

THE HERPETOFAUNA OF THE OWEN SITOLE COLLEGE OF AGRICULTURE,

ZULULAND

by

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PREFACE

The fieldwork described in this thesis was carried out at the Owen Sitole College of Agriculture from March 1986 to August 1987, and in January and December 1988. The thesis is registered with the University of Natal and was supervised by Professor John C. Poynton, Department of Biology, University of Natal.

This study represents original work by the author and has not been submitted in any form to another university. Where use was made of the work of others it has been duly acknowledged in the text.

DEDICATION

To Brian Coulson Gannon and members of the Fairhaven Work Party for the special attention they have given to my education.

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ABSTRACT

A herpetofaunal study was undertaken at the 670 ha Owen Sitole College of Agriculture (OSCA) near Empangeni, Zululand, from 1986 to 1988. Collecting was carried out primarily opportunistically, throughout all seasons. A total of 28 amphibian taxa and 44 reptile taxa, comprising two chelonians, one crocodylid, 13 lizards and 28 snakes, were recorded. A further 11 amphibian and 42 reptile taxa may possibly occur.

The majority of amphibians and reptiles display a tropical distribution, often with enormous ranges. Nineteen (68%) amphibian taxa have tropical or quasi-tropical (Poynton 1964) zoogeographical affinities and 33 (75%) reptile taxa have tropical wide ranging or tropical east coast littoral (Bruton and Haacke 1980) zoogeographical affinities. Only one amphibian taxon and four reptile taxa, all snakes, have Cape or temperate affinities. These taxa are marginal in the region, reaching their distributional limits in Maputaland.

Niche segregation of amphibians occurs primarily according to water bodies. Vegetation per se does not appear to be important, with the majority of species occurring in a savanna environment; however, three species, Leptopelis natalensis, L. mossambicus and Arthroleptis wahlbergii, appear to be sylvicolous in habits and are restricted to riverine vegetation. The vast majority of taxa are summer breeders, whereas only one, Cacosternum nanum nanum, was recorded breeding in winter too. The sympatry of L. natalensis and Hyperolius semidiscus was confirmed in this study, and H. semidiscus and H. argus were shown to behave as good species with specifically distinct calls.

Snakes are segregated according to size, mode of life, activity patterns and food. Certain species, such as Naja mossambica, have catholic diets whereas others, such as Duberria lutrix lutrix, Aparallactus capensis and Dasyplectis scabra, are specialists. The lizard fauna is differentiated according to diet, foraging strategies and habitat preferences, including substrate and vegetation.

Amphibians are unselective feeders, consuming a variety of insects. Some, namely Xenopus laevis laevis and Pyxicephalus adspersus edulis, have catholic tastes and are even cannibalistic. Snakes and amphibians constitute the main prey items of snakes, whereas most lizards, with the exception of Varanus niloticus niloticus which is a generalist, feed exclusively on arthropods, especially insects.

Schismaderma carens, Bufo gutturalis, Hemidactylus mabouia mabouia, Lygodactylus capensis capensis, Mabuva striata striata, Lamprophis fuliginosus, Causus rhombeatus, Duberria lutrix lutrix and Naja mossambica are attracted to places of human habitation either for feeding or for shelter. Many amphibians benefit from artificial water bodies. No less than 19 taxa were recorded from the fish ponds, the majority of which bred there, possibly because the waters are more stable, permanent and relatively free of predators than natural water bodies.

The Leguaan Tick Aponomma exornatum was recorded parasitizing adult Varanus niloticus niloticus, and the Snake Tick A. latum was found on N. mossambica and C. rhombeatus; A. latum, with an extensive subSaharan distribution, shows no predilection for any species of snake. Pentastomids and nematodes were found in a number of snakes (Atractaspis, Telescopus, Psammophis and Causus); the life cycle implications of these organisms are that mammals and snakes are intermediate hosts, though more ecological and experimental evidence is necessary.

Python sebae natalensis and Kinixys natalensis, both Red Data Book - Reptile and Amphibian species, are particularly threatened, the first due to slaughter for traditional uses, the second due to agricultural activities and frequent fires. It is recommended that both these reptiles be afforded maximum protection in the 110 ha game park, which is regularly patrolled and which is subjected to infrequent fires. Generally, however, the herpetofauna has fared well at the hands of the local people, testimony to which is the high species diversity.

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INTRODUCTION

STUDY AREA

Locality, size and topography

The Owen Sitole College of Agriculture (OSCA) is situated between 28°37'34" and 28°39'22" S; 31°55'31" and 31°57'45" E (2831 DB Empangeni), 16 and 180 kilometres north of Empangeni and Durban respectively, in the KwaZulu National State (Ekokonsult 1983). OSCA averages 3,2 km in length from east to west and approximately 2,2 km in width from north to south. It lies approximately 28 kilometres inland due east from the coastline and covers an area of 670 hectares. The elevation varies from about 23 metres at its lowest point in the Nseleni River valley to 120 metres in the northwest portion of the area. The western and southwestern boundaries are delineated by the Nseleni River while the Cwaka River, a tributary of the Nseleni, divides the property into two approximately equal halves. The old Empangeni-Mtubatuba road constitutes the southern boundary (see Fig. 1).

In general the area consists of gently undulating hills sloping down to the flood plains of the Nseleni and Cwaka Rivers.

History and land use

The land on which OSCA is presently situated was occupied by approximately 200 people during the early 1960's. They were accommodated in about 29 kraals located on rising ground. These people utilized the land for subsistence farming, particularly maize and cattle. The veld was burned to increase productivity, but the frequency of fires is not known.

In the early 1960's, King Cyprian Bhekuzulu approached the local chief, Chief Jacob Mtetwa, for land for the establishment of an agricultural college for Zulu people. Chief Mtetwa was agreeable to the idea of a college and was prepared to donate land for its establishment. However, he died before a decision could be made on what portion of land should be donated. His successor, his brother Ntembe, subsequently resisted the idea of a college on his people's land. A number of meetings took place before Ntembe was persuaded to change his mind. Soon after the land was donated to the KwaZulu authorities, the people occupying the land were relocated.



Figure 1. Map of OSCA, showing the major arterial route, buildings, water bodies and land utilisation.

In 1966 the first OSCA buildings were erected. By 1968 the Department of Agriculture was functional, and the first student intake was accepted that same year. A course in Veterinary Science (Animal Husbandry) was offered for the first time in 1973; the Department of Nature Conservation was established in 1974; and Agricultural Home Economics became a functional department in 1980. The College was originally named Cwaka Agricultural College, but was renamed the Owen Sitole College of Agriculture in honour of the First Minister of Agriculture in the KwaZulu Government.

The main buildings at OSCA comprise an administration block and staff offices, a veterinarian centre, a water purification plant, student dormitories, a large kitchen and dining room, lecture classes, a hall, a store and workshop, agricultural buildings, and staff houses. A tarred road was built between the main entrance gate and College buildings, and many secondary gravel roads were developed for transporting labourers and produce, and for carrying out inspections. The College premises were fenced in over the years, including the section adjoining the natural boundary formed by the Nseleni River. Thirty six cattle camps were fenced; 42 paddocks were built on dairy pastures, and small scale horticulture and nursery projects initiated. After introducing a course in nature conservation, a game park was established for the practical instruction of trainees and stocked with game.

According to the Ekokonsult Report (1983), the following agricultural and other activities take place:

Ploughed lands, including those under flood irrigation	approx.	32 ha
Planted pastures		3 ha
Horticultural land under irrigation		2 ha
Existing and potential natural veld pastures		450 ha
Game park		110 ha
Roads, College buildings, housing, yards and others		60 ha

A further 13 ha is recognised by Ekokonsult (1983) as having potential for agricultural production, while a fish farm, comprising eight ponds and covering an area of some 2 ha, was partially developed immediately opposite the water purification plant. H. Allen (in litt.) points out that, of the total area, 342 ha is presently used for grazing, 9 ha for forestry, 19 ha for pastures, while the small scale unit and grazing crops occupy 24 and 3,9 ha respectively. The land surrounding the College is used for mixed farming, particularly cattle, sugar cane and maize, with only patches of indigenous vegetation remaining.

People and activities

Due to changing KwaZulu policies and resultant staff, student and labourer fluctuations, it was not possible to arrive at discrete numbers of people present at the College. The figures provided are therefore approximate and based on the latest situation at OSCA. Forty lecturing, clerical and administration staff and their families, and 30 labourers and their families, are accommodated at OSCA. A further work force of 70 to 100 casual labourers, depending on funds, work on the premises daily. During term time, no less than 180 students (trainee officers) are accommodated in dormitories.

Other than education, the main activity is agriculture. Labourers tend the fields and take cattle to pasture, or are involved in related activities such as building or repairing fences, constructing irrigation schemes and bush clearing. A small work force is involved in alien vegetation eradication, building of soil conservation structures and brush covering in the game park. It is mandatory for students to work in the field in the afternoons where principles learned in the classroom are demonstrated and practised.

Climate and weather

The region in which the College occurs experiences a sub-tropical climate. Summer months are warm to hot and humid. Heavy rainfalls, in the form of convectional downpours which are often brief and violent, occur mainly in January, February and March, though persistent rainfalls are not uncommon. The rain originates over the warm Indian Ocean where evaporation is high, and is brought inland by the easterly and south-easterly winds. The winter is cool to warm with occasional frontal rains brought in by the mid-latitude cyclones, originating in the south Atlantic Ocean and swept in from the south-west. Hot berg winds, originating over the southern Africa plateau, are an occasional feature of the winter months.

Although no reliable climatological or meteorological data are available for OSCA specifically, with the notable exception of rainfall figures, accurate recordings are available from Empangeni. Because of their close proximity, and since the topography and altitude between OSCA and Empangeni differs little, it is reasonable to assume that both localities experience similar meso-climates and weather patterns. Bonsma (1976) provides a comprehensive table of climatological data for Empangeni (Table 1). The most important climatological data are briefly as follows:

Table 1. Climatological data for Empangeni from Bonsma (1976).

304/736 Empangeni
 0 = 28°46'S; y = 31°55'E; H = 137 m.

	Tx	Tn	Tm	F1	F2	F3	F4	Rmm	Rd	SS	=
1.	29,5	20,2	24,9					124,9	12	5,74	6
2.	30,2	19,9	25,1					130,9	8	7,75	1
3.	28,6	18,9	23,7					138,9	10	6,55	4
4.	26,9	16,8	21,9	No frost.				82,2	9	5,87	2
5.	25,7	13,1	19,4	Lowest temp.				71,0	1	6,62	0
6.	22,3	11,5	16,9	recorded				47,1	8	4,98	3
7.	21,8	11,5	16,7	= ±3,6°C				46,9	9	5,53	6
8.	25,0	18,9						47,0	3	7,20	3
9.	28,1	17,1	22,6					72,3	3	7,87	4
10.	26,9	18,3	22,6					103,2	12	5,87	11
11.	28,4	19,3	23,9					117,2	13	5,30	8
12.	29,5	20,0	24,7					129,3	12	6,68	1
X	26,9	16,6	21,8					1110,9	100	6,33	49

Symbols

- 0 Latitude
- y Longitude
- H Height above sea level
- Tx Mean maximum temperature °C
- Tn Mean minimum temperature °C
- Tm Mean monthly temperature °C
- F1 Beginning of frost
- F2 Mean beginning of frost
- F3 Mean ending of frost
- F4 The incidence of the last frost
- Rmm Monthly rainfall in mm
- Rd Average number of days per month on which rain fell
- SS Mean number of hours of sunshine per day
- R Days on which thunderstorms occurred
- Days on which hail fell
- = Fog days

Mean annual maximum temperature 26,9° C

Mean annual minimum temperature 16,6° C

Mean annual monthly temperature 21,8° C

In the summer months the temperature may soar to 38° C. No frost is recorded. On average, rain falls on 100 days of the year. The hottest months are January, February and March; June and July are the coldest.

Rainfall figures for OSCA from 1977 to 1988 yielded a mean annual amount of 1267,3 mm, ranging from 480,8 mm in 1980 to 2948,6 mm in 1984 (Figure 2 and Table 2). Daily and monthly rainfall figures are provided for 1986, 1987 and 1988 (Tables 3, 4 and 5), the years in which the present study took place. The abnormally high figure for 1984 is directly ascribable to Cyclone "Demoina" which, together with convectional rainfalls, accounted for a total of 1608,2 mm of rain in January and February. The high rainfall figure for 1987 is related to the heavy downpours and consequent floods which brought with them considerable damage in the early summer months of that year.

Water bodies

The major water bodies at OSCA are the Cwaka River and Cwaka Dam. The Cwaka River is a perennial river. The flow rate varies considerably from season to season. In winter the river averages approximately two to four metres in width, though in places it may be up to seven metres across. In summer the river often becomes swollen and the velocity increases dramatically, particularly after sustained downpours. Damage from Cyclone "Demoina" was still very much in evidence in 1986 and 1987, with uprooted trees and debris deposited metres above the present river banks, but this damage has been masked or entirely obliterated by the floodwaters which occurred during the Natal-KwaZulu floods in the early summer months of 1987.

Small ephemeral pockets of water also accumulate in depressions on the banks of the river and in the surrounding veld after substantial rains. These stagnant pools of water may last for a few days or weeks to many months, depending on local conditions.

Cwaka Dam was built in the late 1960's. This large water body measures 680 metres in length and 140 metres in width, with a wall 160 metres long. The depth of the water varies from 5,17 metres at the wall to 2,4 metres in the shallow sections, with a total capacity of 373 371 cubic metres (H. Allen in litt.). Smaller bodies of permanent or semi-permanent water include a pond at the main complex, a balancing dam for irrigating pastures above the

OWEN SITOLE AGRIC COLLEGE

Total annual rainfall

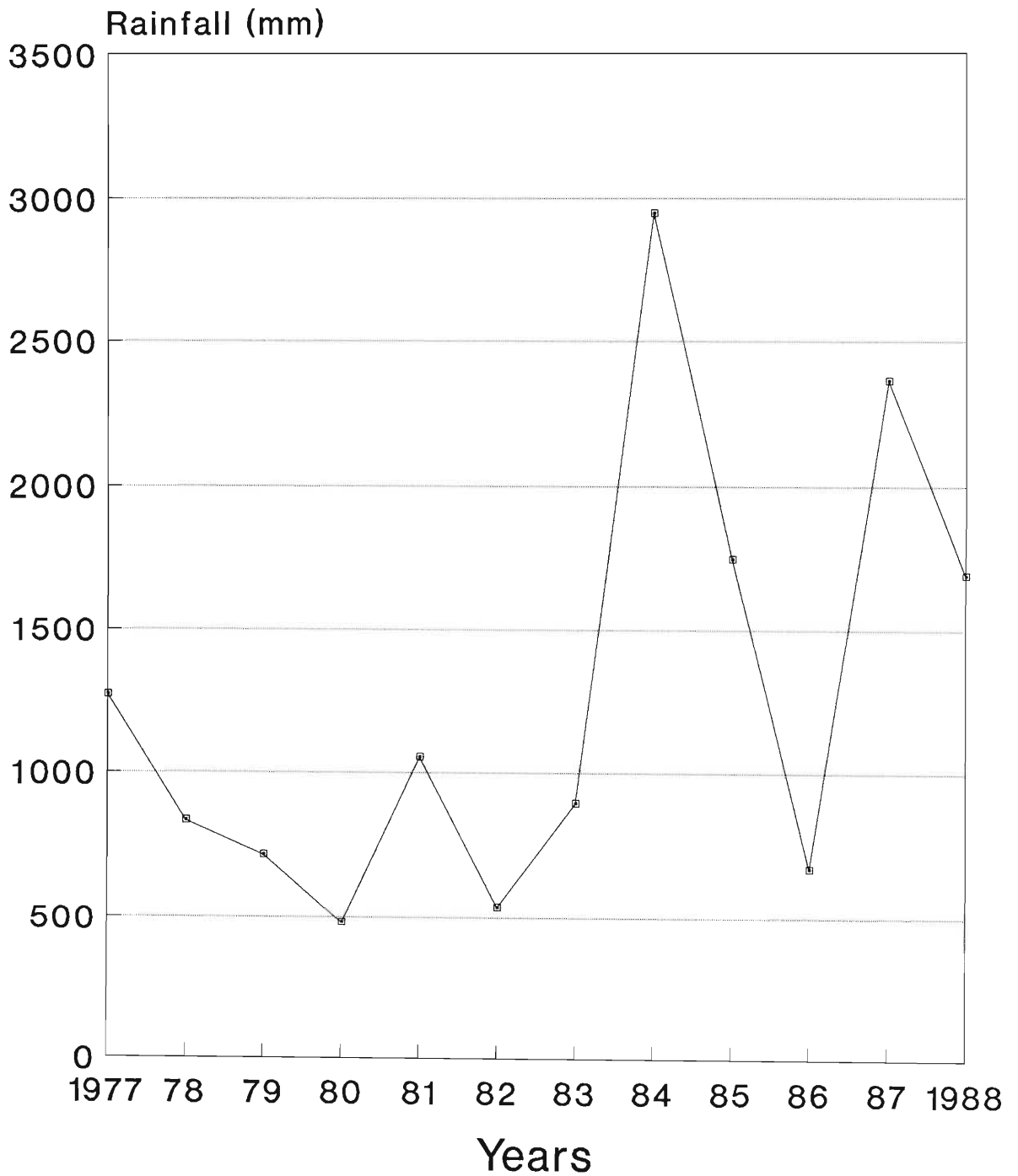


Figure 2. Annual rainfall (mm) for OSCA from 1977-1988.

Table 2

OWEN SITOLE COLLEGE OF AGRICULTURE
Rainfall (mm) 1977-1988

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
JAN	158,0	232,0	71,6	69,3	122,5	99,5	34,3	954,3	288,7	40,4	149,4	15,1
FEB	496,0	85,0	39,5	58,0	141,5	22,0	33,2	653,9	487,2	77,1	15,6	201,9
MAR	132,0	52,0	25,1	26,5	10,0	169,0	63,9	156,2	21,5	75,5	250,4	259,4
APR	45,5	107,0	65,0	25,0	88,5	44,1	16,1	248,3	2,4	27,2	25,6	53,0
MAY	13,5	12,0	81,5	6,5	171,5	40,5	21,0	41,1	8,4	6,0	32,8	26,0
JUN	13,0	40,0	23,5	14,0	69,5	3,8	8,8	103,5	90,8	39,4	283,3	76,0
JUL	16,0	53,0	10,0	6,0	7,5	1,0	37,6	248,0	57,7	0,8	75,9	34,5
AUG	44,0	20,0	45,5	24,5	119,0	1,6	67,3	100,0	43,9	17,7	221,0	20,7
SEP	93,0	28,0	114,0	135,5	73,0	31,3	22,3	33,6	98,0	45,0	976,0	95,4
OCT	69,0	126,0	38,0	11,5	72,5	85,2	173,7	124,4	397,2	45,2	86,3	229,1
NOV	84,0	58,0	103,5	61,5	145,5	7,8	274,3	145,9	180,4	58,6	97,8	135,1
DEC	103,0	21,0	100,0	42,5	33,5	30,2	142,3	139,4	72,5	238,9	147,9	546,5
TOTAL	1267,0	834,0	717,2	480,8	1054,5	536,0	894,8	2948,6	1748,7	671,8	2362,0	1692,7

Table 3

OSCA RAINFALL FIGURES FOR 1986

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	DAY
1		22,0											1
2		5,9							3,0	0,3			2
3		1,9	8,0		1,0								3
4			0,1		4,5	34,0							4
5					0,5						1,5		5
6											9,4		6
7											2,9		7
8									3,0			70,3	8
9		0,4	2,0	0,6					2,5		24,5		9
10		3,0		0,7					2,0		0,8	3,9	10
11			5,5	2,5			0,8			0,2		1,0	11
12		20,4	3,9	5,9									12
13		1,0				5,4							13
14													14
15	5,5											0,3	15
16	0,3		37,9						4,5	3,2	5,0		16
17	6,5		1,2							0,7		19,7	17
18	16,3		4,0					5,0					18
19			1,5									0,3	19
20		0,6		11,0							2,0	0,2	20
21	0,3			6,5							5,5		21
22	2,7	2,0											22
23		19,5	6,5										23
24			3,0								2,0	6,3	24
25		0,4	1,9						10,0		0,5		25
26									7,0		3,0	10,3	26
27									13,0	15,0			27
28	7,9									5,5	1,0	44,2	28
29	0,9							0,7		18,5	0,5		29
30										1,8		70,5	30
31								12,0				11,9	31
TOTAL	40,4	77,1	75,5	27,2	6,0	39,4	0,8	17,7	45,0	45,2	58,6	289,9	TOTAL

YEAR TOTAL = 671,8 mm

Data from the South African Weather Bureau, Department of Transport, Pretoria

Table 4

OSCA RAINFALL FIGURES FOR 1987

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	DAY
1	0,9									11,0		3,0	1
2	2,2												2
3			6,5							7,0			3
4		1,0						16,5	20,0				4
5			12,0	0,2				2,5			7,0		5
6			44,1								18,0	7,2	6
7	8,5	0,5									13,5		7
8	3,6		10,0	1,7			1,6		10,0				8
9	19,8			0,4							5,8		9
10	33,1	0,3		5,0							7,5		10
11	3,9			5,0		11,0					3,0		11
12							0,4			15,5			12
13										17,0		7,5	13
14	8,0									13,5			14
15		0,3	18,0	0,3						12,0			15
16			24,3					16,5	22,0			19,0	16
17						4,0			2,0		4,0	2,0	17
18			7,5			29,0					23,0		18
19	20,2	4,5				18,5		6,5					19
20	8,4		68,0				2,5			9,0	5,0		20
21	0,2	9,0	27,0		24,7		6,0		25,0				21
22			18,0		1,1		45,8		7,5			42,5	22
23	1,1			11,0			11,3						23
24	6,1			2,0				8,0					24
25	0,4		5,5					61,0	15,5				25
26			9,5		7,0	210,0	0,8	105,0	124,5		2,0		26
27						1,8	7,5		168,5	1,3	9,0	1,9	27
28						8,0		5,0	501,0				28
29	33,0								80,0				29
30													30
31													31
TOTAL	149,4	15,6	250,4	25,6	32,8	283,3	75,9	221,0	976,0	86,3	97,8	147,9	TOTAL

YEAR TOTAL = 2362,0 mm

Data from the South African Weather Bureau, Department of Transport, Pretoria

Table 5

OSCA RAINFALL FIGURES FOR 1988

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	DAY
1		2,9	46,0						25,0			50,0	1
2			58,0						5,0	13,5	8,5	30,0	2
3	0,4		54,0						15,5		18,5	10,0	3
4			5,9	21,4	7,0				5,0		0,6	11,0	4
5					5,0								5
6	1,7												6
7				14,7		20,0							7
8		75,0	3,5	8,3				2,1					8
9		27,0	46,0					0,5			13,0		9
10		10,5				19,0	28,5			23,7			10
11							3,0			10,0			11
12									25,0	12,5			12
13							3,0		5,0	6,4			13
14									5,5	0,7	10,0		14
15			40,0						4,0	1,9	11,0		15
16			6,0						5,0				16
17				6,0				2,2		70,0			17
18	2,7			2,5				12,5		20,2		146,0	18
19	0,1									32,0		9,5	19
20										18,0			20
21	7,5									1,5			21
22	0,1												22
23	1,5							2,2					23
24	1,1			0,1								92,0	24
25		65,0								8,0	6,5	49,0	25
26		21,5								0,4	8,0	44,0	26
27						21,5			0,4		9,0		27
28					14,0	7,5		1,2			47,0		28
29						8,0				10,0	3,0		29
30										0,3		105,0	30
31													31
TOTAL	15,1	201,9	259,4	53,0	26,0	76,0	34,5	20,7	95,4	229,1	135,1	546,5	TOTAL

YEAR TOTAL = 1692,7 mm

Data from the South African Weather Bureau, Department of Transport, Pretoria

compound, eight fish ponds opposite the water purification plant, four cattle dams in natural veld pastures, a dam in the horticulture field, and a dam in the game park. The main complex pond was built in 1983 or 1984 (H. Allen in litt.).

The balancing dam was excavated in 1986. It has steep banks with sparse vegetation and was filled with water for the first time in June that same year. The fish ponds were apparently excavated in 1973. They comprise eight separate ponds of various sizes, ranging from approximately 13 x 4 metres to 7 x 4 metres. These excavations were left unattended for over a decade. The ponds were flooded in 1984 and again in 1987, and at no stage during the study period did they dry up though levels were low in the winter season. It seems probable that the ponds were filled with varying depths of water since their existence. In 1988 the fish ponds were filled with layers of cut grass to seal them, but any further attempts to put the ponds into production have been abandoned.

It is not known exactly when the cattle dams were built, though they have been in existence since the late 1960's. At least three of them occur in naturally depressed areas and it is probable that they were built by locals well before the establishment of the College. These dams are filled with varying amounts of water throughout the year. The dam in the game park, originally used for watering cattle, is now used exclusively by game.

A number of semi-permanent streams traverse the area. Those which were investigated include a canalised stream in the horticulture field and two canalised streams which drain farm buildings and paddocks. The two latter streams flow into culverts under the tarred road, past the veterinarian centre and nursery, and empty into grassveld; these streams flow almost uninterruptedly in summer while in winter there are usually at least a few pockets of water remaining, even months after the last rains.

Geology, geomorphology and pedology

R. Maud (in litt.) has summarised the geological and geomorphic events which have affected the Empangeni region:

Extension of Letaba Formation

(Lebombo/Stormberg Group) basalts

190 million years ago

Disruption of Gondwanaland, rift faulting

160 million years ago

Development of polycyclic "African" erosion surface; deposition of Cretaceous sediments along continental margin	18 million years ago
Development of "Post African I" cyclic erosion surface	
Major uplift and tilting of continental margin, termination of "Post African I" cycle of erosion	4 million years ago
Development of "Post African II" erosion surface, graded to sea level at +/- 110 metres	
Development of marine cut benches in marginal areas at 70 metres and 30 metres. Deposition of old (red) coastal dunes	1,5 million years ago
Glacio-eustatic variations in sea level and climatic changes:	
Low sea level - 100 metres Cool, dry	150 000 years ago
Deposition of coastal dunes	
High sea level + 8 metres Warm, moist	125 000 years ago
Low sea level - 120 metres Cool, dry	18 000 years ago
Deposition of coastal dunes	
High sea level + 2 metres Warm	3 000 years ago

During the last glacial period, 18 000 years ago, the region was severely eroded, other than on river terraces (red river terrace Shorrocks form soil dates from 125 000 years ago) and some valley bottoms. Residual soils overlying weathered rock parent materials all date from 8 000 to 10 000 years ago. OSCA is incised somewhat below the 110 metres Post African II erosion surface. As such, the landscape in the area is generally younger than about 3 - 4 million years. A broader account is provided by Partridge and Maud (1987).

At OSCA specifically, the entire area is underlain by volcanic basalts of the Letaba Formation of the Lebombo Group, which form the uppermost group of the Karoo Sequence (Drennan *et al.* 1986). The basalts are generally deeply weathered, often producing exfoliating rocks. Rock exposure is generally poor. The weathered basalts give rise to fertile, but highly erodible, brownish-black to reddish soils.

According to Drennan *et al.* (1986), the river terraces which are present in the area represent the flood plains of the rivers and the soils in these areas are derived predominantly from alluvium. This alluvium may be many metres thick.

The soils at OSCA have been investigated by Drennan *et al.* (1986). Briefly, two soil types predominate. The first is a black clay loam topsoil overlying a lithocutanic subsoil derived from weathered basalt. It is a shallow soil which covers approximately one third of the area and is to be found on upper slopes and hilltops. The second type is a black loamy topsoil overlying a dark brown to dark grey clayey subsoil. Together these soils cover approximately 454 ha of the College surface.

Vegetation

The College occurs in Acock's (1975) Veld Type 1: Coastal Forest and Thornveld, and is characterised by the thornveld element of coast-belt forest. Typical thornveld trees are Acacia karroo, A. nilotica and A. robusta, the last species occurring primarily in the riverine environment. The Coral Tree Ervthrina caffra and Ilala Palm Hyphaene natalensis also occur. Grasses are dominant, particularly Themeda triandra, Digitaria didactyla, Heteropogon contortus and many species of Cymbopogon, Eragrostis, Panicum, Aristida, Setaria and Chloris. Shrubs and forbs, and a few Aloe spp., complement the grasses.

A few hectares of xerophytic vegetation occur on the northern slopes of rock outcrops in the game park. The dominant plants of this xerophytic component are the Bottlebrush Aloe Aloe rupestris and the Rubber Hedge Euphorbia Euphorbia tirucalli.

The riverine vegetation along the banks of the Cwaka River is typically lush and dense, forming a canopy through which little wind and solar radiation penetrates, creating a cool, moist, almost windless micro-climate. This belt of vegetation, averaging between approximately four and seven metres in breadth on either bank of the river, can be likened to a linear oasis. Dominating in this environment are the Wild Date Palm Phoenix reclinata, the Cape Fig Ficus capensis, waterberries Syzygium spp., and the Natal Mahogany Trichelia emetica. The Small Knobwood Zanthoxylum capense, the White Pear Apodytes dimidiata and the Blue Gwarri Euclea crispa often occur along the edges of the canopy. This riverine vegetation acts as an important silt trap, and after flooding or substantial rains, ephemeral ponds of water can be found in river bank concavities.

Along the fringes of the Cwaka Dam and many other permanent and semi-permanent bodies of water, including the Cwaka and Nseleni Rivers, grow stands of Phragmites australis ("Fluitjiesriet"), Typha capensis (Bulrush), Scirpus littoralis and other littoral, grass-like herbs. Some of the fish ponds specifically are occupied by T. capensis and S. littoralis. Large numbers of water lilies Nymphaea caerulea occupy the Cwaka Dam and Cwaka River, with small clusters occurring in smaller bodies of permanent water such as the main complex pond, but do not occur in the fish ponds. The water lilies in the Cwaka River are often washed away during floods.

