

Wetland-associated mammals of Namibia - a national review

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Revised November 1989; accepted March 1990

ABSTRACT

Namibia is primarily an arid country (estimated 3% wetlands) and the majority of its mammal fauna is also arid-adapted. Thirty-eight species (20%) are dependent on free water and/or associated wetland habitats to the extent that their distributions in Namibia may be effected by this dependence. Half of these species are only dependent on drinking water, thus 19 species or 10% of Namibian mammals are dependent on wetland habitats. The highest species diversity of wetland-dependent mammals is in the Kavango-Caprivi area, where 92% of Namibian wetland-associated species occur to some extent, and 40% occur nowhere else in Namibia.

There is a general paucity of information on the smaller mammals. However, there is presently no evidence that they suffer from any conservation problems, other than general reductions in critical habitat. The hippopotamus has suffered major range reductions; it is extinct in the Orange, and nearly so in the Cunene River. Of Namibian wetlands, the Kavango River and associated riparian growth has been effected most. Only about 35 km of the original 400 km has not been heavily altered by an ever-encroaching human population. Human pressure is the critical factor throughout the Kavango-Caprivi region and this can be expected to increase in the future, with a subsequent increase in conservation problems for the six local wetland habitat-dependent antelope species. Waterbuck and puku numbers are already down to critical levels. A high proportion of Namibian wetland habitat-dependent mammals are of national conservation concern. This is because these species suffer from both direct exploitation and habitat-altering human practices. However, as Namibia is an end user of these major river systems, the major effort in the future will have to be split between preserving the species and critical habitats that still remain in Namibia and, through neighbourly cooperation, assuring the quantity and quality of these waters at their sources.

INTRODUCTION

Namibia is predominantly an arid and semi-arid region. Only the northeast quarter of Namibia receives more than 500 mm of mean annual rainfall, and the entire area is subject to droughts (Van der Merwe 1983). Namibia's five major rivers (Cunene, Kavango, Kwando, Zambezi, and the Orange) are restricted to the northern and southern border regions only, there are no major internal perennial rivers, and permanent wetlands make up less than 3% of Namibian territory (A.J. Williams, pers. comm.).

Because wetlands and their associated processes are a relatively rare feature on the Namibian landscape they are of particular concern to environmentalists. In a water-deficient region, these same wetlands are also of interest to developers.

METHODS

The data presented here was previously collected and assembled under the Ministry of Wildlife, Conservation and Tourism's long-term atlasing programmes, designed to determine and monitor the conservation status of all Namibian vertebrates. All conservation status rankings have been extracted from Namibian Red Data Books which are now in preparation, and the conservation-status definitions (abbreviated in Appendix 1) are those locally developed for these books. Geographic regions and wetland categories considered here are those identified during the workshop.

RESULTS AND DISCUSSION

Appendix 1 gives generalised biogeographical and specific conservation status information for each Namibian wetland-associated mammal species. This information is summarised and put into national species-diversity perspective in table 1.

Relatively few species of Namibian mammals are dependent on wetlands or free water: of the 189 species considered (marine forms excluded), only 38 species (20%) are wetland-dependent to an extent that their distribution in Namibia may be limited by

the availability of free water or aquatic habitats. Of this group, a further 19 species are "wetland-associated" only to the extent that they must have regular or seasonal access to drinking water as provided by springs, seeps, artesian wells, and artificial impoundments (Appendix 1). Thus, 19 species (10%) of Namibian mammals are dependent on wetlands in the traditional sense, i.e. permanent rivers, lakes, swamps, and associated mesic habitats.

With many species, and small mammals (Insectivora, Chiroptera, and Rodentia) in particular, it is difficult to determine whether the apparent association is with available water or the associated vegetation. Also unknown is whether these relationships can stand periodic but relatively short term changes e.g. seasonal drying up. These relationships are, however, better understood with larger "game" species. Hippopotamus *Hippopotamus amphibius*, red lechwe *Kobus lechwe*, sitatunga *Tragelaphus spekei* and waterbuck *Kobus ellipsiprymnus*, for instance, are directly dependent on wetlands as necessary habitat. On the other hand, the ephemeral flow of west-flowing rivers (Appendix 1) create vegetative corridors which allow the successful and permanent invasion of species into these regions not usually classified as wetland-dependent, or otherwise indigenous to the specific area.

