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HISTORICAL GEOGRAPHYCAL DISTRIBUTION OF LARGER MAMMALS IN THE MESSINA AREA

1. INTRODUCTION

Environmental (biotic and abiotic) as well as anthropological factors determine the presence or absence of a species in a specific area. One or more of these factors can change over a short or long period of time. Environmental changes include aspects such as yearly rainfall, floods and droughts and can normally not be managed. Management have to adapt to these changes. Anthropological changes include aspects such as agricultural practises (deforestation, overgrazing etc.) and international borders of countries that artificially divide distribution ranges or migration routes. Most of these changes can be managed. Changes of environmental and anthropological factors can have a positive or negative effect on a species and might even alter the distribution patterns of a species.

It is necessary to determine the magnitude of changes, if any, because it may determine management actions to be implemented and therefore have financial or other ecological implications. For instance habitat, local climatic conditions, veld condition, freedom of movements etc. have changed over the past fifty years on most game farms situated in South Africa. These aspects induced a change in the carrying capacity, which on its turn induced a change in the amount of animals and species to be kept on the property. This alters the functioning of the natural systems.

Man induced many intolerable and irreversible changes to the natural environment and has most probably had the biggest influence on distribution patterns of mammals on the African continent. The natural geographical distribution of many species has therefore drastically changed over the past few decades. Some species have disappeared in most of their former distribution ranges (black and white rhino's) while others have been introduced in areas where they never occurred in the past (roan antelope and blesbok).

Changes in mammal species distribution patterns have significant influences on other mammal species and their habitats, the natural environment itself (habitat) and other species (invertebrates etc.). It also has a social and financial impact on for instance the game farming and tourism industries of a region or country. Effective management of these dynamic environments and impacts require an understanding of the relationships between a species, its preferred habitat and other species.

The historic occurrence of a species in a specific area is an important, but not the only aspect that should be evaluated when determining the desired mammal species composition of a conservation area or game farm. Habitat suitability, size of suitable habitat, veld condition, competition from or with other species, conservation status of a species, management implications, legal obligations and implications, financial implications etc. are also important aspects to consider.

2. METHODS

This report is primarily based on a literature study. Personal experience obtained from working in the Messina District and knowledge of the study area, as well as discussions with local people is also included.

Du Plessis (1969) studied the past and present geographical distribution of the Perrisodactyla and Artiodactyla in Southern Africa, and is regarded as an authority on this subject. The aim of the study was to describe the widest distribution during historical times of species and some subspecies and to compare the former with the present. The period under consideration was from the time of the first European settlements at the Cape in 1652 up to 1969. Du Plessis (1969) also provides a description of the causes of change in numbers and distribution.

Distribution of species (maps and descriptions) from Smithers (1983) and Estes (1992) were compared with that of Du Plessis (1969). Information of species that were not included by Du Plessis (carnivores etc.) was compiled from Smithers (1983) and Estes (1992). Results are presented in appendix A, table 1.

The scale of distribution maps is very large and descriptions are very broad. Maps include in most cases the entire continent and descriptions are on a regional base. The exact location of Maremani Nature Reserve on these maps and descriptions are not clear. Maremani Nature Reserve is therefore regarded as included in a distribution area of a species if it is included in the area directly east of 30^0E or east of the town Messina.

3. FACTORS INFLUENCING HABITAT PREFERANCE

A short overview of the factors that are important in habitat determination of a species, and therefore its presence or absence in an area, is provided. This information helps a manager to understand the functioning of, and interactions between animals and their habitats. It is also important for compiling specific veld- and game management and monitoring strategies and actions.

Habitat, in terms of larger mammals, refers to the vegetation composition, floristic and structural, of the area as a product of various factors such as climate, geology and soils (Joubert 1976). The habitat of an animal is therefore the area where that animal preferably occurs and where all its life necessities are fulfilled.

Consistency of herbivores to a specific habitat is connected with:

- Availability of preferred food source of the required growth stage, for instance leafs or grasses, short or tall grass, fruits, new growth etc.
- Minimum size of living space of the species for daily and seasonal movements (migrations, nomadic species etc.)
- Freedom of extreme competition from associated species.
- Adequate shelter from climatic elements and predators.

- Availability of surface water.

- Facilities to escape from abnormal climatic conditions such as droughts, floods etc.

- Compliance to requirements of reproduction, for instance tall grass to hide calves (Pienaar 1974).