It is perhaps important to point out that up until 1987 the fish ponds were extensively colonised with T. capensis, S. littoralis and other emergent and littoral vegetation. Much of this vegetation, in particular the reeds, was cleared in 1987 during efforts to get the ponds productive, but patches had coppiced again in 1988.

Most of the arable land has been cultivated with a variety of crops. Vegetables and fruits, including orchards, are also grown. The cattle grazing camps and game park, which together comprise 560 hectares of the total College grounds, are subject to veld burning programmes to maintain a thornveld sub-climax, checking the spread of Acacia thickets and opening the veld up to the savanna grasses. The camps and park are on average burned every alternate year.

Many species of alien vegetation occur at the College, introduced either intentionally by man or from surrounding regions by wind, water or seed-dispersal agents. The most important of these are the Australian Gum Trees Eucalyptus spp., Horsetail Tree Casuarina equisetifolia, Lantana Bush Lantana camara, Brazilian Pepper Trees Schinus terebinthifolius, the Joshua Tree or Spanish Bayonet Yucca aloifolia, the Paraffin Weed Chromolaena odorata, the Guava Tree Psidium guajava and the Lavender Bush Lippia. The gum and horsetail trees have been grown in small plantations or to line avenues, while the other species are aggressive aliens in

natural veld and are subject to eradication by labourers, with varying success. The Common Coral Tree Erythrina lysistemon has also been planted at various sites, especially on lawns near the main complex.

Habitats

Only a brief description of the main habitats is necessary, because amphibians and reptiles respond only to broad physiographic features unlike, for example, many kinds of birds, which respond to details of the vegetation. There are four main habitat types, namely savanna, riverine or riparian, xerophytic, and disturbed.

The largest habitat is savanna, comprising grasses and predominantly Acacia trees. Details have been discussed in the section on vegetation. This habitat includes the game park and cattle camps. The Cwaka Dam, cattle dams and seeps, which also form part of this habitat, have been discussed in the section on water bodies.

The riverine or riparian habitat is to be found along the Cwaka River. It is characterized by large trees which in places form a dense canopy. Details have been discussed in the section on vegetation.

The xerophytic habitat is the smallest of the four habitats and occurs on the northern slopes of rock outcrops in the game park. The dominant plants of this habitat type are mentioned in the section on vegetation.

The disturbed habitat refers to ploughed and horticulture lands, the main complex of buildings and staff houses and associated infrastructure. Culverts and roads, and canalized streams, also form part of this habitat.

These habitats are represented in the aerial pictures (Plates 1-5).



Plate 1. Aerial picture of OSCA(a), showing the main building complex, ploughed lands, the game park, portions of the Cwaka and Nseleni Rivers, the cattle camps, and southern and western boundaries.

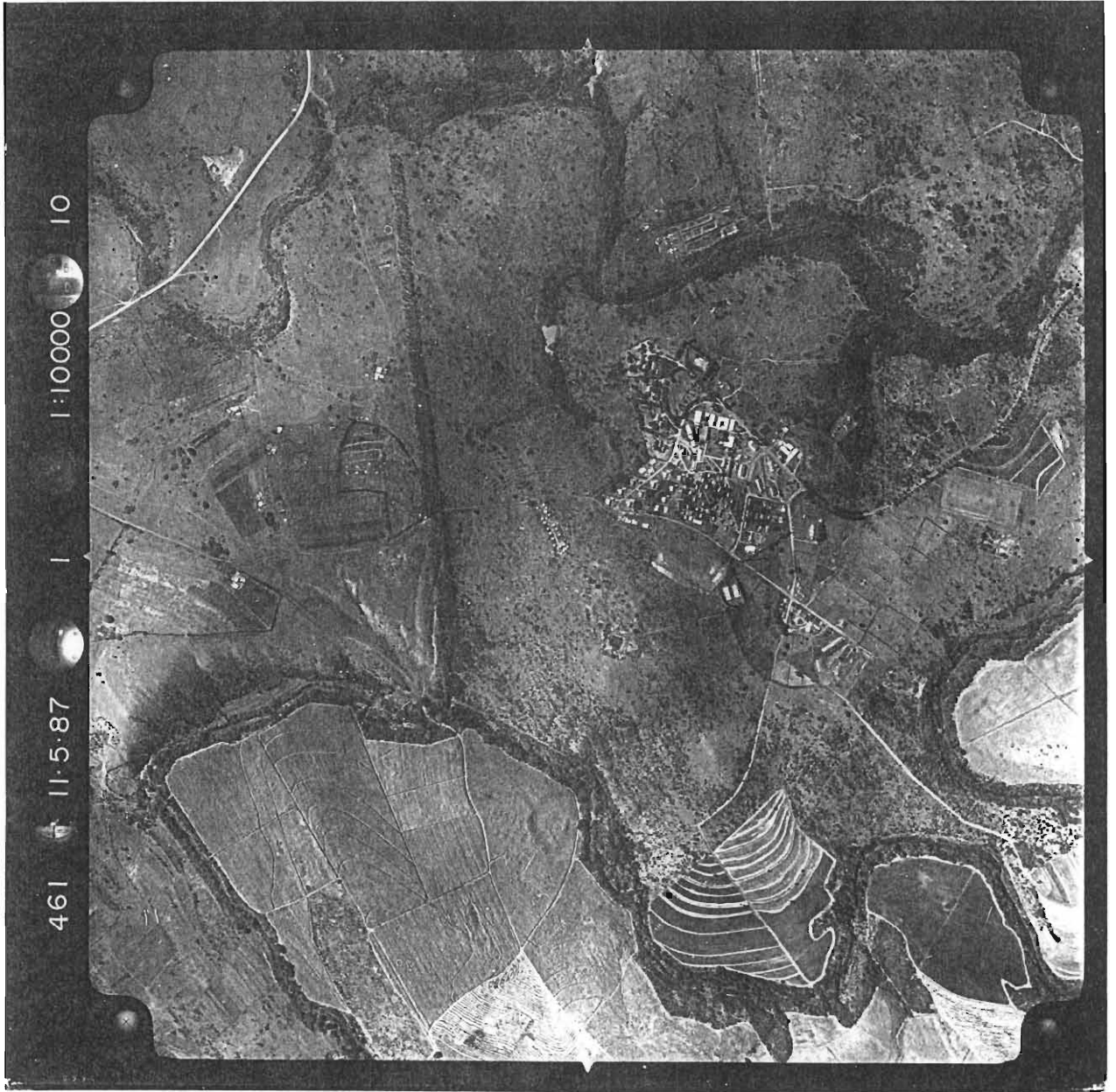


Plate 2. Aerial picture of OSCA(b), showing the main building complex and portions of the ploughed lands, Cwaka and Nseleni Rivers, the game park, and northern and western boundaries.

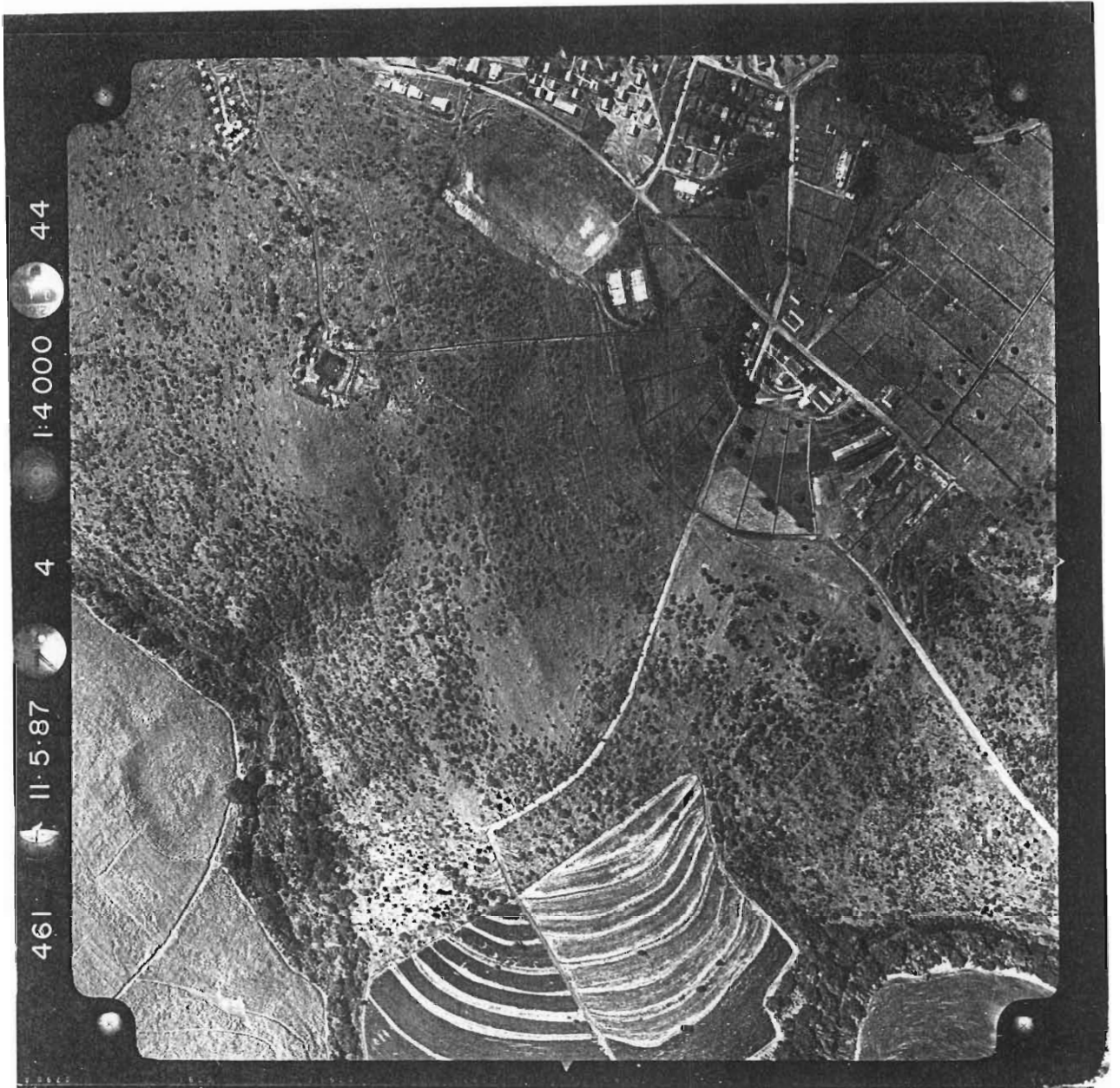


Plate 3. Aerial picture of OSCA(c), showing the balancing dam and portions of the main complex, ploughed lands and Nseleni River.



Plate 4. Aerial picture of OSCA(d), showing the main building complex, Cwaka Dam, the Cwaka River, cattle camps and game park, and portions of the southern and northern boundaries.



Plate 5. Aerial picture of OSCA(e), showing Cwaka Dam and portions of the Cwaka River, cattle camps, game park, and the southern and eastern boundaries.

Phillips' zonation

Apart from the zonation system offered by Acocks (1975) into which the College can be classified, Phillips (1973) offers an alternative system based on bioclimatology. Phillips (1973) developed his system for the Natal region specifically, including Zululand, and submitted criteria such as physical and biological features, including climatic hazards, soils, water resources, ecosystems and so forth, as well as human affairs and economics for each of his 11 groups.

The College occurs in Phillips' (1973) bioclimatic group 1 which he describes as coast lowlands with evergreen forest, short forest, bush and wooded savanna with a humid to subhumid climate. More specifically, the College occurs in Turner's (in Phillips 1973) Zululand coastal plain which he describes as an extensive but featureless region, nowhere in excess of 500 feet, stretching 150 miles south from the border of Mozambique to a point a few miles south of Richards Bay, terminating at the mouth of the Mlalazi River.

Rutherford and Westfall biomes

By definition, a biome is a broad ecological unit which represents a major life zone extending over a large natural area (Smith 1974; Godman and Payne 1979; Abercrombie *et al.* 1980; in Rutherford and Westfall 1986); it is also referred to as an area of similar abiotic environment and thus ecological structure (Putman and Wratten 1985) and contains a relatively similar set of life forms (Odum 1971).

In an attempt to categorize the biomes of southern Africa objectively, Rutherford and Westfall (1986) assessed a number of environmental components, namely zoology, botany and climate. Of particular interest is that they could not find any evidence to delineate biomes on the basis of geological units. They concluded that there are seven recognisable biomes.

The College occurs in Rutherford and Westfall's (1986) savanna biome, which they suggest covers an area of about 959 000 km² or 46,2% of southern Africa. Vegetationally, this biome is characterized by a herbaceous, usually graminoid, layer with an upper layer of woody plants. Climatically, it occurs in the summer and strong summer rainfall areas. Most of this area is on the extensive plains of the Kalahari Basin and coastal platform of Mozambique/Tongaland.

Rutherford and Westfall (1986) are of the opinion that the conservation of the savanna biome is good with 8,5% of the area conserved in South Africa. This compares favourably with the grassland and Nama-Karoo biomes with conserved areas of 1,1% and 0,7% respectively.

BACKGROUND TO THE STUDY

One of the priorities in any conservation area is to compile inventories of the flora and fauna, for without information on the biota it is impossible to establish meaningful management objectives. Thus initially, in March 1986, the object of the project was to establish what amphibians and reptiles occur in the OSCA game park. However, it was soon realised that OSCA contained a variety of habitats, not all of which were represented in the game park, and so it was decided to include the entire OSCA grounds in the study. Concurrently, it was decided to provide in-service herpetological training to trainee nature conservation officers and display live reptile collections for educational purposes.

AIMS OF STUDY

The main aims of the study are to assess the taxonomy, ecology, zoogeography and conservation of the OSCA herpetofauna.

The following key questions were asked:

- 1) Do the species recorded from OSCA conform to taxonomic descriptions in authoritative accounts?
- 2) If atypical features do occur, to what extent do they differ from typical features and what are the possible reasons for these differences?
- 3) What is the composition and diversity of the herpetofauna, and how does it compare with other intensively collected areas?
- 4) What other species may occur, and what are the reasons for their apparent absence?
- 5) What species occupy what habitats?
- 6) What are the habitat preferences of certain species, and why do certain species show a preference for disturbed or artificial habitats?
- 7) What activities benefit or threaten species, and what is the status of Red Data Book - Reptile and Amphibian (RDB - RA) species at OSCA specifically?

- 8) What animals are predators and what are prey, and which faunal groups constitute important links in food webs?
- 9) How does niche segregation occur; that is, how do species partition resources and how do similar species compete or avoid competition with each other?
- 10) What parasites infect reptiles, what are the routes of infection, and what effect do parasitic organisms have on their hosts?
- 11) What are the effects of environmental perturbations on the herpetofauna, particularly fires and floods?
- 12) What is the frog species diversity in relation to bioclimates?
- 13) What are the zoogeographical affinities of the herpetofauna?
- 14) What are the attitudes of locals towards amphibians and reptiles, and to what use do they put these animals?
- 15) What measures should be adopted to effectively conserve the herpetofauna?

Further aims were to review herpetological research in Natal; to critically review the zoogeographical evaluation of the region in the literature; and to discuss whether or not the OSCA species checklist fits the currently envisaged zoogeographical pattern - that is, does the OSCA species list support Poynton's (1980) picturing of an east African fauna subsisting in the region of study?

MATERIALS AND METHODS

Duration of study

Due to the author's numerous duties at OSCA, which included lecturing, administrative and management duties, the study was carried out on an ad hoc basis. It is impossible to calculate the exact number of hours spent collecting and cataloging material since the study progressed as and when time allowed. The bulk of the fieldwork was carried out from March 1986 to August 1987, with two additional fieldtrips of a week's duration each in January and December 1988 respectively. These fieldtrips were planned to coincide with the most productive times of the year, at the onset of or during the rainy season when amphibians and reptiles tend to be most active.

People involved in collecting

The author involved a number of people in the collection of specimens. Trainee nature conservation officers received instruction in herpetology, particularly taxonomy, ecology, zoogeography and conservation. They were directed to different habitats in the game park to collect specimens during ecology practical sessions, which were held one or two afternoons per week. In 1986 twenty four students participated and eighteen were involved in 1987. Students participated in supervised collecting exercises at least once a month too, except over vacations. Many of these students also collected specimens independently. Staff members, trainees from other disciplines and labourers occasionally also collected specimens or directed the author to where animals could be collected. Two of the trainees who displayed a keen interest in herpetology and who had a sound knowledge of the taxonomy of the common species were provided with data sheets and literature to continue with observation and collection records when the author was transferred to Jonkershoek in September 1987. Correspondence was regularly entered into, and during the December 1988 fieldtrip all additional data were collected. Each sight record was discussed with the trainees, and included in the results only where such records could be substantiated.

Opportunistic collecting

Except for the fieldtrip in December 1988 when traps were installed, no trapping techniques were employed. The vast majority of specimens were, therefore, collected opportunistically.

Places of human habitation and activity, especially in and around the main complex, students' dormitories, veterinarian centre and staff houses, were generally well collected. Different

habitats in the game park were specifically sampled. The Cwaka River and associated riparian vegetation, seepages and pools of stagnant water, grassveld patches, thickets of acacia trees, xerophytic plant patches and rocky situations were regularly checked (see Plate 6). Cwaka Dam and the fish ponds were also regularly investigated, particularly during the wet season (see Plates 7-9). The cattle dams, streams and other bodies of water, and the pastures and agricultural fields were less frequently investigated (see Plate 10). Organised collecting exercises were carried out during and immediately after controlled veld fires in the game park.

Other collecting techniques, excluding traps

No special techniques were used for collecting amphibians. They were simply either seized in the hands or scooped up in nets. A variety of techniques were used for the collecting of reptiles, the safest of which were demonstrated to the trainees. Most agile and alert lizards were collected by stunning them with a length of inner car tube. The tubes were cut into strips 25 - 35 cm long and about 1 cm wide. The one end was wound over the forefinger and held down with the thumb; the other end was retracted in the other hand to the desired tension and released at the target. Specimens up to four metres away were "twanged" in this way. This method proved particularly effective in collecting agamid and limbed scincid lizards. The overall mortality from this method was approximately 20% with the highest percentage of mortalities occurring with the small gekkonid lizards, particularly Lygodactylus capensis capensis, and small specimens of the skink Mabuya striata striata.

Many gekkonid lizards were relatively easily caught with the hands, however, albeit often with the loss of their tails which were quickly autotomised. Varanid lizards were collected mainly when they became trapped in houses or other human structures, and were physically subdued. This involved grabbing the lizard around the middle of the tail, swinging it up and clutching it behind the head with the other hand.

Collecting snakes posed the greatest difficulty of all. Although trainees were taught fundamental snake taxonomy, and most could readily distinguish colubrids (venomous and non-venomous) from elapids and vipers, it was impressed on them not to take any chances whatsoever, especially with venomous species, and that it was preferable to leave a snake alone rather than to risk being bitten if they did not have the tools or confidence to collect it. It was recommended that all students arm themselves with hessian sacks and forked sticks tailored from branches during collecting exercises. Although a large number of snakes, some highly venomous, were collected during the survey, not one student was bitten.



Plate 6. The Cwaka River, dominated by the Wild Date Palm *Phoenix reclinata*.



Plate 7. Cwaka Dam, the largest body of water at OSCA, with *Scirpus littoralis* in the foreground.

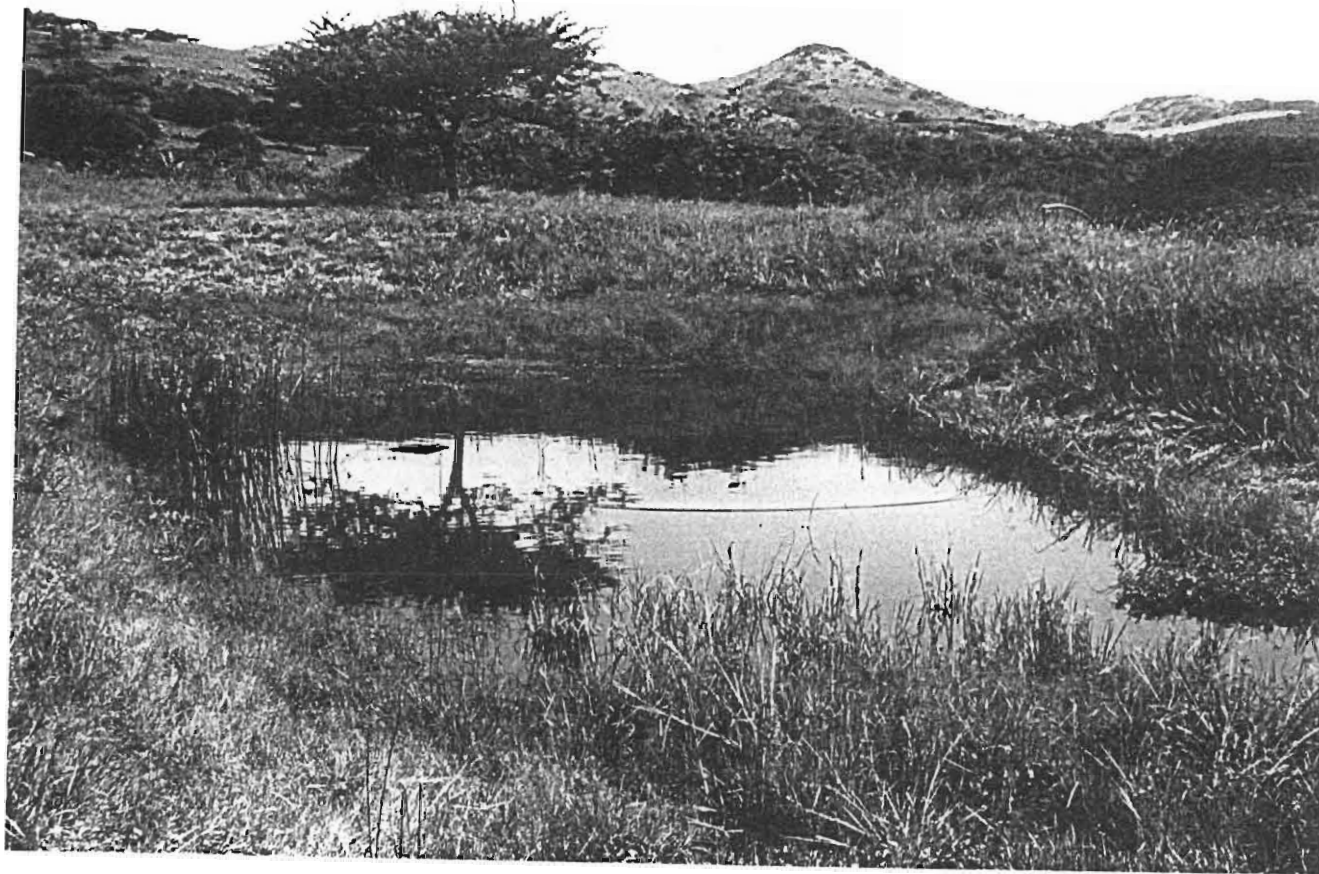


Plate 8. One of the smaller fish ponds, surrounded by Bulrushes *Typha capensis* and grasses.

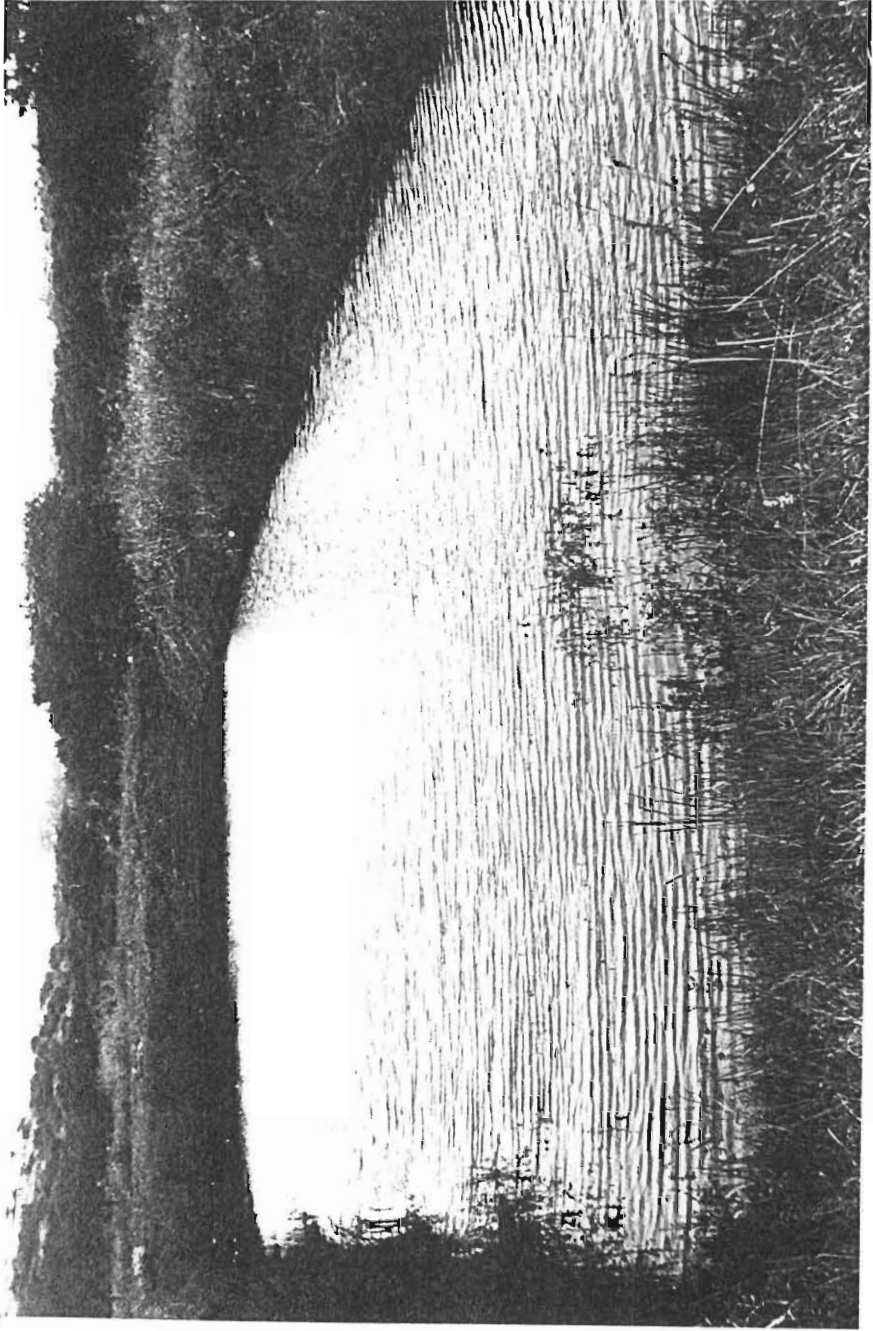


Plate 9. One of the larger fish ponds, surrounded primarily by grasses.

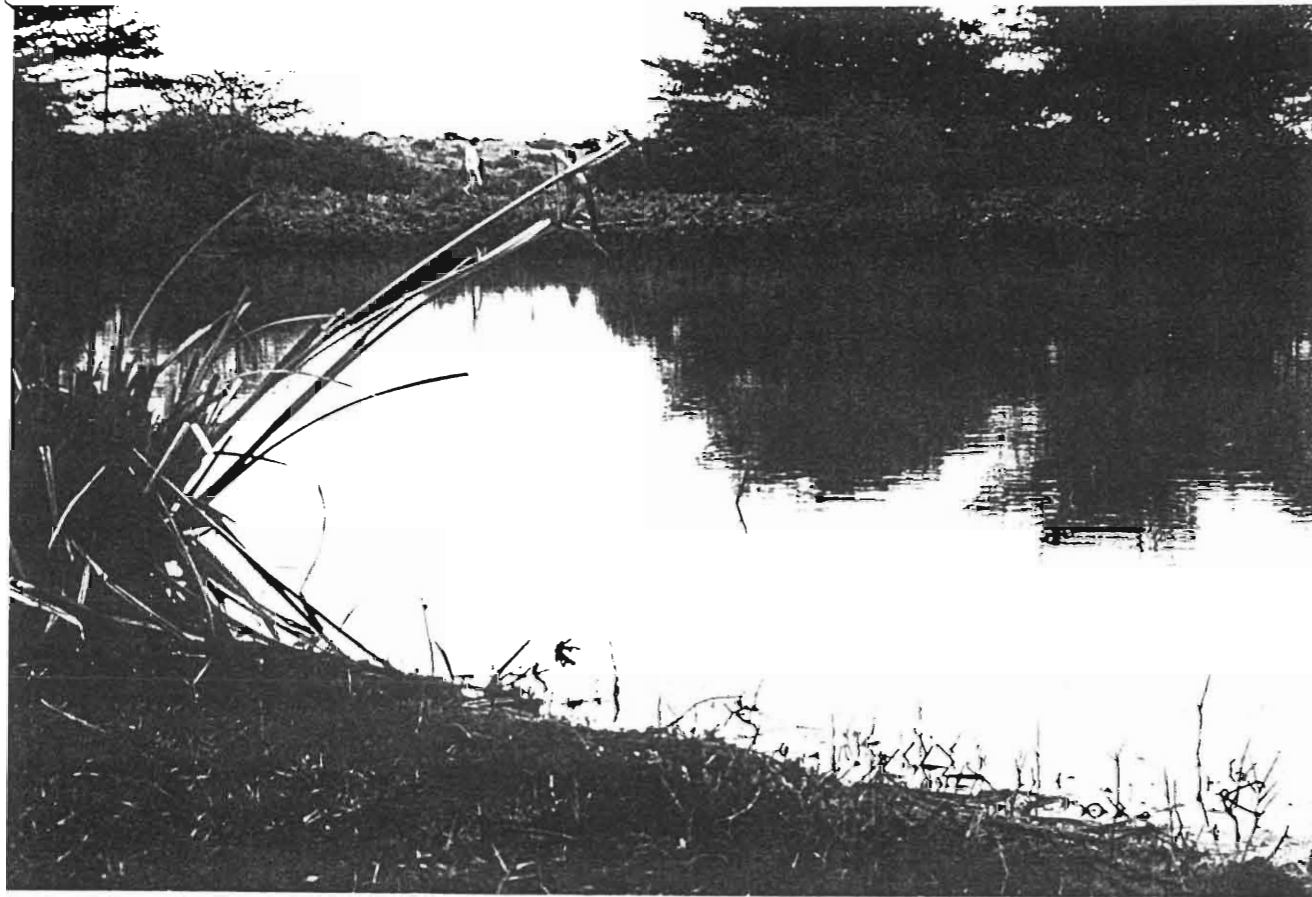


Plate 10. The cattle dam below the staff houses, surrounded primarily by grasses and *Acacia* spp.

