

Wetland-associated reptiles and amphibians of Namibia - a national review

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ABSTRACT

Namibia possesses a varied amphibian fauna, and being primarily an arid and semi-arid region, 88% of this fauna is independent of permanent wetlands. The few species that do depend on permanent wetland habitats (8) are species with marginal distributions in Namibia. The primary interest in these species is that they are highly vulnerable due to their sensitive habitat and can thus act as environmental indicators. Relatively few Namibian reptiles (8) are dependent on permanent wetlands and fewer still are associated with ephemeral ones (6).

The mouth of the Cunene River is of particular interest, as a nonbreeding aggregation of green turtles *Chelonia midas* occurs there, and the population of Nile soft-shelled turtles *Trionyx triunguis* represents this species' southern-most range limit. A breeding population of crocodiles *Crocodylus niloticus* is also present. No reptile or amphibian species is currently considered to be endangered in Namibia.

Namibia's permanent wetlands are not entirely under local control: the fate of the Cunene River is ultimately influenced by Angola, the Kwando River by Angola and Zaire, the Zambezi River by Zambia, and the Orange River by Lesotho and South Africa. Since Namibia is generally positioned well down stream in these systems, it is imperative to attempt to influence the future conservation of these systems at their origins.

INTRODUCTION

Namibia is characterised by a low mean annual rainfall with only the north east quarter of the country receiving in excess of 500 mm annually (Van der Merwe 1983). The entire region is also subject to periodic droughts, some areas receiving little or no rain for several years in succession.

Wetlands, in the traditional sense, make up only 3% of the national area (A.J. Williams, pers. comm.), and perennial rivers (Cunene, Kavango, Kwando, Zambezi, and the Orange) are restricted to the northern and southern borders: there are no major inland rivers in Namibia. Wetlands are of particular concern to opposing interest groups: to environmentalists because of their vulnerability (as sites of essential ecological processes) in an essentially water-deficient region, and to developers who need water and land for economic reasons. For this reason, a workshop on the subject of Namibian wetlands was held in Windhoek in November 1988, and this paper is a contribution to that workshop.

MATERIALS & METHODS

The data presented here has been collected and assembled under a permanent programme of defining and monitoring the conservation status of all Namibian vertebrates. Red Data books on reptiles, and amphibians are now in preparation and all conservation status rankings and definitions (abbreviated in Appendix I) have been extracted from these. Some biogeographical data have been taken directly from an atlas of Namibian frogs (Channing & Griffin in prep.).

RESULTS AND DISCUSSION

Appendix 1 gives generalised biogeographical and specific conservation-status information for each species of Namibian wetland-associated reptile and amphibian. This information is summarised and put into national perspective in Table 1. Marine forms are mentioned only when they enter terrestrial or estuarine situations.

Most Namibian amphibians are dependent on free water for at least part of their life-cycle. However, by physiological and/or

behavioural adaptations many species have been able to successfully invade arid & semi-arid areas (e.g. Channing 1976; Sullivan 1989), where free water is only available on a very irregular and unpredictable schedule. Namibia's arid and semi-arid areas are thus, by no means characterised by a depauperate frog fauna (Channing & Griffin in prep.).

Forty-four frog species, 88% of the national total (Table 1), have broad distributions outside the permanent wetland regions of Namibia, and have therefore adapted, where needed, a nonpermanent water-dependence strategy. The most highly adapted of this group would seem to be two *Breviceps* species (Microhylidae). This genus lays eggs in moist ground and the tadpole stage is completed within the egg, thereby eliminating the need for free water to complete the life cycle. These species are not normally exposed to extreme arid situations however; *B. adspersus* does not extend its range into the arid Namib and proNamib (it does, however, occur on dry Kalahari dunes in Hereroland), and *B. macrops*, although occurring in seemingly very arid habitat in the Southern Namib Desert, depends on the regular coastal fogs which are characteristic of the area. Neither species utilise free water for breeding even when available.

