):

- Topographical Model
- Provinces
- KZN Regions
- Conservation Areas
- Demographic Data
- Rivers
- Water bodies
- Roads
- Towns
- Bushmeat Occurrences and Bushmeat Related Occurrences

2.7.3 Physical and Conceptual Model

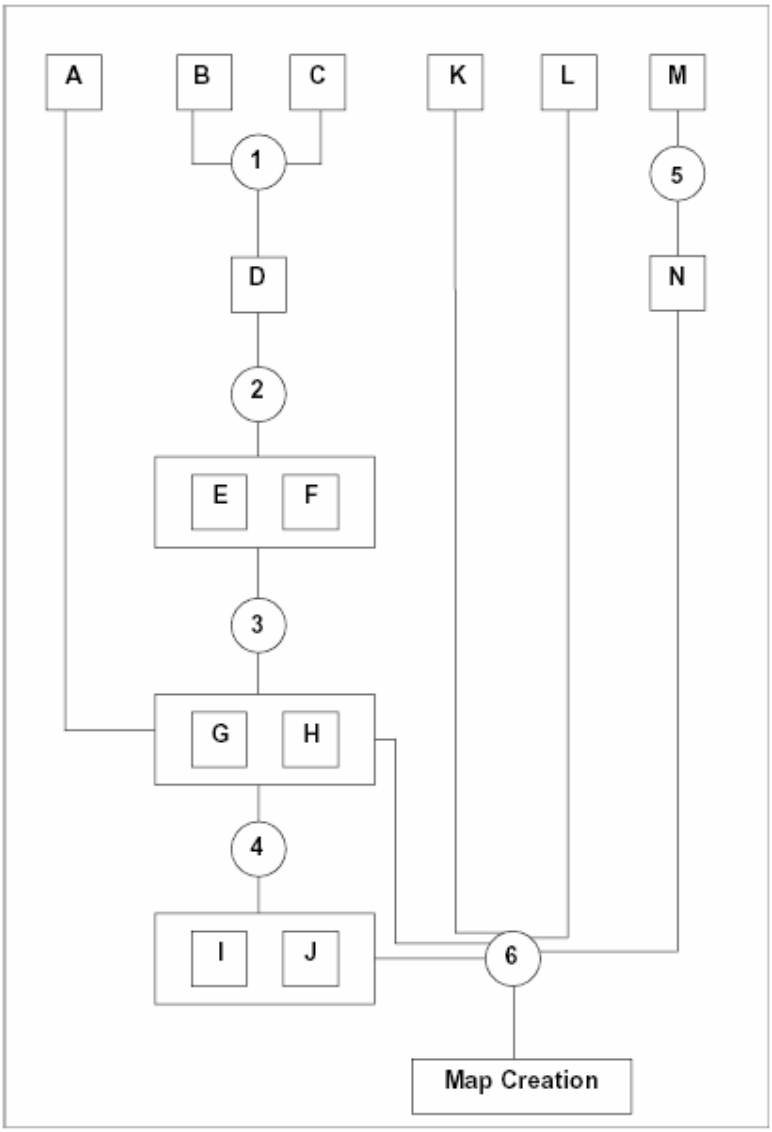
FIGURE 1. PHYSICAL AND CONCEPTUAL MODEL



2.7.4 Cartographic Model

- Schematic Representation of Cartographic Model to be viewed with **Table 1** and Procedures on following page.

FIGURE 2. CARTOGRAPHIC MODEL



- Data List to be viewed with **Figure 2** and Procedures below.

TABLE 1. DATA LIST

Number	Name	Description	Type of File
A	Census.shp	Demographic Data from 1996 and 2001 Census	ArcGis Shape File
B	Security Reports.xl	Excel File of KZN Security Reports from Oct 2003 to Oct 2004	Microsoft Excel File
C	Police Station Data.xl	Excel File of KZN Police CAS files from 1998 to 2002	Microsoft Excel File
D	Incidents Register.dbf	Dbase File of Bushmeat and Bushmeat Related Incidents	Dbase 4 File
E	Bushmeat.dbf	Dbase File of Bushmeat Incidents	Dbase 4 File
F	Bushmeat Related.dbf	Dbase File of Bushmeat Related Incidents	Dbase 4 File
G	Bushmeat.shp	Shape File of Bushmeat Incidents	ArcGis Shape File
H	Bushmeat Related.shp	Shape File of Bushmeat Related Incidents	ArcGis Shape File
I	Ndumo Census.shp	Ndumo Area Demographic Data from 1996 and 2001 Census	ArcGis Shape File
J	Mkhuze Census.dbf	Mkhuze Area Demographic Data from 1996 and 2001 Census	ArcGis Shape File
K	ENPAT KZN.shp	ENPAT Data of KwaZulu-Natal	ArcGis Shape File
L	MAPIT KZN.shp	MAPIT Data of KwaZulu-Natal	ArcGis Shape File
M	SRTM SA.grd	SRTM Data of South Africa	Digital Elevation Model
N	Hillshade.aux	Topographical Model of KwaZulu-Natal	Raster Image

- Procedures

1. In Microsoft Excel combine the excel files to create one excel file and export to Microsoft Access.
2. In Microsoft Access sort the data to distinguish between Bushmeat and Bushmeat Related Incidents and then create separate dbase files.
3. Import dbase files into ArcGis and create shape files by geocoding all Bushmeat and Bushmeat Related Occurrences to specific addresses.
4. In ArcGis utilise SQL and spatial analysis procedures to link bushmeat occurrences to demographic areas and create shape files of areas with highest occurrences.
5. In ArcGis utilise SQL and spatial analysis procedures to create Topographical model of KwaZulu-Natal.
6. In ArcGis overlay all relevant shape files for map creation.

3 RESULTS AND PRESENTATIONS

3.1 Overall View – Bushmeat Occurrences

In the period between 1998 and 2004 a total number of 1370 bushmeat occurrences have been documented. It must, however, be noted that data from 2003 and 2004 are more complete and accurate than data received from the period 1998 to 2002.

3.1.1 Bushmeat Occurrences per Region

For analysis purposes the regions as delineated by Ezemvelo KZN Wildlife were utilised. According to the KZN Security Report Database, Zululand had the highest occurrences of Bushmeat Incidents (55%) with the Coast Region 41% and uKhahlamba only 4% (**Table 2**). (Also refer to **Annexure A: Map 2** for Bushmeat Occurrences and KwaZulu-Natal Regions).

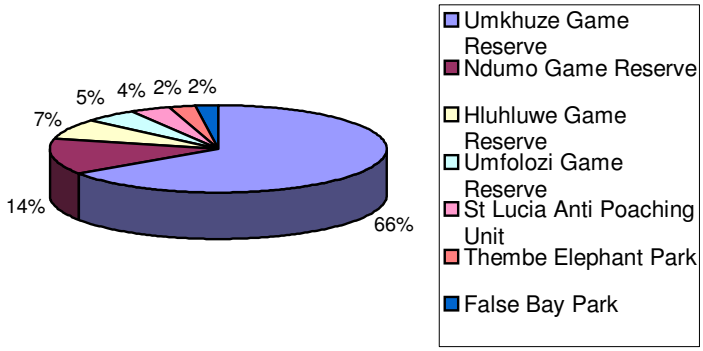
TABLE 2. BUSHMEAT OCCURRENCES PER REGION

Region	Nr of Incidents	(%)
Zululand	746	55.0
Coast	568	41.0
uKhahlamba	56	4.0
Total Incidents	**1370**	**100.0**

3.1.2 Bushmeat Occurrences per Conservation Area

Mkhuze Game Reserve has the highest percentage of Bushmeat incidents that occur inside a conservation area (66%) with Ndumo Game Reserve second with 14% (**Figure3**). It is interesting to note that all of the above-mentioned conservation areas are in close proximity to one another and located in the eastern side of Zululand and the Coast area in KwaZulu-Natal. (See **Annexure B: Table 3** for all Bushmeat Occurrences within conservation areas and **Annexure A: Map 1** for the Locality and Area orientation.)

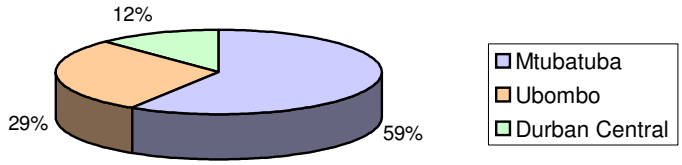
FIGURE 3. CONSERVATION AREAS WITH HIGHEST BUSHMEAT OCCURRENCES



3.1.3 Bushmeat Occurrences per Police Station

During the analysis procedure, most incidents were mapped to conservation areas, but in older datasets no information regarding the respective conservation areas were available and therefore incidents were mapped to the Police Station were the case was reported. Mtubatuba Police Station has the highest report rate of incidents (59%) with Ubombo and Durban Central 29% and 12% respectively (**Figure 4**). (Refer to **Annexure B: Table 4** for all Bushmeat incidents mapped to Police Stations.)