The greatest diversity of Namibia's wetland-associated mammals occurs in the Caprivi and Kavango region: 92% of all Namibian wetland-associated species occur in this region, and 40% of Namibian wetland-associated species occur nowhere else in the country. A similar situation is found with Namibian wetland-associated herpetofauna (Griffin & Channing this volume). This region is an integration zone between the Southern African Biotic Region and the Zambeziaca Biotic Region, and thus has biotic affinities with both areas.

Other prominent Namibian wetland areas, e.g. the Orange and Cunene Rivers and the ephemeral wetlands of Owambo, Bushmanland, and Hereroland, are of little relative importance to wetland-associated mammals except as seasonally-available drinking places. A notable exception is the dependence of otters *Aonyx capensis* and *Lutra maculicollis* and the water mongoose

TABLE 1: Numerical summary of Namibian wetland-associated mammals

Family	Total no. of species in Namibia*	No. species of national conservation concern	No. species wetland-associated	Nature of Association		No. wetland-associated species of national conservation concern
				Permanent (year round)	Non-permanent (ephemeral)	
Soricidae	6	1	1	1	-	1
Erinaceidae	1	1	0	-	-	-
Chrysochloridae	1	0	0	-	-	-
Pteropodidae	5	0	0	-	-	-
Emballonuridae	2	0	0	-	-	-
Molossidae	10	0	0	-	-	-
Vespertilionidae	19	4	2	?	2 (?)	2
Nycteridae	2	0	0	-	-	-
Rhinolophidae	7	0	0	-	-	-
Hipposideridae	2	0	0	-	-	-
Lorisidae	1	1	0	-	-	-
Cercopithecidae	2	0	2	1	1	-
Protilidae	1	1	0	-	-	-
Felidae	7	4	1	1	-	1
Canidae	5	3	0	-	-	-
Mustelidae	5	3	2	2	-	2
Viverridae	14	7	3	2	1	3
Elephantidae	1	1	1	1	-	1
Rhinocerotidae	2	2	2	2	-	2
Equidae	2	1	2	2	-	1
Procaviidae	1	0	0	-	-	-
Orycteropidae	1	0	0	-	-	-
Suidae	2	1	1	1	-	1
Hippopotamidae	1	1	1	1	-	1
Giraffidae	1	1	0	-	-	-
Bovidae	26	18	15	15	-	13
Manidae	1	1	0	-	-	-
Bathyergidae	2+	0	-	-	-	-
Hystriidae	1	0	0	-	-	-
Pedidae	1	0	0	-	-	-
Gliridae	2	0	0	-	-	-
Sciuridae	4	1	0	-	-	-
Thryonomidae	1	1	1	1	-	1
Petromuridae	1	1	0	-	-	-
Muridae	38+	10	4	3	1	4
Leporidae	4	0	0	-	-	-
Macroscelididae	5	1	0	-	-	-
TOTALS	189	67	38	33	5	33

* Includes species which are not presently recorded from Namibia, but are expected to occur

Atilax paludinosus on these rivers, all of which are species of national conservation concern.

The ephemeral westward flowing rivers act as linear oases, allowing more mesic adapted species (both wetland and non wetland-associated) to penetrate the otherwise inhospitable Namib Desert. The periodic flow of these rivers promotes patches of vegetation, especially at their mouths, which in turn supports isolated populations of whistling rats *Parotomys littledalei*, striped mice *Rhabdomys pumilio*, multimammate mice *Mastomys coucha* and occasionally warthog *Phacochoerus aethiopicus* and lions *Panthera leo*. Steenbok *Raphicerus campestris*, common duiker *Sylvicapra grimmia*, giraffe *Giraffa camelopardalis*, tree squirrels *Funisciurus congicus*, tree rats *Thallomys nigricauda*, and other mammals are not wetland-dependent, but are dependent on the vegetation these linear oases provide. The so-called "Desert Elephant" *Loxodonta africana* is dependent on riparian vegetation for food in this area as well as free water (Viljoen 1982). The migrating fruit bat *Eidolon helvum* use these vegetated river beds seasonally as routes to the West coast, and judging from the number of carcasses found on the coast, this is often a one-way trip. Sandwich Harbour, a semi-estuarine lagoon, is characterised by a complete absence of wetland-associated mammals, but has been invaded by two species of alien rodents which are probably dependent on the local wetland vegetation (Griffin & Panagis 1985).

A high proportion of wetland-associated mammals are of national conservation concern for two reasons. First, the large mammals are traditionally subject to over hunting, which has little to do with their dependence on drinking water or wetland habitats. Second, since major wetland habitats such as rivers and swamps only enter Namibia peripherally, species that are specifically adapted to these situations also only enter the country peripherally. Because of these species' restricted distributions in Namibia, their relatively low populations (Howard-Williams & Gaudet 1985) in the case of swamp-dwelling herbivores, and because of the vulnerability of these habitats in general, these species are given a conservation status rank of "PERIPHERAL" or higher (see definitions in Appendix 1).