All other species of Namibian anurans (48 species) are dependent on free water to complete their life cycles. In the case of *Bufo hoeschi*, this can be accomplished in as little as 21 days, utilising rain-filled rock pools in the Central Namib Desert (Channing 1976). In the adjacent Naukluft Mountains, utilising permanent water situations, *Rana fuscigula* tadpoles may take two or more years to metamorphose.

Despite the presence of isolated populations of some species in very arid areas (Channing & Griffin in prep.), for instance *Tomopterna* sp. at the mouths of Namib-crossing rivers, these populations may only be remnants of past flooding events which originated in the central, less arid, areas of Namibia. They may not be viable populations in the long-term.

Sixteen percent of Namibia's frog fauna (Table 1) are exclusively associated with permanent rivers and associated permanent wetlands. Few species are fully dependent on a permanent aquatic habitat although many species, particularly within the genera *Rana*, *Ptychadena*, and *Hyperolius* seem to select habitats with year-round water. Several of these species, however,

TABLE 1: Numerical summary of Namibian wetland-associated reptiles and amphibians

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)	
Pipidae	2	1	2	-	2	1
Bufo	13	7	13	-	13	7
Microhylidae	5	3	3	-	3	2
Ranidae	25	13	25	8	17	13
Rhacophoridae	1	0	1	-	1	0
Hemisotidae	1	0	1	-	1	0
Hyperoliidae	5	2	5	?	5(?)	2(?)
Crocodylidae	1	1	1	1	-	1
Pelomedosidae	4	3	4	2	2	3
Testudinidae	7	7	0	-	-	-
Trionychiidae	1	1	1	1	-	1
Cheloniidae	4	4	1	1	-	1
Dermochelidae	1	1	0	-	-	-
Gekkonidae	41	28	0	-	-	-
Agamidae	7	2	0	-	-	-
Chamaelionidae	2	0	0	-	-	-
Scincidae	26	8	0	-	-	-
Lacertidae	25	11	0	-	-	-
Cordylidae	13	7	0	-	-	-
Varanidae	2	2	1	1	0	1
Amphisbaenidae	8	0	0	-	-	-
Leptotyphlopidae	5	4	0	-	-	-
Typhlopidae	4	1	0	-	-	-
Boidae	2	2	0	-	-	-
Colubridae	52	11	6	2	4	6
Elapidae	9	0	0	-	-	-
Viperidae	8	4	0	-	-	-
TOTALS						
Amphibians	52	26	50	8+	42+	25
Reptiles	222	97	14	8+	6+	13

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

have the ability to resist temporary and regular drying up of the habitat (Loveridge 1976; Dudley 1978). The presence of *Ptychadena subpunctata*, *P. mascareniensis* and *Hyperolius nasutus* (species normally associated with a permanent water supply) in seasonal wetlands in the southern Kavango and Bushmanland region (Griffin 1985) illustrate this facility. Still, we can assume that an alteration in the non-permanent and permanent wetland habitat, whether it be changes in quantity or quality of water and associated vegetation, will have an effect on the density and diversity of frog populations in this area.

Phrynomantis affinis (Microhylidae), is one of Namibia's rarest frogs. Little is known about this species, other than that it depends on wetlands on a seasonal basis only, and that northern Namibian population represent the southern most range of this species.

Relatively few reptiles are associated with or dependent on wetlands in Namibia (Table 1). The water leguana *Varanus niloticus*, the crocodile *Crocodylus niloticus* four species of freshwater turtles (*Pelusios* spp. & *Trionyx triunguis*), and two species of snakes (*Colubridae*) are dependent on permanent aquatic habitats for various reasons. The most common reasons are a dependence or preference for feeding on fish and frogs, species which are themselves wetlands dependent, and being directly dependent on the aquatic habitat for shelter. Another four species of snakes (*Colubridae*) are associated with, but are not dependent on wetlands on a year-round basis.

The mouth of the Cunene River as a wetland habitat is of particular herpetological interest. The disjunct population of the Nile softshelled turtle *Trionyx triunguis* occurring there (Penrith 1971) is the southern most range of this species. It is fairly common in similar estuarine situations in northern & central

Angola. Little is known about this population other than that they concentrate in the mouth, lagoon, and adjacent river, and are fairly numerous. Unsubstantiated records of marine turtles breeding in this area may actually be attributable to this species.