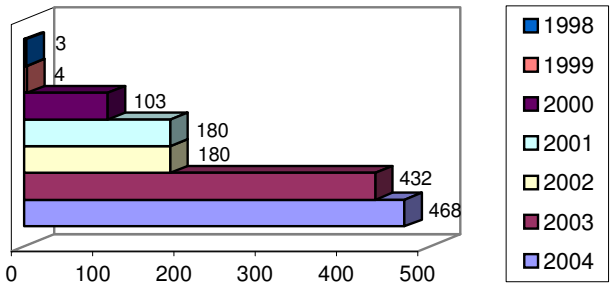
FIGURE 4. POLICE STATIONS WITH HIGHEST BUSHMEAT OCCURRENCES



3.1.4 Bushmeat Occurrences per year

The number of bushmeat incidents has increased every year from 1998 where only 3 incidents were reported to 2004 where more than 460 incidents were reported (**Figure 5**, **Annexure A: Map 3)**. It must however be noted that the data for 2004 and 2003 are of much better quality and a lot more complete than the data for 1998 to 2002. Therefore the figures for 1998 and 1999 are definitely not a real representation of the number of bushmeat occurrences during that period of time. (Refer to **Annexure B: Table 5** for bushmeat incidents per year.)

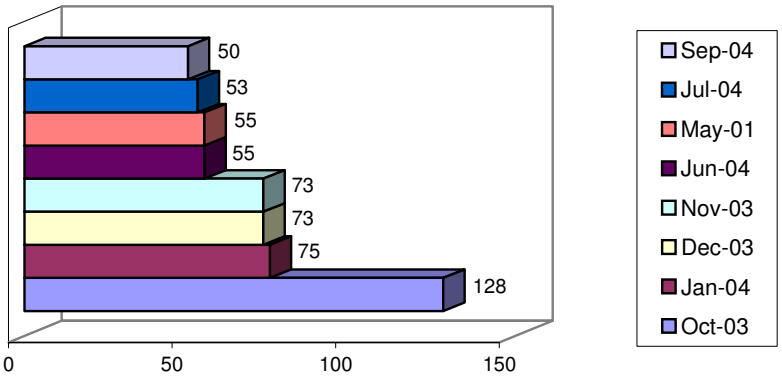
FIGURE 5. BUSHMEAT OCCURRENCES PER YEAR



3.1.5 Bushmeat Occurrences per Month

Once again it must be considered that the data for 2003 and 2004 are complete and accurate in comparison to data from 1999 to 2002. It is therefore no surprise that most months with high bushmeat incidents occur in the 2003 – 2004 period (**Figure 6, Annexure B: Table 6**). There is however one exception - May 2001 had a total of 55 recorded bushmeat incidents. Another interesting trend can be recognised in the months from October 2003 to January 2004. It seems that in these 4 months a total of 349 bushmeat incidents occurred. The month with the highest bushmeat incidents is October 2003 with 128 incidents reported.

FIGURE 6. BUSHMEAT OCCURRENCES PER MONTH



3.1.6 Bushmeat Occurrences by Incident

All bushmeat occurrences were grouped by type of bushmeat incident. Poaching was by far the highest occurring incident (86%) with Illegal fishing the second highest with only 9.8% (**Table 7**, **Annexure A: Map 4)**.

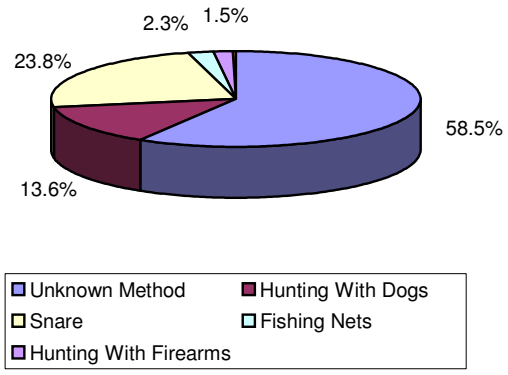
TABLE 7. BUSHMEAT OCCURRENCES BY INCIDENT

Incident	Nr of Incidents	(%)
Poaching	1181	86.2
Illegal Fishing	134	9.8
Illegal Trade	41	3.0
Possession Of Bushmeat	12	0.9
Attempted Poaching	2	0.1
Total Incidents	**1370**	**100.0**

3.1.7 Bushmeat Occurrences per Method

Because of incomplete data most of the bushmeat occurrences cannot be linked to a specific method. The most preferred methods of bushmeat hunting seems to be Snares (23.8%) and Hunting with dogs (13.6%) (**Figure 7**, **Annexure A: Map 5**, **Annexure B: Table 8**).

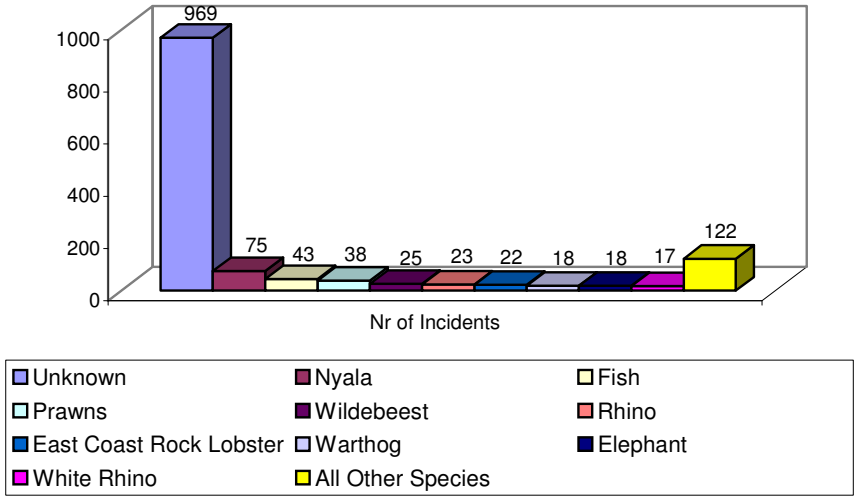
FIGURE 7. BUSHMEAT OCCURRENCES PER METHOD



3.1.8 Bushmeat Occurrences per Species

The data is not complete regarding the specific species targeted for bushmeat. Most of the incidents (969) did not list a specific species. The species targeted most in bushmeat incidents is the Nyala with 75 incidents. Other species with notable bushmeat incident rates are Rhino (40), Wildebeest (25), Elephant (18) and Warthog (18). All other targeted species were grouped in a column (122) (**Figure 8**, **Annexure B: Table 9**).

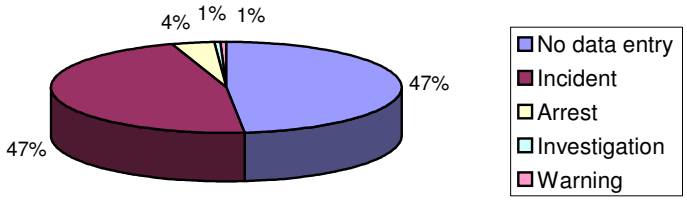
FIGURE 8. BUSHMEAT OCCURRENCES PER SPECIES



3.1.9 Bushmeat Occurrences by Police Action

The data for Police Action was incomplete. Only 53% of the bushmeat occurrences had any sort of Police Action associated to them. Mere incidents were reported in 47% of the cases and only 4% of the bushmeat occurrences lead to arrests being made (**Figure 9**, **Annexure A: Map 6**, **Annexure B: Table 10**). The fact that the data for the Police Action is so unreliable makes it difficult to analyse actual Police involvement in the bushmeat occurrences.

FIGURE 9. BUSHMEAT OCCURRENCES BY POLICE ACTION

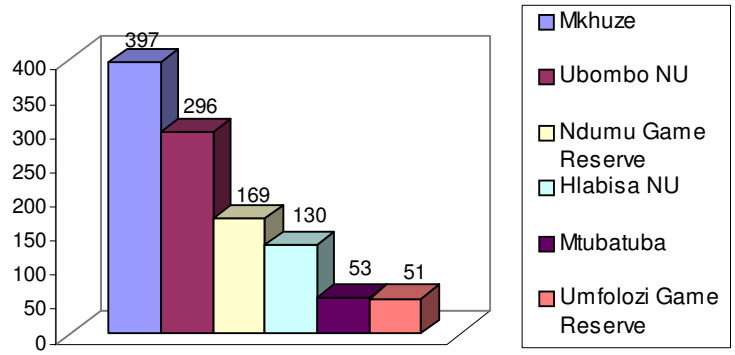


3.1.10 Bushmeat Occurrences by Place Name

By overlaying the bushmeat occurrences dataset with census data, the bushmeat occurrences per conservation area and bushmeat occurrences per Police Station were linked to place names and total bushmeat occurrences per area were calculated. (Refer to **Annexure A: Map 7** and **Annexure B: Table 11)**. The highest number of bushmeat

incidents occurred at Mkhuze (397) and Ubombo (296), which is located in close proximity to the Mkhuze Game Reserve (**Figure 10**). Another area of concern is the Ndumo Game Reserve with 169 incidents recorded. These two conservation areas – Mkhuze Game Reserve and Ndumo Game Reserve – will be analysed in more detail in section 3.4 of this report.

FIGURE 10. BUSHMEAT OCCURRENCES BY PLACE NAME



3.2 Overall View – Bushmeat Related Occurrences

In the period between 1998 and 2004 a total number of 344 bushmeat related occurrences have been documented. It must however be noted that data from 2003 and 2004 are much more complete and accurate than data received from the period 1998 to 2002.