Most snakes were physically handled with or without the use of protective equipment. Others were simply coaxed into sacks or containers. Since no aluminium grabsticks or tongs were available, arboreal species were often lifted out of trees with long sticks or poles before being handled. The author usually collected Mozambique Spitting Cobras Naja mossambica with a thick glove and goggles or some other form of eye protection. These snakes were often cornered in buildings or in human artefacts and grabbed in the gloved hand. This method of capture provided the opportunity to study the snake's reaction to being handled.

Traps

During the December 1988 fieldtrip, two sets of traps were installed in the game park. The trap components comprised drift fences, funnel traps and pit traps. The drift fences consisted of 10 x 0,5 metre strips of green shade cloth with nylon loops regularly spaced at one metre intervals along the top and bottom margins. The funnel traps consisted of 90 cm long cylindrical traps made of aluminium mosquito gauze with funnels with 5 cm apertures stapled to either end. The pit traps comprised 25 litre buckets each with a height of 40 cm.

The first set of traps was installed in a typical grassveld habitat. It consisted of three drift fences in a Y shape with pit traps situated at the convergence of the three fences and at the extremities of each fence. The drift fences were anchored into place using 1,5 metre long iron droppers which were hammered into the ground through the nylon loops. The drift fences were fixed to the ground by digging a narrow trench and packing soil against the sides, precluding the possibility of animals passing under the material. Two funnel traps were located halfway along each fence, one on either side. The funnel entrances were moulded to fit flush against the sides of the drift fences and were staked into place. Holes were dug and the buckets sunk to the level of the soil (see Plate 11).

The second set of traps was erected under a tree canopy approximately 20 metres from the Cwaka River. The trees were White Pears Apodytes dimidiata and Blue Gwarris Euclea crispa. The traps were installed in a similar manner to those in the savanna habitat, except only two fences were used in an L shape since the extensive root system of the trees precluded the use of a third fence.

The traps were in operation for a total of eight days. They were checked twice daily, at sunrise and at sunset to establish diurnal or nocturnal activity patterns respectively. However, the generally cold, wet and windy conditions experienced over the days of trapping were not conducive for reptile activity. This trapping method was supplemented with opportunistic collecting.

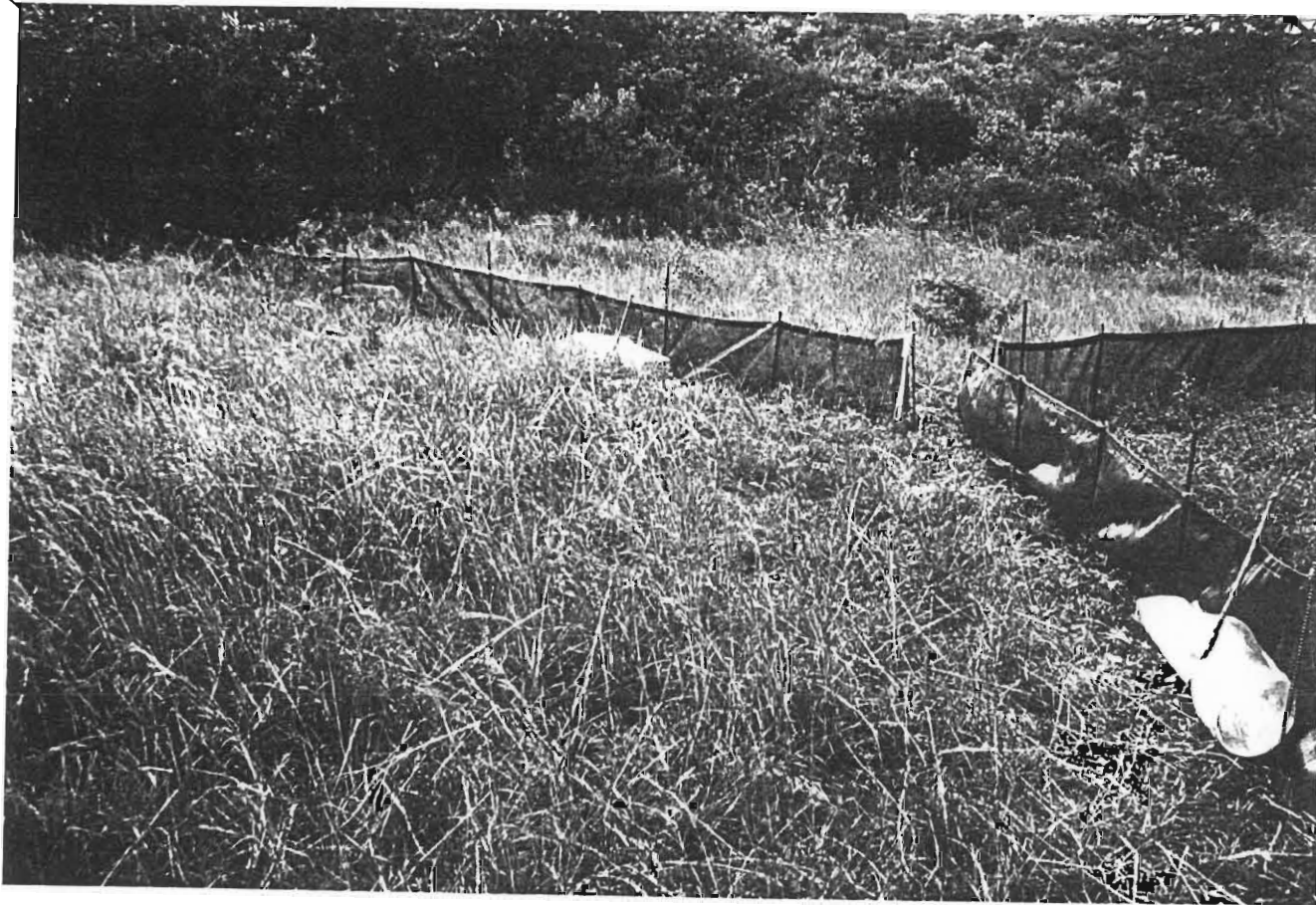


Plate 11. Array traps with pitfalls and funnels in grassveld habitat.

Live collections

Reptiles were kept in captivity for varying periods of time. They were housed in terraria and other structures where they were studied whenever opportunity arose, though mainly at feeding times. Only occasionally were frogs kept in captivity. The reptile collection was put on display for visiting school groups; trainees were taught to identify the different taxa and herpetological principles were demonstrated to them. On termination of the author's duties at OSCA, a small number of snakes (Lamprophis fuliginosus, Dispholidus typus typus, Naja mossambica, Causus rhombeatus and Bitis arietans arietans) were donated to FitzSimons' Snake Park in Durban and Port Elizabeth Snake Park, while others were released into the game park.

Data collection and storage

Standard catalogue forms were compiled for collections (Fig. 3-5). They were also used for sightings. Preserved specimens were catalogued under the acronym OSCA, prefaced by an A if amphibian and R if a reptile, and numbered. Separate accession catalogue registers were opened for amphibians and reptiles respectively. Initially an attempt was made to catalogue specimens in sequence to the date on which they were collected; however, this proved difficult due to mortalities in captivity and the discovery of preserved material which had been collected prior to the initiation of the survey, and so the effort was abandoned. Thus specimens were catalogued as they were received by the author. Sightings were accepted only if the observer could substantiate his observations.

A small number of specimens collected from OSCA before the initiation of the survey are included in this study. Correspondence was entered into with a number of past members of staff to establish or verify the origins of the preserved material, which was lodged in the OSCA museum. If doubt existed about the locality of the material, it was excluded from the study. The entire OSCA collection was transported to Jonkershoek Research Station near Stellenbosch and subsequently to the Eastern Cape Research Unit, Grahamstown, where it was reworked before being deposited at the Port Elizabeth Museum (PEM).

Notes were kept on any atypical or interesting features the animals displayed either at the time of collection or while in captivity. Colour pattern, temperament, feeding strategy and behaviour were documented. All invertebrate, amphibian, reptilian, avifaunal or mammalian prey offered to captive animals were first identified, and whenever practicable, weighed and measured. Any defence strategies adopted by prey animals were also noted.

AMPHIBIA

SPECIES:

SPECIMEN NUMBER:

DATE:

TIME:

HABITAT:

WEATHER CONDITIONS:

MEASUREMENTS: S.V.L.
 S.L.
 D.H.

MASS:

DESCRIPTION OF SPECIMEN:

FIELD NOTES:

Figure 3. Amphibian catalogue form.

REPTILIA

SPECIES:

SPECIMEN NUMBER:

DATE:

TIME:

HABITAT:

WEATHER CONDITIONS:

MEASUREMENTS: T.L.
 B.L.
 T.
 B.D.

MASS:

DESCRIPTION OF SPECIMEN:

FIELD NOTES:

Figure 4. Reptile (snakes, lizards and crocodiles) catalogue form.

REPTILIA

SPECIES:

SPECIMEN NUMBER:

DATE:

TIME:

HABITAT:

WEATHER CONDITIONS:

MEASUREMENTS: C.C.L.
 T.L.
 S.W.
 S.H.

MASS:

DESCRIPTION OF SPECIMEN:

FIELD NOTES:

Figure 5. Reptile (chelonians) catalogue form.

Taxonomy and nomenclature during the fieldwork was based on the following major texts: Poynton (1964), Passmore and Carruthers (1979) and Wager (1986) for amphibians; FitzSimons (1943) for lizards and Broadley (1983) for snakes. The work of Branch (1988) for all reptiles, and Boycott and Bourquin (1988) for tortoises and terrapins specifically, were additional references used later in the study. Scale counts of snakes were carried out according to the system proposed by Dowling (1951).

Specimen collection and storage

Ideally, a reference collection was all that was required, and overcollecting was discouraged. Furthermore, it was stressed to collectors that habitats should be left as unaltered as possible; for instance, logs and rocks which were upturned were to be returned to their original position, while no attempt was made to break open old termitaria, ideal retreats for many snakes, since this type of activity results in permanent habitat destruction. However, the author had little control over the number of live or dead specimens which were brought in, or mortalities in captivity. For instance, the Mozambique Spitting Cobra Naja mossambica was often destroyed by members of staff at or near places of human habitation. When not badly mutilated, specimens were collected and preserved, providing a series for study.

Where photographic records were obtainable, specimens were often released. All photographs were taken with a 35mm single lens reflex camera, a variety of close-focus lenses and colour slide films (transparencies). Black and white prints in this study were duplicated from these slides.

Students were taught how to despatch snakes which they were unable to capture live. This involved delivering a hard blow with a stick to the region of the heart (approximately 200 - 300 mm behind the head in a specimen with a body length of 1 000 mm) which, if it did not stop the heart immediately, broke the back and rendered the animal immobile. Unfortunately, snakes which were brought in by members of staff and labourers were often badly mutilated. Small reptiles and amphibians were usually sacrificed by placing them in a deep freeze.

All specimens are preserved in a 5 - 10% solution of unbuffered formalin. The use of this chemical did create certain problems, however, not least of which was the rapid fading of colours; the hardening of specimens leading to breakages, scale losses and other mutilations when snakes and lizards were reworked or re-bottled. Formalin was chosen as a preservative because of its relatively cheap price and availability.

Measurements and sexing

Since body size has been found to exert an important influence on the ecological characteristics of snakes, especially in the areas of life-history evolution and foraging ecology, while body mass may be important in calculating relative clutch mass and metabolic rates (Seugel and Ford 1988), amphibians and reptiles were, whenever practicable, weighed and measured.

An electric Sartorius balance, sensitive to 0.01 g with a maximum weighing facility of up to 1 000 g, was used throughout the study period, with the exception of the fieldtrips when a variety of Pesola spring balances with different sensitivity ratings were used. Reptiles exceeding 1 000 g were weighed with a portable spring-action scale, marked in gradations of 100 g up to a maximum of 10 kg. Whenever reptiles with distended guts were weighed, indicating that they contained a meal, this is indicated in the text.

Both live and dead specimens were measured. Most amphibians and small reptiles were measured with a dissecting caliper later measured off against a ruler, while those collected later during fieldtrips were measured with a Helios stainless steel sliding caliper. Large reptiles were measured with a one metre-long stainless steel ruler mounted on a board, a measuring tape, or a length of string later measured off against a ruler or tape.

The following measurements were taken for amphibians: snout-vent length (S.V.L.) - from tip of snout to the vent (cloaca); head diameter (D.H.) - across the gape of the mouth, i.e. from corner to corner and not across the eyes; shank length (S.L.) - second articulation of the leg, i.e. the tibia. Live specimens did occasionally prove problematic to measure, particularly the toads Bufo and Schismaderma which have the habit of inflating themselves with air and hunching their backs when threatened. This problem was to some degree rectified by applying pressure on the back of the animal, flattening it linearly.

Most live reptiles were easy to measure. Particularly active specimens were temporarily cooled in the fridge to permit easier handling and consequently more accurate measuring. If a discrete measurement was not possible, the approximate length of the animal is given in the text (prefaced by ca.). Preserved reptiles were measured off against a length of string which was used to follow the contour of the animal. This practice was performed with reservations, however. Attempts to measure tightly coiled snakes, for instance, were abandoned if reliable measurements were not possible, and instead only an approximate length is given.

Snakes and lizards were measured as follows: total length (T.L.) - from tip of snout to tip of tail; body length (B.L.) - from tip of snout to vent (cloaca); tail length (T.) - from vent to tip of tail; body diameter (B.D.) - the greatest body diameter. If the tail of a specimen was truncated, or showed evidence of having been truncated, this is specified. Unless otherwise indicated, the body diameter is given for animals with empty guts only. The number of times the tail is included into the total length is given only for snakes with complete tails, while the number of times the midbody diameter is included in the total length is given for the genera Typhlops and Leptotyphlops only.

Whenever practicable, the following measurements for chelonians were taken: curved carapace length (C.C.L.) - the longest curved length of the carapace; total length (T.L.) - the longest linear length of the shell (carapace and plastron); shell width (S.W.) - greatest shell width; shell height (S.H.) - greatest shell height.

Amphibians were sexed in a variety of ways. Males were sexed by inspecting their throats for gular slits (Ptychadena), pleated skin folds (Phrynobatrachus), spotting or dark pigmentation (Bufo, Phrynomerus, Tomopterna, Cacosternum and Arthroleptis), central gular discs or vocal sacs (Kassina, Afrixalus and Hyperolius) or wrinkled skin (Schismaderma). Xenopus was sexed by examining the skin folds around the vent, which are smaller in males than in females. However, certain species could not be sexed on external features alone (cf. Rana and Chiromantis), and dissection was necessary. The sexing of immature frogs was also performed by dissection, though the lack of fully developed testes or ovaries did make this task difficult. In the field, sexing was based on observations such as mating and egg-laying, or other inferential information such as calling.

Generally, the sexing of reptiles proved considerably more difficult. Perhaps with the exception of Dispholidus typus typus in Natal (males are usually green and females usually brown, though this is not an invariable rule), there is no sexual dichromatism amongst the snakes. The sexes of some snakes are morphologically different, however, the tail being proportionately longer in males than females. This is most conspicuous in Bitis arietans arietans where the tail is contained 6,2 - 9 times into the total length in males, and 11,3 - 17 times in females (Broadley 1983).

Only a few lizards could be reliably sexed on external features. Adult Stellio atricollis males usually have comparatively larger heads and more swollen cheeks than females, and robust tails normally with a double row of preanal pores. Males are often brilliantly coloured too, especially during the breeding season. Breeding Mabuva striata striata males are often

suffused with orange on the throat and sides of the head, while male gekkonid lizards often have femoral and preanal pores, and noticeable hemipenial bulges just behind the vent.

Initially, a number of snakes and lizards, live specimens as well as fresh mortalities, were either gently squeezed behind the cloaca or probed using makeshift sex probes. In many cases these methods proved unsatisfactory or unreliable and were eventually abandoned, largely because many species could not be induced to evert their hemipenes. It is important to note that the hemipenes of some snakes, particularly the psammophines, are small, and squeezing and probing may cause injury to specimens.

Eventually, in July 1988, two other procedures were employed to determine the sex of preserved material. First, longitudinal incisions were made into the proximal portion of the tail, just behind the vent, to expose the male copulatory organs. Although this proved sufficient to sex some of the specimens, the hardening and bleaching properties of formalin often made it practically impossible to distinguish the hemipenes from the retractor muscles of others. In the second procedure, the specimens were pinned out and incisions made along the entire length of their ventrums to expose the reproductive organs and, incidentally, to gather gut contents and parasites. A sound knowledge of reptile anatomy is required to locate the testes and ovaries however, especially of unproductive males and females, and consequently a number of specimens could not be reliably sexed using this technique.

Two criteria were used for sexing tortoises: the shape of the plastron (concave in males, straight in females) and the length of the tail (proportionately longer in males than in females). Terrapins were also sexed according to the length of the tail, but since there is no obvious plastral concavity in males, the distally upturned femoral shields was another feature used to sex males. Only reproductive adults could be reliably sexed in this manner.

In the text, the past tense is used to describe specimens which were sighted or collected and subsequently released, while the present tense refers to preserved material which is now lodged at TM and PEM.

Tables of specimens with mensural data

The present author is of the opinion that providing unworked mensural data on amphibians and reptiles in tabular form may be important to other herpetologists. The raw data can be used for comparative purposes in similar studies, particularly when comparing age, sex and size ratios in different species. The data may also throw light on the ecological characteristics

of herpetological species, especially, as noted by Seugel and Ford (1988), the life-history evolution and foraging ecology of snakes.

These tables are provided in the appendix.

Prey items and parasites

Amphibian prey items were identified at feeding sites, from scats or from the guts of preserved specimens. However, not every preserved amphibian was dissected, and so gut dietary items were analysed incidentally. Reptile prey items were also identified at feeding sites, from disgorged meals and from gut contents. Invertebrate remains in Naja mossambica were identified by Mr. Mark Wright, Department of Agriculture, and the mammalian remains in Psammophis phillipsii were identified by Dr. Anthony Maddock and Mr. Guy Palmer, Chief Directorate of Nature and Environmental Conservation. Parasites were collected opportunistically from all reptiles, with the notable exception of chelonians, and preserved in formalin. Ectoparasites were despatched to the Directorate of Veterinary Services at the Onderstepoort Veterinary Institute for identification; endoparasites were identified by Dr. M.H.C. Visser of the Zoology Department, University of Stellenbosch.

Age classes

Age class ratings were based on the reproductive development and/or size of the specimens. An adult refers to a sexually mature individual or one whose size corresponds to adult sizes provided in authoritative accounts (Poynton 1964, Passmore and Carruthers 1979, Poynton and Broadley 1985a, Poynton and Broadley 1985b, Wager 1986, Poynton and Broadley 1987, and Poynton and Broadley 1988 for amphibians; FitzSimons 1943 for lizards, Broadley 1983 for snakes, Bourquin and Boycott 1988 for chelonians, and Branch 1988a for all reptiles), a subadult refers to a young individual which is not reproductively mature or whose size suggests it is not reproductively mature, and is of a size somewhere between an adult and a juvenile; and a juvenile is a small, sexually immature individual which, in the case of a frog, has recently metamorphosed from tadpole to frog or, in the instance of a reptile, has recently hatched (oviparous) or has been given birth to (viviparous).

Abundance and scarcity ratings

Each taxa was accorded a rating in terms of how frequently or infrequently it was encountered. A common taxon refers to a taxon which is often encountered in its preferred habitat and whose population is large and viable; an uncommon taxon refers to a taxon which

is found infrequently but whose population is, or is assumed to be, viable; and a rare taxon refers to a taxon which is scarce and very infrequently encountered, and whose breeding potential and viability is unknown. These ratings are applicable to taxa recorded from OSCA only, and are not to be confused with the conservation status of the taxa in South Africa, such as those listed in the Red Data Book - Reptiles and amphibians (RDB-RA) (Branch 1988c).

CHECKLIST OF THE HERPETOFAUNA OF THE OWEN SITOLE COLLEGE OF
AGRICULTURE

SYSTEMATIC ACCOUNT

CLASS: AMPHIBIA

ORDER: ANURA

FAMILY: PIPIDAE

SUBFAMILY: XENOPODINAE

Xenopus Wagler, 1827

Xenopus laevis laevis (Daudin, 1802) - Common Platanna

FAMILY: BUFONIDAE

Bufo Laurenti, 1768

Bufo gutturalis Power, 1927 - Guttural Toad

Schismaderma Smith, 1849

Schismaderma carens (Smith, 1848) - Red Toad

FAMILY: MICROHYLIDAE

SUBFAMILY: PHRYNOMERINAE

Phrynomerus Noble, 1926

Phrynomerus bifasciatus bifasciatus (Smith, 1847) - Banded Rubber Frog

FAMILY: RANIDAE

SUBFAMILY: RANINAE

Pyxicephalus Tschudi, 1838

Pyxicephalus adspersus edulis Peters, 1854 - Bullfrog

Tomopterna Duméril and Bibron, 1841

Tomopterna cryptotis (Boulenger, 1907) - Tremolo Sand Frog

Tomopterna natalensis (Smith, 1849) - Natal Sand Frog

Rana Linnaeus, 1758

Rana angolensis Bocage, 1866 - Common River Frog

Strongylopus Tschudi, 1838

Strongylopus fasciatus fasciatus Smith, 1849 - Striped Stream Frog

Ptychadena Boulenger, 1918

Ptychadena oxyrhynchus (Smith, 1849) - Sharp-nosed Grass Frog

Ptychadena anchietae (Bocage, 1867) - Plain Grass Frog

SUBFAMILY: PHRYNOBATRACHINAE

Phrynobatrachus Günther, 1862

Phrynobatrachus natalensis (Smith, 1849) - Snoring Puddle Frog

Phrynobatrachus mababiensis FitzSimons, 1932 - Dwarf Puddle Frog

Cacosternum Boulenger, 1887

Cacosternum nanum nanum Boulenger, 1887 - Bronze Caco

FAMILY: RHACOPHORIDAE

Chiromantis Peters, 1854

Chiromantis xerampelina Peters, 1854 - Foam Nest Frog

FAMILY: ARTHROLEPTIDAE

Arthroleptis Smith, 1849

Arthroleptis wahlbergii Smith, 1849 - Bush Squeaker

FAMILY: HEMISOTIDAE

Hemisus Günther, 1867

Hemisus guttatus (Rapp, 1842) - Spotted Shovel-nosed Frog

FAMILY: HYPEROLIIDAE

Leptopelis Günther, 1859 "1858"

Leptopelis natalensis (Smith, 1849) - Forest Tree Frog

Leptopelis mossambicus Poynton, 1985 - Brown-backed Tree Frog

Kassina Girard, 1853

Kassina senegalensis (Duméril and Bibron, 1841) - Bubbling Kassina

Afrixalus Laurent, 1944

Afrixalus brachycnemis brachycnemis (Boulenger, 1896) - Golden Leaf-folding Frog

Afrixalus fornasinii (Bianconi, 1850) - Greater Leaf-folding Frog

Hyperolius Rapp, 1842

Hyperolius semidiscus Hewitt, 1927 - Yellow Striped Reed Frog

Hyperolius argus Peters, 1854 - Argus Reed Frog

Hyperolius tuberilinguis Smith, 1849 - Tinker Reed Frog

Hyperolius pusillus (Cope, 1862) - Water Lily Frog

Hyperolius marmoratus marmoratus Rapp, 1842 - Painted Reed Frog

Hyperolius marmoratus taeniatus Peters, 1854 - Painted Reed Frog

CLASS: REPTILIA

ORDER: CHELONII

SUBORDER: PLEURODIRA

FAMILY: PELOMEDUSIDAE

SUBFAMILY: PELOMEDUSINAE

Pelomedusa Wagler, 1830

Pelomedusa subrufa (Lacépède, 1788) - Cape or Hingless Terrapin

SUBORDER: CRYPTODIRA

FAMILY: TESTUDINIDAE

SUBFAMILY: TESTUDININAE

Kinixys Gray, 1831

Kinixys natalensis Hewitt, 1935 - Natal Hinged Tortoise

ORDER: CROCODILIA

FAMILY: CROCODYLIDAE

Crocodylus Laurenti, 1768

Crocodylus niloticus Laurenti, 1768 - Nile Crocodile

ORDER: SQUAMATA

SUBORDER: LACERTILIA

INFRAORDER: GEKKOTA

FAMILY: GEKKONIDAE

SUBFAMILY: GEKKONINAE

Hemidactylus Oken, 1817

Hemidactylus mabouia mabouia (Moreau de Jonnés, 1818) - Tropical House Gecko

Lygodactylus Gray, 1864

Lygodactylus capensis capensis (A. Smith, 1849) - Cape Dwarf Gecko

INFRAORDER: ANGUIMORPHA

FAMILY: VARANIDAE

Varanus Merrem, 1820

Varanus niloticus niloticus (Linnaeus, 1766) - Nile Monitor or Water Leguaan

INFRAORDER: IGUANIA

FAMILY: AGAMIDAE

Stellio Laurenti, 1768

Stellio atricollis (A. Smith, 1849) - Tree Agama

FAMILY: CHAMAELEONIDAE

Chamaeleo Laurent, 1768

Chamaeleo dilepis dilepis Leach, 1819 - Flap-necked Chamaeleon

FAMILY: SCINCIDAE

SUBFAMILY: ACONTIINAE

Acontias Cuvier, 1817

Acontias plumbeus Bianconi, 1849 - Giant Legless Skink

SUBFAMILY: SCINCINAE

Scelotes Fitzinger, 1828

Scelotes brevipes Hewitt, 1925 - Hewitt's Monodactyle- or Dwarf Burrowing Skink

SUBFAMILY: LYGOSOMATIINAE

Mabuva Fitzinger, 1828

Mabuva homalocephala depressa (Peters, 1854) - Peters' Black-flanked Skink

Mabuva varia (Peters, 1867) - Common Variable Skink

Mabuva striata striata (Peters, 1844) - Common Striped Skink

Panaspis Cope, 1868

Panaspis wahlbergii (A. Smith, 1849) - Wahlberg's Snake-eyed Skink

FAMILY: CORDYLIDAE

SUBFAMILY: CORDYLINAE

Chamaesaura Schneider, 1799

Chamaesaura macrolepis (Cope, 1862)- Large-scaled Snake-Lizard

SUBFAMILY: GERRHOSOURINAE

Tetradactylus Merrem, 1820

Tetradactylus africanus africanus (Gray, 1838) - African Long-tailed Seps

SUBORDER: SERPENTES

INFRAORDER: SCOLECOPHIDIA

FAMILY: TYPHLOPIDAE

SUBFAMILY: TYPHLOPINAЕ

Typhlops Opper, 1811

Typhlops bibronii (A. Smith, 1846) - Bibron's Blind Snake

FAMILY: LEPTOTYPHLOPIDAE

Leptotyphlops Fitzinger, 1843

Leptotyphlops scutifrons scutifrons (Peters, 1854) - Peters' Worm- or Thread-Snake

INFRAORDER: HENOPHIDIA

FAMILY: BOIDAE

SUBFAMILY: PYTHONINAE

Python Daudin, 1803

Python sebae natalensis A. Smith, 1840 - African Rock Python

INFRAORDER: CAENOPHIDIA

FAMILY: COLUBRIDAE

SUBFAMILY: BOAEDONTINAE

TRIBE: BOAEDONTINI

Lamprophis Fitzinger, 1843

Lamprophis aurora (Linnaeus, 1754) - Aurora House-Snake

Lamprophis inornatus (Duméril and Bibron, 1854) - Olive-brown or Black House-Snake

Lamprophis fuliginosus (Boie, 1827) - Brown House-Snake

TRIBE: LYCOPHIDINI

Lycophidion Fitzinger, 1843

Lycophidion capense capense (A. Smith, 1831) - Cape Wolf-Snake

Mehelya Csiki, 1903

Mehelya capensis capensis (A. Smith, 1847) - Cape File-Snake

Mehelya nyassae (Günther, 1888) - Black File-Snake

TRIBE: PSEUDASPINI

Duberria Fitzinger, 1826

Duberria lutrix lutrix (Linnaeus, 1758) - Southern Slug-Eater

SUBFAMILY: PSAMMOPHIINAE

Psammophylax Fitzinger, 1843

Psammophylax rhombeatus rhombeatus (Linnaeus, 1754) - Spotted or Rhombic
Skaapsteker

Psammophis Boie, 1825

Psammophis sibilans brevirostris Peters, 1881 - Short-snouted Grass-Snake

Psammophis phillipsii (Hallowell, 1844) - Olive Grass-Snake

SUBFAMILY: ATRACTASPIDINAE

TRIBE: APARALLACTINI

Aparallactus Smith, 1849

Aparallactus capensis A. Smith, 1849 - Black-headed Snake or Cape
Centipede-Eater

TRIBE: ATRACTASPIDINI

Atractaspis Smith, 1849

Atractaspis bibronii A. Smith, 1849 - Bibron's Stiletto- or Side-stabbing
Snake

SUBFAMILY: 'INCERTAE SEDIS'

Prosymna Gray, 1849

Prosymna ambigua stuhlmannii (Pfeffer, 1893) - East African Shovel-snout

SUBFAMILY: COLUBRINAE

TRIBE: BOIGINI

Philothamnus Smith, 1840

Philothamnus hoplogaster (Günther, 1863) - Green Water-Snake

Philothamnus semivariiegatus semivariiegatus A. Smith, 1840 - Spotted
or Variegated Bush-Snake

Crotaphopeltis Fitzinger, 1826

Crotaphopeltis hotamboeia (Laurenti, 1768) - Red-lipped or Herald Snake

Telescopus Wagler, 1830

Telescopus semiannulatus semiannulatus A. Smith, 1849 - Eastern Tiger-Snake

Dispholidus Duvernoy, 1832

Dispholidus typus typus A. Smith, 1829 - Boomslang or Back-fanged Tree-Snake

Thelotornis Smith, 1849

Thelotornis capensis capensis A. Smith, 1849 - Southern Vine- or Twig-Snake

TRIBE: DASYPELTINI

Dasypeltis Wagler, 1830

Dasypeltis scabra (Linnaeus, 1758) - Common or Rhombic Egg-Eater

FAMILY: ELAPIDAE

SUBFAMILY: ELAPINAE

TRIBE: NAJINI

Naja Laurenti, 1768

Naja mossambica Peters, 1854 - Mozambique Spitting Cobra

TRIBE: DENDROASPIDINI

Dendroaspis Schlegel, 1848

Dendroaspis polylepis Günther, 1864 - Black or Black-mouthed Mamba

Dendroaspis angusticeps (A. Smith, 1849) - Green Mamba

FAMILY: VIPERIDAE

SUBFAMILY: CAUSINAE

Causus Wagler, 1830

Causus rhombeatus (Lichtenstein, 1823) - Common or Rhombic Night-Adder

SUBFAMILY: VIPERINAE

Bitis Gray, 1842

Bitis arietans arietans (Merrem, 1820) - Puff-Adder

TAXONOMY

Amphibian taxonomy

The identification of forms was based primarily on major southern or southeastern African amphibian texts (Poynton 1964; Passmore and Carruthers 1979; Poynton and Broadley 1985a, 1985b, 1987; and Wager 1986). A number of crude features were selected for diagnoses in the present study: the shape of the pupil; the length of the toes or fingers; the degree of webbing of the fingers and toes; the colour and texture of the ventrum; and colour pattern. The basic morphology of the form, plus the snout-vent length, tibial length and head diameter were also used as features of diagnostic value.