Green turtles *Chelonia midas* aggregate in the mouth during all seasons. Again, little is known about the nature of their presence there, other than that they are regularly and frequently observed in the mouth and adjacent beaches and lagoon area. The frequency of observations by patrolling conservation officers over the past 12 years, and from aerial censuses suggest that green-turtles may be present in numbers of up to 200 at times. Non-nesting hauling-out on adjacent beaches immediately to the south has been reported by Tarr (1987), and further south at least as far as Cape Cross (D. de Villiers, pers. comm.). Although green turtles frequent the entire Namibian coast (Loutit & Haacke in prep) there is no evidence that they breed here or regularly frequent similar local situations e.g. Sandwich Harbour or the Orange River mouth. The breeding site of these animals (all non-juveniles) is unknown; the smallest specimens found in the area are around 30 cm in length (J. Kleinhans pers. comm.). Nesting of marine turtles has been reported from the beaches just north of the mouth (Hughes et al. 1973.) Their paper, also cites Foz do Cunene as a nesting site, which may be an error as this site is actually 7 km inland along the river, and would thus not be a likely nesting site for marine turtles. This aggregation of non-breeding turtles at the Cunene River mouth is an anomaly which is currently under investigation.

Crocodiles occur in patches all along the Cunene River, and in relatively small numbers. Adults infrequently haul up on the sea beaches just to the south of the mouth (R. Loutit pers. comm.). All age classes are known from this area, indicating that this population successfully breeds in this extremely arid and deser-

lic area.

A few Namibian endemic frogs (several whose taxonomic status is in disarray) are associated with ephemeral wetlands. These species depend on rainwater pools in areas that are of no interest to developers. Thus, although they are of conservation concern because of their possible endemicity, they are, in a conservation sense, secure. Four species of permanent wetland-dependent reptiles are of local conservation concern in addition to being international Red Data Species. No species of Namibian wetland associated reptiles or amphibians are currently considered to be endangered.

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APPENDIX 1: Conservation status of Namibian wetland-associated reptiles and amphibians. 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 impoundments	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
Pipidae																
<i>Xenopus muelleri</i>	X	O	X	-	-	-	-	-	-	-	-	-	-	-	seasonal (breeding & feeding)	peripheral
<i>X. laevis</i>	X	X	X	O	X	O	X	O	X	O	X	O	X	O	seasonal (breeding & feeding)	secure

APPENDIX 1 cont.