3.2.1 Bushmeat Related Occurrences per Region

For analysis purposes the regions as delineated by Ezemvelo KZN Wildlife were utilised. Most of the bushmeat related incidents occurred in the Coast region (46.2%). Zululand had the second highest occurrence rate with 37.8% and uKhahlamba 16% (**Table 12**). It is interesting to note that in the analysis of bushmeat occurrences per region, the Zululand region had a higher occurrence (55%) than the Coast region (41%) (**Annexure B: Table 2**). (Also refer to **Annexure A: Map 8** for Bushmeat Related Occurrences and KwaZulu-Natal Regions).

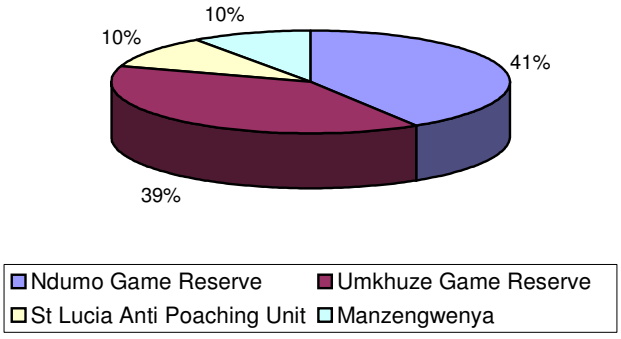
TABLE 12. BUSHMEAT RELATED OCCURRENCES PER REGION

Region	Nr of Incidents	(%)
Coast	159	46.2
Zululand	130	37.8
uKhahlamba	55	16.0
Total Incidents	**344**	**100.0**

3.2.2 Bushmeat Related Occurrences per Conservation Area

Ndumo Game Reserve has the highest percentage of Bushmeat related incidents that occur inside a conservation area (41%) with Mkhuze Game Reserve second with 39% (**Figure 11**). (See **Annexure B: Table 13** for all Bushmeat Related Occurrences within conservation areas and **Annexure A: Map 1** for the Locality and Area orientation). Mkhuze Game Reserve had the highest bushmeat occurrence inside a conservation area with 66% and Ndumo Game Reserve was second with 14% (**Annexure B: Table 3**).

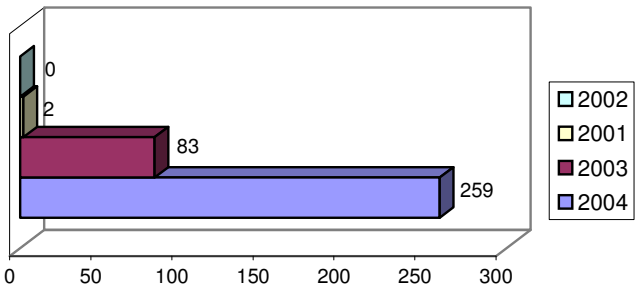
FIGURE 11. CONSERVATION AREAS WITH THE HIGHEST BUSHMEAT RELATED OCCURRENCES



3.2.3 Bushmeat Related Occurrences per Year

The number of bushmeat related incidents increased from 2001 where only 2 incidents were reported to 2004 where 259 incidents were reported (**Figure 12**, **Annexure A: Map 9**). No incidents were reported for 1998 to 2000. It must however be noted that the data for 2004 and 2003 are of much better quality and a lot more complete than the data for 1998 to 2002. Therefore the figures for 1998 and 1999 are definitely not a real representation of the number of bushmeat related occurrences during that period of time. (Refer to **Annexure B: Table 14** for bushmeat related incidents per year).

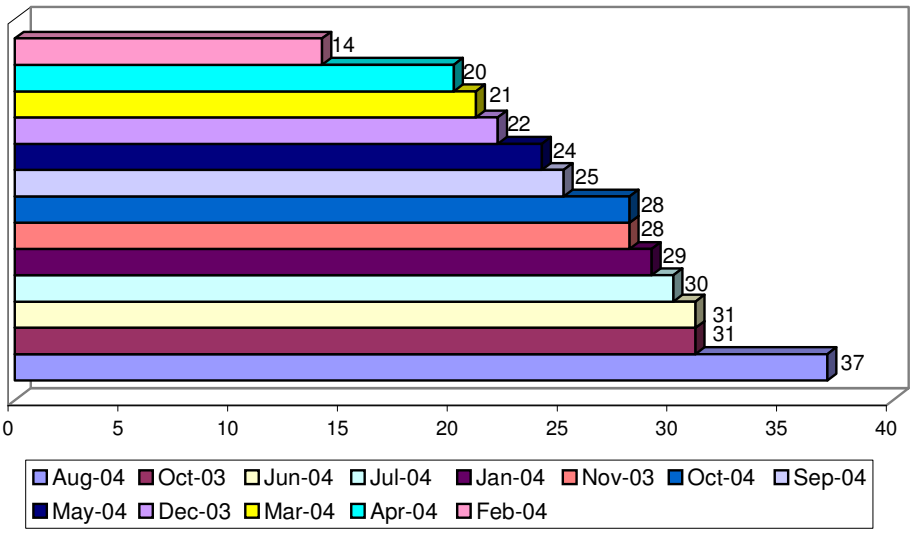
FIGURE 12. BUSHMEAT RELATED OCCURRENCES PER YEAR



3.2.4 Bushmeat Related Occurrences per Month

The month with the highest Bushmeat related occurrence report rate, was August 2004 with 37 incidents (**Figure 13**). An interesting trend is noticeable from June 2004 to August 2004 where a total of 98 bushmeat related incidents occurred. The question arises whether more incidents occurred during these months or was the police just relatively active during this period of time? (Also refer to **Annexure B: Table 15**).

FIGURE 13. BUSHMEAT RELATED OCCURRENCES PER MONTH



3.2.5 Bushmeat Related Occurrences by Incident

As previously mentioned, the bushmeat related occurrences were selected for their relevance and connection with the bushmeat trade. **Table 16**, groups the bushmeat related

occurrences by incident type. Illegal Entry into conservation areas has the highest report rate for bushmeat related occurrences (56.1%), followed by Damage to conservation area fences (11.3%) and Arson/Fire in conservation areas (9.3%). Illegal smuggling, harvesting and possession of plants such as Cycads and Dagga are also listed among the incidents related to the bushmeat trade. (Refer to **Annexure A: Map 10**).

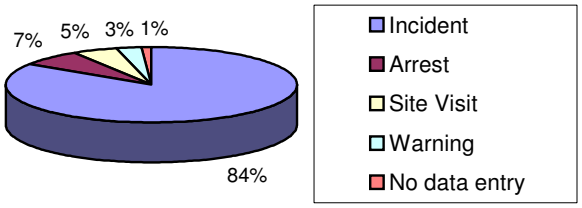
TABLE 16. BUSHMEAT RELATED OCCURRENCES BY INCIDENT

Incident	Nr of Incidents	(%)
Illegal Entry	193	56.1
Damage to fence	39	11.3
Arson / Fire	32	9.3
Illegal Encroachment	19	5.5
Illegal Harvesting	16	4.7
Illegal Trade / Smuggling	12	3.5
Suspicious Activities	12	3.5
Possession of Illegal Plants	7	2.0
Shots Fired	6	1.7
Dogs in Protected Areas	3	0.9
Illegal Immigrants	2	0.6
Poacher Attacked	1	0.3
Illegal Boats	1	0.3
Possession of Firearms	1	0.3
Total Incidents	**344**	**100.0**

3.2.6 Bushmeat Related Occurrences by Police Action

By analysing the Police Action activity, it is once again apparent that in most instances Police Action merely consisted of documenting an incident (84%) (**Figure 14**, **Annexure A: Map 11**, **Annexure B: Table 17**). Only 7% of the bushmeat related occurrences lead to arrests being made.

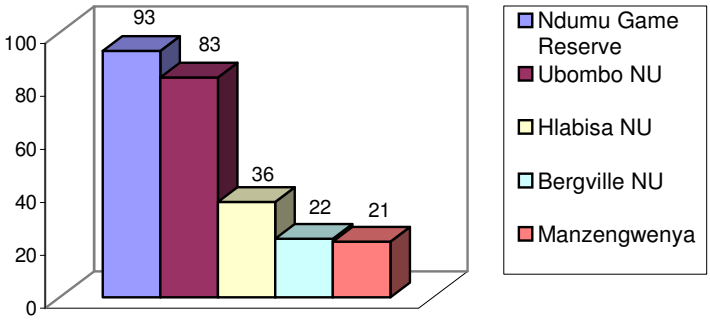
FIGURE 14. BUSHMEAT RELATED OCCURRENCES BY POLICE ACTION



3.2.7 Bushmeat Related Occurrences by Place Name

By overlaying the bushmeat related occurrences dataset with census data, the bushmeat related occurrences were linked to place names and total bushmeat related occurrences per area were calculated. The highest number of bushmeat related incidents occurred at Ndumo Game Reserve (93) and Ubombo (83), which is located in close proximity to the Mkhuze Game Reserve (**Figure 15**, **Annexure A: Map 12**, **Annexure B: Table 18**). It is interesting to note that Mkhuze Game Reserve and Ndumo Game Reserve were also listed as the highest occurring areas for Bushmeat incidents (**Annexure B: Table 11**). These two conservation areas – Mkhuze Game Reserve and Ndumo Game Reserve – will be analysed in more detail in section 3.4 of this report.