The term form is used in this work as it is used by other authors (Poynton 1964) to refer to either a race, subspecies or monotypic species. It is based on the external appearance or phenotypic features of the animal, with disregard for the internal complexity or genetic make-up. Electrophoresis and other protein-separation testing would certainly throw light on the classification of amphibians, testing which, up until the present time, has not been attempted largely due to the lack of manpower. It would also present an insight into the genetic affinities of forms, and assist in the classification of anurans at the subspecific, specific, generic and familial levels.

The internal anatomy of amphibians, such as the shape and size of the pectoral girdle, can yield useful information about the taxonomy of forms, but, as noted by Poynton (1964), it is not necessarily as reliable as a taxonomic character than is an external feature, and of course requires that the amphibian be dissected before a diagnosis can be made. Furthermore, the internal anatomy of the form may show as much variation as the external features. No attempt was made to examine this feature in the present study.

The nomenclatural classification of amphibians, however, cannot be based entirely on external characteristics. Ecological considerations are perhaps even more important. For instance, frogs collected from one locality may display similar or only subtle differences in external features, but may occupy different habitats and produce different calls. These calls are mate recognition specific, precluding, in the great majority of circumstances anyway, the possibility of interspecific mating. The taxonomist, often lacking information about these differences in the field, might be tempted to identify all the specimens under one species, ascribing the subtle differences to variation within the population or perhaps recognising different subspecies. Such cases are not figmented. The recognition of Tomopterna delalandii and cryptotis as full species; the description of a new species of sand frog, namely T. krugerensis

by Passmore and Carruthers (1975), a species which is partially sympatric with cryptotis; and the elevation of Strongylopus fasciata montana (=bonaespei) to specific rank by Greig *et al.* (1979) are cases in point. The recognition of sibling species is therefore very much dependent on field observation.

The specific mate recognition calls of different forms ensures that mating occurs between conspecific sexual partners. The recognition of these calls is invaluable in identifying the different forms. However, the identification of frogs and toads purely on the basis of their calls requires a familiarity with the vocalisations of each form. Moreover, there are some forms which are capable of producing two dissimilar calls, such as Rana angolensis. During the course of collecting exercises, the present author become familiar with the calls of a number of frogs and toads; however, unfamiliarity with others led to missed opportunities to establish the relative abundance, habitat, activity patterns, biological associations and other ecological and behavioural data for a number of forms.

Reptile taxonomy

The taxonomy of reptiles in southern Africa is considerably more advanced than the taxonomy of southern African amphibians. This is largely because reptiles have enjoyed more attention from herpetologists than amphibians. Unlike anurans however, most reptiles cannot vocalise, and of those which can, the call is rarely if ever used as a means of identification. Southern African exceptions may include the Nile Crocodile Crocodylus niloticus, males of which may bellow during the breeding season, or the barking geckos Ptenopus whose distinctive crepuscular or nocturnal calls may also aid in their identification.

One of the most obvious characteristics of snakes and lizards is their dry, horny skin which is modified into scales. The number and configuration of the scales, along with morphology, teeth or fang structure, colour pattern, and size are diagnostic for the identification of forms.

Apart from the obvious external features of taxonomic value, such as scalation and dentition, hemipenial morphology is another useful feature which has been largely neglected by herpetologists. Branch (1986), in a taxonomic review of the hemipenial morphology of African snakes, states that the male genitalia of snakes, the hemipenes, are structures that have no obvious correlation with ecology, food habits or locomotion, and as such they give greater insight into phylogenetic relationships than habit- or habitat-correlated characters. The study of hemipenial morphology should ideally be based on fresh material and requires considerable preparation, including the severing of retractor muscles, and eversion of the hemipenes by the injection of paraffin (Branch 1986a). In this study, no attempt was made to evert the

hemipenes. The hemipenes of some specimens, however, were partially everted when fixative was injected into the base of their tails. The basic configuration and depth of the hemipenes in the dormant position, in terms of the subcaudal level at which bifurcation and termination occurs was, however, noted incidentally to sexing material.

In the present study, the author investigated the following primary features in the diagnosis and description material: morphology, scalation or scutation, and colour pattern. Full scale counts (head-shields, ventrals, subcaudals and midbody rows) were performed on all material, except where otherwise indicated. The size, teeth, fang or beak structure, and total length/tail length ratio were secondary or additional features also used, especially where the taxonomy of material was confused.

RESULTS

SPECIES: Xenopus laevis laevis (Daudin, 1802). Common Platanna.

RANGE: All southern Africa, excluding most of the Mozambique Plain and its eastern fringes north of Lake St. Lucia, most of Botswana, and northern Namibia (Poynton 1964; Poynton and Broadley 1985a).

HABITAT PREFERENCES: Any more or less permanent bodies of water (Passmore and Carruthers 1979); common in most plateau rivers, lakes, flooded pits and wells (Poynton and Broadley 1985a).

SPECIES OCCURRENCE: A common frog. Four adults were collected, and many more sighted, of which three are preserved: OSCA A14, A15 and A36. Four larvae were collected, and many more sighted: OSCA A42.

A14 and A15 were collected from a pool of murky water below the purification plant in October 1986; A36 and another adult (released) were collected from the cattle dam below the staff houses in July 1987. The larvae were collected, and many more sighted, from the shallows of one of the fish ponds in January 1988. From one to seven adults were observed in clear canalised water below the culvert opposite the nursery from January to March 1987, and again in December 1988. Adults were also sighted in the cattle dam opposite the paddocks in December 1988.

SIZE, SEX, MEASUREMENTS AND MASS: See Tables 1 and 2. A14, A15 and a specimen released were adult males; A36 is an adult female; and A42 comprises four larvae (tadpoles).

Three males (n=3) provided a mean S.V.L. of 63 (range 58 - 67) mm, S.L. 27,3 (25 - 29) mm and D.H. 21 (19 - 24) mm; one female (n = 1) provided a S.V.L. of 102 mm, S.L. 40 mm and D.H. 31 mm.

Four larvae (n=4) ranged from Nieuwkoop and Faber (1986) stages 51 to 62. Two specimens at stages 51 and 54 had S.V.L.'s of 25,3 and 26,2 mm, and D.H. of 12,0 and 11,2 mm respectively; the specimen at stage 59 had a S.V.L. of 31,5 mm, S.L. 6,2 mm and D.H. 13,9 mm; the specimen at stage 62 provided a S.V.L. of 18,6 mm, S.L. 8,0 and D.H. 7,0 mm.

One male (n=1) weighed 27,84 g; and one female (n=1) weighed 74,33 g.

TAXONOMIC CHARACTERISTICS: The small series displayed the features diagnostic for X. l. laevis as described in Wager (1986), Passmore and Carruthers (1979), and Poynton and Broadley (1985a). A female specimen (A36), with a S.V.L. of 102 mm, typified this taxon which is known to attain a size of over 100 mm (Poynton and Broadley 1985a) and which also assisted to distinguish it from the smaller northerly subspecies petersii Bocage. Dark patches were scattered on an olive brown dorsum, while the ventral colours showed the full range from greyish-white without any grey flecks to yellowish with localised grey flecks. Wall and Blacker (1974) have reported on the sympatry of laevis with X. muelleri (Peters) along the edge of the Mozambique Plain and Zambesi Plain, where introgression can be achieved.

FIELD NOTES: The specimens in the canal below the culvert were observed feeding on drowned and drowning earthworms. They inhabited the pools with large numbers of Natal River Crabs Potamonautes sidneyi (Rathbun, 1904). During the day they would often remain motionless on the pool substrate, but quickly sought shelter under decaying leaf litter or underwater rock ledges and crevices whenever disturbed. At night they were occasionally seen in a stationary position just below the surface of the water, their heads tilted upwards.

The pool floor was covered primarily with sand and a few loose boulders, and was filled with water only after substantial rains. It is dry for most of the year, particularly in winter. Also collected from in and around the canal were Rana angolensis, Ptychadena anchieatae, Cacosternum nanum nanum, Tomopterna natalensis and Phrynobatrachus mababiensis.

One of the males and the female collected from the cattle dam below the staff houses, were hooked on rod and line using earthworms as bait. Chiromantis xerampelina, Phrynobatrachus mababiensis, Schismaderma carens, Bufo gutturalis and Kassina senegalensis have also been recorded from this locality.

The two specimens collected from the murky pool at the end of a drainage pipe (A14 and A15) were individuals from a small population whose presence had been noted for at least four months. Although this pool experienced considerable fluctuations in water levels, it at no stage during the study dried up. These specimens were kept in captivity for four weeks along with other anurans before being sacrificed. Over this period, A14 fed on an adult Tomopterna natalensis and an adult Hyperolius marmoratus taeniatus. Both prey were completely digested when this frog was sacrificed ten days after consuming the last item.

The four larvae were collected from one of the large fish ponds. They were dead or dying and were lying on their sides or backs in the shallows of the pond which was filled to a depth of less than a metre. Many more larvae were showing signs of distress, swimming sluggishly

to the surface and then spiraling down again. There was no water turbulence at the time, and the water was extremely warm. Other anurans recorded from in and around this pond were S. carens, R. angolensis, P. anchietae, Phrynomerus bifasciatus bifasciatus, C. n. nanum, Phrynobatrachus natalensis, P. mababiensis, K. senegalensis, C. xerampelina, Afrivalis brachycnemis brachycnemis, Hyperolius argus, H. tuberilinguis and H. marmoratus subsp.

Adults were sighted at night at the cattle dam opposite the cattle paddocks. They were submerged just below the surface of the water, but disappeared within moments of a torch light being shone on them. P. anchietae, R. angolensis and K. senegalensis were also recorded from this dam. It is probable that this frog occupies Cwaka Dam and other permanent as well as temporary water bodies at OSCA, but because of its aquatic habits was difficult to find.

SPECIES: Bufo gutturalis Power, 1927. Guttural Toad.

RANGE: Maputaland, Natal, Lesotho, northern Cape Province and Free State, Transvaal, Swaziland, Mozambique, Zimbabwe, eastern and northern Botswana, and northern Namibia (Poynton 1964).

PREFERRED HABITAT: Open pools, dams, streams or other more or less permanent water (Passmore and Carruthers 1979); breeding takes place usually in bodies of shallow permanent water (Poynton and Broadley 1988).

SPECIES OCCURRENCE: A common toad, particularly in and around places of human habitation. Over twenty specimens were collected, and many more sighted, of which three are preserved: OSCA A4, A30 and A71.

The majority of specimens were collected, and many more sighted, under lamp-lit walkways and lawns at the main complex, students' dormitories, staff houses and water purification plant predominantly in the summer and autumn months. Two specimens were collected from inside buildings in April 1987, the one from inside a student's shoe; one was collected from under a wooden plant box at the nursery in March 1987, and another two were collected from a seep at the fish ponds in April 1987; three were collected from the pit and funnel traps in the savanna grassveld in December 1988, and one from a pit trap in the riverine vegetation in December 1988; and one was collected from a stream below the culvert near the veterinarian centre in December 1988. A small, but indeterminable number of individuals were found

hiding in or near human artefacts, or were flushed from vegetation during bush-clearing operations.

Males were sighted or heard calling from cattle dams, and from the edge of small circular cement ponds and surrounding grasses at the animal husbandry unit at night in January and December 1987, and again in January and December 1988. This species was also heard calling from the cattle dam below the staff houses and at Cwaka Dam in December 1988.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 3. A4 is an adult male and A30 an adult female; A71 is a juvenile. A total of fourteen specimens (n=14) were measured.

Ten specimens (n=10) were adults, providing a mean S.V.L. of 67,4 (range 56 -80) mm, S.L. 25,9 (22 - 31) mm and D.H. 25,6 (21 - 29) mm; three were subadults (n=3) with a mean S.V.L. of 36,7 (range 34 - 39) mm, S.L. 14,7 (13 -17) mm and D.H. 14,0 (11 - 16) mm; and one (n=1) was a juvenile with a S.V.L. of 20 mm, S.L. 7 mm and D.H. 7 mm.

Nine adults (n=9) and two subadults (n=2) were weighed, yielding an average mass of 33,16 (range 24,19 - 47,75) g and 4,20 (3,66 - 4,73) g respectively.

TAXONOMIC CHARACTERISTICS: The OSCA population is typical for B. gutturalis as described in Passmore and Carruthers (1979) and Wager (1986). The ground colour varied from yellow and olive to various shades of brown. The vast majority of specimens, including all small toads, had continuous vertebral lines; only in a few large adults was this line broken, or absent posteriorly.

FIELD NOTES: Activity patterns, which included movements to calling and feeding sites, tended to peak during and immediately after heavy downpours, which is primarily from December through to March. Males called after the first summer rains; they tended to congregate at call sites from which they called in choruses. The inflated vocal sacs were black and white, spotted with yellow. Males molested while calling emitted puppy-like yelps and inflated their bodies with air, rarely attempting to leap away. Two of the specimens fed to snakes emitted similar distress calls when seized in the jaws.

The density of toads encountered under lamps varied considerably. There was little activity in the winter months with specimens sighted only occasionally, and then only on relatively warm evenings. Late one evening (21h40) in January, within hours of a torrential downpour, a total of 27 specimens were counted on a lawn within a four metre radius of a lamp. This locality

was approximately 120 metres from the nearest recorded breeding site. Similar observations were made in the warm and humid summer evenings, particularly after downpours.

Many specimens, the majority of which were not catalogued, were fed to Naja mossambica, Causus rhombeatus and Bitis arietans arietans. Their only means of defence against these snakes was to remain motionless, thereby tending to evade being noticed, and when approached, to inflate their bodies with air.

B. gutturalis will tackle practically any insect small enough to overpower. They were attracted to the insects by the movements of the latter, and approached their prey in a series of leaps. Items taken included large numbers of termites (Hadotermitidae and Termitidae), small moths (Lepidoptera), lacewings (Neuroptera), long-horned grasshoppers and katydids (Tettigonidae), and small beetles (Hymenoptera) and bugs (Hemiptera). Adult antlions (Palpares sp.) and large moths were often investigated, but were usually ignored in preference for smaller prey.

In captivity this toad would burrow in loose, moist earth. Burrowing was effected by shuffling the body backwards into the substratum, using both the fore- and hindlimbs. The body was flattened dorso-ventrally when in position, usually with the anterior portion of the body, head and forelegs partially protruding, and the toad would remain immobile in this state for days. In this condition the pigmentation darkened considerably.

Although B. gutturalis and S. carens were found occurring in similar artificial or disturbed habitats, they were, with one notable exception, never encountered at the same sites. For instance, these two species were never observed feeding together at the same site, such as under a lamp post, though the one species was occasionally found congregating under a post within metres of the other. Segregation between these two species is thus the norm, and occurs without calls or any other form of vocalisation.

SPECIES: Schismaderma carens (Smith, 1848). Red Toad.

RANGE: Natal, Swaziland, Transvaal, north-eastern Cape, eastern Botswana, Zimbabwe and Mozambique (Poynton 1964).

HABITAT PREFERENCES: Permanent, fairly deep waterholes in open or wooded savanna (Passmore and Carruthers 1979); widespread in savannas (where) it favours deep pools or dams for breeding (Poynton and Broadley 1988).

SPECIES OCCURRENCE: A common toad, particularly in and around places of human habitation. A total of forty four post-larval specimens were collected, and many more sighted, of which three are preserved: OSCA A2, A6 and A16(b). A further thirty seven larvae (tadpoles) were collected, and many more sighted: A63.

The vast majority of post-larval specimens were collected or sighted from lamp-pit lawns and walkways, in or near buildings, under building rubble and wooden and plastic nursery boxes or trays, and from gardens throughout the year, though predominantly in the late summer and autumn months. Two specimens were also collected from savanna grassveld situations in December 1988, the one from a pit trap. Large numbers of toadlets were observed on the partially vegetated banks of the balancing dam above the compound in January 1988. Shoals of larvae were sighted in the cattle dam below the staff houses in January and December 1988; larvae (A63) were collected, and many more sighted, from a fish pond in December 1988.

SIZE, SEX, MEASUREMENTS AND MASS: See Tables 3 and 4. A2 and A6 are adult males, and A16(b) is an adult female. A total of forty four post-larval specimens and thirty seven larval specimens were measured.

Twenty four specimens (n=24) were adults which provided a mean S.V.L. of 70,2 (range 55 - 85) mm, S.L. 28,0 (23 - 34) mm and D.H. 24,6 (18 - 32) mm; fourteen (n=14) were subadult with a mean S.V.L. of 37,4 (range 30 - 46) mm, S.L. 15,6 (11 - 20) mm and D.H. 13,1 (10 - 17) mm; and six (n=6) were juveniles (toadlets) with a mean S.V.L. of 26,2 (range 20 - 29) mm, S.L. 10,3 (7 - 13) mm and D.H. 9,3 (7 - 11) mm.

Thirty seven larvae (n=37) were measured, providing a mean S.V.L. of 16,6 (15,8 - 17,7) mm.

Twenty one adults (n=21) were weighed, yielding an average mass of 35,31 (range 14,49 - 59,42) g; fourteen subadults (n=14) provided an average mass of 5,34 (2,39 - 9,12) g; and six juveniles (n=6) provided an average mass of 1,79 (0,66 - 2,55) g.

TAXONOMIC CHARACTERISTICS: The OSCA population is typical for S. carens as described in Poynton (1964), Passmore and Carruthers (1979) and Wager (1986). The ground colour varied from greyish-brown to brick red.

FIELD NOTES: Both preserved males had very long testes. What appeared to be a parasite was lodged in the lung of A2. A16(b), collected in November 1986, contained a large, but indeterminable number of small eggs.

The vast majority of specimens collected were offered to snakes. They were readily taken by Naja mossambica, Causus rhombeatus and Bitis arietans arietans, but Philothamnus semivariiegatus semivariiegatus, Lamprophis fuliginosus and Psammophis sibilans brevirostris all refused offers of this toad, though the latter two species did show initial interest, with P. s. brevirostris actually grabbing a small specimen in its jaws before quickly releasing it. As with B. gutturalis, the only means of defence offered by these toads when advanced on was to remain motionless and to inflate their bodies with air. On only three occasions was this toad heard to emit distress calls when bitten, though most specimens did kick violently with their hind limbs. A small adult with a S.V.L. of ca. 50 mm was airlifted from the grass banks of a shallow ephemeral stream near the game park by a Fiscal Shrike Lanius collaris and impaled on an Acacia karroo thorn where it was left to decompose without the bird making any attempt to feed on it. An adult with a S.V.L. of ca. 60 mm was found while it was in the process of being swallowed by a subadult Mozambique Spitting Cobra N. mossambica in the locker of one of the students' dormitories, but was quickly disgorged when the snake was disturbed.

Another specimen, A16(b) with a S.V.L. of 63 mm, was placed in a terrarium with a number of other anurans and Natal River Crabs (Potamonautes sidneyi). This toad died 11 days later of unknown causes and was partially eaten by the crabs before being consumed by a Bullfrog Pyxicephalus adspersus edulis (A16(a) with a S.V.L. of 84 mm) from whose gut it was removed one day later.

This toad gathered in considerable numbers under lamps at night to feed on insects attracted to the light. Up to 27 subadults and adults were observed under one lamp at the water purification plant in December 1988. One night in January a few hours after a downpour, 36 individuals were counted on a lawn within a four metre radius of a lamp pole. The pole was located approximately 140 metres away from the nearest recorded breeding site for this species. On this occasion a large adult B. gutturalis was observed on the perimeter of this radius. This was the first time the two species were found in close proximity to each other;

on all other occasions the two species have been segregated. The segregation of the two species under lamps at night occurred without calling or any other vocalisations.

S. carens fed on practically the same food items as B. gutturalis; that is, it would tackle any insect small enough to overpower. Any sudden movement by the insect, whether small enough to consume or not, was investigated in a series of short, deliberate leaps. The gut of A2 contained the remains of termites (Hodotermes mossambicus).

Juveniles and subadults tended to be more active than adults, leaping with greater frequency. Furthermore, S. carens tended to be more active and agile than B. gutturalis, and would often move away in a series of short hops when threatened; on one occasion a specimen with a S.V.L. of ca. 40 mm was recorded covering almost three metres in 2,3 seconds. Juveniles and subadults generally displayed brighter dorsal colours, from brick red to pinkish, than adults.

Of all the adult S. carens specimens observed, only one specimen, A6 with a S.V.L. of 60 mm, S.L. 27 mm and D.H. 20 mm, showed any visible deformity. Its back was noticeably hunched and its hind legs were emaciated. Its legs proved extremely weak and it was incapable of the short leaps performed by, and characteristic of, this species; its mobility was in fact reduced to little more than shuffling along the ground.

In January 1988 large numbers of S. carens toadlets, apparently having just completed metamorphosis, were encountered on the sparsely vegetated banks of the balancing dam above the staff houses. The average S.V.L. of these toads was approximately 20 mm and they displayed a cryptic colouration, making it difficult to distinguish them from the drab gravel substrate. Large numbers of individuals, in places as many as 30 or more per square metre, were found under the shade of creepers on the banks of the balancing dam. Also present at the balancing dam, which had been excavated and filled with water only six months prior to this observation, was Ptychadena, probably P. anchietae, though other species may well have been present. It seems probable that S. carens also occurs at Cwaka Dam; the fact that it was not recorded there is probably an artefact of collecting.

Large shoals of S. carens tadpoles were observed in the cattle dam below the staff houses in January 1988. The tightly packed shoals consisted of many hundred to a few thousand individuals, and these shoals would intermittently rise to the surface. Also recorded from this

dam were X. l. laevis, B. gutturalis, P. mababiensis, C. xerampelina and K. senegalensis, though almost certainly other species occurred here too.

SPECIES: Phrynomerus bifasciatus bifasciatus (Smith, 1847). Banded Rubber Frog.

RANGE: Northern Natal, Mozambique, Transvaal, northern Cape Province, Botswana, northern Namibia and Zimbabwe (Poynton 1964; Poynton and Broadley 1985a).

HABITAT PREFERENCES: Shallow pans or inundated grass in savanna and Acacia veld (Passmore and Carruthers 1979); breeds in open pans, vleis or pits, often only temporarily filled (Poynton and Broadley 1985a).

SPECIES OCCURRENCE: An uncommon frog. A total of four specimens were collected, of which two were sacrificed and preserved: OSCA A21 and A27. One specimen was collected from the grass verge of one of the fish ponds in January 1987; one from under a wooden nursery box at the main nursery in March 1987; and two from water basin outlet pipes in an ablution block in April 1987 and December 1988, respectively.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 6. A21 is an adult male and A27 is an immature (subadult) female. Mensural data were obtained for four specimens.

A21 and two unsexed adults (n=3) provided a mean S.V.L. of 40,0 (range 39 - 41) mm; S.L. 12,7 (11 - 13) mm and D.H. 12,3 (11 - 13) mm. The subadult (n=1) provided a S.V.L. of 36 mm, S.L. 11 mm and D.H. 11 mm.

The three adults (n=3) yielded a mean mass of 5,04 (range 4,27 - 5,53) g; the subadult (n=1) weighed 3,16 g.

TAXONOMIC CHARACTERISTICS: The OSCA material is typical for P. bifasciatus as described in Passmore and Carruthers (1979), Poynton and Broadley (1985a) and Wager (1986). The orange dorso-lateral stripes, running from above the eyes to just short of the flanks, were continuous. The white dots tended to be largest and most concentrated on the lateral aspects of the belly, whereas the centre of the belly was only slightly flecked with small white dots. The concentration of dots on the throat was variable. Poynton and Broadley (1985b) name the taxon in the trinomial, implying that other subspecies occur to the north of the Zambesiaca area.

FIELD NOTES: Considerable colour change was noted. The typical black ground colour changed to a light greyish-black with a golden sheen, while the orange sacral patch and dorso-lateral stripes change to pink, almost white, under different lighting conditions. Colour change also occurred when the frog was agitated.

The testes of A21 were dark and spherical. The one specimen found in the ablution block in January 1987 was collected from the same plastic drainage pipe as one of two S. carens. When agitated, this aposematic frog would produce a thick mucous secretion which is sticky to the touch. The trilling call of this species was not recorded. It seems likely that this frog also occurs at Cwaka Dam and the cattle dams but, as with S. carens, was probably missed as a result of infrequent collecting at these sites. It would appear, however, that this species is peripheral at OSCA, reaching its southern distributional limit at Twinstreams (Poynton 1964).

SPECIES: Pyxicephalus adspersus edulis Peters, 1854. Bullfrog.

RANGE: Essentially a tropical form (Poynton 1964), widespread throughout Mozambique, the lowveld of Zimbabwe and occurring in Botswana, Namibia, the Transvaal lowveld and Zululand (Parry 1982).

HABITAT PREFERENCES: Temporary rain-filled depressions or vleis in open veld (Passmore and Carruthers 1979) .

SPECIES OCCURRENCE: A common frog. A total of five specimens were collected, three of which are preserved: OSCA A13, A16(a) and A22. The site and date of collection for A13 are not known, other than the specimen was collected from the OSCA grounds prior to the survey. The other four specimens were collected from open grassveld in the game park in March 1987, the vegetated upper slopes of Cwaka Dam in December 1986, under a moist stack of grass in November 1986, and under wooden trays in the nursery in February 1987, respectively. Calling was recorded from the horticulture fields and game park in December 1986 and January 1987.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 7. A16(a) is an adult female; A22 is a subadult female; and A13 is a juvenile.

The adult female and two other unsexed adults (n=3) provided a mean S.V.L. of 78,3 (range 72 - 84) mm, S.L. 30,7 (30 - 32) mm and D.H. 32,7 (30-34) mm; the subadult (n=1) provided a S.V.L. of 50 mm, S.L. 18 mm and D.H. 21 mm; the juvenile (n=1) provided a S.V.L. of 23 mm, S.L. 7 mm and D.H. 8 mm.

Two of the adults (n=2) were weighed, yielding a mean mass of 63,66 (range 57,03 - 70,28) g. The subadult (n=1) weighed 14,12 g.

TAXONOMIC CHARACTERISTICS: The small OSCA series falls within the range of characteristics for this taxon as described by Parry (1982) and Poynton and Broadley (1985b), in respect of size (maximum size of OSCA specimen 84mm; maximum size for edulis generally not more than 100mm, Parry 1982); D.H. versus S.V.L. (OSCA specimens 48 - 40%; 49 - 41% for edulis according to Poynton and Broadley 1985b; the slightly larger average D.H. of the OSCA material is probably ascribable to the crude measuring technique employed); and colour pattern (the dorsal colours range from a light to dark green, olive and beige).

With the exception of the juvenile (A13), all specimens had vertebral stripes, running from tip of snout to tip of urostyle. Tympanic spots were present. The ventral colour was dirty white or cream with a few green flecks on the throat. These characteristics distinguish this subspecies from the larger, broader-headed adspersus Tschudi and the smaller, narrow-headed angusticeps Parry.

FIELD NOTES: The specimen collected from under a moist stack of grass in November was in the process of shedding its cocoon of skin (see Plate 12). Two specimens, with a S.V.L. of 79 mm and mass of 70,28 g and S.V.L. of 72 mm and mass of 57,03 g respectively, were fed to an adult B. a. arietans from Hluhluwe (R72 with a T.L. of 965 mm and mass of 1150 g). The largest specimen, A16(a) with a S.V.L. of 84 mm, was kept in a vivarium where it consumed a partially eaten and decomposing S. carens (A16(b) with a S.V.L. of ca. 63 mm) the day before it was sacrificed. Males were heard calling from pools of water in the horticulture fields, from which this frog has also been ploughed up on occasion, and water-filled depressions in grassveld habitats in the game park after downpours in December 1986 and January 1987.