SPECIES	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 emboundments	Springs, seeps, and artesian wells	Orange River system	Fish River system	Seasonal wetlands in southern third of country	Ephemeral eastward flowing rivers		
Bufo																
<i>B. f. poweri</i>	X	X	X	X	X	X	O	X	X	O	-	X	-	-	seasonal (breeding)	secure
<i>B. gutturalis</i>	X	X	X	X	-	X	X	-	O	X	O	-	O	-	seasonal (breeding)	secure
<i>B. maculatus</i>	X	X	X	X	O	-	-	-	O	O	-	-	-	-	seasonal (breeding)	secure
<i>B. goriepeensis</i>	-	-	-	-	-	-	-	-	-	-	X	-	-	-	seasonal (breeding)	peripheral
<i>B. rangeri</i>	-	-	-	-	-	-	-	-	-	-	X	-	-	-	seasonal (breeding)	peripheral
<i>B. hoesehi</i>	-	-	-	-	O	O	X	-	X	-	-	-	-	-	seasonal (breeding)	endemic-SP
<i>B. kavangensis</i>	O	X	O	-	-	O	X	-	O	O	-	-	-	-	seasonal (breeding)	secure
<i>B. fenoulheti</i>	X	-	-	-	-	-	-	-	-	-	-	-	-	-	seasonal (breeding)	peripheral
<i>B. dombensis</i>	-	-	-	X	X	X	-	O	-	X	-	-	-	-	seasonal (breeding)	endemic-SP
<i>B. damoranus</i>	-	-	-	X	X	X	O	-	X	-	-	-	-	-	seasonal (breeding)	endemic-SP
<i>B. jordanii</i>	-	-	-	-	O	-	-	-	O	-	-	-	-	-	seasonal (breeding)	rare-SP
<i>B. lemarii</i>	-	-	O	-	-	-	-	-	-	-	-	-	-	-	seasonal (breeding)	NYR-TBE-peripheral
<i>Schismaderma carens</i>	X	O	-	-	-	-	-	-	-	-	-	-	-	-	seasonal (breeding)	secure
Microhylidae																
<i>Platysomus bifasciatus</i>	X	X	X	O	-	X	X	X	O	O	-	-	-	-	seasonal (breeding)	secure
<i>P. umectens</i>	-	-	-	-	X	-	-	X	X	X	X	O	X	-	seasonal (breeding)	endemic
<i>P. affinis</i>	-	-	-	-	-	X	X	-	-	-	-	-	-	-	seasonal (breeding)	rare
Ranidae																
<i>Pyxicephalus adspersus</i>	X	X	X	O	-	X	X	O	X	O	-	-	X	X	seasonal (breeding)	secure
<i>Tomopterna cryptotis</i>	X	X	X	X	X	X	X	O	X	O	X	X	X	X	seasonal (breeding)	secure-SP
<i>T. tuberculosa</i>	-	-	-	X	X	O	-	-	O	-	-	-	-	-	seasonal (breeding)	secure-SP
<i>T. krugerensis</i>	-	-	-	-	-	X	O	O	-	O	-	-	-	-	seasonal (breeding)	secure-SP
<i>T. marmorata</i>	O	O	O	-	-	O	-	-	O	X	-	-	-	-	seasonal (breeding)	secure-SP
<i>Rana fuscigula</i>	-	-	-	-	-	-	-	-	O	X	X	X	-	-	permanent (habitat)	peripheral
<i>R. darlingtoni</i>	X	-	-	-	-	-	-	-	-	-	-	-	-	-	permanent (habitat)	peripheral - SP
<i>R. angolensis</i>	X	-	-	O	-	-	-	-	-	-	O	-	-	-	permanent (habitat)	NYR-TBE-peripheral
<i>Strongylopus grayi</i>	-	-	-	-	-	-	-	-	-	-	O	-	-	-	permanent (habitat)	peripheral
<i>S. springbokensis</i>	-	-	-	-	-	-	-	-	-	-	O	-	-	-	seasonal (breeding)	NYR-TBE-peripheral
<i>Hildebrandtia ornata</i>	O	O	O	-	-	X	X	-	-	O	-	-	-	-	seasonal (breeding)	secure
<i>Psychadena auchietae</i>	X	O	-	-	-	-	-	-	-	-	-	-	-	-	seasonal (breeding)	peripheral
<i>P. mossambica</i>	X	X	X	-	-	-	-	-	-	-	-	-	-	-	seasonal (breeding)	peripheral
<i>P. schillikerorum</i>	X	-	-	-	-	-	-	-	-	-	-	-	-	-	permanent ? (habitat)	peripheral
<i>P. galbei</i>	X	-	-	-	-	-	-	-	-	-	-	-	-	-	permanent ? (habitat)	peripheral
<i>P. pumilio</i>	O	-	O	-	-	-	-	-	-	-	-	-	-	-	seasonal (breeding)	NYR-TBE-peripheral
<i>P. oxyrhynchus</i>	X	-	X	-	-	-	-	-	-	-	-	-	-	-	permanent (habitat)	peripheral
<i>P. taenioceles</i>	X	-	X	-	-	-	-	-	-	-	-	-	-	-	permanent (habitat)	peripheral
<i>P. muscaveniensis</i>	X	X	X	-	-	-	X	-	-	X	-	-	-	-	seasonal (breeding)	secure
<i>P. subpunctata</i>	X	X	X	-	-	-	X	-	X	X	-	-	-	-	seasonal (breeding)	secure
<i>P. porosissima</i>	O	-	-	-	-	-	-	-	-	-	-	-	-	-	seasonal ? (breeding)	NYR-TBE-peripheral
<i>Phrynobatrachus natalensis</i>	X	X	X	X	X	-	X	-	X	X	-	-	-	-	seasonal (breeding)	secure
<i>P. mahabeniensis</i>	X	X	X	-	-	-	X	-	O	O	-	-	-	-	seasonal (breeding)	secure
<i>Cacosternum namaquense</i>	-	-	-	-	-	-	-	-	-	O	-	-	X	-	seasonal (breeding)	secure-SP
<i>C. buettgeri</i>	X	X	X	O	X	X	X	O	O	X	-	O	X	X	seasonal (breeding)	secure
Rhacophoridae																
<i>Chironomantis xerampelina</i>	X	X	X	-	-	-	-	-	-	-	-	-	-	-	seasonal (breeding)	secure
Hemisotidae																
<i>Hemisus marmoratus</i>	X	-	-	-	-	-	-	-	-	-	-	-	-	-	seasonal (breeding)	secure
Hyperoliidae																