FIGURE 15. BUSHMEAT RELATED OCCURRENCES BY PLACE NAME



3.3 Demographic Analysis of Areas with highest Bushmeat Occurrences

In the Pillinger Report (2003) it was established that personal details of hunters who had been arrested by field rangers indicated that the majority were residents from communities residing on the eastern and western borders of Mkhuze- and Ndumo Game Reserves and that a number of these hunters were responsible for trafficking in bushmeat. If the assumption is then made that most of the bushmeat are utilised for subsistence use, then it can be deducted that the local inhabitants of KwaZulu-Natal who utilised the bushmeat as a protein source will reside in the areas surrounding the areas with high bushmeat occurrence reporting rates.

Refer to **Annexure A: map 13**. During the analysis, the areas with the highest bushmeat occurrences were selected and a 10-kilometer radius was drawn around these areas. It can be deducted that a person walks on average 5-kilometers per hour and at night it is possible

to make a round trip of approximately 4 hours before dawn. Therefore most bushmeat incidents occur inside a radius that spans an area approximately 2 hours from place of residence.

From **Map 13** it is evident that there are three major problem areas concerning bushmeat incidents. These areas are:

- Hluhluwe – Imfolozi area;
- Ndumo Game Reserve and surrounding areas;
- Mkhuze Game Reserve and surrounding areas.

In the following section the demographic composition of the above-mentioned conservation areas as well as the areas surrounding these conservation areas will be analysed.

3.3.1 Hluhluwe – Imfolozi area

This problem area encompasses Hluhluwe Game Reserve, part of Imfolozi Game Reserve and the Southern part of the Greater St. Lucia Wetland as well as the surrounding areas. The demographic profiles of the inhabitants of the above-mentioned areas are listed on the following pages (**Table 19** to **Table 22**). Initially the census data of 1996 was utilised and then compared with the results of the 2001 census data.

- **Population**

The population data of the Hluhluwe – Imfolozi area from 1996 and 2001 were compared. It is interesting to note that the population figures of all races except Africans have decreased from 1996 to 2001. The population figure for the African race group has increased with approximately 26 000 individuals from 1996 to 2001. Currently more than 99% of the population in this area belongs to the African race and only 0.80% of the population belong to any other racial group (**Table 19**).

TABLE 19. POPULATION DATA COMPARISON – HLUHLUWE – IMFOLOZI AREA

1996 Census Data		
Race	**Number of Individuals**	**(%)**
African	201,609	98.48%
Coloured	397	0.19%
Asian	154	0.08%
White	2,551	1.25%
Population	**204,715**	**100.00%**

2001 Census Data		
Race	**Number of Individuals**	**(%)**
African	228,018	99.20%
Coloured	326	0.14%
Asian	72	0.03%
White	1,436	0.62%
Population	**229,852**	**100.00%**

- **Age**

A comparison between the age groups of the 1996 census data and 2001 census data was drawn. Because of incomplete data from the 1996 census, the specific age of approximately 1,819 individuals could not be determined. This will have to be taken into consideration when comparing the 1996 data with the census data of 2001. In all but one of the age groups did the general population increase from 1996 to 2001. The 65 – 69 years age group showed a decrease of approximately 245 individuals and the 55 – 59 years age group showed a decrease of approximately 37 individuals (**Table 20**). There is however an interesting trend that can be seen throughout a number of age groups. The percentage of various age groups in comparison to the overall population has decreased from 1996 to 2001. This trend can be grouped roughly into three categories as listed below:

- Age-group 0 to 14 years – This group consists of young children and the decrease can signify that more deaths occurred because of illness such as AIDS during young age. It can also signify that fewer births have taken place since 1996.
- Age-group 20 to 24 years – This group consists of young adults and a decrease among this age-group can in many instances be related to deaths associated with crime, road accidents and even sexually transmitted diseases such as AIDS.
- Age group 55 to 69 years – This group consists of the elderly and frail and a decrease among this group can be related to deaths associated with sickness and old age.

TABLE 20. AGE DATA COMPARISON – HLUHLUWE – IMFOLOZI AREA

1996 Census Data			2001 Census Data		
Age	Number of Individuals	(%)	Age	Number of Individuals	(%)
0-4	28,625	13.98%	0-4	29,184	12.70%
5-9	31,870	15.57%	5-9	33,116	14.41%
10-14	31,440	15.36%	10-14	34,770	15.13%
15-19	25,657	12.53%	15-19	32,188	14.00%
20-24	18,896	9.23%	20-24	20,453	8.90%
25-29	12,563	6.14%	25-29	15,178	6.60%
30-34	10,515	5.14%	30-34	11,910	5.18%
35-39	9,513	4.65%	35-39	10,718	4.66%
40-44	7,187	3.51%	40-44	9,583	4.17%
45-49	5,698	2.78%	45-49	7,183	3.12%
50-54	3,994	1.95%	50-54	5,846	2.54%
55-59	4,270	2.09%	55-59	4,233	1.84%
60-64	3,841	1.88%	60-64	4,849	2.11%
65-69	3,835	1.87%	65-69	3,590	1.56%
70-74	2,094	1.02%	70-74	3,430	1.49%
75-79	1,418	0.69%	75-79	1,604	0.70%
80-84	775	0.38%	80-84	1,152	0.50%
> 85	705	0.34%	> 85	888	0.39%
Unspecified Age	1,819	0.89%			
Population	**204,715**	**100.00%**	**Population**	**229,875**	**100.00%**

- **Households**

The number of households in 1996 was compared with the number of households in 2001. The percentage annual growth rate from 1996 to 2001 was calculated and the projected household figures for 2005 and 2006 determined (**Table 21**). [2]

TABLE 21. HOUSEHOLD DATA COMPARISON – HLUHLUWE – IMFOLOZI AREA

	1996	2001	Annual % growth rate until 2001	Projected 2005	Projected 2006
Total Households	**28,846**	**40,258**	**6.89%**	**52,561**	**56,185**

- **Household Income**

The household income of the various income groups as determined by the 2001 census data were categorised. Please note that because of a high increase in the inflation, the 1996

[2] For Formula Refer to Annexure C

income data cannot be compared with the income data of 2001. The Rand has become worth less and therefore income-group classes have changed.

From a total of 40,258 households, 37.08% earn less than R 4,800 a month and only 22.38% earn more than R 19,201 a month (**Table 22**). The average household income for this area falls within the R 19,201 to R 38,400 income-group. This figure is inflated to a certain extent because the Hluhluwe – Imfolozi Area is rather extensive and includes quite a number of affluent areas such as the residential areas of St. Lucia as well. It is therefore unlikely that most households within this region would actually fall within the R 19,201 to R 38,400 income-group.

TABLE 22. HOUSEHOLD INCOME DATA – HLUHLUWE – IMFOLOZI AREA

2001 Census Data		
Income Group	**Number of Households**	**(%)**
No Income	8,840	21.96%
R1 - R4,800	6,085	15.12%
R4,801 - R9,600	9,131	22.68%
R9,601 - R19,200	6,872	17.07%
R19,201 - R38,400	5,156	12.81%
R38,401 - R76,800	2,611	6.49%
R76,801 - R153,600	1,086	2.70%
R153,601 - R307,200	283	0.70%
R307,201 - R614,400	51	0.13%
R614,401 - R1,228,800	29	0.07%
R1,228,801 - R2,457,600	55	0.14%
> R2,457,600	17	0.04%
Not applicable institutions	42	0.10%
Total households	**40,258**	**100.00%**

3.3.2 Ndumo Game Reserve and surrounding areas

This problem area encompasses Ndumo Game Reserve, Tembe Game Reserve as well as the surrounding areas. Also included in this area is a part of Mozambique. Unfortunately no demographic data from Mozambique was available for analysis and therefore the results for this area will not be entirely accurate. The demographic profiles of the inhabitants of the above-mentioned areas are listed on the following pages (**Table 23** to **Table 26**). Initially the census data of 1996 was utilised and then compared with the results of the 2001 census data.

- **Population**

The population data of the Ndumo Game Reserve area from the 1996 and 2001 census were compared. The population figure for the African race group has increased with approximately 24 000 individuals from 1996 to 2001 (**Table 23**). Currently more than 99.9% of the population in this area belongs to the African race and only 0.1% of the population belong to any other racial group.

TABLE 23. POPULATION DATA COMPARISON – NDUMO GAME RESERVE AND SURROUNDING AREAS

1996 Census Data		
Race	**Number of Individuals**	**(%)**
African	44,969	99.78%
Coloured	74	0.16%
Asian	9	0.02%
White	15	0.03%
Population	**45,067**	**100.00%**

2001 Census Data		
Race	**Number of Individuals**	**(%)**
African	69,057	99.90%
Coloured	6	0.01%
Asian	8	0.01%
White	54	0.08%
Population	**69,125**	**100.00%**

- **Age**

A comparison between the age groups of the 1996 census data and 2001 census data was drawn. Because of incomplete data from the 1996 census, the specific age of approximately 2,402 individuals could not be determined. This will have to be taken into consideration when comparing the 1996 data with the census data of 2001. In all but one of the age groups did the general population increase from 1996 to 2001. The 65 – 69 years age group showed a decrease of approximately 27 individuals (**Table 24**). There is however an interesting trend that can be seen throughout a number of age groups. The percentage of various age groups in comparison to the overall population has decreased from 1996 to 2001. This trend can be grouped roughly into three categories as listed below:

- Age-group 0 to 9 years – This group consists of young children and the decrease can signify that more deaths occurred because of illness such as AIDS during young age. It can also signify that fewer births have taken place since 1996.
- Age-group 25 to 29 years – This group consists of young adults and a decrease among this age-group can in many instances be related to deaths associated with crime, road accidents and even sexually transmitted diseases such as AIDS.