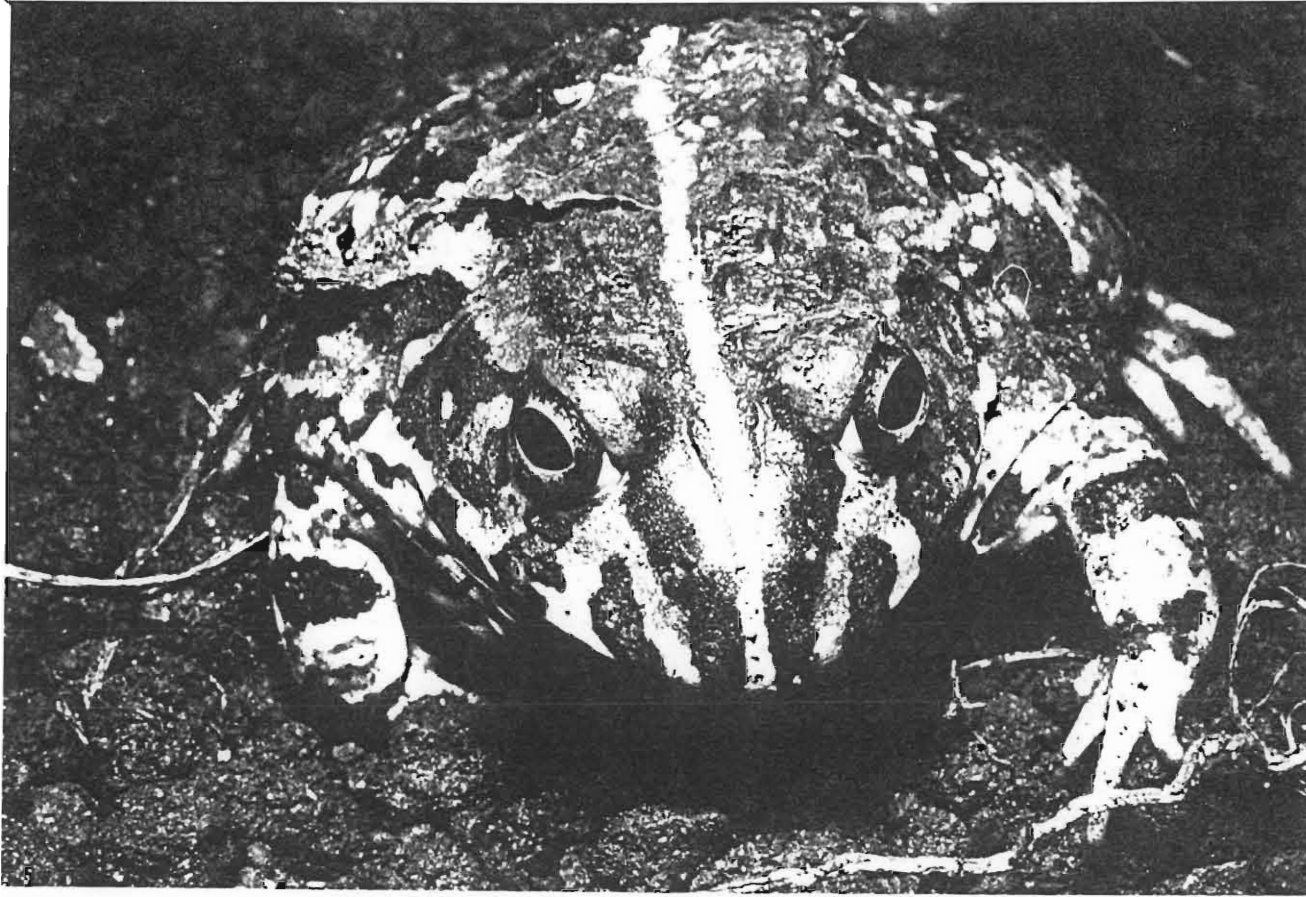


Plate 12. An adult Bullfrog *Pyxicephalus adspersus edulis* shedding its cacoon of skin (2,7 x life size).

SPECIES: Tomopterna cryptotis (Boulenger, 1907). Tremolo Sand Frog.

RANGE: All of southern Africa excluding the southwestern Cape and extremely arid areas, and also excluding all but the northernmost part of Natal (Poynton 1964).

HABITAT PREFERENCES: Temporary rain pools and vleis in open savanna (Passmore and Carruthers 1979); breeding takes place in shallow pools or rivers with sandy beds and in pans (Poynton and Broadley 1985b).

SPECIES OCCURRENCE: An uncommon frog. Only two specimens were collected, one of which is preserved: OSCA A17. A photographic record for the other was obtained. The preserved specimen was collected from leaf litter on the banks of the Cwaka River in October 1986; the other was collected from a water-filled depression in the horticulture fields in May 1987.

SIZE, SEX, MEASUREMENTS AND MASS: The preserved specimen (n=1) is an adult female with a S.V.L. of 51 mm, S.L. 22 mm and D.H. 20 mm; the other specimen was an unsexed adult. The mass of A17 was not obtained.

TAXONOMIC CHARACTERISTICS: The voucher specimen conforms to the description for T. cryptotis as provided in Passmore and Carruthers (1979), Poynton and Broadley (1985b) and Wager (1986). The dorsum was a mottled pale to dark brown with an extremely narrow and discontinuous vertebral line which originates between the eyes and terminates near the vent. A relatively broad, white dorso-lateral stripe was also present. The ventrum was smooth and white while the greater, anterior portion of the throat was heavily infused with varying shades of brown. The specimen for which a photographic record was obtained displayed a similar dorsal pattern.

Although there are only slight morphological differences between cryptotis and delalandii, Poynton and Broadley (1985b) are of the opinion that their treatment as separate species, as in Passmore and Carruthers (1979), is justified on the grounds of different calls, and serves to underline the taxonomic differences between the Cape and tropical faunas. Based on present distributional evidence, cryptotis and delalandii appear to be spatially separated, the latter ranging from the southwestern Cape to the eastern Cape. Poynton's (1964) remark, however, that the two forms are allopatric and show some intergradation (sic!), presumably in the eastern Cape, requires investigation. Passmore and Carruthers' (1975) recognition of krugerensis, again separated from cryptotis on very slight external differences but different calls, serves to illustrate the problem facing the researcher in identifying material without

ecological data, particularly since these two forms are sympatric over at least parts of their range.

FIELD NOTES: A17 contained a large, indeterminable mass of eggs. The eggs were white with a brown pole, 1,4 mm in diameter and were attached to each other. This species was not heard calling and it is probably peripheral at OSCA since it appears to keep away from coastal plains.

SPECIES: Tomopterna natalensis (Smith, 1849). Natal Sand Frog.

RANGE: Southern Mozambique, Transvaal, Natal and eastern Cape (Poynton 1964; Poynton and Broadley 1985b).

HABITAT PREFERENCES: Permanent streams, furrows or vleis in grassland (Passmore and Carruthers 1979); typical of small streams without much cover, but also occurring in open pans (Poynton and Broadley 1985b).

SPECIES OCCURRENCE: A common frog. A total of twelve specimens was collected, with many more sighted, of which three are preserved: OSCA A7, A29 and A45. These specimens were collected from a water-filled irrigation canal in August 1986; a reed bed on the banks of the Cwaka River in October 1986; under a shrub near the soccer field in November 1986; a grass patch alongside a pond in April 1987; under a carpet of freshly cut grass covering a seep at the fish ponds in January 1988; the platform of a small cement pond at the animal husbandry unit in January 1988; moist undergrowth of a garden in December 1988; roadside culverts near the veterinarian centre and main complex in December 1988; and from a seepage below the main nursery in December 1988. Vocalisations were recorded in December 1986 and January 1987, and again in January and December 1988.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 8. All twelve specimens collected were adults. A29 and seven other specimens (released) were males; A7, A45 and two others (released) were females.

Six males (n=6) were measured, providing a mean S.V.L. of 32,3 (range 30 - 35) mm, S.L. 16,2 (15 - 18) mm and D.H. 13,7 (12 - 14) mm; four females (n=4) provided a mean S.V.L. of 36 (range 31 - 39) mm, S.L. 16,5 (15 - 19) mm and D.H. 14,8 (12 - 17) mm.

Five males were weighed (n=5), providing a mean mass of 3,88 (range 3,50 - 5,39) g; two large females (n=2) yielded a mean mass of 8,00 (7,50 - 8,50) g.

TAXONOMIC CHARACTERISTICS: The twelve specimens examined conformed to the description of T. natalensis as described in Passmore and Carruthers (1979), Poynton and Broadley (1985b) and Wager (1986). The colour pattern was variable. The ground colour ranged from a marbled grey, tan to light brown, through to dark brown. A29 was dark brown with patches of light brown when sacrificed, whereas A7 and A45 were predominantly grey. One of the females was a mottled tan to brown when captured, but became greyish-tan in captivity. Subtle morphological differences (not quantified) were noted. The eye orbits of A29 were considerably more raised, its snout shorter and blunter, and its build stockier than all other specimens examined. The interorbital patches in all specimens were fused to form a continuous bar. Dorsally, every specimen displayed a variable amount of black spotting. These marks were concentrated on the posterior aspect of the back, towards the urostyle, with random spots and flecks occurring in the sacral, scapular and occipital region of most, though not all specimens. Although the ventrums were smooth and white to greyish-white, the thighs were slightly granular, particularly those of A29.

FIELD NOTES: Males were observed calling from exposed positions on grass-fringed cement ponds in close proximity to B. gutturalis, which was also calling from the same site, during intermittent downpours in January 1988. In December 1988, males were observed calling from exposed and partially concealed positions, particularly on fallen leaves and in grasses, in and around roadside culverts. At the culvert closest to the main complex, this species was recorded calling within metres of P. mababiensis and C. n. nanum which were also calling. One of the males made rasping squawks while being transported in a sack. One specimen (S.V.L. 32 mm) was put in a vivarium with other frogs and was quickly consumed by an adult X. l. laevis (A14 with a S.V.L. of 64 mm).

SPECIES: Rana angolensis Bocage, 1866. Common River Frog.

RANGE: All southern Africa excepting Namibia, the western Cape, Kalahari and southern part of the central plateau, and apparently also absent from most of the Mozambique Plain (Poynton 1964).

PREFERRED HABITAT: Perennial streams or other permanent bodies of water (Passmore and Carruthers 1979); a "common frog" where there is permanent water combined with vegetation cover on the banks (Poynton and Broadley 1985b).

SPECIES OCCURRENCE: A common frog. Six specimens were collected of which five are preserved: OSCA A1, A54, A55, A57 and A64. The date of collection and locality for A1 is not known other than it was collected from the OSCA grounds before the survey. A54 and A55 were collected from a canalised stream below a roadside culvert near the veterinarian centre in December 1988; A57 was collected from the banks of the cattle dam in the paddocks in December 1988; and A64 was collected from a rain-filled depression on the banks of the Cwaka River also in December 1988. The sixth specimen (released) was collected from the grass bank of a fish pond in January 1988.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 9. A1 and A57 are adult males, and A64 is an immature (subadult) female.

Two adult male frogs (n=2) provided a mean S.V.L. of 58,0 (range 56 - 60) mm, S.L. 35,0 mm (no range) and D.H. 19,5 (19 - 20) mm; three subadults (n=3) provided a mean S.V.L. of 36,3 (range 31 - 42) mm, S.L. 23,3 (19 - 28) mm and D.H. 11,7 (9 - 14) mm.

The two adults (n=2) provided a mean mass of 22,50 (range 21,50 and 23,50) g; the three subadults (n=3) yielded an average mass of 5,00 (3,00 - 7,50) g.

TAXONOMIC CHARACTERISTICS: The five specimens fall within the range of characteristics for R. angolensis as described by Poynton (1964), Passmore and Carruthers (1979), Poynton and Broadley (1985b) and Wager (1986). In 1964 Poynton showed that angolensis Bocage and fuscigula Duméril and Bibron are specifically distinct; until then, some authors (Loveridge 1933; Hewitt 1937; FitzSimons 1947) had placed angolensis as a subspecies of fuscigula. Poynton's (1964) specific distinction was based primarily on the ratio of head width/tibia length: a series with a mean above 70% was ascribable to fuscigula, whereas a series with a mean below 60% was ascribable to angolensis. The mean head width/tibia length ratio of the small OSCA series (n=5) was 53,2% (range 50,0 - 57,1%).

Vertebral stripes were present on all specimens examined; greyish to dark olive green mottling occurred on the jaw and throat only of both adults and one subadult, while flecks were restricted to the margins of the jaw of the other two subadults. Spotting on the thighs was indistinct. The dorsal colour may change from green with patterns of brown spots in the wild to almost black in captivity.

FIELD NOTES: The gut of A1 contained the remains of a short-horned grasshopper (Acrididae). Unidentified parasites were found on the intestinal wall of A64. The unpreserved specimen which was collected from the fish ponds was found within a few metres of P. anchietae (A46). Termite remains were found in the gut of A55. The two subadult specimens collected from the canal below the culvert (A54 and A55) were first sighted in grasses before leaping into the water; also recorded from this locality were X. l. laevis, P. anchietae, T. natalensis, P. mababiensis and C. n. nanum. The two dissimilar calls (rattles and croaks) of R. angolensis were heard at the cattle dam opposite the paddocks in December 1988, where X. l. laevis, P. anchietae, K. senegalensis and C. xerampelina were also recorded. This species appears to avoid the Mozambique Plain, and is entirely absent from the St. Lucia Lake complex area (J. Poynton pers. comm.).

SPECIES: Strongylopus fasciatus fasciatus (Smith, 1849). Striped Stream Frog.

RANGE: South-eastern Cape seaboard and the eastern plateau slopes, extending over the Transvaal plateau and Zimbabwe (Poynton 1964).

PREFERRED HABITAT: Grassy margins of streams, pans, dams, seepage or other bodies of water (Passmore and Carruthers 1979). This "grass frog" is found in open grasslands of the eastern highlands and along the main watershed in Zimbabwe; it calls along stream banks or grassy vleis usually under cover of vegetation, but it is often encountered a considerable distance from water (Poynton and Broadley 1985b).

SPECIES OCCURRENCE: A rare frog. A. Steyn (in litt.) reported on one specimen which he observed in a grassveld habitat below the location (undated).

SIZE, SEX, MEASUREMENTS AND MASS: No data available.

TAXONOMIC CHARACTERISTICS: No particulars available, except that the frog displayed the striped pattern and long toes peculiar to this taxon. Another subspecies S. f. fuelleborni occurs in central Africa, particularly in the mountains of Malawi, eastern Zambia and southern Tanzania (Poynton and Broadley 1985b).

Poynton (1964) recognised two subspecies of fasciata (=fasciatus), typical fasciatus which ranges from the southeastern Cape to Natal, Transvaal and Zimbabwe, and montana, a

southwestern Cape form. In 1979, Greig *et al.* elevated montana (=bonaespei) to full species, based on a different call, colour markings and morphological characteristics.

As a general comment, the splitting of Strongylopus from Rana at generic level is open to criticism; morphologically the two genera display many similarities and are cold-tolerant with an essentially non-tropical distribution (Poynton and Broadley 1985b), though van Dijk (1966) has noted different larval features.

FIELD NOTES: Apart from the record by A. Steyn, no further specimens have been found. His record is acceptable since it is practically impossible to confuse this distinctly banded frog with any other species, and its range quite conceivably includes OSCA. However, this taxon must be regarded as peripheral in Zululand.

SPECIES: Ptychadena oxyrhynchus (Smith, 1849). Sharp-nosed Grass Frog.

RANGE: Maputaland, Natal lowlands, eastern and northern Transvaal, Zimbabwe and Mozambique (Poynton 1964).

PREFERRED HABITAT: Pans, vleis and temporary pools in the tropical lowveld and coastal regions (Passmore and Carruthers 1979) or moist savanna to lightly wooded areas, entering forest to a limited extent; not ranging far from water, the species breeds in shallow pools along streams or dambos, also in pools on rock outcrops (Poynton and Broadley 1985b).

SPECIES OCCURRENCE: An uncommon frog. Only three specimens were collected: OSCA A12, A60 and A70. The locality and date of collection for A12 are not known, other than the specimen was collected from the OSCA grounds prior to the survey; A60 was collected from the grass banks of one of the fish ponds in December 1988, and A70 was collected from a moist horticulture field in December 1988.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 10. A12 and A60 are adult males, and A70 is an adult female.

The males (n=2) provided a mean S.V.L. of 51,5 (range 51 - 52) mm, S.L. 37 (35 - 39) mm and D.H. 17 mm (no range); the female (n=1) provided a S.V.L. of 57 mm, S.L. 43 mm and D.H. 21 mm. The mass of one of the males (n=1) was 15,50 g; the female (n=1) weighed 28,00 g.

TAXONOMIC CHARACTERISTICS: The characteristics of all three specimens conform with the description for P. oxvrhynchus as provided in Passmore and Carruthers (1979), Passmore and Broadley (1985b) and Wager (1986). The belly and inguinal region was yellow, while the throat and chest was white. The dorsal ridges were whitish with the intervening skin flecked with dark brown or black. The ground colour of A12 and A60 was grey to brown; A70 differed from the two males in that the head and anterior aspect of the dorsum were a brick-red colour. A thin skin fold running across the chest from forelimb to forelimb was present in all specimens examined.

Poynton and Broadley (1985b) point out that Ptychadena is the largest ranid genus in the Zambesiaca area, but it is composed of species very similar in appearance and hence easily confused. They recognise no less than 17 species in the Zambesiaca area; Passmore and Carruthers (1979) describe six species from within the borders of South Africa.

FIELD NOTES: The relatively sharp snout with nares situated approximately halfway between the eyes and the tip of the snout, and mottled thighs which do not form longitudinal lines, normally quickly distinguishes this species from P. anchietae, with which it can be confused and with which it occurs at OSCA. This species was not recorded calling. This species also appears to be less of a bushveld species than P. anchietae (J. Poynton pers. comm.).

W. Prinsloo (pers. comm.) described an adult Ptychadena, light brown in colour and without any distinctive bands or marks, which he encountered in riparian vegetation on the banks of the Cwaka River in September 1986. When pursued, this frog apparently leapt very effectively, taking refuge under a pile of leaves. Poynton and Broadley (1985b) have reported on the tendency of subpunctata and mascariensis to leap into water when disturbed, and oxvrhynchus, anchietae, porosissima, uzungwensis, gubei and mossambica to escape away from water. The possibility that porosissima occurs at OSCA cannot be overlooked.

SPECIES: Ptychadena anchietae (Bocage, 1867). Plain Grass Frog.

RANGE: Eastern Natal as far as the Tugela River, Mozambique, Swaziland, Transvaal, eastern Botswana and Zimbabwe (Poynton 1964).

PREFERRED HABITAT: Shallow pools, inundated grassland, vleis and dams (Passmore and Carruthers 1979); very common in lowland savanna, this species is usually found near water, the adults taking cover in grass or river debris during the day (Poynton and Broadley 1985b).

SPECIES OCCURRENCE: A common frog. Six specimens were collected, and many more sighted, of which four are preserved: OSCA A37, A46, A56 and A61. A37 was collected from an earth drainage canal at the bottom of the horticulture fields in July 1987; A46 was collected from a grass bank between the fish ponds in January 1988; A56 was collected from the grass banks of the cattle dam opposite the paddocks in December 1988; and A61 was collected from a patch of grass under the shade of an Umdoni Tree Syzygium cordatum between the main nursery and roadside culvert in December 1988. Other specimens were sighted or collected from the balancing dam above the staff houses in January 1988; from rain pools near the Cwaka River in January 1988; and from the fish ponds, drainage canals below culverts near the Veterinarian Centre and main complex, and horticulture fields in December 1988.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 11. A46, A61 and a specimen released were adult females, and A37 is a subadult female; A56 is a subadult male, and another, released specimen was an adult male.

The three adult females (n=3) provided a mean S.V.L. 47,7 (range 45 - 52) mm, S.L. 32,3 (30 - 36) mm and D.H. 15,7 (14 - 18) mm; the subadult female (n=1) provided a S.V.L. of 28 mm, S.L. 20 mm and D.H. 10 mm.

The adult male (n=1) provided a S.V.L. of 42 mm, S.L. 28 mm and D.H. 15 mm; and the subadult male (n=1) provided a S.V.L. of 37 mm, S.L. 27 mm and D.H. 14 mm.

One of the adult females (n=1) yielded a mass of 14,00 g, while the subadult female (n=1) weighed 2,07 g; the adult male (n=1) weighed 9,50 g and the subadult male (n=1) 4,00 g.

TAXONOMIC CHARACTERISTICS: The specimens are characteristic of P. anchietae as described in Passmore and Carruthers (1979), Poynton and Broadley (1985b) and Wager (1986), though with a considerable degree of colour variation. The dorsal colours ranged from light to dark grey (most specimens examined) through to tan or brown. Black freckling occurred on the grey and tan specimens, and was usually confined to the longitudinal ridges. The black markings on the back of the thighs fused to form longitudinal bands alternating with a yellowish-white which, under subdued lighting conditions, became a vivid and bright yellow. The tibiae were either grey and banded, or a homogenous tan without any markings. Most

specimens had a white throat and chest, and yellow belly; however, at least one specimen had a white throat, chest and belly, while another had a yellowish sheen on the throat, fading to white in preservative. A thin skin fold running across the chest from forelimb to forelimb was present in all specimens examined.

FIELD NOTES: Species of Rana, Strongylopus and Ptychadena, because of their acrobatic leaps at the least disturbance, often directly into the water, are particularly difficult to catch. Many of the P. anchietae specimens which leapt into large bodies of water quickly emerged on the perimeter of the body of water with only the eyes and snout protruding. Others, particularly those in drainage canals, sought refuge under plant debris on the floor bottom where they remained for minutes.

Calling was recorded at both the cattle dam opposite the paddock and at the fish ponds in December 1988. One specimen was observed floating on the water's surface during the day, while another was recorded performing four consecutive leaps in excess of three metres each on a hard grass surface. This frog was found at habitats where every other species at OSCA has been recorded, with the notable exception of P. a. edulis, Arthroleptis wahlbergii, and Hemisus guttatus.

SPECIES: Phrynobatrachus natalensis (Smith, 1849). Snoring Puddle Frog.

RANGE: All southern Africa excepting the southwestern portion and most of the Mozambique Plain (Poynton 1964).

PREFERRED HABITAT: Pools or marshy areas associated with pans, streams or vleis (Passmore and Carruthers 1979); abundant in savanna and grassland, mainly associated with permanent or near-permanent shallow water (Poynton and Broadley 1985b).

SPECIES OCCURRENCE: A common frog. A total of five specimens was collected, with many more sighted, of which four are preserved: OSCA A32, A44, A63 and A66. A32 was collected from a shallow vegetated pool at the seep below the water purification plant in July 1987; A44 was collected from under a carpet of freshly cut grass covering seepages at the fish ponds in January 1988; A63 was collected from a rain-filled depression near the banks of the Cwaka River in December 1988; A66 was collected from a fish pond in December 1988; and one specimen was collected (subsequently released) from a rain-filled depression adjacent to the Cwaka River in August 1987. Further specimens were recorded calling from

the same habitat from which A44 was collected and from surrounding clumps of grass along pond seepage points in January 1988; another specimen was sighted in a rain-filled depression near the Cwaka River in December 1988.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 12. A44, A63 plus another specimen (released) were adult females; A66 is an adult male; and A32 is a subadult female.

The three adult females (n=3) provided a mean S.V.L. of 16,7 (range 16 - 18) mm, S.L. 9,3 (9 - 10) mm and D.H. 6 (5 - 7) mm; the adult male (n=1) provided a S.V.L. of 30 mm, S.L. 15 mm and D.H. 11 mm; the subadult female (n=1) provided a S.V.L. of 13 mm, S.L. 7 mm and D.H. 5 mm.

Two adult females (n=2) yielded a mean mass of 0,53 (range 0,50 - 0,55) g; the adult male (n=1) weighed 3,00 g; and the subadult female (n=1) weighed 0,24 g.

TAXONOMIC CHARACTERISTICS: All specimens examined fall within the range of characteristics for P. natalensis as described in Passmore and Carruthers (1979), Poynton and Broadley (1985b) and Wager (1986). The larger size and extensive webbing of natalensis readily distinguished it from mababiensis. Dorsal colours ranged from light to dark grey and brown, with varying degrees of mottling. The dorsal glands were numerous, rounded and gave a warty appearance. A32, A44 and A66 were without vertebral stripes or bands; A63 and the specimen released, however, had white vertebral stripes, running from the tip of the snout to the tip of the urostyle. The ventral surfaces were smooth and white and without any markings. The throat coloration, apart from grey freckling along the edges of the lower jaw, were without markings, except for A44 which had a few grey speckles on the posterior portion of the throat. The vocal sac of the male folded into a pair of deep lateral creases along the lower jawline. The ventral aspect of the hindlimbs were a semi-transparent light grey.

FIELD NOTES: When approached, the specimen from the vegetated pool submerged itself and hid under decaying leaf litter. A44 was collected from the same habitat at the fish ponds as P. mababiensis. P. natalensis was recorded calling from seepage points between the fish ponds both during the day and at night in January 1988. Males called from the base of clumps of grasses. A66 was collected from a pond occupied by P. anchietae, P. oxvrhynchus and H. tuberilinguis. P. natalensis appears to be widespread in Zululand.

SPECIES: Phrynobatrachus mababiensis FitzSimons, 1932. Dwarf Puddle Frog.

RANGE: Eastern Cape, Natal, Mozambique, Transvaal, Zimbabwe and northern South West Africa (Namibia) (Poynton 1964).

PREFERRED HABITAT: Any moist, marshy area in tropical or sub-tropical regions (Passmore and Carruthers 1979); although not avoiding woodland or even marginal forest, this species is particularly abundant and widespread in drier savanna where it occurs around the borders of pans, vleis and streams (Poynton and Broadley 1985b).

SPECIES OCCURRENCE: A common frog. Four specimens were collected, with many more sighted or heard calling: OSCA A40, A41, A58 and A62. A40 and A41 were collected from the banks of the cattle dam below the staff houses in January 1988; A58 was collected from the roadside culvert near the veterinarian centre in December 1988; and A62 was collected from a rain-filled depression near the Cwaka River in December 1988. A large, but indeterminable number of specimens were recorded calling from the banks of the cattle dam below the staff houses, under freshly cut grass stacks at seepages between the fish ponds, and from the banks of Cwaka Dam and the cattle dam in pasture veld in January 1988.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 13. A40 and A41 are adult females, and A58 and A62 are adult males. The two females (n=2) provided a mean S.V.L. of 11 mm (no range), S.L. 5,5 (5 - 6) mm and D.H. 4 mm (no range); the two males (n=2) yielded a mean S.V.L. of 12,5 (range 11 - 14) mm, S.L. 7 (6 - 8) mm and D.H. 4,5 (4 - 5) mm. Their mass was not obtained.

TAXONOMIC CHARACTERISTICS: The colour pattern and webbing of all specimens examined falls within the range of characteristics for P. mababiensis as described in Passmore and Carruthers (1979), Poynton and Broadley (1985b) and Wager (1986). The dorsum was predominantly grey, flecked with black and orange, with raised glandular protuberances to give a warty appearance. A vertebral stripe was present on A40, but absent on A41, A58 and A62. From a small series of nine specimens examined on the banks of the cattle dam, three had vertebral stripes. A40, A41 and A62 had white ventrums and throats, except for two black flecks between the forelimbs and flecks of black along the margins of the lower jaw. A58 had a dark grey throat typical of males, whereas A62 was without any throat pigmentation. The ventral aspect of the hindlimbs were a fleshy grey.

FIELD NOTES: Apart from the male which was collected at night while it was calling, all other specimens were collected on sunny and humid days. They were either on open mud

banks or in the shade of vegetation, especially grasses, surrounding water bodies. The male was calling from an exposed position on leaf debris within metres of T. natalensis, males of which were also calling. Buzzing and ticking calls peculiar to P. mababiensis were also recorded from the fish ponds, cattle dams and Cwaka Dam, both during the day and at night.

For a small frog, this species jumps effectively, covering distances of between 30 - 40 cm per leap. This species was recorded from the same site as P. natalensis; a specimen of the latter (A44) was collected from the fish ponds within metres of a calling P. mababiensis.

SPECIES: Cacosternum nanum nanum Boulenger, 1887. Bronze Caco.

RANGE: Eastern Transvaal midlands, Natal (below about 1 200 m) and eastern and southern Cape Province (Poynton 1964).

PREFERRED HABITAT: Marshy areas associated with small streams and vleis (Passmore and Carruthers 1979); typically found in the vicinity of grassy or overgrown streams, often calling in flooded grassland beside streams (Poynton and Broadley 1985b).

SPECIES OCCURRENCE: A common frog. Five specimens were collected, with many more sighted or heard calling, of which four were sacrificed: OSCA A28, A31, A33 and A53. A28 was collected from the drainage canal below the road culvert opposite the nursery in March 1987; A31 and A33 were collected from an ephemeral stream below the nursery in July 1987; and A53 was collected from a water-filled plastic bowl on the veranda of a house in January 1988. Another specimen was collected and subsequently released from the drainage canal below the culvert opposite the nursery in December 1988. Many more frogs were recorded from a variety of aquatic situations throughout OSCA, including water-filled depressions in the horticulture fields, seeps in the game park and cattle camps, and at the fish ponds, in the months of June, July and August 1987, and January 1988.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 14. A28, A31, A33 and the specimen collected and released were adult males; A53 is an adult female. The four males (n=4) provided a mean S.V.L. of 22 (range 21 - 24) mm, S.L. 9,5 (9 - 10) mm and D.H. 8 (7 - 9) mm; the female (n=1) yielded a S.V.L. of 28 mm, S.L. 12 mm and D.H. 9 mm. The average mass for the three preserved males (n=3) was 0,85 (range 0,77 - 1,00) g.