Above-mentioned aspects can relatively easily be managed. Manipulation of one or more of these aspects in space and time can be used to the advantage of one or more species, and / or to the disadvantage of another species. For instance, numbers of a common species and / or their habitats can be managed in such a manner that their presence in an area are not detrimental to habitat specific and competition sensitive rare or endangered species.

The distribution of herbivores within their selected habitat are influenced by:

- Their tendency to a uniformly or concentrated distribution where a specific fodder species, vegetation composition or degree of shelter are present.

- The degree of eurofagia (wide feeding spectrum) or stenofagia (narrow feeding spectrum) in their feeding behaviour.

- Their dependence on surface water, drinking frequency and tendency to stay near water.

- Their response to seasonal changes in vegetation and fire.

- Their consistency to a particular successional development stage.

- Their degree of tolerance to associated herbivores and place in the social hierarchy of the herbivore community (Pienaar 1974).

These aspects are primarily associated with an animal's behaviour and can be used to monitor the success of veld and game management actions.

The presence of predators in an area are, among other factors, more directly linked to the presence of their preferred pray species, and specially in confined areas to competition from other predator species.

4. ECOLOGICAL SEPARATION

Ecological separation of species becomes an important issue where animals are in confined areas, interspecies competition of associated species is high, available habitat for a species is not optimum or habitat changes had occurred. Some species, for instance roan antelope and sable antelope, are more sensitive to competition from other species. Ecological separation by or from such species is essential for the survival or successful breeding of these species. These two species are also taxonomically closely related and their preferred habitat, social structure, behaviour

etc are very similar. There are however a distinct ecological separation between these species that are very important when they do occur in the same confined area.

Lamprey (1963) found that ecological separation of 14 ungulate species in the Tarangire Game Reserve in Tanganyika occurs in the following six ways:

- Occupancy of different vegetation types or habitats.
- Selection of different fodder types.
- Occupancy of different areas in the same season.
- Occupancy of the same area in different seasons.
- Usage of different vegetation strata.
- Occupancy of different dry season feeding areas when competition for fodder is the greatest.

Other factors that are important in ecological separation and niche determination of animals are:

- Fodder and habitat preference.
- Diversity of seasonal behaviour patterns.
- Migrations.
- The manner in which animals influence the habitat through their effect on vegetation and water supplies.
- The influence of species on each other.
- The ability of some species to survive without surface water (Lamprey 1963).

Certain species (tsessebe and roan antelope) have a preference for transition areas between adjacent vegetation types, called ecotones. This phenomenon can be ascribed to a greater diversity of fodder, availability of shelter from climatic conditions and predators (Lamprey 1963).

Animals that prefer for instance open areas (zebras and blue wildebeest) will chose the most suitable open area in an area with limited open areas (Lamprey 1963). This shows that animals can adapt, or survive, in semi-optimal conditions. However, factors such as population growth rate, calve survival rate, physical condition or behaviour patterns can be negatively influence under semi-optimal habitat conditions.

5. RESULTS AND DISCUSSION

Three main groupings are identified according to the historic occurrence of species in the area. Seven sub-groupings are identified according to the indication of the different authors. This provides an indication of the certainty of past occurrences in the study area.

5.1. SPECIES HISTORICALLY PRESENT.

5.1.1. Indicated by all three authors.

Blue wildebeest,	Buffalo (only east of 30^0E),	Burchell's zebra,
Bushbuck,	Bushpig,	Common duiker,
Eland (only east of 30^0E),	Giraffe,	Hippopotamus,
Impala,	Klipspringer,	Kudu,
Nyala (only east of 30^0E),	Sable antelope,	Steenbok,
Warthog,	Waterbuck.	

There is no uncertainty about the historic occurrence of these species in the study area, even if only small areas within the Maremani Nature Reserve can be regarded as suitable habitat. Current available habitat suitability and veld condition is probably only important for the occurrence or re-introduction of buffalo, hippopotamus and sable antelope. The other species already occur in the study area.

5.1.2. Indicated by Du Plessis and Estes but not by Smithers.

Reedbuck

This species is grouped within this main group because two authors did indicate it's historic presence in the study area. However, there is some uncertainty regarding the historic occurrence of reedbuck in the study area that needs further discussion.

Smithers (1983) specifically mentioned that reedbuck is absent in the Limpopo Valley. The reasons are not clear, but must be directly linked with the habitat description given by Smithers (1983). A possible explanation is that reedbuck is very habitat specific and shelter through tall grass and reed beds, as well as sufficient water is essential habitat requirements. This is found in marshy areas or grasslands adjacent to permanent streams or rivers. These conditions are not found under normal circumstances in the Limpopo Valley, and thus the absence from the area. Habitat suitability for reedbuck in the Maremani Nature Reserve is therefore questionable.