- Age group 55 to 74 years – This group consists of the elderly and frail and a decrease among this group can be related to deaths associated with sickness and old age.

TABLE 24. AGE DATA COMPARISON – NDUMO GAME RESERVE AND SURROUNDING AREAS

1996 Census Data			2001 Census Data		
Age	**Number of Individuals**	**(%)**	**Age**	**Number of Individuals**	**(%)**
0-4	6,658	14.77%	0-4	9,945	14.38%
5-9	7,208	15.99%	5-9	10,960	15.85%
10-14	6,358	14.11%	10-14	11,106	16.06%
15-19	5,022	11.14%	15-19	8,643	12.50%
20-24	3,472	7.70%	20-24	5,475	7.92%
25-29	3,210	7.12%	25-29	4,251	6.15%
30-34	2,358	5.23%	30-34	3,940	5.70%
35-39	2,035	4.52%	35-39	3,393	4.91%
40-44	1,259	2.79%	40-44	2,723	3.94%
45-49	1,073	2.38%	45-49	1,635	2.36%
50-54	632	1.40%	50-54	1,577	2.28%
55-59	724	1.61%	55-59	934	1.35%
60-64	779	1.73%	60-64	1,159	1.68%
65-69	1,027	2.28%	65-69	1,000	1.45%
70-74	414	0.92%	70-74	1,239	1.79%
75-79	286	0.63%	75-79	554	0.80%
80-84	89	0.20%	80-84	409	0.59%
> 85	61	0.14%	> 85	193	0.28%
Unspecified Age	2,402	5.33%			
Population	**45,067**	**100.00%**	**Population**	**69,136**	**100.00%**

- **Households**

The number of households in 1996 was compared with the number of households in 2001. The percentage annual growth rate from 1996 to 2001 was calculated and the projected household figures for 2005 and 2006 determined (**Table 25**).[3]

TABLE 25. HOUSEHOLD DATA COMPARISON – NDUMO GAME RESERVE AND SURROUNDING AREAS

	1996	2001	Annual % growth rate until 2001	Projected 2005	Projected 2006
Total Households	**6,084**	**13,268**	**13.68%**	**22,160**	**25,192**

[3] For Formula Refer to Annexure C

- **Household Income**

The household income of the various income groups as determined by the 2001 census data were categorised. Please note that because of a high increase in the inflation, the 1996 income data cannot be compared with the income data of 2001. The Rand has become worth less and therefore income-group classes have changed. From a total of 13,268 households, 64.33% earn less than R 4,800 a month and 55.91% earn no income at all. Only 9.65% earn more than R 19,201 a month (**Table 26**). The average household income for this area falls within the R 9,601 to R 19,200 income-group.

TABLE 26. HOUSEHOLD INCOME DATA – NDUMO GAME RESERVE AND SURROUNDING AREAS

2001 Census Data		
Income Group	**Number of Households**	**(%)**
No Income	7,418	55.91%
R1 - R4,800	1,117	8.42%
R4,801 - R9,600	2,281	17.19%
R9,601 - R19,200	1,165	8.78%
R19,201 - R38,400	778	5.86%
R38,401 - R76,800	312	2.35%
R76,801 - R153,600	105	0.79%
R153,601 - R307,200	38	0.29%
R307,201 - R614,400	13	0.10%
R614,401 - R1,228,800	7	0.05%
R1,228,801 - R2,457,600	13	0.10%
> R2,457,600	15	0.11%
Not applicable institutions	6	0.05%
Total households	**13,268**	**100.00%**

3.3.3 Mkhuze Game Reserve and surrounding areas

This problem area encompasses Mkhuze Game Reserve as well as the surrounding areas. The demographic profiles of the inhabitants of the above-mentioned areas are listed in on the following pages (**Table 27** to **Table 30**). Initially the census data of 1996 was utilised and then compared with the results of the 2001 census data.

- **Population**

A comparison between the age groups of the 1996 census data and 2001 census data for the Mkhuze Game Reserve area was drawn. The population figure for the African race group has increased with approximately 16 000 individuals from 1996 to 2001 (**Table 27**). Currently more than 99.3% of the population in this area belongs to the African race and only 0.7% of the population belong to any other racial group.

TABLE 27. POPULATION DATA COMPARISON – MKHUZE GAME RESERVE AND SURROUNDING AREAS

1996 Census Data		
Race	**Number of Individuals**	**(%)**
African	45,475	99.22%
Coloured	65	0.14%
Asian	29	0.06%
White	262	0.57%
Population	**45,831**	**100.00%**

2001 Census Data		
Race	**Number of Individuals**	**(%)**
African	61,953	99.30%
Coloured	98	0.16%
Asian	44	0.07%
White	293	0.47%
Population	**62,388**	**100.00%**

- **Age**

A comparison between the age groups of the 1996 census data and 2001 census data was drawn. Because of incomplete data from the 1996 census, the specific age of approximately 1,415 individuals could not be determined. This will have to be taken into consideration when comparing the 1996 data with the census data of 2001. The general population increased in all age groups from 1996 to 2001 (**Table 28**). There is however an interesting trend that can be seen throughout a number of age groups. The percentage of various age groups in comparison to the overall population has decreased from 1996 to 2001. This trend can be grouped roughly into two categories as listed below:

- Age-group 0 to 14 years – This group consists of young children and the decrease can signify that more deaths occurred because of illness such as AIDS during young age. It can also signify that fewer births have taken place since 1996.
- Age group 55 to 79 years – This group consists of the elderly and frail and a decrease among this group can be related to deaths associated with sickness and old age.

TABLE 28. AGE DATA COMPARISON – MKHUZE GAME RESERVE AND SURROUNDING AREAS

1996 Census Data		
Age	Number of Individuals	(%)
0-4	7,216	15.74%
5-9	7,178	15.66%
10-14	6,635	14.48%
15-19	5,293	11.55%
20-24	4,055	8.85%
25-29	2,883	6.29%
30-34	2,367	5.16%
35-39	1,970	4.30%
40-44	1,489	3.25%
45-49	1,134	2.47%
50-54	789	1.72%
55-59	899	1.96%
60-64	798	1.74%
65-69	810	1.77%
70-74	404	0.88%
75-79	276	0.60%
80-84	123	0.27%
> 85	97	0.21%
Unspecified Age	1,415	3.09%
Population	**45,831**	**100.00%**

2001 Census Data		
Age	Number of Individuals	(%)
0-4	8,806	14.12%
5-9	9,144	14.66%
10-14	8,839	14.17%
15-19	8,308	13.32%
20-24	5,704	9.15%
25-29	4,370	7.01%
30-34	3,479	5.58%
35-39	3,148	5.05%
40-44	2,552	4.09%
45-49	1,893	3.04%
50-54	1,506	2.41%
55-59	1,120	1.80%
60-64	1,083	1.74%
65-69	828	1.33%
70-74	727	1.17%
75-79	395	0.63%
80-84	276	0.44%
> 85	188	0.30%
		0.00%
Population	**62,366**	**100.00%**

- **Households**

The number of households in 1996 was compared with the number of households in 2001. The percentage annual growth rate from 1996 to 2001 was calculated and the projected household figures for 2005 and 2006 determined (**Table 29**).[4]

TABLE 29. HOUSEHOLD DATA COMPARISON – MKHUZE GAME RESERVE AND SURROUNDING AREAS

	1996	2001	Annual % growth rate until 2001	Projected 2005	Projected 2006
Total Households	**6,988**	**12,710**	**15.88%**	**22,915**	**26,552**

- **Household Income**

The household income of the various income groups as determined by the 2001 census data were categorised. Please note that because of a high increase in the inflation, the 1996

[4] For Formula Refer to Annexure C

income data cannot be compared with the income data of 2001. The Rand has become worth less and therefore income-group classes have changed. From a total of 12,710 households, 50.8% earn less than R 4,800 a month and 38.03% earn no income at all (**Table 30**). Only 15.59% earn more than R 19,201 a month. The average household income for this area falls within the R 9,601 to R 19,200 income-group.

TABLE 30. HOUSEHOLD INCOME DATA – MKHUZE GAME RESERVE AND SURROUNDING AREAS

2001 Census Data		
Income Group	**Number of Households**	**(%)**
No Income	4,834	38.03%
R1 - R4,800	1,623	12.77%
R4,801 - R9,600	2,458	19.34%
R9,601 - R19,200	1,798	14.15%
R19,201 - R38,400	1,097	8.63%
R38,401 - R76,800	549	4.32%
R76,801 - R153,600	229	1.80%
R153,601 - R307,200	55	0.43%
R307,201 - R614,400	13	0.10%
R614,401 - R1,228,800	11	0.09%
R1,228,801 - R2,457,600	17	0.13%
> R2,457,600	11	0.09%
Not applicable institutions	15	0.12%
Total households	**12,710**	**100.00%**

3.4 Case Study: Bushmeat Occurrences within Mkhuze and Ndumo Game Reserves

Even though the Hluhluwe-Imfolozi area is listed as one of the problem areas, the area in question is rather extensive and consists of various conservation areas. Of the three problem areas it has the least bushmeat occurrences. The following section therefore focuses on Mkhuze - and Ndumo Game reserves because of the intensity and frequency of bushmeat occurrences within these relatively small areas. A total of 720 bushmeat incidents occurred in Mkhuze Game Reserve and 171 in Ndumo Game Reserve over the study period.