TAXONOMIC CHARACTERISTICS: The series conforms to the description of C. n. nanum as provided in Poynton (1964), Passmore and Carruthers (1979) and Wager (1986). The dorsal coloration ranged from light to dark brown with black markings. A28 and A31 had faint, barely discernible vertebral stripes, noticeable in the case of A28 only on the posterior portion of the back. Both A33 and A53 were without vertebral stripes. The hindlimbs of all specimens were banded in black. The throats of all the males examined were heavily infused with olive to greyish-black dots with only traces of white showing through, whereas the female had only a moderate number of olive dots on the throat. The speckling on the white belly was variable and ranged from practically no speckles on the belly (A33) to fairly heavy speckling (A28 and A53). The olive coloration dulls quickly in preservative.

Another subspecies C. n. parvum, which occurs in Natal north of 30° S (above 1 200 m) and the eastern Transvaal escarpment, is distinguished by the size of the metasternum, throat pigmentation, and the inter-orbital distance (Passmore and Carruthers 1979).

FIELD NOTES: This frog's response to rainfall is remarkable. For instance, from the 27 to the 29 June 1987, OSCA received a total of 220,8 mm rainfall, an event which was immediately followed by C. n. nanum calling from practically every ephemeral stream or waterlogged area. This activity continued for the entire months of July and August, the calls occurring during both the day and at night.

Numerous males, the concentration in places being as high as four specimens per square metre, were located calling from concealed positions in vegetation, predominantly Catstail Dropseed Sporobolus pyramidalis and Giant Paspalum Paspalum urvillei, at an ephemeral stream below the nursery. Two specimens (A31 and A33), were collected from this habitat while calling during the day early in July 1987. Clusters of eggs were also observed in the stream early in July. The eggs were small with an approximate diameter of 1 mm, white with a brown pole, and enclosed in jelly. They were attached to submerged stalks of grass in clusters of between approximately 15 and 40 eggs.

The other male (A28) was collected from a shallow pool of water in a canal leading from the culvert opposite the nursery, while it was calling during the day in March, a habitat from which X. l. laevis has also been recorded. The male collected from the culvert, and subsequently released, in December 1988 was found at night and was calling at the time of collection.

The female (A53) was collected at night from a water-filled bowl on the veranda of a house in January immediately after a convectional downpour. This site is approximately 120 metres

from the nearest recorded breeding site for this frog. This specimen contained between approximately 200 - 300 eggs.

This species apparently tends to avoid the Mozambique Plain (J. Poynton pers. comm.). Although common at OSCA, C. n. nanum must be considered peripheral for it has not been recorded at either Richards Bay or Twinstreams, the latter being a well collected locality.

SPECIES: Chiromantis xerampelina Peters, 1854. Foam Nest Frog.

RANGE: Northern Zululand, Swaziland, Mozambique, eastern and northern Transvaal, eastern and northern Botswana, northern Namibia and Zimbabwe (Poynton 1964).

PREFERRED HABITAT: Trees and other elevated positions overhanging pans and rivers in tropical lowveld wooded savanna (Passmore and Carruthers 1979); particularly common in dry savanna at low altitudes (Poynton and Broadley 1987).

SPECIES OCCURRENCE: A common frog. Three specimens were collected, and another one sighted, only one of which was sacrificed: OSCA A24. A24 was collected from an Acacia tree (Acacia robusta) on the banks of the Cwaka River in March 1987; one specimen was collected from an Acacia tree opposite the students' dormitories in December 1988 and another from the garden of a staff member's house in December 1988; a further specimen was sighted next to its nest in littoral vegetation at the fish ponds in January 1988. Three unattended nests were sighted attached to branches of Acacia and other trees at the cattle dam below the staff houses in January 1988, and a further unattended nest was observed attached to a tree seedling on the banks of the cattle dam opposite the paddock in December 1988. W. Prinsloo (pers. comm.) reported on nest-building activity by this frog at the cattle dam soon after the first summer rains.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 15. A24 is an adult male and the two released specimens were adult females.

The adult male (n=1) provided a S.V.L. of 61 mm, S.L. 29 mm and D.H. 19 mm; the two adult females (n=2) provided a mean S.V.L. of 76,5 (range 76 - 77) mm, S.L. 37 mm (no range) and D.H. 24 mm (no range).

The adult male (n=1) weighed 14,11 g; the two adult females (n=2) yielded a mean mass of 36,5 (range 32,00 - 41,00) g.

TAXONOMIC CHARACTERISTICS: The three specimens examined were typical of C. xerampelina as described in Passmore and Carruthers (1979), Wager (1986), and Poynton and Broadley (1987). The ground colour ranged from a distinct pattern of grey to olive, tan and black to almost pure white. A dark interorbital patch was present. The belly was granular and pure white, and not pinkish as suggested by Passmore and Carruthers (1979). The throat up to the pectoral fold was scattered with fine grey freckles. The webbing reached only as far as the tubercle of the outer finger and therefore conforms to the general pattern of clinal variation for this taxon; in Malawi it tends to join the disc of the outer finger (Poynton and Broadley 1987).

FIELD NOTES: The nests inspected at the cattle dam below the staff houses in January 1988 were situated between approximately 60 cm and two metres above the surface of the water, and only one was actually overhanging the water, the others being situated almost a metre from the edge of the water. However, at the time of this observation it was noted that the water level had dropped quite considerably, and it is probable that the nests were built some weeks or possibly months earlier and no longer contained larvae.

The nest at the fish pond was situated approximately 40 cm above the surface of the water and was hanging over the edge of the pond. The adult frog which was observed nearby displayed an almost pure white dorsal coloration when viewed by torchlight. The nest observed at the cattle dam opposite the paddocks in December 1988 was attached to the only seedling available on the perimeter of this water body. It was situated approximately 40 cm above the water's surface.

The one unpreserved specimen collected at night from a garden in December, was active at the time of collection. It was observed jumping from tree to bush during humid and overcast weather conditions. This locality was at least 120 metres from the nearest source of permanent water.

The two specimens released immediately clung to branches where they bathed in the sun. Within minutes their coloration matched the bark almost perfectly.

SPECIES: Arthroleptis wahlbergii Smith, 1849. Bush Squeaker.

RANGE: Natal and Maputaland below 1 200 metres (Poynton 1964); the coastal area from Port St. Johns through Zululand, and inland below 900 metres from Richmond to Nkandhla in Natal (Wager 1986).

PREFERRED HABITAT: Forests, clumps of trees or shrubs and thickets (Wager 1986); litter and low vegetation of coastal and midland bush (Passmore and Carruthers 1979).

SPECIES OCCURRENCE: A rare frog. Only one specimen was collected: OSCA A65. This specimen was collected from litter-strewn soil under an Apodytes - Euclea forest canopy near the Cwaka River in December 1988.

SIZE, SEX, MEASUREMENTS AND MASS: A65 is an adult female (n=1) with a S.V.L. of 27 mm, S.L. 11 mm and D.H. 10 mm.

TAXONOMIC CHARACTERISTICS: The features of A65 are diagnostic for A. wahlbergii as described in Poynton (1964), Passmore and Carruthers (1979) and Wager (1986). The dorsum was a dark mottled brown with the pattern of diamond shapes barely visible. There was no vertebral line, though a slight vertebral ridge was present. The ventrum was granular and olive, suffused with white.

FIELD NOTES: A65 was collected from a bucket trap. This species was not heard calling. This frog may prove to be more common, especially in forest litter which is a habitat which was poorly sampled.

SPECIES: Hemisus guttatus (Rapp, 1842). Spotted Shovel-nosed Frog.

RANGE: Probably widespread over Natal (Poynton 1964); Natal and Zululand coastal belt from Umkomaas to Mtubatuba, and inland from Newcastle to Piet Retief (Wager 1986).

PREFERRED HABITAT: Burrows in loamy banks adjacent to pans (Passmore and Carruthers 1979); open country in the vicinity of pools or vleis where the soil is damp (Wager 1986).

SPECIES OCCURRENCE: A rare frog. Only one specimen was found. It was unearthed in a compost heap near the nursery and photographed (A. Steyn in litt. and W. Prinsloo pers. comm.). According to A. Steyn (in litt.), this specimen was found in spring 1985.

SIZE, SEX, MEASUREMENTS AND MASS: The specimen was apparently a large adult, presumably a female. No further data available.

TAXONOMIC CHARACTERISTICS: No specimen available. The large size (females up to 75 mm, Wager 1986), pointed snout, olive brown ground colour, numerous yellow dots and burrowing mode of life distinguishes this frog.

FIELD NOTES: This record is accepted as the range of H. guttatus quite conceivably includes OSCA and it is a species which can hardly be confused with any other. Furthermore, a compost heap would provide an appropriate habitat for this burrowing frog.

SPECIES: Leptopelis natalensis (Smith, 1849). Forest Tree Frog.

RANGE: Coastal lowlands from Lake St. Lucia to Pondoland (Transkei) (Poynton 1964), but now also known to inhabit the Natal coastal belt as far as Port St. Johns in the Transkei, and to stretch inland to the Nkandhla and Ngoye Forests in Zululand (Wager 1986).

PREFERRED HABITAT: Riverine bush and swamp along the Natal coast (Passmore and Carruthers 1979); bushy or forested areas (Wager 1986).

SPECIES OCCURRENCE: An uncommon frog. Only one specimen was collected: OSCA A25. This specimen was collected from a guava tree Psidium guajava on the banks of the Cwaka River in March 1987. This species was also heard calling from riparian vegetation along the Cwaka River in January 1988.

SIZE, SEX, MEASUREMENTS AND MASS: A25 is an adult male (n=1) with a S.V.L. of 45 mm, S.L. 22 mm and D.H. 18 mm. It weighed 6,52 g.

TAXONOMIC CHARACTERISTICS: The voucher specimen conforms to the description and diagnostic characteristics for L. natalensis as provided in Poynton (1964), Passmore and Carruthers (1979) and Wager (1986). The colour pattern of A25 was creamy to light brown dorsally with faint light green lines running almost diagonally across the back; a

discontinuous green bar occurred between the eyes with green patches present behind the eyes; and two green lines ran from the eyes toward the snout but did not join at the snout. The fore- and hindlimbs were also lightly banded in green. These colours faded quickly in preservative. The ventral surface conforms with the colour description provided by Passmore and Carruthers (1979). Poynton (1964) gives the maximum size of this species as 47 mm for specimens in Natal and up to 61,5 mm for material from Pondoland (Transkei) without suggesting why this should be so.

FIELD NOTES: This species occurs in a similar habitat to L. mossambicus, a frog with which it was also heard calling from the riverine habitat in January 1988.

SPECIES: Leptopelis mossambicus Poynton, 1985. Brown-backed Tree Frog.

RANGE: The Mozambique Plain and eastern Transvaal lowlands northwards (Poynton 1964); from Richards Bay in Zululand north through the Transvaal lowveld to Kenya (Wager 1986).

PREFERRED HABITAT: Open, swampy areas (Poynton 1964); wooded savanna in the vicinity of streams and pans (Passmore and Carruthers 1979); bushy watercourses, savannah forest and open vleis (Wager 1986); or savanna to open reedbeds, in the vicinity of rivers or swamps (Poynton and Broadley 1987).

SPECIES OCCURRENCE: An uncommon frog. Only one specimen was collected: OSCA A38. It was collected from a dark, wet pit surrounded by riparian vegetation below Cwaka Dam in January 1987. This species was also recorded calling from riparian vegetation along the banks of the Cwaka River in January 1988.

SIZE, SEX, MEASUREMENTS AND MASS: A38 is a subadult female (n=1) with a S.V.L. of 30 mm, S.L. 14 mm and D.H. 13 mm. It provided a mass of 2,28 g.

TAXONOMIC CHARACTERISTICS: The voucher specimen fulfills the diagnostic criteria for L. mossambicus as described in Poynton (1985d), Wager (1986) and Poynton and Broadley (1987). Dorsally, A38 had a longitudinally elongated brown patch which originated in the occipital region and terminated at the tip of the urostyle, entirely covering the sacral region. It appeared to be more extensive than the horseshoe shape or n-shaped notch described by Passmore and Carruthers (1979) and Poynton and Broadley (1987) respectively, though it seemed to differ little from the description of the holotype from Maputo. An extremely thin

and faint line ran longitudinally from the snout to between the eyes and onto the occipital region where the elongated patch begins, but did not merge into the patch. A brown line occurred from the side of the snout (not forming a V) across the nostril through the eye where it continued across the tympanum and faded dorso-laterally behind the shoulder. The rest of the dorsum was tan.

The granular ventrum was greyish-white without any markings on the throat in contrast to the fawn coloured ventrum and darker stippling on the throat as described by Passmore and Carruthers (1979). The tibiae also had dark brown patches. The enlarged, clearly defined dorsal patch and brown patches on the tibiae are in keeping with southern African populations; these markings are absent or only faintly represented in northerly populations from Beira and the Zambezi-Shire basin (Poynton 1985d).

FIELD NOTES: This species occurs in a similar habitat to L. natalensis; that is, the riparian vegetation of the Cwaka River. Both natalensis and mossambicus were heard calling from this environment in January 1988.

SPECIES: Kassina senegalensis (Duméril and Bibron, 1841). Bubbling Kassina.

RANGE: All of southern Africa except the western Cape Province, Kalahari and southern Namibia (Poynton 1964); Eastern Cape, Natal, Orange Free State, South West Africa (Namibia), Transvaal and north to the Sahara (Wager 1986).

PREFERRED HABITAT: Grassland in the vicinity of vleis, pans or dams (Passmore and Carruthers 1979); breeds in shallow temporary pools and pans (Poynton and Broadley 1987).

SPECIES OCCURRENCE: A common frog. Only two specimens were collected, one of which was sacrificed and preserved: OSCA A47. A47 was collected from a grass bank at the fish ponds in January 1988; the other specimen was collected from a grass bank at the cattle dam opposite the paddocks in December 1988. Males were recorded calling from thickets below the fish ponds and from grass tussocks and other vegetation on the slopes of the fish ponds in January and December 1988, and from the cattle dams below the staff houses and opposite the paddocks in December 1988.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 16. A47 and the specimen collected and released were adult males. These two specimens (n=2) provided a mean S.V.L. of 40

(range 37 - 43) mm, S.L. 13,5 (13 - 14) mm and D.H. 13,5 (13 - 14) mm. The mass of the smaller specimen was 6,00 g.

TAXONOMIC CHARACTERISTICS: The dorsal pattern of A47 and the specimen released consisted of three longitudinal dark chocolate brown stripes and elongated patches interspersed with a light khaki brown to olive, and thus is similar to the pattern described in Passmore and Carruthers (1979), Wager (1986), and Poynton and Broadley (1987). The belly was creamy white becoming yellowish along the edge of the throat. The longitudinally oval gular disc of A47 was grey, surrounded by dark folds. The lateral aspects of the ventrum and the ventral aspects of the fore- and hindlimbs were spotted with white.

Poynton and Broadley (1987), in their review of senegalensis, could not find sufficient morphological evidence to support the notion of three forms or subspecies as proposed by Mertens (1971), Schiötz (1975), Laurent (1976a), namely argyreivittis, modesta and deserticola. It is interesting to note that nine specimens of male senegalensis from Durban, presumably with unbroken vertebral stripes as is typical of South African material (Passmore and Carruthers 1979), provided snout-vent lengths of 31 - 34 mm (Poynton and Broadley 1987), whereas the two male specimens from OSCA provided S.V.L.'s of 37 - 43 mm. A larger series from OSCA is necessary to establish whether specimens from this region are consistently larger than the Durban population.

FIELD NOTES: Males were heard calling from small thickets just below the fish ponds at sunset in January 1988. Later that evening they moved to positions in vegetation along the slopes of the fish ponds, nearer the water, where their calls intensified. A47 was collected from a grass bank between fish ponds and appeared to be en route to a call site.

The Semnodactylus wealii recorded on the tarred road in front of the veterinarian centre by A. Steyn (in litt.) is almost certainly K. senegalensis since the former's range does not extend as far north as Zululand. The misidentification is probably due to the superficial similarity in dorsal pattern to K. senegalensis, particularly since the ground colour of OSCA specimens appears to be similar to that of the S. wealii illustrated in Passmore and Carruthers (1979).

SPECIES: Afrixalus brachycnemis brachycnemis (Boulenger, 1896). Golden Leaf-folding Frog. Syn: Afrixalus aureus sp. n. and A. delicatus sp. n.

RANGE: Mozambique Plain and its fringing lowlands north of the Tugela River, and the eastern Zimbabwe uplands (Poynton 1964); from Mtunzini in Zululand north through the eastern Transvaal to Zimbabwe (Wager 1986); from Mhlatuze Valley in Natal through the eastern Transvaal, Swaziland and southern Mozambique (aureus) (Pickersgill 1984); the coastal lowlands from Avoca and Mount Edgecombe in Natal, northwards below 200 m a.s.l. in Swaziland and Mozambique, perhaps no further north than the Zambezi River (delicatus) (Pickersgill 1984).

PREFERRED HABITAT: Sedge and other vegetation at the edges of pans and vleis (Passmore and Carruthers 1979); coastal and lowveld vegetation around vleis (Wager 1986); apparently confined to bushveld and fairly dry grassveld, breeding in ephemeral pans and cattle-watering dams (aureus) (Pickersgill 1984); apparently confined to tropical and subtropical coastal bush and grassland, probably below altitudes of 200 m, though equally common in swamps, marshes and mangrove and Hibiscus swamp forests, but only in permanent or semi-permanent waters (delicatus) (Pickersgill 1984).

SPECIES OCCURRENCE: A common frog. A total of four specimens were collected and many more sighted: OSCA A49, A50, A51 and A67. All four specimens were collected from fringing grasses and other littoral vegetation at the fish ponds; A49, A50 and A51 in January 1988, and A67 in December 1988. Many more frogs were recorded from the fish ponds and Cwaka Dam in December 1988.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 17. A49, A51 and A67 are adult males; A50 is an adult female. The mean S.V.L. of the males (n=3) is 21,7 (range 19 - 24) mm, S.L. 8,7 (7 - 10) mm and D.H. 6,3 (6 - 7) mm; the female provided a S.V.L. of 23 mm, S.L. 9 mm and D.H. 6 mm. Details of the mensural data, which are important for the taxonomic diagnosis, are given below. The mass for this small series was not obtained.

TAXONOMIC CHARACTERISTICS: The taxonomy of the dwarf Afrixalus frogs is in a state of confusion. In 1964 Poynton recognised three forms occurring within the borders of South Africa, namely spinifrons (Cope), brachycnemis knysnae (Loveridge) and brachycnemis brachycnemis (Boulenger). According to Poynton (1964), typical brachycnemis occurs on the Mozambique Plain and fringing lowlands north of the Tugela River and the eastern southern Zimbabwe uplands; brachycnemis knysnae occurs from the Natal midlands to the south-eastern Cape lowlands; and spinifrons occurs along the Natal coast from Kwambonambi

area to probably not far south of Durban. Knysnae was distinguished from typical brachycnemis by an entire subarticular tubercle of two outer fingers and by the presence of densely or sparsely distributed dorsal spines (rarely occurring in brachycnemis), and spinifrons from brachycnemis by the dense concentration of asperities on the head. This classification was accepted by Passmore and Carruthers (1979) and Wager (1986).

In 1984 Pickersgill proposed new methods of diagnosing small-sized south-eastern African Afrixalus forms. He described three new "species" from just south of the Tugela to the Zambezi, namely aureus, crotalus and delicatus. Since crotalus is a northern "species", occurring in eastern Zimbabwe northwards to southern Malawi and eastwards through central Mozambique to the coast (Pickersgill 1984), its diagnostic features are not discussed here.

Pickersgill (1984) distinguishes aureus from delicatus primarily by the lumbar patches and lack of ventral asperities, though he also found significant size differences with aureus males averaging 21,2 (range 18,9 - 23,7) mm and females 24,4 (21,6 - 25,8) mm, whereas delicatus males averaged 17,7 (range 15,2 - 19,5) mm and females 19,4 (17,2 - 21,8) mm. However, as noted by Poynton and Broadley (1987), one of the critical features of diagnostic value, notably spinosity, was found to occur only in males in breeding condition, leaving the identification of much of the available material in a less than satisfactory state.

Due to the confusion, and since A67 was collected at a different time of the year from A49, A50 and A51, these specimens are described separately. In life, the dorsal colour of A67 was yellow with olive-brown bands on the flanks (see Plate 13). The ventrum was slightly granular and white. The gular disc was a bright yellow, fading to white in preservative; it was granular and heart-shaped with a concave posterior edge. Present were a broad transverse tibial band and lumbar patch on the left side, and a narrow tibial band on the right side. No asperities or spines were visible to the naked eye. This diagnosis, plus the measurements of S.V.L. 19 mm, S.L. 7 mm (tibia 37% of S.V.L.) and D.H. 6 mm, places A67 between Pickersgill's (1984) aureus and delicatus, if these two forms are distinct.

The coloration of A49, A50 and A51 was similar to A67, except that the female had small specks of olive-brown on the yellow dorsum, not unlike the illustration of a specimen from Manzini, Swaziland in Passmore and Carruthers (1979). The gular discs of the males, bright yellow in life, were granular, oval-shaped and without concave posterior edges. The throat of the female was a semi-transparent, fleshy colour. The tibial markings comprised broad transverse bands, which faded quickly in preservative. The ventrum was granular and white; no asperities were visible on either the dorsum or ventrum. The two males (n=2) provided a mean S.V.L. of 23 mm (range 22 - 24), S.L. 9,5 mm (9 - 10) and D.H. 6,5 mm (6 - 7),

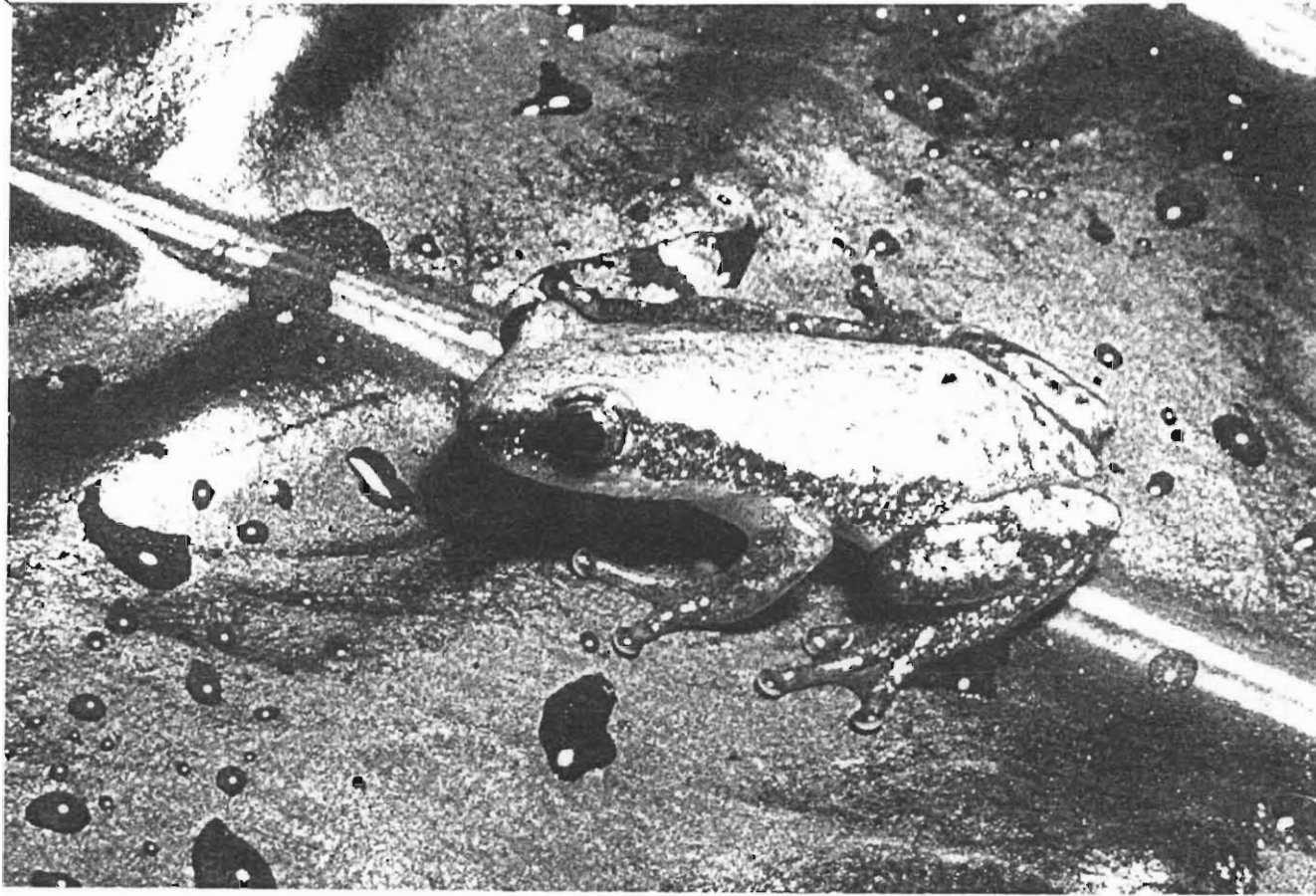


Plate 13. An adult male *Afrixalus b. brachycnemis* (A67) showing dorsal and left flank colour pattern (4 x life size).

whereas the female measured a S.V.L. of 23 mm, S.L. 9 mm and D.H. 6 mm. The tibiae (n=3) were 39 - 42% of S.V.L. (mean 40,7 %). This diagnosis is similar to Pickersgill's (1984) aureus.

A larger series is required to clarify the taxonomy of dwarf Afrivalus from OSCA. Also, more ecological information (calls, breeding habits and habitat preferences) is necessary. Based on the available evidence, it is tempting to conclude that A67 is an intergrade aureus/delicatus (or a young aureus?), while A49, A50 and A51 are aureus; however, it is in keeping with Poynton and Broadley's (1987) suggestion that, given the options of leaving the material unidentified or lumping it all under "brachycnemis", the researcher may well, for the present, opt for the latter.

FIELD NOTES: All four specimens were collected at night. A49, A50 and A51 were collected simultaneously; A49 and A50 were found together at the one pond, and A51 alone at another. Both males were calling at the time of collection, and no further A. b. brachycnemis specimens were recorded from the ponds that night. Also recorded from the ponds that night and over the next few days in January 1988 were X. l. laevis, R. angolensis, K. senegalensis, H. argus and H. marmoratus subsp.

A67, which was also calling at the time of collection, was a specimen from a large population found at one of the upper fish ponds. Calling and mating, males clasping females in the region of the axillae, was recorded for this population. Both calling and mating took place from exposed or only partially concealed positions on fringing vegetation. Oviposition was, however, not observed. Also inhabiting this pond were S. carens larvae, A. fornasinii, H. tuberilinguis, H. pusillus and H. marmoratus subsp; all the hyperoliid frogs were calling and mating at the time of observation. An adult Water Leguaan Varanus niloticus niloticus was found under the carpet of grass at the edge of the pond. At another pond A. b. brachycnemis was recorded along with P. anchietae, P. oxyrhynchus, A. fornasinii and H. tuberilinguis. Later that night a population of these frogs was also heard calling from dense mats of inundated grasses at Cwaka Dam, a habitat from which B. gutturalis, A. fornasinii, H. tuberilinguis, H. pusillus and H. marmoratus subsp., all of which were heard calling, were also recorded.

The population recorded at the ponds in December 1988, individuals of which seemed to be remarkably similar in size, was of a smaller size than the three specimens collected in January 1988. However, the calls of A49 and A51 (a high-pitched buzzing sound, best described as a "zick") were similar to that of the population found in December 1988, and to that described for this taxon by Passmore and Carruthers (1979) and Wager (1986).

While kept in a plastic jar overnight, the female deposited small clusters of eggs. A total of 93 eggs were laid. The eggs were round, unpigmented, approximately 1,2 mm in diameter, yellowish-white, and encased in clear jelly. A50 was found to contain further eggs when she was sacrificed and dissected.

SPECIES: Afrixalus fornasinii (Bianconi, 1850). Greater Leaf-folding Frog.

RANGE: The eastern lowlands from Durban northwards (Poynton 1964) through southern Swaziland, Mozambique and Zimbabwe.

PREFERRED HABITAT: The peripheral areas of swamps and streams (Passmore and Carruthers 1979); vegetation near pools and swamps (Wager 1986).

SPECIES OCCURRENCE: A common frog. Two specimens were collected and sacrificed, and many more sighted: OSCA A34 and A35. Both preserved specimens were collected simultaneously from the toilet cistern of a staff member's house in July 1987; a further specimen was observed in the same cistern between May and November 1988 (J. Hughes pers. comm.). Large populations were recorded from the fish ponds and Cwaka Dam in December 1988.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 18. Both A34 and A35 are adult females. These specimens (n=2) provided a mean S.V.L. of 30,5 (range 30 - 31) mm, S.L. 15 mm (no range) and D.H. 10,5 (10 - 11) mm with a mass of 1,77 (1,67 - 1,86) g.

TAXONOMIC CHARACTERISTICS: Both preserved specimens, and other specimens observed, were typical for A. fornasinii as described in Passmore and Carruthers (1979), Wager (1986), and Poynton and Broadley (1987). There was no noticeable variation in colour pattern, though the ground colour did change from creamy white to light brown.

FIELD NOTES: The distance to the nearest permanent source of water from the locality from which A34 and A35 were collected was approximately 80 metres. The presence of these frogs had apparently been noted by J. Hughes (pers. comm.) in May, and they submerged themselves in the water on every occasion the cistern lid was opened. The garden surrounding the toilet is lush, and it would appear probable that these frogs had taken up semi-permanent residence in the cistern, gaining entry via the overflow pipe.