Smithers (1983) also mentioned that the distribution of reedbuck is very irregular within their range. This can be attributed to the fact that reedbuck is very habitat specific. Suitable habitat is not a common occurrence and normally relatively small in size. This is also applicable to other habitat specific species.

5.1.3. Indicated by Du Plessis and Smithers - not specifically mentioned by Estes.

Sharpe's Grysbok

It is well known that this species still naturally occurs in the Messina District and should also be present in the study area.

5.1.4. Other large mammals.

Aardwolf,	African civet,	African wild cat,
African wild dog,	Antbear,	Bat-eared fox,
Black-backed jackal,	Brown hyaena,	Caracal,
Cheetah,	Elephant,	Honey badger,
Large spotted genet,	Leopard,	Lion,
Pangolin,	Porcupine,	Serval,
Spotted hyaena.		

It is probably only lion, spotted hyaena, cheetah and wild dog that do not occur presently permanently within the boundaries of the Maremani Nature Reserve. Lion and spotted hyaena have been eradicated from the Messina District. Cheetah and wild dogs are still occasionally seen but are under threat of also being eradicated by some game farmers. The removal of these species was mainly due to historic culling and hunting when cattle farming were the dominant land use in the area. The perception exists more recently that, because of their feeding habits, carnivores are vermin and are responsible for great financial losses for the game farmer.

The smaller carnivores mentioned above should already be present in the study area, especially in a well-managed environmentally healthy conservation area.

The re-introduction of larges carnivores into a relatively small confined area should be done with exceptional care. The occurrence of other rare and endangered antelope, and other species, could be negatively influenced by such actions.

5.2. <u>SPECIES HISTORICALLY NOT PRESENT.</u>

5.2.1. Indicated by all three authors.

Black wildebeest,	Blesbok,	Blue duiker,
Bontebok,	Cape mountain zebra,	Damara Dik-Dik,
Gemsbok,	Hartmanne's mountain zebra,	Lechwe,
Lichtensteins hartebeest,	Oribi,	Puku,
Red hartebeest,	Springbok,	Sitatunga.

There is no uncertainty that these species did not occurred historically in the Messina District or the Maremani Nature Reserve, even if small areas within the study area can currently be regarded as suitable habitat. These species can therefore be labelled as non-indigenous to the study area.

Gemsbok, hartmanne's mountain zebra and red hartebeest are present in the study area. Although they are adaptable and reproduce outside their natural habitat range, do they occupy habitats, consume fodder and occupy space that is preferred, and in desperate demand by the indigenous species in this arid area.

5.2.2. Indicated by Du Plessis and Smithers - not specifically mentioned by Estes.

Black faced impala,	Red duiker,	Suni,
Quagga – extinct,	Blue buck – extinct.	

These species did not occurred in the study area historically because of their habitat requirements and localised distribution ranges.

5.3. SPESCIES HISTORICALLY PRESENT BUT ABSENT IN RESENT TIMES.

5.3.1. Indicated by Du Plessis but not by Smithers and Estes.

Black rhino	Grey rhebok	Mountain reedbuck
Roan antelope	Tsessebe	White rhino

These species are very habitat specific and therefore are their distribution within an area confined to small specific suitable areas. Habitat suitability, interspecies competition, size of the suitable habitat and other factors are very important for the occurrence or re-introduction of these species. Black rhino, roan antelope and white rhino are also red data listed species.

Smithers (1983) indicated that white rhino and tsessebe did possible occurred historically in the area. White rhino's have already been introduced legally into the study area and tsessebe did occur in the area up to 1969.

Smithers (1983) indicated that black rhino did possible not occurred historically in the area, probably because of habitat and climatic constraints. This species did probably not occur in the study area itself.

Mountain reedbuck did occurred in the area up to 1969 but specifically south of 24^0S and above 4000 feet. This species did probably also not occur in the study area itself.

Grey rhebok are still occurring naturally on a very few farms in the Messina District. These occurrences are isolated and it is doubtful if

sufficient suitable habitat exists in the study area to support a viable population in the long term.

The occurrence of roan antelope in the Mopane veld type was probably also irregular and only confined to specific small areas. Sufficient suitable habitat probably also does not exists in the study area to support a viable population in the long term.