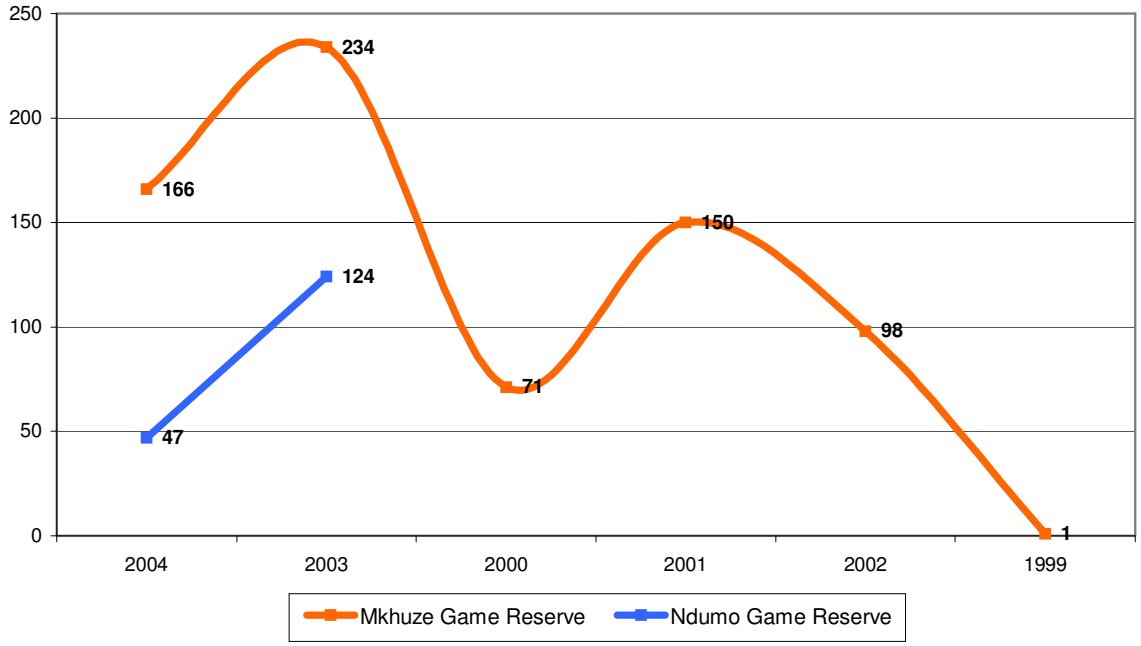
Initially it was intended to create maps of Mkhuze and Ndumo Game Reserve to try and establish in which specific areas of these two game reserves most bushmeat incidents occur. This however wasn't possible due to the fact that exact locations of the bushmeat incidents were not available the majority of the incidents.

3.4.1 Bushmeat Occurrences per Year

There are no records for bushmeat occurrences within Ndumo Game Reserve prior to 2003. This does not mean that no bushmeat incidents occurred prior to 2003, but simply that the data is incomplete and that Ezemvelo KZN Wildlife only started documenting bushmeat occurrences more accurately in 2003. The Mkhuze Game Reserve records for 1999 to 2002 were obtained from the Mkhuze Police Station. Data for the Mkhuze Game Reserve records from 2003 and 2004 were however also obtained from Ezemvelo KZN Wildlife.

The Graphs from both Mkhuze Game Reserve and Ndumo Game Reserve show an interesting trend in the fact that 2003 yielded a higher bushmeat occurrence as 2004 (**Figure 16**). In 2003 a total of 124 bushmeat occurrences were documented in Ndumo Game Reserve and 166 occurrences in Mkhuze Game Reserve. Mkhuze Game Reserve's figure dropped with 30.7% to 47 bushmeat occurrences in 2004 and Ndumo Game Reserve's figure dropped with 52.9% to 124 occurrences in 2004.

FIGURE 16. BUSHMEAT OCCURRENCES PER YEAR COMPARISON

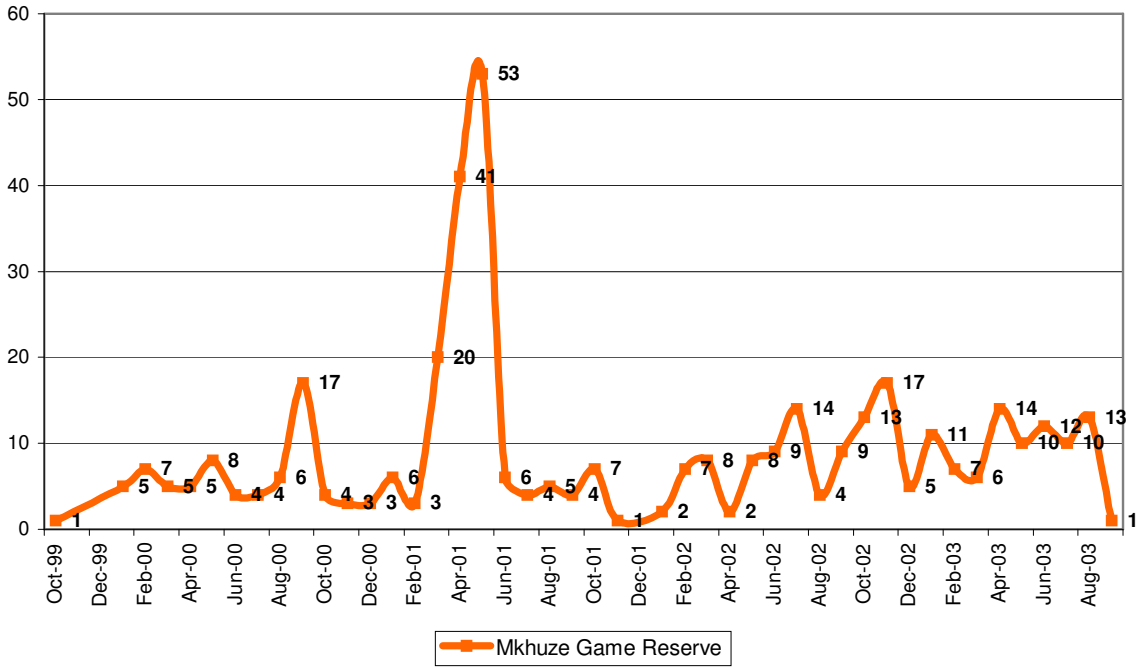


3.4.2 Bushmeat Occurrences per Month

Because of the incomplete data as previously mentioned, no data prior to October 2003 are available for Ndumo Game Reserve. It was therefore not possible to compare the bushmeat occurrences per Game reserve by month prior to October 2003.

Bushmeat occurrences in Mkhuze Game Reserve for the period of October 1999 to August 2003 were analysed by month. All data were collated from the Mkhuze Police Station CAS records. There was a very high occurrence of bushmeat incidents in the period March 2001 to May 2001 (**Figure 17**). During these three months a total of 114 bushmeat incidents occurred in Mkhuze Game Reserve. Unfortunately the data available does not allow us to draw further analysis regarding this specific period in time. For all 114 records the incident is simply listed as Poaching by "Unknown Method" of "Unknown Species".

FIGURE 17. MKUZE GAME RESERVE BUSHMEAT OCCURRENCES PER MONTH FROM OCTOBER 1999 TO AUGUST 2003.



Bushmeat occurrences per month from October 2003 to October 2004 between Mkhuze Game Reserve and Ndumo Game Reserve were compared. Bushmeat Occurrences in

Mkhuze Game Reserve has dropped with approximately 11.9% from October 2003 to October 2004 (**Figure 18**). In Ndumo Game Reserve however, the figures have stayed more constant during the initial stages of the investigation, but towards the end of 2004 it seems that bushmeat occurrences in Ndumo Game Reserve have escalated and during specific months more incidents occurred in Ndumo than in Mkhuze. Officials from Ezemvelo KZN Wildlife have confirmed this trend. (Davis, Personal Communication)[5]

During October 2003 and January 2004 196 bushmeat incidents occurred in Mkhuze Game Reserve. Upon further analysis of this period in time, the following statistics were revealed:

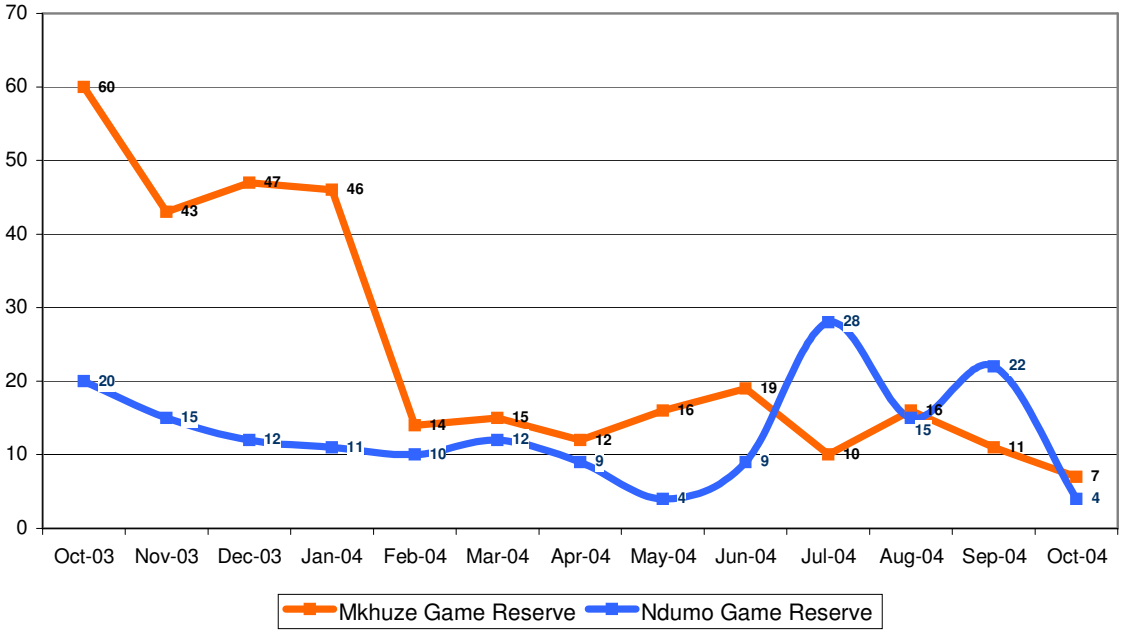
- Because of incomplete data most records (156) did not list the specific species involved in the various bushmeat incidents. Species such as Nyala (15 incidents), Wildebeest (14 incidents) and Rhino (5 incidents) were however targeted as bushmeat.
- One incident of illegal trade in bushmeat was recorded and 195 Poaching incidents.
- Dogs were used as hunting method in 27% of the incidents and snares were used 51%. In the rest of the incidents (22%) the hunting methods were not known.
- The police made only 4 arrests during this period of time.

From July 2004 to September 2004 Ndumo Game Reserve experienced an increase in bushmeat occurrences. During this period of time 65 incidents occurred. Upon further analysis of this period in time, the following statistics were revealed:

- Because of incomplete data most records (43) did not declare the specific species involved in the various bushmeat incidents. The species with the highest target rate was Nyala with 12 bushmeat incidents.
- In all 65 records poaching was listed as the bushmeat incident.
- In 35% of the incidents, the specific hunting method is not known. Dogs were used as hunting method in 26% of the instances and snares 37%. Firearms were used in only 2% of the incidents.
- The police made only 1 arrest during this period of time.

[5] Telephonic Conversation with Andy Davies from Ezemvelo KZN Wildlife in December 2004.

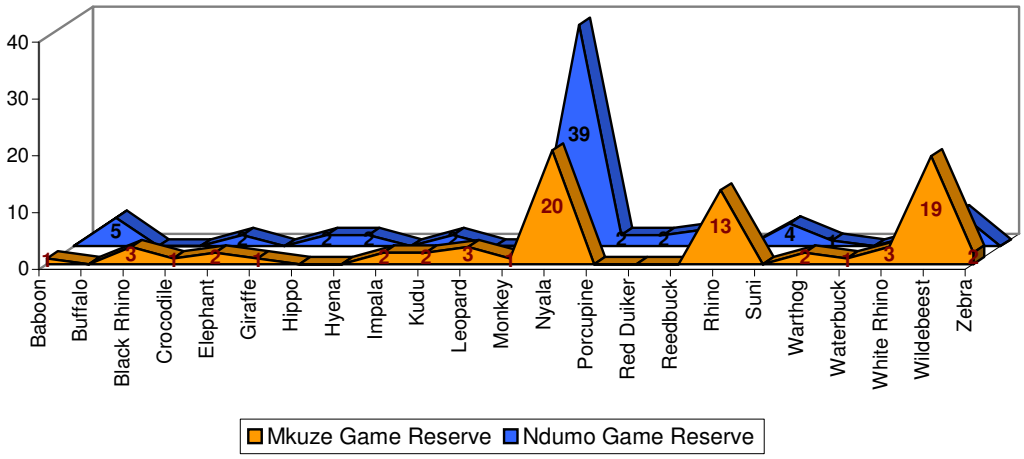
FIGURE 18. BUSHMEAT OCCURRENCES PER MONTH COMPARISON FROM OCTOBER 2003 TO OCTOBER 2004.



3.4.3 Bushmeat Occurrences per Species

The Nyala is the species targeted most in Ndumo- as well as Mkhuze Game Reserves (**Figure 19**). In Mkhuze Game Reserve Rhino and Wildebeest were also targeted frequently as bushmeat.

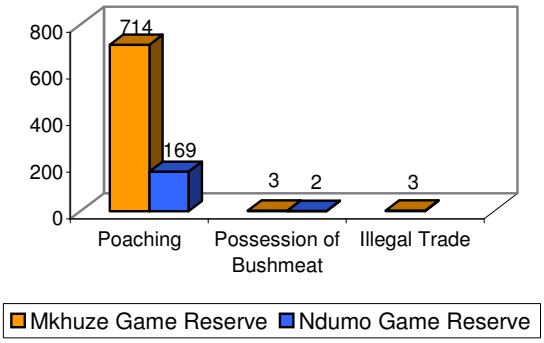
FIGURE 19. BUSHMEAT OCCURRENCES PER SPECIES COMPARISON



3.4.4 Bushmeat Occurrences by Incident

In both game reserves more than 98% of the incidents are recorded as poaching incidents (**Figure 20**). Possession of bushmeat was also listed as an incident in both game reserves. Illegal trade of bushmeat took place in the vicinity of Mkhuze Game Reserve.

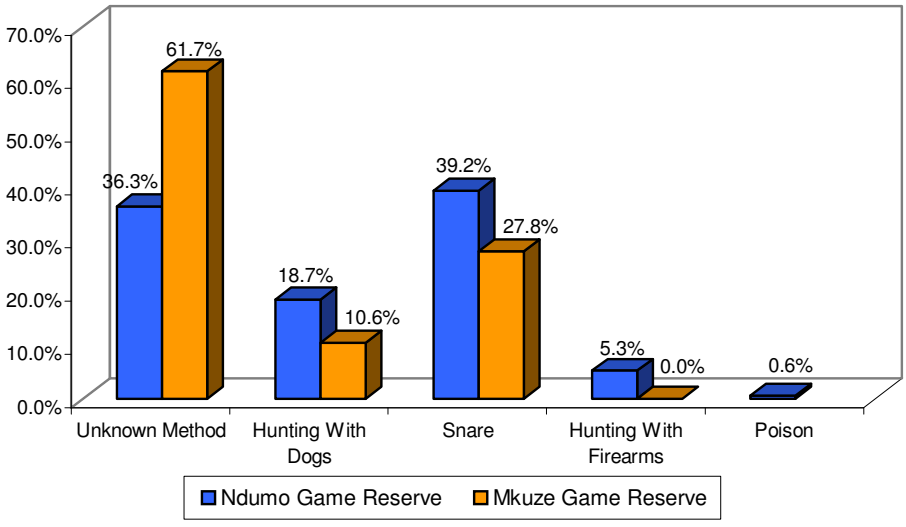
FIGURE 20. BUSHMEAT OCCURRENCES BY INCIDENT COMPARISON



3.4.5 Bushmeat Occurrences by Method

The most preferred hunting method in both game reserves is the use of snares (**Figure 21**). The second preferred method is hunting with dogs and hunting with firearms ranks third. In a small percentage of the bushmeat occurrences (0.6%) in Ndumo Game Reserve poison was utilised as hunting method.

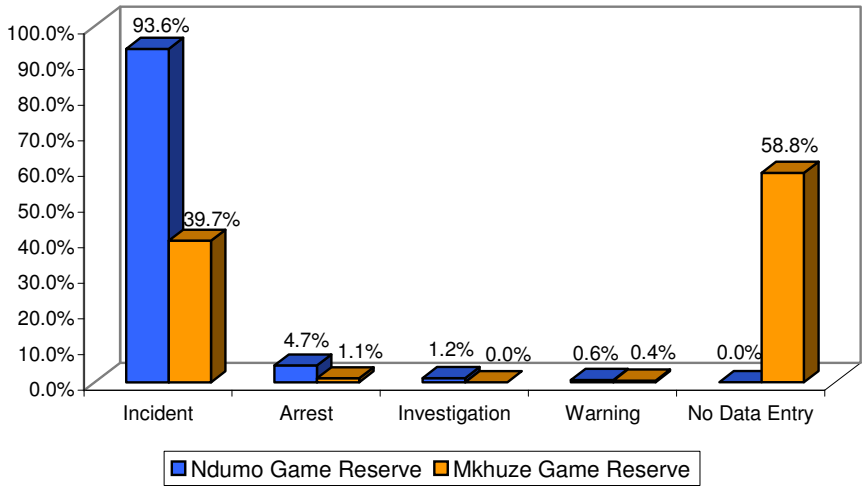
FIGURE 21. BUSHMEAT OCCURRENCES BY METHOD COMPARISON



3.4.6 Bushmeat Occurrences by Police Action

Because of incomplete data approximately 59% of the bushmeat incidents in Mkhuze Game Reserve has no Police Action associated with them. In both game reserves most bushmeat occurrences are merely reported as an incident. In Ndumo Game Reserve 4.7% of the bushmeat occurrences lead to arrests being made. Only 1.1% of the 720-bushmeat occurrences in Mkhuze Game Reserve over the study period lead to arrests being made (**Figure 22**).