A large population of this frog was heard calling simultaneously with B. gutturalis, A. b. brachycnemis, H. tuberilinguis, H. pusillus and H. marmoratus subsp. at Cwaka Dam and, minus B. gutturalis, at the fish ponds in December 1988. Calling is performed from exposed or partially concealed littoral or emergent vegetation. Mating was observed at the fish ponds, males clasping the females in amplexus.

SPECIES: Hyperolius semidiscus Hewitt, 1927. Yellow Striped Reed Frog.

RANGE: Lower eastern plateau slopes south of Piet Retief area, but not reaching the coast north of Mtunzini (Poynton 1964); the coastal area from Port Elizabeth to Mtunzini in Zululand and inland from Pietermaritzburg to Piet Retief (Wager 1986).

PREFERRED HABITAT: Reedbeds at the edges of rivers (Passmore and Carruthers 1979); vegetation in the vicinity of pools and vleis (Wager 1986).

SPECIES OCCURRENCE: An uncommon frog. A total of three specimens was collected, of which two are preserved: OSCA A18 and A23. A18 was collected from a Water Berry Tree Syzygium cordatum in a marshy habitat in the game park in October 1986; A23 was collected from a Guava Tree Psidium guajava near the students' dormitories in March 1987; and the third specimen was collected from a grass patch near the Cwaka River in April 1987.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 19. A18 and A23 are adult females; the specimen collected and released was an adult male.

The two females (n=2) provided a mean S.V.L. of 33,5 (range 33 - 34) mm, S.L. 18,5 (18 - 19) mm and D.H. 12 mm (no range); the male (n=1) provided a S.V.L. of 35 mm, S.L. 19 mm and D.H. 12 mm.

One female (n=1) yielded a mass of 1,73 g; the male (n=1) weighed 2,56 g.

TAXONOMIC CHARACTERISTICS: All three specimens fall within the range of features diagnostic for H. semidiscus as described in Poynton (1964), Passmore and Carruthers (1979) and Wager (1986), though with a considerable amount of colour-pattern variation. A18 was a light to dark green (variable under different lighting conditions) with the yellow canthal bands running across the eyes onto the snout, the left band to the tip of the snout, the right

terminating just beyond the nostril. The ground colour of A23 was a creamy yellow and was similarly marked to A18, though in this specimen the bands on the snout almost converged to form a V-shape. The dorso-lateral bands extended to just short of the folds created by the hindlimbs when the frog was resting. These bands were bordered by narrow blackish lines. The ground colour of the male (released) was similar to A18, ranging from light to dark green under different lighting conditions. It displayed a similar dorso-lateral and canthal banding pattern to the females.

The three specimens were spotted with cream to bright yellow on the dorsum, particularly on the posterior aspect (between the sacral region and the tip of the urostyle), and on the forelimbs and tibiae. The concealed surfaces of the limbs and webbing were a reddish-orange. The bellies, which were granular, were yellow. The throats of both females were pigmented; the gular disc of the male was dark yellow.

FIELD NOTES: A18 was resting on the undersurface of a Syzygium cordatum leaf with legs tucked in at the time of collection. This frog was kept in captivity for eleven days before sacrificing it, during which time it deposited small clusters of between 150 - 200 pigmented eggs. Dissection of this frog revealed many more eggs. The eggs were approximately 1,1 mm in diameter, white with a dark pole and were encased in thick jelly when laid.

A23, collected from the twig of a Psidium guajava near the students' dormitories - a considerable distance from any source of permanent water - was emaciated and extremely weak, incapable of leaping. She did not contain eggs, presumably having already laid, and weighed considerably less (0,83 g) than A18 which had a similar S.V.L.

This species appears to inhabit the riverine environment of the Cwaka River with Leptopelis spp. The fact that it was not recorded at Cwaka Dam where reedbeds exist is ascribable to an artefact of collecting or, alternatively, due to competition with other hyperoliid frogs, in particular H. tuberilinguis. Also, A18 was collected less than 100 metres from the site where H. argus, A48 with S.V.L. of 35 mm, was recorded in January 1988.

SPECIES: Hyperolius argus Peters 1854. Argus Reed Frog.

RANGE: The eastern lowlands from Durban northwards (Poynton 1964, who misidentified Natal material as H. p. puncticulatus) through Zululand and Mozambique to Kenya (Wager 1986).

PREFERRED HABITAT: The dense vegetation on the perimeters of coastal pans (Passmore and Carruthers 1979) or more or less open savannas, and larger bodies of still water, such as backwaters of large rivers, open swamps or dams especially where water-lilies are present (Poynton 1986).

SPECIES OCCURRENCE: A rare frog. Only one specimen was collected: OSCA A48. This frog was collected from a stack of dry grass floating on the water of a fish pond in January 1988.

SIZE, SEX, MEASUREMENTS AND MASS: A48 is an adult male with a S.V.L. of 35 mm, S.L. 19 mm and D.H. 14 mm. Its mass was not obtained.

TAXONOMIC CHARACTERISTICS: A48 fits the description for a H. argus male as described in Passmore and Carruthers (1979), Wager (1986), and Poynton and Broadley (1987). It was a light green colour when collected, but subsequently changed colour to light brown to dark green and almost black under different lighting conditions. A yellow band originated on the tip of the snout, running laterally across the top of the snout (canthal band), and dorso-laterally across the eyes onto the body where it disappeared into the flanks covered by the hindlimbs when the animal was in a resting position. The canthal and dorso-lateral bands were bordered with thick black lines. Patches of yellow bordered with black also occurred on the dorsal aspect of the tibiae. The ventrum, which was slightly granular, was white while the granular gular disc was yellowish. The ventral aspect of the limbs was light green.

Poynton (1986) validated the name argus for Natal material which he had earlier (1964) assigned to puncticulatus Pfeffer (1893). Specimens of H. semidiscus (A18 and A23 plus a third specimen released) were distinguished from H. argus by their narrow canthal and dorso-lateral lines or bands (broad in argus), the fact that the canthal bands do not meet on the snout or that the dorso-lateral bands do not extend as far back as argus, and their conspicuously slender builds (robust in argus).

Poynton (1986) agrees with Loveridge's (1941) suggestion that the affinities of semidiscus appear to lie with argus and puncticulatus. In 1986 Poynton reported on the possibility of argus and semidiscus occurring sympatrically; this suggestion was based on two Natal Museum specimens from Eshowe, one of which, a female, showed semidiscus markings, while the other, a male, showed markings more typical of argus. A small series of male Hyperolius frogs collected from Mount Edgecombe, just north of Durban, apparently shows features of introgression between argus and semidiscus (Poynton 1986). The OSCA material confirms the

sympatry of argus and semidiscus; they have yet, however, to be recorded from the same habitat. On the night that argus was collected, its "clucking" call was clearly distinguished from the "creaking" and "croaking" calls commonly associated with semidiscus; the dissimilar calls of these two frogs, important for specific mate recognition (SMR), suggests argus and semidiscus behave as good species at OSCA at any rate, though more ecological evidence is necessary.

FIELD NOTES: A48 was collected at night while it was calling. Also calling from the fish ponds on this occasion were H. marmoratus subsp., A. b. brachycnemis and K. senegalensis, while L. natalensis and L. mossambicus could be heard calling from the riverine vegetation along the Cwaka River.

SPECIES: Hyperolius tuberilinguis Smith, 1849. Tinker Reed Frog.

RANGE: The Natal and Mozambique coastal plain (Poynton 1964) northwards; from Margate up the coastal belt through Zululand, Mozambique and Malawi (Wager 1986).

PREFERRED HABITAT: Lowveld pans and swamps, especially those where vegetation is abundant (Passmore and Carruthers 1979); common in reedbeds bordering swamps and rivers (Poynton and Broadley 1987).

SPECIES OCCURRENCE: A common species. Three specimens were collected, and many more recorded, of which only two are preserved: OSCA A3 and A59. A3 was collected from the fish ponds in August 1986, while A59 was collected from the fish ponds in December 1988. One specimen was collected from the window pane of one of the students' dormitories in November 1986, and another from Bullrushes Typha capensis at Cwaka Dam in December 1986 (both released). This species was also recorded on emergent and littoral vegetation at Cwaka Dam and the fish ponds in August, November and December 1986, April 1987 and again in December 1988.

SIZE, SEX, MEASUREMENTS AND MASS: A3 is an unsexed juvenile and A59 is an adult male; the one specimen collected and released was an adult female. The juvenile (n=1) provided a S.V.L. of 26 mm, S.L. 13 mm and D.H. 9 mm; the adult male (N=1) provided a S.V.L. of 30 mm, S.L. 16 mm and D.H. 11 mm; the female (n=1) yielded a S.V.L. of 39 mm, S.L. 19 mm and D.H. 12 mm. The male (n=1) weighed 1,50 g and the female (n=1) 4,32 g.

TAXONOMIC CHARACTERISTICS: All specimens fall within the range of characteristics diagnostic for H. tuberilinguis as described by Poynton (1964), Passmore and Carruthers (1979), and Wager (1986). A3 has a mottled green and brown dorsum with a geometric pattern similar to that for juveniles as described by Poynton (1964). Two narrow brown lines run from the eyes over the canthus rostralis and nostrils onto the snout, but do not meet.

The head, dorsum, forelegs, shanks and feet of A59 were a bright yellow, as were all the individuals sighted in December 1988. The thighs (flash colour) were a bright orange. The ventrum was white and granular, and the gular disc was yellow surrounded by orange folds. All other populations sighted on previous occasions were a homogenous and striking leaf-green colour, similar to the colour of Typha capensis fronds on which many of them were observed. The concealed surfaces were also bright orange.

FIELD NOTES: Many specimens were observed during daylight hours, basking in the sun while clinging to Typha capensis fronds. The limbs were drawn in tight against the body which was flattened dorso-ventrally against the plant. The eye orbits were partially closed. When disturbed, this frog will plunge into the water where it will remain submerged for minutes on end. Two specimens were observed on the sparse growth of Bullrushes at the fish ponds in April 1987, but when this vegetation was subsequently cleared this species was not seen again until December 1988, when it was recorded in large numbers. The specimen collected from the window pane of the students' dormitories in November 1986 was a considerable distance from the nearest water body containing Bullrushes to which this species is obviously attracted.

Large numbers of males were recorded calling from the fish ponds and Cwaka Dam in December 1988. Males vocalised from exposed or partly exposed positions on vegetation, including grasses. Mating was also observed at these localities, the male holding the female in the region of the axilla (axillary clasp). In December 1988, this species was recorded inhabiting the same ponds as S. carens larvae, P. anchietae, P. oxyrhynchus, P. natalensis, A. b. brachycnemis, A. fornasinii, H. pusillus and H. marmoratus subspp.

SPECIES: Hyperolius pusillus (Cope, 1862). Water Lily Frog.

RANGE: The coastal belt from Kei Mouth in the eastern Cape north through Maputaland, Natal and Zululand, and the lowveld of the eastern Transvaal, Mozambique to Malawi and Kenya (Poynton 1964; Wager 1986).

HABITAT: Pans and vleis in the warmer lowveld and coastal regions, especially where there are water lilies or other floating plants (Passmore and Carruthers 1979).

SPECIES OCCURRENCE: A common frog. Only one specimen was collected and sacrificed: OSCA A68 (lost in transit). This specimen was collected from the fish ponds in December 1988. Many more were sighted at this locality while others were heard calling at Cwaka Dam in December 1988.

SIZE, SEX, MEASUREMENTS AND MASS: A68 was an adult male (n=1) with a S.V.L. of 20 mm, S.L. 11 mm and D.H. 7 mm. This specimen was not weighed.

TAXONOMIC CHARACTERISTICS: The characteristics of A68 were typical for H. pusillus as described in Passmore and Carruthers (1979), Wager (1986) and Poynton and Broadley (1987). The dorsum was a translucent green; faint dorsal lines were present; dark spots were visible on the head, back and fore- and hindlimbs. The gular disc was bright yellow, and the webbing and expanded discs were yellowish-orange.

FIELD NOTES: This species was recorded calling in considerable numbers from exposed and partially concealed vegetation, particularly grasses, at the fish ponds and Cwaka Dam in December 1988. Mating, the male grasping the female in amplexus, was also observed at the fish ponds. The fish pond at which A68 was recorded, was also occupied by S. carens larvae, A. b. brachycnemis, A. fornasinii, H. tuberilinguis and H. marmoratus subsp.

SPECIES: Hyperolius marmoratus marmoratus Rapp, 1842 x Hyperolius marmoratus taeniatus Peters, 1854. Painted Reed Frog.

RANGE: H. m. marmoratus ranges from the Transkei to about St. Lucia (Passmore and Carruthers 1979), extending inland to about the 4,000 ft. (1,200 m) contour (Poynton 1964); H. m. taeniatus ranges from the Mozambique Plain north of Lake St. Lucia, and adjoining plateau slopes (Poynton 1964).

PREFERRED HABITAT: Sedgefields or other erect water plants growing around almost any permanent body of water in the lowveld and coastal regions (Passmore and Carruthers 1979); typically found calling in abundance in reedbeds of ponds, swamps or sluggish rivers, but males also call on waterside grasses, bushes or trees, or in floating vegetation (Poynton and Broadley 1987).

SPECIES OCCURRENCE: A common species. Seven specimens were collected, and many more sighted, of which five were sacrificed: OSCA A19, A20, A26, A43 and A52. These specimens were collected from the window pane of a students' dormitory in October 1986; along the banks of the Cwaka River in November 1986; the fringes of Cwaka Dam in March and December 1986; a dry cement water canal in the game park in July 1987; and the edges of the fish ponds in January 1988. Populations of this frog were recorded from the fish ponds in January and December 1988, and Cwaka Dam in December 1988.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 21. With the exception of a juvenile (A43) which cannot be sexed, all preserved material are adult and subadult males. The juvenile (n=1) provided a S.V.L. of 20 mm, S.L. 9 mm and D.H. 6 mm. The mean S.V.L. of the preserved males, plus another two adult males collected and released (n=6), was 27,7 (range 26 - 30) mm, S.L. 14,5 (14 - 16) mm and D.H. 9,7 (9 - 10) mm. The mean mass of three adults (n=3) was 1,67 (range 1,39 - 2,10) g.

TAXONOMIC CHARACTERISTICS: Specimens collected and observed displayed a range of colour patterns, from typical H. m. marmoratus (see Plate 14) to almost typical H. m. taeniatus (see Plate 15) as described in Poynton (1964), Passmore and Carruthers (1979) and Wager (1986). A52 showed the typical nominate marmoratus colour pattern of mottled black, yellow and white dorsally. Dramatic colour change was noted in this specimen, however, from the black and white mottled pattern to almost pure white with only traces of grey and yellow showing when this specimen was exposed to different lighting conditions, and when agitated. By contrast, A19 represents closest the typical pattern of taeniatus. This specimen was longitudinally striped in colours of black, white and yellow. The white and black stripes were approximately equidistant, and the yellow stripe was contained within the white stripe. However, posteriorly in the region of the sacrum and dorso-laterally on the flanks, this colour pattern was occasionally interrupted, becoming marbled or patchy. A26 revealed a similar colour pattern to A19, except that the black and white stripes were not equidistant, the black bands being noticeably broader, while the pattern interruption in the sacral region was more extensive. Both A19 and A26 were able to change their bright colours to a predominantly

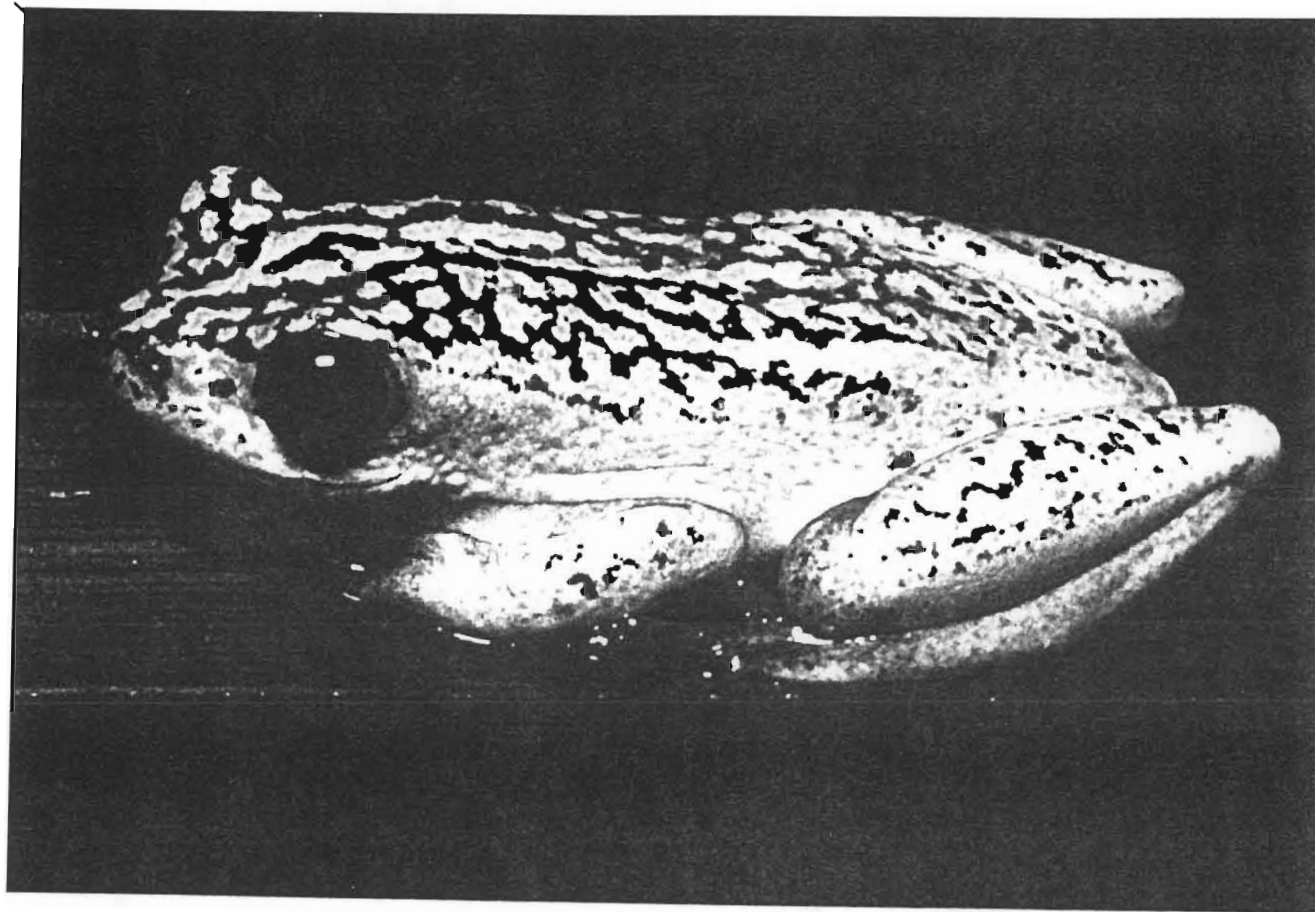


Plate 14. An adult *Hyperolius m. marmoratus* showing the typical mottled colour pattern of this subspecies (5 x life size).

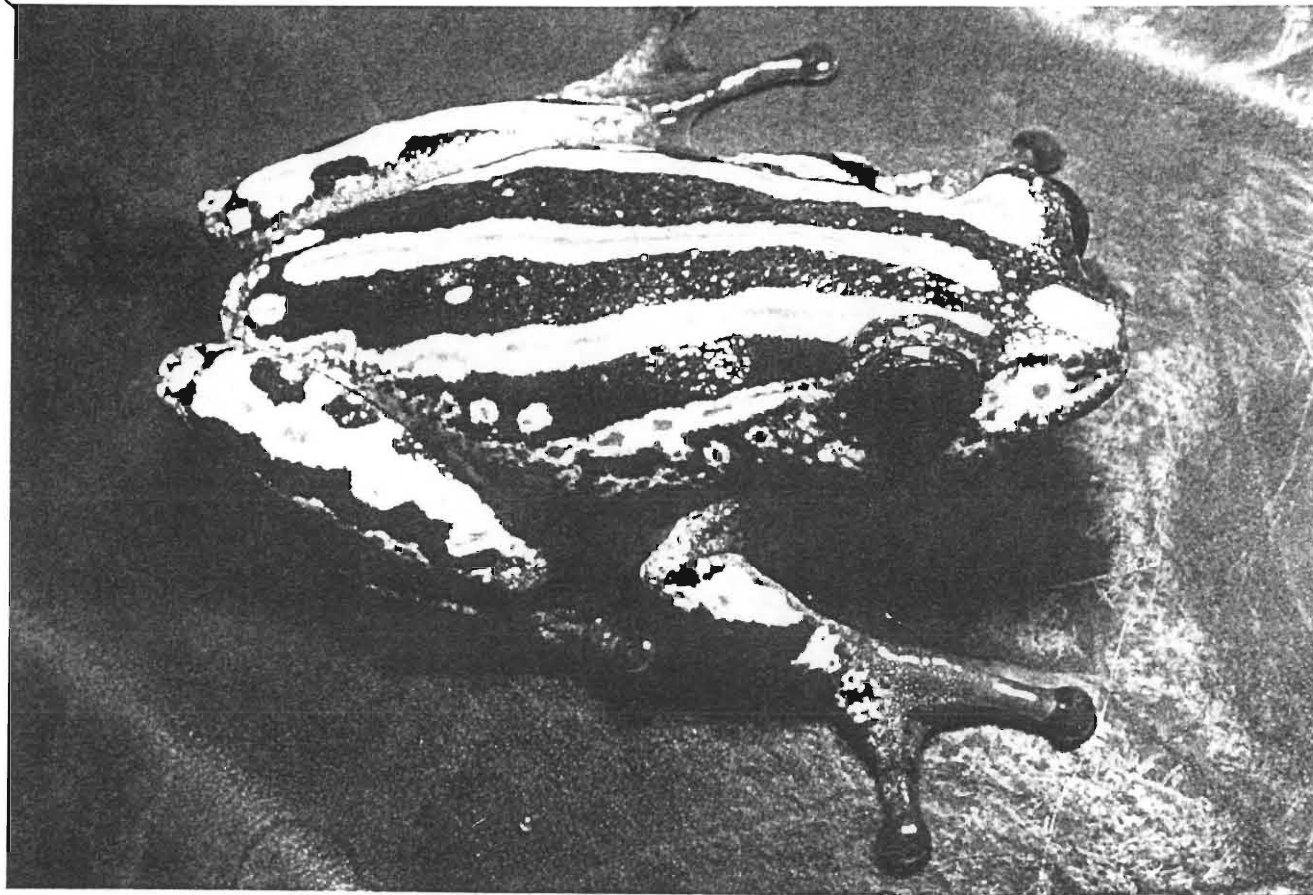


Plate 15. An adult *Hyperolius m. taeniatus* showing characteristics of intergradation with nominate *marmoratus*: the black lines are broader than the white, and the striped pattern is interrupted posteriorly with spots (4,5 x life size).

white with light grey and yellow stripes, usually when excited or disturbed, without such change appearing to be dependent on any background colour or lighting conditions.

A20 displayed a brown colour pattern with an elongated stripe dorso-laterally, typical of the juvenile or young mature male pattern of taeniatus. A43, the juvenile, was a homogenous light brown colour without any distinguishing markings. Many more young males observed were a drab brown to tan, with a light dorso-lateral stripe running from the snout across the flanks.

The dorsal aspect of the thighs of A19 were patterned similarly to the dorsum, but some of the lines were broken and showed a marbling effect. A56 has thighs patterned in the same manner as the dorsum, while A26 had a pattern intermediate between the two. The marbled thighs of A19 and A26 were reddish-orange, as were the concealed surfaces of the limbs, the webbing and digits of all adults collected or observed. The ventral colours ranged from white to reddish-pink. The gular discs of all males were grey.

The Hyperolius marmoratus complex has been attended by considerable taxonomic confusion. Poynton (1985c) is of the opinion that the marmorate reedfrog in southern Africa comprises a single intergrading nexus of forms, which can be treated as subspecies of marmoratus, since the name marmoratus was applied by Rapp (1842) (in Poynton 1985c) to a recognisable form in Natal. According to Passmore and Carruthers (1979), three subspecies exist within the borders of South Africa, while Poynton and Broadley (1987), in a review of the marmoratus complex, recognise no less than 15 subspecies from the Zambesiaca area. The splitting of this complex has been based almost entirely on dorsal patterning, since they all conform to a basic morphological pattern.

On present evidence, the OSCA material displays a range of patterning from typical marmoratus to taeniatus as described in Poynton (1964), Passmore and Carruthers (1979) and Wager (1986), suggesting these two subspecies intergrade in the coastal and adjoining area between 28° and 29° S, including Lake St. Lucia, a locality from which intergrading was first noted by Poynton (1964).

FIELD NOTES: This frog appears to favour littoral and other vegetation fringing water bodies, and was recorded on Typha capensis fronds, sedges and standing grasses, clumps of freshly cut grasses, and shrubs and small trees overhanging water bodies. Specimens were found during the day seeking shelter under carpets of freshly cut grasses at the fish ponds in January 1988. At night many males, displaying the typical marmoratus colour pattern, were observed calling from exposed positions, usually on grass stalks and branches of small trees, at

the fish ponds. Young mature males of the brown colour variety were also observed vocalising from these positions at the fish ponds. Also recorded calling from this locality on the same occasion was H. argus, A. b. brachycnemis and K. senegalensis. L. natalensis and L. mossambicus were heard calling too from the riparian vegetation in the game park.

In December 1988, a large number of reed frogs were recorded calling from one of the fish ponds. They displayed the full range of marmoratus to taeniatus colour patterns, as well as intergradations thereof. In amplexus mating was recorded, including subadult brown males, on exposed or partially exposed vegetation. S. carens larvae, A. b. brachcnemis, A. fornasinii, H. tuberilinguis and H. pusillus were recorded from the same pond on this occasion.

An adult collected from the Cwaka Dam was basking in the direct sunlight while clinging to a Typha capensis frond less than a metre away from an adult H. tuberilinguis, which was also basking. Another adult collected from a Bullrush frond on the banks of the Cwaka River and kept in captivity, was consumed by an adult X. l. laevis (A14 with S.V.L. of 64 mm).

SPECIES: Pelomedusa subrufa (Lacépède, 1788). Cape or Hingeless Terrapin.

RANGE: Throughout southern Africa, except the hyper-arid Namib Desert and Lesotho; found wherever water is present, even in the central Karoo and Etosha (Branch 1988a).

PREFERRED HABITAT: Practically any permanent or semi-permanent body of water, including dams, pans, vleis, lakes and slow-moving rivers; slow-moving and still water, including temporary pans (Branch 1988a); although appearing to show a preference for dams, pans swamps and bogs it does occur to a lesser degree along rivers (Boycott and Bourquin 1988).

SPECIES OCCURRENCE: An uncommon species. A total of four specimens were collected; one from the small dam below the dairy in December 1986, one from the tarred road immediately opposite a culvert in May 1987, one from the banks of the Cwaka River in August 1987, and one from a pole foundation in the game park immediately below the water purification plant in August 1987.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 22. All four specimens were adults comprising two males and two females; these specimens were released.

The two males (n=2) provided a mean S.C.L. of 252,5 (range 250 - 255) mm, S.W. 185 (180 - 190) mm and S.H. 87,5 (85 - 90) mm; the two females (n=2) provided a mean S.C.L. of 232,5 (range 230 - 250) mm, S.W. 182,5 (180 - 185) mm and S.H. 80 mm (no range).

The two males (n=2) provided a mean mass of 2100 g (no range); the two females (n=2) yielded a mean mass of 1750 (1600 - 1900) g.

TAXONOMIC CHARACTERISTICS: The *P. subrufa* series was characteristic of this species as described in Boycott and Borquin (1988) and Branch (1988a). This species is readily distinguishable from *Pelusios sinuatus*, a species with which it may occur sympatrically in Zululand, by the flatter carapace, the S-shaped curve produced by the neck when the head is withdrawn into the shell, and the fixed anterior portion of the plastron.

FIELD NOTES: The terrapin collected from the small dam had apparently been hibernating in the drying mud at the bottom of the dam, but became active as a result of overnight rains. The specimen from the tarred road was active at the time of collection, and appeared to have arrived from the small stream which passes through the culvert under the tarred road. The specimen from the bank of the Cwaka River was basking at the time of collection. The specimen from the pole foundation was trapped. It appeared to have fallen into the steep-sided foundation which was almost a metre deep and from which escape was impossible.

All four specimens produced a powerful and offensive odour when handled. Locals, who refer to this and all other chelonians as "ufudu", refused to handle it. Two of the specimens' shells, particularly the carapaces, were covered with dense mats of algae. The one specimen was clocked swimming at a speed of 2,8 m/sec when released into a broad section of the Cwaka River.

Branch (1988a) has proposed the common name Marsh or Helmeted Terrapin for *P. subrufa* and Borquin and Boycott (1988) have called it the Cape Terrapin. The present author endorses the name Cape Terrapin since it is the only indigenous terrapin found in the Cape, though the name Hingeless Terrapin is probably more appropriate since it distinguishes this terrapin from all other indigenous terrapins *Pelusios*, which have hinged plastrons.

SPECIES: Kinixys natalensis Hewitt, 1935. Natal Hinged Tortoise.

RANGE: Natal midlands northwards through the mountainous inland regions, along the Lebombo range on the Swaziland/Mozambique border and into the eastern Transvaal (Boycott and Borquin 1988; Boycott and Jacobsen 1988; Branch 1988a).

PREFERRED HABITAT: Tropical lowveld (Branch 1988a) and valley bushveld in the south, mountain thornveld and bushveld in northern Natal, and arid bushveld in the extreme north of its range; absent from the coastal plain and lowveld regions of Natal, preferring the more rocky, inland regions (Boycott and Borquin 1988; Boycott and Jacobsen 1988).