Of Namibian wetland-associated mammals, the hippopotamus has suffered the greatest range reduction. This is due to over hunting, not habitat destruction. They were extinct in the Orange River by 1925 (Shortridge 1934), and have been regularly reduced in the Cunene. Shortridge (1934) estimated 12. Joubert & Mostert (1975) estimated 4-6, and the most recent count in 1990 was of three animals (C. Eyre pers. comm.).

The status of Swakop and Kuiseb River populations of hippo, mentioned in early accounts (Shortridge 1934; Fischer 1936) has not been clarified. Whether these rivers supported permanent populations, or just the odd hippo during the last century is

not clear. What is evident though, is that these rivers did at least have permanent reedbeds and pools of water, indicating that climatic or runoff conditions were considerably different from the present.

Although hippo populations had previously been reduced through hunting in the Kavango River and the rivers and swamps of the Caprivi, these populations are now back to relatively high levels in some areas. Approximately 25 occur in the upper Kavango River (B. Beytel pers. comm) and 800-1000 occur in the rivers and swamps of the Caprivi. Perhaps one of the reasons that this highly vulnerable species fared better in some areas is that they were "Chief's Game" and therefore benefitted from a degree of local protection, i.e. traditional hunting was restricted to chiefs only. Most reductions were, however due to military personnel on both sides of the border.

Current estimated populations and current population trends of the six remaining wetland habitat-dependent herbivores are given in Table 2.

TABLE 2: Population trends of selected Namibian wetland habitat-dependent herbivores

Species	Population Trends
sitatunga (<i>Tragelaphus spekei</i>)	Approximately 200 animals occur in the lower Kavango, Kwando, and Linyanti system. Extinct in the Kavango north of the Mahango. Present population stable (or increasing slightly) and secure.
bushbuck (<i>T. scriptus</i>)	Approximately 500 animals occur in the lower Kavango, Kwando, Linyanti and Zambezi system. Extinct in the Kavango north of Bagani. Present population under constant pressure from human and agricultural practices.
oribi (<i>Ourebia ourebi</i>)	Approximately 50 animals occur in the Kavango-Caprivi area. Not recently recorded north of the Mahango and very rare in the Mahango. Scattered animals in the Kwando, Linyanti, and Zambezi systems. Populations low and not secure, probably due to increasing human activities and resultant habitat alteration.
puku (<i>Kobus wardoni</i>)	Approximately 5 animals occur in the Nkasa-Lupala island area, down from 13 in 1983. Population not stable and reason for decline not entirely understood.
red lechwe (<i>K. lechwe</i>)	Approximately 2000 animals occur in the lower Kavango, Kwando and Linyanti areas. Population is increasing, up from 1400 in 1985 (population was depressed due to temporary loss of habitat through drought). No recent records from north of Bagani or in the Zambezi areas.
waterbuck (<i>K. ellipsiprymnus</i>)	Five animals were recently counted on the Kwando River floodplain, down from 40 in 1987. No recent records from the Kavango, Zambezi and Linyanti systems where they previously occurred. Reasons for decline unknown. Several animals matching the description of Defassa waterbuck (<i>K. v. crawshayi</i>) were seen during 1983-1987 in the Zambezi area but have not been resighted.

The local ranges of these species has been greatly reduced, especially along the Kavango River where only about 35 km of the original 400 km of natural riparian vegetation (on the Namibian side) remains unaltered by human activity. Where critical habitat remains, e.g. in the Mahongo Reserve, populations of some species are able to hold their own, and even increase to the point where "take-offs" are possible, for example red lechwe. Other species, e. g. puku and waterbuck, were never common in recent times and are now on the brink of extinction in Namibia.

The natural short-term as well as long-term fluctuations in the water levels of these perennial rivers plays an important role in these population reductions. A lowered water level reduces the

amount of available habitat, as well as making the animals more vulnerable to hunting. Shortridge's mouse (*Mastomys shortridgei*) (plate 1) which is dependent on floodplains and other mesic conditions, is a very localised species with a limited overall distribution (Gordon & Griffin in prep) and could be detrimentally effected by agricultural development in some areas.