FIGURE 22. BUSHMEAT OCCURRENCES BY POLICE ACTION COMPARISON



4 CONCLUSION

4.1 Discussion

There is a steady increase in the number of reported bushmeat occurrences in KwaZulu-Natal from year to year. This is supported by the number of snares recovered and carcasses found in Pillinger's study from July 2002 to January 2003 (Pillinger, 2003). From the analysis it is apparent that Mkhuze Game Reserve has the highest percentage of bushmeat occurrences (66%) with Ndumo Game Reserve second with 14%. This is reflected in the fact that Ezemvelo KwaZulu-Natal Wildlife commissioned Simon Pillinger in 2002 to conduct a study regarding the bushmeat trade in these areas. Towards the end of 2004 bushmeat occurrences in Ndumo Game Reserve escalated and during specific months more bushmeat incidents occurred in Ndumo than in Mkhuze. Andy Davies of Ezemvelo KZN Wildlife confirmed this trend (Personal Communication, December 2004).

The increase in the number of bushmeat occurrences in KwaZulu-Natal can be attributed to an increase in population and poverty as well as the lack of a substantial alternative protein source. Bushmeat are primarily targeted by members of impoverished communities in the surrounding rural areas. The impact of AIDS on the local communities is also a factor to be taken into account when investigating the bushmeat phenomenon in KwaZulu-Natal. Even though the total population has increased from 1996 to 2001, an interesting trend was visible during the analysis of the age-group data. A decrease in the number of individuals in the 20 – 29 years age–group has been identified. This signifies that young adults perish and leave children and older people to fend for themselves. With the main breadwinner out of the picture, many families rely on bushmeat in the vicinity as an only food source.

In the Pillinger Report (2003) it was established that personal details of hunters who had been arrested by field rangers indicated that the majority were residents from neighbouring communities and that a number of these hunters were responsible for trafficking in bushmeat. "The Mkhuze Game Reserve shares its borders with a number of communities. The northern border is relatively mountainous and is well populated. The southern border area consists mainly of game and cattle farms with limited poaching while the eastern and western border areas are well populated with a number of people known to be responsible for trafficking bushmeat." (Pillinger, 2003:13). The areas surrounding Mkhuze Game

Reserve has a total population of more than 62 000 individuals and consists of 99% Africans. In 2001 in the region of 12 710 households were recorded and at an annual growth rate of 15.88% the number of households for 2005 is estimated at approximately 22 915. Of these households more than 38% earn no monthly income at all. The areas surrounding Ndumo Game Reserve has a total population of more than 69 000 individuals and consists of 99% Africans. In 2001 in the region of 13 268 households were recorded and at an annual growth rate of 13.68% the number of households for 2005 is estimated at approximately 22 160. Of these households more than 55.9% earn no monthly income at all. According to neighbouring community leaders, the major source of revenue of the area is derived from the wages of local employees, migrant workers and social payouts (Pillinger, 2003).

Poachers travel great distances on foot to hunt inside conservation areas where the targeted animal species are still relatively abundant. The most preferred method for poaching in all areas are the utilisation of snares (23.8%) followed by hunters using spears and dogs (13.6%) and firearms (1.5%). These methods are confirmed by Pillinger (2003). In Ndumo Game Reserve snares were utilised in 39.2% of the incidents and in Mkhuze in 27.8% of the incidents. According to Pillinger (2003) the illicit killing of game in Mkhuze, by means of snaring, begun before the reserve fell under the jurisdiction of the former Natal Parks Board. In areas adjacent to Mkhuze there are very limited populations of game left and this is due to the high level of snaring and traditional hunting over the years. In these areas young males will hunt with dogs rather than snares for fear of injuring their cattle. The game hunted in these areas, are mostly animals that have ventured out of the reserve. Another interesting observation from Pillinger's study (2003) is the fact that hunters who utilise snares in Mkhuze do not remove their snares after use, but hide them away in a secure place for future use.

According to the information derived from the analysis, Nyala and Wildebeest were the most targeted species during poaching activities. Pillinger (2003) established that poachers considered wildebeest the most preferred species, as they are allegedly the easiest to hunt. Nyala, Impala, Warthog, Reedbuck and Bushbuck meat is always in demand but not always readily available. He also made an attempt to establish if any species had become increasingly difficult to hunt due to poaching pressures. The species considered the most affected was the Wildebeest.

Bushmeat are sold at local commercial markets as a subsistence protein source for consumption by the local communities. Pillinger (2003) established that butcheries in the areas surrounding Mkhuze all had bushmeat for sale. The amount of bushmeat was of such proportions that it could only have emanated from the protected areas, since the surrounding areas do not have that amount of game to offer. A rough estimate of approximately 20 antelope per week are sold at the bushmeat markets. The majority of the bushmeat is sold in small quantities. Larger cuts are sold at traditional markets in close proximity to Mkhuze Game Reserve. Bushmeat were identified at meat markets at Mseleni Mission Hospital, Mbaszwana, Ubombo hospital and Ndumo. This has lead to the following statement in the Pillinger Report of 2003: "…There are indications that the majority of antelope killed are very likely for commercial use and only a limited number of animals are used for subsistence livelihood." This statement is only accurate to a degree. Even though bushmeat are sold at markets, the only clientele of these markets consist of residents from local communities and these communities utilise the bushmeat for subsistence use. Pillinger (2003) observed that no bushmeat was available at meat markets in areas located on the eastern and western boundaries of Ndumo. It is therefore indicative that poachers in the Ndumo region are possibly hunting for their own consumption and not for commercial purposes. "Antelope (Nyala, Impala, Duiker and Reedbuck) are mainly killed for local consumption." (Pillinger, 2003:16). There is no evidence of a significant international commercial trade in bushmeat in the study area.

One of the most troubling results of the study was the police action associated with bushmeat occurrences. In most cases no Police Action was involved and in only 4% of all bushmeat incidents was an arrest made. The staff members from Mkhuze Game Reserve are all highly motivated and dedicated to prevent poaching, but an increase in the number of poaching might result from an insufficient number of specialised anti-poaching patrols; limited specialised staff and funds and Insufficient support from the South African Police Services and Judiciary system. In Ndumo there is a great concern regarding Mozambican poachers who cross the international boundary to hunt in Ndumo and Tembe, as there are no official policy on pursuing the poachers on their return to Mozambique. Due to poor policing or misunderstanding by members of the SAP Mozambican poachers are regularly released from police custody without being charged as soon as they are arrested (Pillinger, 2003). There is a large discrepancy in the number of poachers being detained and the number of poachers arrested each month. This is due to the lack of commitment from the

SAP, allegations of possible corruption and the lack of dedicated and trained officers to ensure that wildlife cases are taken through to the courts (Pillinger, 2003).

The accuracy of the results and trends as discussed in the previous chapters must however be viewed in light of the data utilised to execute the study. The analysis was done with bushmeat occurrences data obtained from Ezemvelo KZN Wildlife and the South African Police as well as statistical data obtained from the National Census of 1996 and 2001. Bushmeat occurrences have only been documented in a more effective a specialised manner since October 2003. Prior to this date no complete data of the bushmeat phenomenon exists. The results of the bushmeat analysis have been measured against data from the National Census of 1996 and 2001. The accuracy of the demographic data for the areas with high bushmeat occurrence rates is therefore linked to the accuracy of the census data.

4.2 Recommendations

In view of the above discussions, the following recommendations are proposed:

More effective policing by the South African Police Services are recommended as well as an increase in judiciary participation. One of the reasons provided for the low bushmeat occurrences within Tembe Elephant Park, is the fact that they possess a very dedicated and active anti-poaching officer (Pillinger, 2003). The use of mobile anti-poaching units seems to be the only effective mechanism to combat the problem. Sources stated that the anti-poacher units were a deterrent to poachers to rather hunt in adjacent areas, wait until the unit leaves, or not to hunt at all (Pillinger, 2003).

More effective documentation of bushmeat occurrences by utilising a Global Positioning System to accurately log the specific locations as well as standardised documentation procedures are recommended for all field officers in all protected areas and regions. This will enable more effective monitoring of the bushmeat phenomenon. The utilisation of a GPS and a standardised documentation form will however also imply a supplementary education and training of field officers and staff.

Ezemvelo KZN Wildlife should implement changes in their enforcement strategies to incorporate problem areas adjacent to protected areas. Community conservation and awareness programmes as well as a better understanding of, and an increase in partnerships with surrounding communities will help to alleviate the bushmeat problem. According to Pillinger (2003), a good relationship exist between the management of Mkhuze Game Reserve management and the surrounding communities and the communities seem to understand the problems that illegal poaching convey. It is therefore recommended that community involvement be implemented in future bushmeat investigations. It is essential to address the key socio-economic problems as the main cause for the increase in the number of bushmeat occurrences in KwaZulu-Natal. As Pillinger (2003) also correctly stated, the illicit bushmeat trade in the areas surrounding Mkhuze- and Ndumo Game Reserve can only be brought under control once the quality of life for the surrounding communities improves and more employment opportunities are created.