6. HISTORIC CAUSES OF CHANGES IN DISTRIBUTION AND NUMBERS OF SPECIES.

Du Plessis (1969) specifically mentioned the following causes of altered distribution ranges and dwindling numbers of mammal species. Most of these threats still exist in the modern era.

6.1. Advance of human activities.

- Destruction of natural habitat through agricultural activities such as bush clearing, ploughing, fencing, grass burning and draining of marshes.
- An increase in human populations.
- An increase in sheep and cattle numbers that cause an increase in competition with game, a decrease in grass production and an increase in bush encroachment.
- A decrease in water supply caused by an increase in irrigation.
- An increase in boreholes caused an increase in cattle penetrating natural areas.
- An increase in mining.
- Divisions and subdivisions of farms.

6.2. European hunting.

The purpose of this activity was mainly for:

- food;
- obtaining skins and hides;
- trophies;
- armed trading;
- poaching; and
- compulsive shooting.

6.3. Native hunting.

Native hunting had less of an impact because of primitive weapons and hunting out of necessity.

6.4. Epidemic diseases.

6.5. Game clearance operations.

These operations were conducted for instance as a tsetse control measure and for panting groundnuts.

6.6. War.

7. MODERN DAY CAUSES OF CHANGES IN DISTRIBUTION AND NUMBERS OF SPECIES.

The following aspects can influence, alter or sometimes be considered as threats, to the distribution or existence of many larger mammal species in South Africa.

- Illegal or legal import or export of non-indigenous species or subspecies into or from South Africa. For instance roan antelope subspecies were imported into South Africa and hybridised with the indigenous subspecies.

- Illegal or legal movements of a species or subspecies from or into an area within South Africa were that species are not indigenous to. Blesbok, that are adapted to grass veld, is introduced into savannah areas.

- Veterinary restrictions on the occurrence or movements of certain species in specific areas. The movement of buffalo are controlled among the Zimbabwe boarder because of a fear of an outbreak of foot-and-mouth disease.

- Erection of game and cattle fences has stopped migrations, normal seasonal movements and gene flow of most species. Distribution ranges have been divided.

- Game has a hunting value and is seen as a financial income. More species are introduced into areas were they did not occur because they provide this valuable income. Distribution ranges are therefore expanding.

- The game farming and tourism industries also helped to add financial value to game species. Purchasing and management of game farms require large capital investments. This also helped expanding distribution ranges of many species.

- Provincial and national policies, legislation and requirements regulate for instance the movements of game and carnivores and hence the presence or absence of species in specific area. These policies or legislation might be inadequate in some instances or are not properly enforced.

- Improved modern technology and techniques, for instance use in game capture operations, artificial reproduction and management also made it possible to introduce species in areas were they did not occur historically or to re-introduce species into areas were they were removed from.

8. CONCLUSIONS

8.1. Historic occurrence of a species in a specific area is a sound biodiversity conservation principle. It is also an important starting point for the evaluation or justification of the presence or absence of larger mammal species in any area.

8.2. Available suitable habitat, size of suitable habitat, veld condition, local climatic conditions, carrying capacity, interspecies competition, goals and objectives of the area and conservation status of a species are, among others, also important aspects to consider in the evaluation of the larger mammal species composition of an area.

8.3. Buffalo, hippopotamus, sable antelope, tsessebe, lion, spotted hyaena, cheetah and wild dog are species that did occur historically in the study area but are not present anymore.

8.4. Black rhino, grey rhebok, mountain reedbuck, reedbuck and roan antelope probably did not occur in the study area during historic times.

8.5. Sufficient suitable habitats probably do not exist in the study area to support viable populations of black rhino, grey rhebok, mountain reedbuck, reedbuck and roan antelope in the long term.

8.6. Gemsbok, hartmanne's mountain zebra and red hartebeest are species that did not occurred in the area historically but are now present in the area.

8.7. These non-indigenous species compete with indigenous species for important scares resources that are in desperate demand by the indigenous species in these arid areas.

8.8. Hartmanne's mountain zebra and red hartebeest can interbreed with associated species such as burchell's zebra and tsessebe.

8.9. There are no larger mammal species that are endemic to the area.

9. RECOMMENDATIONS

9.1. The removal of non-indigenous species can be considered.

9.2. The reintroduction of species that were present in the past can be considered.

9.3. Detailed habitat suitability analysis should be done before above-mentioned species are reintroduced.

9.4. Governmental policies and requirements for the introduction of rare species and carnivores exists and have to be taken into consideration before these species can be re-introduced.

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