Unfortunately, Namibia's permanent wetlands are not entirely under local control. Although water quality can be locally influenced to some extent, the quantity of water is dependent primarily on the source. Ultimately the Cunene is controlled by Angola, the Kwando by Angola and Zaire, the Zambezi by Zambia, and the Orange by Lesotho and South Africa. Since Namibia is situated down stream in these systems, it is imperative to attempt to influence the future quality and quantity of these rivers at their origins.

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APPENDIX 1: Conservation status of Namibian wetland-associated mammals.

Occurrence symbols used in Table: "X" = Occurrence of species verified. "O" = Occurrence of species not verified, but expected. "-" = Species not expected.

The following conservation status categories are used:

ENDANGERED: Taxa in danger of extinction if the causal factors continue. VULNERABLE: Taxa believed likely to move into the endangered category in the future if present causal factors continue. Included are taxa of which all or most of the populations are decreasing because of over-exploitation, intensive destruction of habitat or other environmental disturbance. INDETERMINATE: Taxa that are suspected of being ENDANGERED, VULNERABLE, or RARE but for which insufficient information is currently available. RARE: taxa with small populations which are not thought to be presently ENDANGERED or VULNERABLE, but which are potentially at risk. Taxa which are thinly scattered over an extensive range and numbers are low. ENDEMIC: Endemics in this context includes all taxa with 75% or more of the entire taxon's population residing in Namibia. No conservation problems are implied. PERIPHERAL: Taxa with a limited distribution in Namibia (25% or less) and whose main distribution falls outside the country. Local loss could effect the taxon's overall conservation status. Includes taxa with very limited overall distributions, and taxa of international concern (for any reason). SECURE: No special status. Taxa with broad extra-Namibian distributions, no known conservation problems. STATUS PROVISIONAL (SP): Qualifier suffix attached to conservation-status categories, indicating inadequate information on the taxon's taxonomic and/or biogeographical status. NYR-TBE: Taxa not yet recorded from Namibia, but can be expected to occur. No conservation-status ranking is implied in this definition, but predicted rankings are appended.

GEOGRAPHIC REGIONS AND WETLAND CATEGORIES

SPECIES	East Caprivi and Kwando River	Seasonal wetlands of West Caprivi	Kavango River system	Cunene River system	Ephemeral westward flowing rivers	Seasonal wetlands of Owambo and Etosha	Seasonal wetlands of Kavango, Bushmanland and Hereroland	Karst wetlands i.e. springs, cenotes, underground lakes	Artificial empoundments	Springs, seeps, and artesian wells	Orange River system	Fish River system	Seasonal wetlands in southern third of country	Ephemeral eastward flowing rivers	NATURE OF SPECIES' LEAST DEPENDENCE ON WETLAND	NATIONAL CONSERVATION STATUS
Soricidae																
<i>Crocidura mariquensis</i>	X	-	X	-	-	-	-	-	-	-	-	-	-	-	permanent (habitat)	peripheral - SP
Vespertilionidae																
<i>Pipistrellus rueppelli</i>	X	O	X	-	-	-	-	-	-	-	-	-	-	-	seasonal ? (habitat)	peripheral
<i>Eptesicus rendalli</i>	O	O	O	-	-	-	-	-	-	-	-	-	-	-	seasonal (habitat)	NYR-TBE-peripheral
Cercopithecidae																
<i>Papio ursinus</i>	X	X	X	X	X	-	X	X	X	X	X	X	X	X	permanent (drinking)	secure
<i>Cercopithecus aethiops</i>	X	X	X	X	-	-	X	-	-	X	X	-	-	-	seasonal (drinking)	secure
Felidae																
<i>Felis serval</i>	X	O	X	O	-	O	O	-	-	-	-	-	-	-	permanent (drinking)	indeterminate
Mustelidae																
<i>Aonyx capensis</i>	X	-	X	X	-	-	-	-	-	-	X	-	-	-	permanent (habitat & food)	vulnerable
<i>Lutra maculicollis</i>	X	-	X	X	-	-	-	-	-	-	-	-	-	-	permanent (habitat & food)	indeterminate
Viverridae																
<i>Genetta tigrina</i>	X	-	O	O	-	-	-	-	-	-	-	-	-	-	permanent (habitat)	peripheral
<i>Herpestes ichneumon</i>	X	-	O	-	-	-	-	-	-	-	-	-	-	-	permanent (habitat)	peripheral
<i>Atilax paludinosus</i>	X	-	X	X	-	-	X	-	-	-	X	-	-	-	seasonal	peripheral
Elephantidae																
<i>Loxodonta africana</i>	X	X	X	X	X	X	X	X	X	X	-	-	-	-	permanent (drinking)	vulnerable
Rhinocerotidae																
<i>Diceros bicornis</i>	X	X	-	X	X	X	-	X	X	X	-	-	-	-	permanent (drinking)	endangered
<i>Ceratotherium simum</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	permanent (derinking)	extinct

APPENDIX I cont.