APPENDIX 1 cont.

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	Kaasi 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
<i>Leptopelis boragei</i>	X	X	O	-	-	-	X	-	-	-	-	-	-	-	seasonal (breeding)	secure-SP
<i>L. cinnamomeus</i>	-	O	O	-	-	-	-	-	-	-	-	-	-	-	seasonal (breeding)	NYR-TBE-peripheral
<i>Kassina senegalensis</i>	X	X	X	O	-	X	X	X	X	X	-	-	-	-	seasonal (breeding)	secure
<i>Hyperolius nasutus</i>	X	O	X	-	-	-	X	-	O	O	-	-	-	-	seasonal (breeding)	secure - SP
<i>H. angolensis</i>	X	?	X	X	-	-	-	-	-	-	-	-	-	-	seasonal ? (breeding)	peripheral
Crocodylidae																
<i>Crocodylus niloticus</i>	X	-	X	X	-	-	-	-	-	-	-	-	-	-	permanent (habitat)	peripheral
Pelomedusidae																
<i>Pelomedusa subrufa</i>	X	X	X	O	X	X	X	O	X	O	O	X	X	X	seasonal	secure
<i>Pelusios bechuanicus</i>	X	-	X	-	-	-	-	-	-	-	-	-	-	-	permanent (habitat)	peripheral
<i>P. rhodesianus</i>	X	-	O	-	-	-	-	-	-	-	-	-	-	-	permanent (habitat)	peripheral
<i>P. subniger</i>	O	O	-	-	-	-	-	-	-	-	-	-	-	-	seasonal (habitat)	NYR-TBE-peripheral
Trionychidae																
<i>Trionyx triunguis</i>	-	-	-	X	-	-	-	-	-	-	-	-	-	-	permanent (habitat)	peripheral
Chelonidae																
<i>Chelonia midas</i>	-	-	-	X	-	-	-	-	-	-	-	-	-	-	permanent (habitat)	vulnerable
Varanidae																
<i>Varanus niloticus</i>	X	-	X	X	-	-	-	-	-	-	X	-	-	-	permanent (habitat)	indeterminate
Colubridae																
<i>Limnophis bicolor</i>	X	-	O	-	-	-	-	-	-	-	-	-	-	-	permanent (habitat)	peripheral
<i>Natriciteres olivacea</i>	X	O	X	-	-	-	O	-	-	-	-	-	-	-	seasonal (habitat)	peripheral
<i>Dromophis lineatus</i>	X	-	-	-	-	-	-	-	-	-	-	-	-	-	permanent (habitat)	peripheral
<i>Philothamnus hoplogaster</i>	X	-	-	-	-	-	-	-	-	-	-	-	-	-	seasonal (habitat)	peripheral
<i>P. ornatus</i>	X	O	O	-	-	-	O	-	-	-	-	-	-	-	seasonal (habitat)	peripheral
<i>Crotaphopeltis barotseensis</i>	O	-	O	-	-	-	-	-	-	-	-	-	-	-	seasonal (habitat)	NYR-TBE-peripheral