SPECIES	WETLAND-ASSOCIATED MAMMALS											NATURE OF SPECIES' LEAST DEPENDENCE ON WETLAND	NATIONAL CONSERVATION STATUS		
	East Caprivi and Kwando River	Seasonal wetlands of West Caprivi	Kavango River system	Cunene River system	Ephemeral westward flowing rivers	Seasonal wetlands of Owambo and Etosha	Seasonal wetlands of Kavango, Bushmanland and Hereroland	Karst wetlands i.e. springs, cenotes, underground lakes	Artificial empondments	Springs, seeps, and artesian wells	Orange River system			Fish River system	Seasonal wetlands in southern third of country
Equidae															
<i>Equus zebra</i>	-	-	-	X	X	-	-	X	X	-	X	-	-	seasonal (drinking)	endemic
<i>Equus burchelli</i>	X	X	X	-	-	X	-	X	X	-	-	-	-	permanent (drinking)	secure
Suidae															
<i>Potamochoerus porcus</i>	X	O	O	-	-	-	-	-	-	-	-	-	-	permanent (drinking)	peripheral
Hippopotamidae															
<i>Hippopotamus amphibius</i>	X	-	X	X	-	-	-	-	-	-	-	-	-	permanent (habitat)	vulnerable
Bovidae															
<i>Connochaetes taurinus</i>	X	X	X	-	-	X	X	X	X	-	-	-	-	permanent (drinking)	vulnerable
<i>Damaliscus lunatus</i>	X	X	X	-	-	-	X	-	X	X	-	-	-	permanent (drinking)	vulnerable
<i>Ourebia ourebi</i>	X	-	X	-	-	-	-	-	-	-	-	-	-	permanent (habitat)	indeterminate
<i>Aepycerus melampus</i>	X	X	X	-	-	-	-	-	X	X	-	-	-	permanent (drinking)	secure
<i>A. petersi</i>	-	-	-	X	-	X	-	X	X	X	-	-	-	permanent (drinking)	secure
<i>Hippotragus equinus</i>	X	X	X	-	-	-	X	-	X	X	-	-	-	permanent (drinking)	vulnerable
<i>H. niger</i>	X	X	X	-	-	-	X	-	X	X	-	-	-	permanent (drinking)	vulnerable
<i>Syncerus caffer</i>	X	X	X	-	-	-	X	-	X	X	-	-	-	permanent (drinking)	vulnerable
<i>Tragelaphus strepsiceros</i>	X	X	X	X	X	X	X	X	X	X	X	X	X	permanent (drinking)	secure
<i>T. spekei</i>	X	-	X	-	-	-	-	-	-	-	-	-	-	permanent (habitat)	indeterminate
<i>T. scriptus</i>	X	-	X	-	-	-	-	-	-	-	-	-	-	permanent (habitat & drinking)	vulnerable
<i>Redunca arundinum</i>	X	X	X	-	-	-	X	-	X	X	-	-	-	permanent (drinking)	indeterminate
<i>Kobus ellipsiprymus</i>	X	-	-	-	-	-	-	-	X	X	-	-	-	permanent (drinking)	vulnerable
<i>K. leche</i>	X	-	X	-	-	-	-	-	-	-	-	-	-	permanent (habitat)	vulnerable
<i>K. vardonii</i>	X	-	-	-	-	-	-	-	-	-	-	-	-	permanent (habitat)	peripheral
Thryonomidae															
<i>Thryonomys swinderianus</i>	X	-	X	X	-	-	-	-	-	-	-	-	-	permanent (habitat)	peripheral
Muridae															
<i>Otomys angoniensis</i>	X	O	X	O	-	-	-	-	-	-	-	-	-	permanent (habitat)	peripheral
<i>Pelomys fallax</i>	X	-	X	-	-	-	-	-	-	-	-	-	-	permanent (habitat)	peripheral
<i>Dasymys incomptus</i>	X	-	X	-	-	-	-	-	-	-	-	-	-	permanent (habitat)	peripheral
<i>Mastomys shortridgei</i>	-	-	X	-	-	-	-	-	-	-	-	-	-	seasonal (habitat)	peripheral - SP