SPECIES OCCURRENCE: A common species. A total of eight specimens, including two dead fire victims, were collected or sighted, one of which was sacrificed and preserved: OSCA R102. Five of these tortoises, including R102, were recorded from the savanna grassveld of the game park; two were found in cattle camps; and one individual was found at the paddock behind the dairy. Five of these specimens were recorded from July through to November 1987, one in March and one in May 1987 respectively, and the voucher specimen in December 1988. W. Prinsloo (pers. comm.) provided a photographic record of a specimen collected from the game park prior to the survey.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 23. Of the four specimens physically examined, three were sexually mature males and the other (R102) is an adult female. The mean C.C.L. of the three males (n=3) was 161,7 (range 137 -178) mm, T.L. 124,7 (109 - 135) mm, S.B. 90,0 (82 - 98) mm and S.H. 60,3 mm (58 - 63). The female provided a C.C.L. of 177 mm, T.L. 138 mm, S.B. 100 mm and S.H. 67 mm. Two males (n=2) provided a mean mass of 362,88 (range 256,08 - 469,67) g; the female weighed 495,00 g.

TAXONOMIC CHARACTERISTICS: K. natalensis (synonym K. belliana zuluensis Hewitt, 1931 part) was recognised as a full species only in 1981 by Broadley. Loveridge and Williams (1957), in their extensive revision of the African tortoises and turtles, placed Hewitt's natalensis in the synonymy of K. b. belliana. According to Broadley (1981), Boycott (1988), Boycott and Borquin (1988), Boycott and Jacobsen (1988) and Branch (1988a), Kinixys comprises three taxa in southern Africa, namely two subspecies of belliana, nominate belliana and spekii, and the species natalensis. Typical belliana differs from spekii in carapace shape and patterning, the former ranging from Eshowe and Richards Bay in the south, northwards through Zululand into Mozambique (Boycott and Borquin 1988), whereas spekii occurs in northern Natal and Swaziland, extending into the northern and eastern Transvaal through

Zimbabwe northwards. Broadley (1981) has suggested that natalensis is sympatric, or at least parapatric, with both belliana subspecies.

The poorly developed carapacial hinge between the seventh and eighth marginals, the distinctive plastral pattern of symmetrical black and yellow markings (see Plate 16), the average size of adults and the tricuspid beak distinguished OSCA tortoises as natalensis. R102 is without a divided supracaudal shield; Broadley (1981), Boycott (1988), and Boycott and Jacobsen (1988), refer to the partial or total division of the supracaudal shield as one of the diagnostic characteristics, but point out that in a series of natalensis studied (n=36), only 75% of specimens displayed this characteristic which must therefore be considered unreliable when used on its own. The pair of gulars of R102 are asymmetrical; the right gular is considerably longer than the left (12,4 mm vs 10,6 mm) and is thus longer than wide (11,0 mm) (see Plate 17). This contradicts the statement by Boycott (1988), Boycott and Jacobsen (1988), and Boycott and Borquin (1988), that the gulars are broader than long (each gular shield is wider than its length), and serves to illustrate the individual variation within the species. The present author is of the opinion that the partial or total division of the supracaudal shield and the size of the gular shields are unreliable or at least inconsistent diagnostic features, but that the plastral pattern, size and tricuspid beak are good, reliable features.

FIELD NOTES: Four of the specimens collected or sighted were active, either foraging or feeding, and were recorded at mid-morning or in the late afternoon on warm days. One specimen was recorded in the shade of a bush in the game park on a hot afternoon.

A few days after a controlled burn in the game park in early September 1986, the charred carcasses of two specimens were discovered in an area of 28 hectares through which narrow transects were walked. Both specimens appeared to have fled the grassveld in an attempt to find safety under dense vegetation where they were burned. A third specimen, alive but with head, legs and carapace scorched (see Plate 18), was discovered in grassveld immediately adjacent to the burned plot. It appeared dehydrated, and drank liberally from a pond of water to which it was taken.

The voucher specimen has lost portions of the second vertebral and second left nuchal scutes, exposing the bony plates which were cracked, suggestive of mechanical damage (see Plate 19); three other specimens, two from the game park (one of which is a photographic record) and the other from a cattle camp, also had cracked and broken scutes. Another two specimens, one from a grassveld habitat between the staff houses and the cattle dam, and the other from a grassveld habitat in the game park, appeared to be survivors of previous fires, evidence for

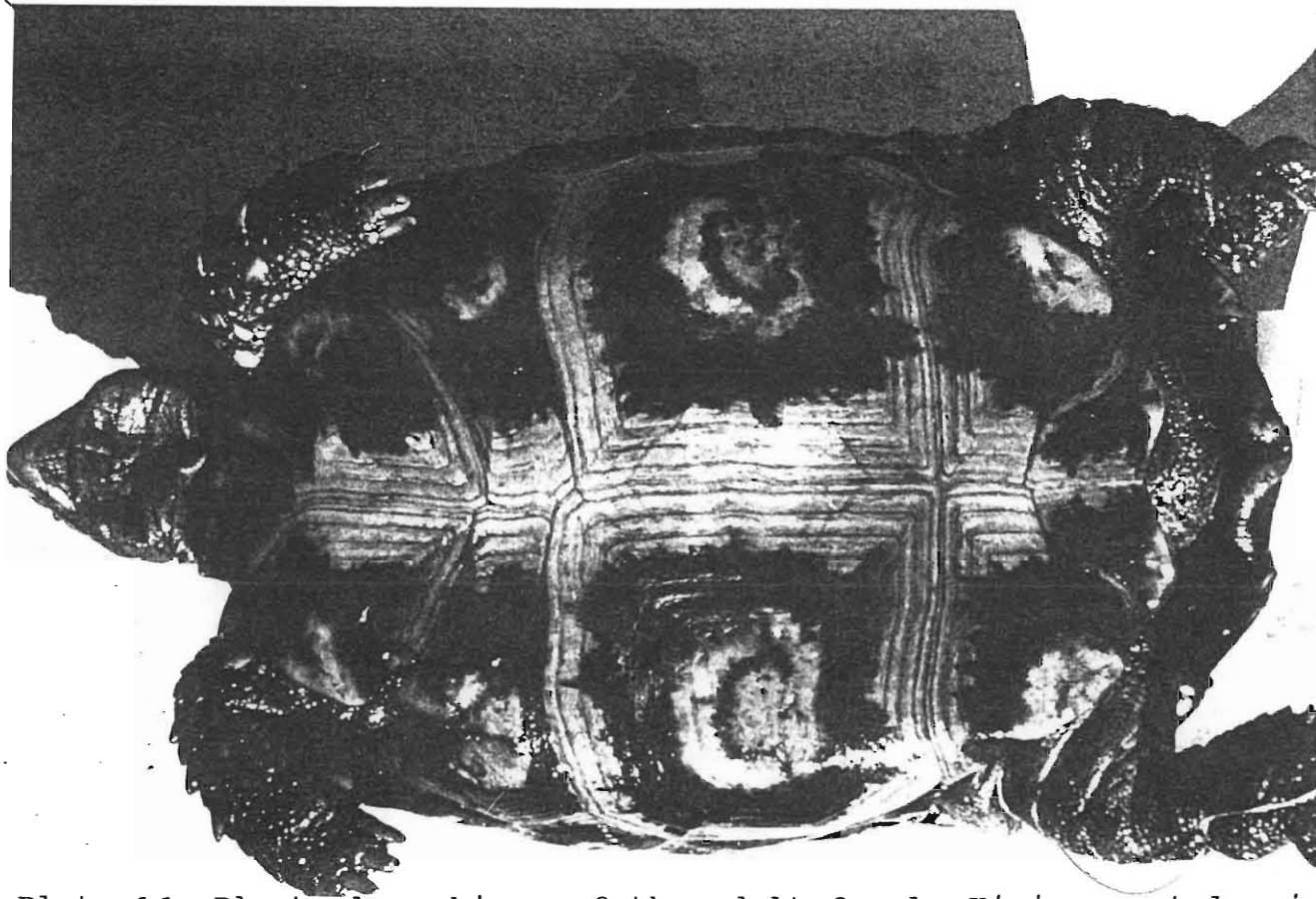


Plate 16. Plastral markings of the adult female *Kinixys natalensis* voucher specimen (R102) (life size).



Plate 17. Pair of asymmetrical gular shields of the *Kinixys natalensis* voucher specimen (R102). Note that the right gular is longer than wide (2,5 x life size).

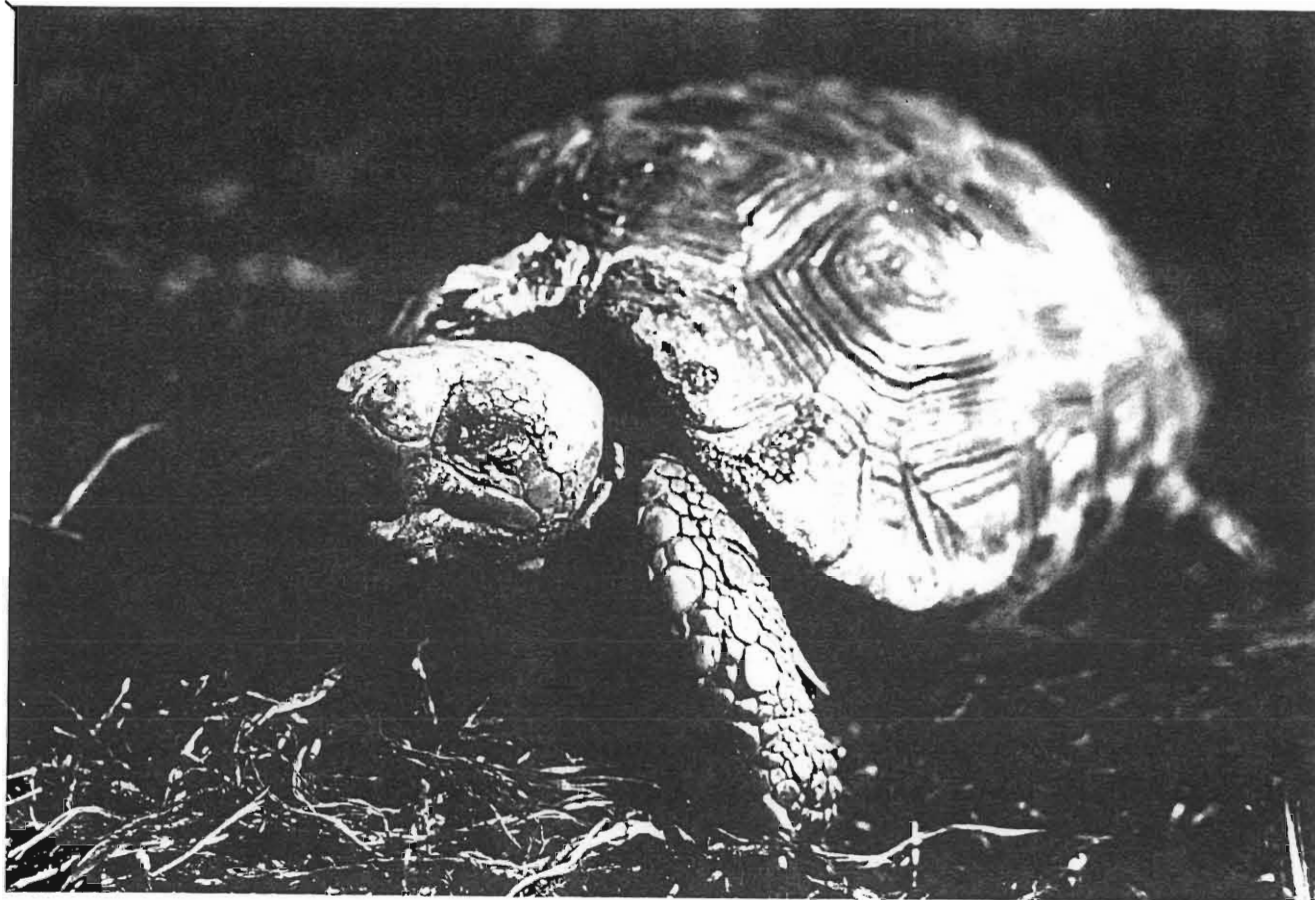


Plate 18. Scorched and dehydrated adult *Kinixys natalensis* following a veld fire in the OSCA game park (1,3 x life size).

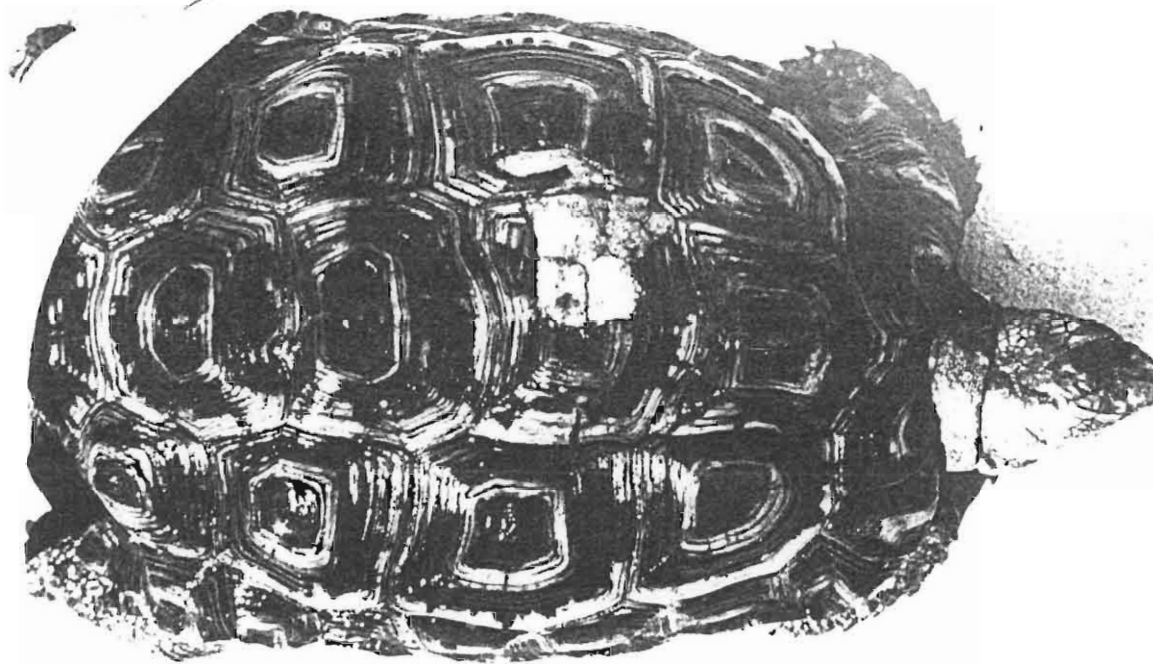


Plate 19. Mechanical damage to the second vertebral and second left nuchal scutes of the *Kinixys natalensis* voucher specimen (R102) (0,9 x life size).

which were the numerous scutes on the sides of the carapace which had been scorched or burned off.

The occurrence of natalensis at OSCA is surprising since this species was believed to be absent from the coastal plain and lowveld regions of Natal (Boycott 1988; Boycott and Borquin 1988; Boycott and Jacobsen 1988) and, according to Branch (1988a), apparently only inhabits rocky areas in an altitude range of 300 - 1000 m. There is presently no evidence to suggest the OSCA population of natalensis has been introduced and it can therefore safely be assumed that these tortoises are indigenous to the area.

SPECIES: Crocodylus niloticus Laurenti, 1768. Nile Crocodile.

RANGE: Northern Namibia, northern Botswana, Zimbabwe, Mozambique, Transvaal, Zululand and Natal as far south as the Tugela River; Okavango Basin, Cunene River and major rivers draining to the east coast, south to Tugela River (Branch 1988a; Jacobsen 1988).

PREFERRED HABITAT: Perennial and permanent rivers, lakes and dams in the savannas and sub-tropics; large rivers, lakes and swamps, but also into river mouths, estuaries and mangrove swamps (Branch 1988a).

SPECIES OCCURRENCE: An uncommon reptile. A number of sightings of this large reptile have been made from the Cwaka River and Cwaka Dam up until 1984, with a further sighting in October 1986 (W. Prinsloo and H. Allen pers. comm.).

SIZE, SEX, MEASUREMENTS AND MASS: No accurate data are available; specimens ranging in size from 1400 - 2500 mm were reliably sighted.

TAXONOMIC CHARACTERISTICS: An unmistakable large amphibious reptile with large peg-like teeth, many of which protrude when the jaws are closed; thick skin with numerous protrusions on the dorsum and long, laterally compressed and scuted tail (Branch 1988a; Jacobsen 1988). C. niloticus is the only indigenous crocodylid in southern Africa.

FIELD NOTES: W. Prinsloo (pers. comm.) reported sighting three specimens, ranging in size from approximately 1400 to 2000 mm in length, at Cwaka Dam up until 1984 when they disappeared, presumably having been swept away by flood waters associated with Cyclone "Demoina". W. Prinsloo (pers. comm.) also reported the presence of a specimen in the

Cwaka River in the game park in 1983 which he estimated was 2500 mm long. He stated that this crocodile migrated up the Cwaka River from the Nseleni River during a drought, and that he occasionally sighted it in riverine vegetation on the banks of the river over a period of almost twelve months before it disappeared at the time of "Demoina". H. Allen (pers. comm.) reported the presence of a specimen, which he estimated was 2200 mm long, basking on a mud bank on the northern side of the inlet to the Cwaka Dam in October 1986.

SPECIES: Hemidactylus mabouia mabouia (Moreau de Jonnés, 1818). Tropical House Gecko.

RANGE: Kaokoveld (northern Namibia), northern Botswana, northern and eastern Transvaal and Zululand (FitzSimons 1943), but now spreading along the Natal coastal and inland regions (Borquin 1987), and eastern Cape coastal towns where individuals have been recorded at East London (W. Haselau pers. comm.) and Port Elizabeth (Branch 1988a).

PREFERRED HABITAT: Hollows of trees, under loose bark, in the crowns of palms, in rock cracks and crevices and, in fact, any dark convenient place on or above the ground (FitzSimons 1943); varied, arid and mesic savannah, and coastal bush (Branch 1988a). Also particularly partial to human dwellings and other buildings.

SPECIES OCCURRENCE: A common species. A total of seven specimens were collected, and an indeterminate number of others sighted, of which two were sacrificed: OSCA R81 and R101. R81 was collected from a window pane at the students' dormitories in March 1987. A hatchling (R101) and unhatched eggs were collected in December 1988. Other specimens were collected or sighted throughout the year, but predominantly in the summer months, on the walls and windows of buildings especially in the vicinity of lamps.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 24. R81 is an adult female and R101 a freshly hatched juvenile; all other specimens collected or sighted were unsexed subadults and adults. The female (n=1) yielded a T.L. of 132 (65 + 67) mm and B.D. of 12 mm; the juvenile (n=1) provided a T.L. 44 (23 + 21) mm, a B.D. of 4 mm and a head diameter (D.H.) of 5 mm; another specimen (released) provided a B.L. of 53 mm, T. 45 mm (tail truncated) and B.D. 10 mm. The eggs measured 9 - 10 mm x 8 - 9 mm. The female (n=1) weighed 7,48 g; the other (released) specimen 3,08 g; the juvenile (n=1) weighed < 0,50 g.

TAXONOMIC CHARACTERISTICS: The specimens examined fulfilled the diagnostic characteristics of H. m. mabouia as described in FitzSimons (1943) and Branch (1988a). The

hatchling was distinctly patterned in grey with ten dark bands across the tail. Another subspecies H. m. tasmani which, according to Branch (1988a), may in fact be a full species, occurs in Zimbabwe and may be distinguished from monotypic mabouia by its larger size, strongly keeled dorsal tubercles and distinct crossbands.

FIELD NOTES: This gecko appeared to be active at OSCA throughout the year, except on very cold and windy nights particularly in the months of June, July and August. As expected, most observations were made in the summer season, especially on warm, humid and windstill evenings which, incidentally, are associated with an increase in insect activity.

A total of ten eggs, three of which were already hatched, were found in a cement and brick pump housing unit covered with a steel lid near the main complex pond. This communal nest of eggs was discovered at the base of loose, perforated clay bricks. An adult was also observed in the unit. The eggs were white, slightly oval and smooth to the touch. One of the eggs was crushed while moving the bricks and revealed a well-developed embryo, which was deposited in the container housing R101. R101 emerged from its egg-shell while the egg was held in the hand. The hatchling was immediately active, initially twitching vigorously before leaping from the hand to scurry over the ground at remarkable speed. R81 was gravid, containing two small ova measuring 5,5 x 3,0 mm each.

This gecko is primarily nocturnal, though in buildings with little light specimens were occasionally sighted foraging during the day. It is particularly fond of lamp-lit situations where it will wait for insects attracted to the light. It will feed on practically any insect it can catch, and prey items included small moths, lacewings, small flies and a variety of other small, unidentified flying insects. Never more than three geckos were observed simultaneously at any one feeding site.

The colour of this gecko appeared to vary not only according to the colour and lighting conditions of the environment in which it occurred, but also to temperature. A specimen collected from behind the blackboard of a classroom displayed a greyish-brown ground colour with distinct dark brown to black bands across the back and tail, but when cooled for photographic purposes became almost pure white with indistinct markings.

This gecko will emit short squeaks when handled roughly and will also resort to biting as a means of defence. Five of the specimens collected were fed to snakes. One was fed to an adult N. mossambica, two to L. fuliginosus and the others to P. s. semivariiegatus. One of the specimens fed to P. s. semivariiegatus put up a desperate struggle when struck, turning its head to bite the snake in the neck where it held on, but released its hold a few minutes later,

and was swallowed head first. A number of specimens were lightly infested with red mites (Acarinae), provisionally identified as Pterygosomid mites.

SPECIES: Lygodactylus capensis capensis (A. Smith, 1849). Cape Dwarf Gecko.

RANGE: Botswana, northern Cape Province, Transvaal, Swaziland and Natal (FitzSimons 1943); eastern half of the subcontinent, from southern Transkei to East Africa, and also occurring at Port Elizabeth (Branch 1988a).

PREFERRED HABITAT: Open woodland and savanna on trees, but also frequently found on old fence poles, on the walls and in the roofings of huts and houses, and among rocks and dead vegetation (FitzSimons 1943); well-wooded, dry savannah (Branch 1988a).

SPECIES OCCURRENCE: A common species. Many specimens were collected and sighted, of which three are preserved: OSCA R10, R42 and R58. Specimens were collected or sighted on creosoted poles, walls of buildings, nylon netting covering nursery plants and other artificial situations, and on a variety of trees and bushes, including Acacia spp., Caussarina equisetifolia, Euphorbia sp. and Pelargonium sp. Collections and observations were made throughout the year in predominantly sunny and warm weather conditions.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 25. R10 and R58 are adult females; R42 is an adult male. The T.L. of the male (n=1) is 70 mm (30 + 40) mm and B.D. 6 mm; the mean T.L. of the females (n=2) is 74,5 (range 68 - 81) mm, B.L. 32,5 (32 - 33) mm, T. 42 (36 - 48) mm and B.D. 7 (6 - 8) mm. Only one specimen (n=1), a female with T.L. 81 mm, was weighed, yielding a mass of 1,08 g.

TAXONOMIC FEATURES: All specimens examined conformed to the description of L. c. capensis as provided in FitzSimons (1943) and Branch (1988a). The colour of specimens was variable, ranging from greyish-white to dark grey and brown, but within the range of colour pattern for this taxon. The throats of all three preserved specimens were mottled to varying degrees with greyish-brown, heavily in R10 through to barely discernible in R42. Juveniles tend to be more densely patterned and have orange-tinted tails.

FIELD NOTES: R10 was gravid. She contained two ova, measuring 4,7 x 4,1 mm. R42, the male, had femoral pores, whereas both females, R10 and R58, were without such pores.

This gecko is particularly common in and around places of human habitation. On walls it is not very agile and is fairly easily caught with the hand, sometimes even losing its grip and falling to the ground. The tail of this species is friable, being autotomised with ease when handled. On trees, however, against which it is often difficult to discern due to its cryptic coloration, it is considerably more difficult to catch since it has the habit of retreating to the opposite side of the tree. Moreover, it displays the tendency to ascend trees beyond one's reach and will often disappear into loose bark if this is available. In cracks and under the bark of trees, particularly Acacia trees, it is often seen associated with Blaberid Cockroaches (Blaberidae). This gecko is most active at mid-morning and in the late afternoon on sunny and warm days. In the heat of the day it will seek shelter in the shade, and foraging trips at these times are of short duration only.

L. c. capensis has a varied diet and appears to take any arthropod which it can overpower. Prey items taken include small hymenoptera, flies (Diptera), beetles, bugs, ants and their larvae, and small jumping spiders (Salticidae). A large number of geckos were observed congregating on a flowering Euphorbia, gorging themselves on small insects which had come to pollinate or feed off the plant, especially beetles, bugs, flies and small bees.

An adult collected in June 1987 emitted a short, sharp squeak when handled. No further calls were heard from this species. Specimens were fed to a number of snakes, namely P. s. semivariatus, Crotaphopeltis hotamboeia, L. fuliginosus and Thelotornis capensis capensis. Many of the specimens collected or sighted were heavily infested with small red mites (Acarinae), provisionally identified as Pterygosomid mites.

SPECIES: Varanus niloticus niloticus (Linnaeus, 1766). Nile Monitor or Water Leguaan.

RANGE: Southern Africa, excluding the dry southwestern and north-western areas of the Cape Province, Namibia and the Kalahari (FitzSimons 1943); eastern part of southern Africa, extending along the Orange River to the Atlantic Ocean and Fish River Canyon, and along the south coast to the Gamtoos River valley, but is absent from the west Cape (Branch 1988a).

PREFERRED HABITAT: Near practically any permanent or semi-permanent body of water, including swamps, vleis, dams, lakes and rivers; rivers, pans and major lakes (Branch 1988a).

SPECIES OCCURRENCE: A common species. A total of six specimens were collected and many more observed, of which three are preserved: OSCA R9, R59 and R63. R9 was

collected from the OSCA grounds prior to the survey; R59 was collected from the lawn in front of a classroom in November 1986; and R63 was collected from inside a staff member's house in October 1986. The other three specimens were collected from the soccer field in November 1986; from under a road culvert in December 1986; and from a staff member's house in April 1987, respectively. This species is common along the banks of the Cwaka River and Cwaka Dam where numerous sightings were made throughout the survey, though predominantly from September to April. A specimen was trodden on while it was sheltering under layers of cut grass at one of the fish ponds in December 1988.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 26. R9 and R59 are unsexed juveniles; R63 was a subadult female; and the three specimens collected and released were an adult male and two adult females, respectively.

The adult male (n=1) provided a T.L. of 1405 (460 + 945) mm and B.D. 135 mm; the two adult females (n=2) provided a mean T.L. of 1445 (1440 - 1450) mm, B.L. 552,5 (550 - 555) mm, T. 892,5 (890 - 895) mm and B.D. 122,5 (120 - 125) mm.

The subadult female (n=1) provided a T.L. of 995 (385 + 610) mm and B.D. 65 mm; the mean T.L. of the juveniles (n=2) was 293,5 (292 - 295) mm, B.L. 114 (113 - 115) mm, T. 179,5 (177 - 182) mm and B.D. 23 (22 - 24) mm.

The adult male (n=1) weighed 3900,00 g; one of the adult females (n=1) weighed 4200,00 g; the subadult female (n=1) weighed 630,00 g; and one juvenile (n=1) weighed 15,27 g.

TAXONOMIC CHARACTERISTICS: All specimens examined were characteristic of V. n. niloticus as described in FitzSimons (1943) and Branch (1988a). The juveniles were distinctly banded in black and yellow, whereas adults were greyish-brown to black with dirty yellow to olive bands on the head, body, limbs and tail.

FIELD NOTES: This semi-aquatic lizard was most commonly encountered along the length of the Cwaka River and at Cwaka Dam. It was often seen bathing on the banks of the river and at the dam, and was occasionally seen emerging from and retreating to rock shelters in the game park on the northern bank of the Cwaka River. These shelters probably constitute this lizard's permanent or semi-permanent retreat. At Cwaka Dam individuals were often sighted foraging in Typha and Phragmites reeds.

From a distance of approximately 20 metres an individual was observed floating on the Cwaka River, and when a motion was made to approach it, it immediately submerged itself and swam

away, indicating that these reptiles have very keen vision. In instances where this reptile was disturbed while sunbathing, it either plunged into the water or retreated into dense vegetation if this is available. It sunbathed on rocks, on the open banks of the river or dam and occasionally on the branches of trees or bushes overhanging the river.

One juvenile (R59), the subadult (R63) and two of the adults were collected approximately 150 - 160 metres away from the Cwaka River to which this lizard is obviously attracted, while the other adult was collected approximately 200 metres from the Cwaka River. A further adult, observed foraging near the main building complex, took refuge under a dry culvert, also a considerable distance from the river or any other source of permanent water.

The subadult was kept in captivity for almost two months. It accepted offers of chicken eggs and Natal River Crabs Potamonautes sidneyi. The one juvenile (R59) was kept in captivity for three weeks during which time it readily fed on flying termites (Hodotermes mossambicus) and short-horned grasshoppers (Acrididae).

The speed of this lizard was on numerous occasions calculated, both while it was running on the ground and swimming in the water. An adult was pursued over hard, flat ground on a sunny day, covering a distance of approximately 30 metres in 5,2 seconds. However, it slowed down noticeably after it had covered this distance. Two adults were clocked in the water. The one specimen covered a distance of almost 22 metres in 4,7 seconds and the other five metres in 1,7 seconds. This reptile swam with its limbs drawn in close to its body, and propulsion was effected with lateral undulations of its powerful tail.

When approached in the open, this lizard responded by making a dash for dense vegetation or, if this was not available, any natural or artificial situation where it could hide, such as a crack in a rock or under a culvert. All adults which were cornered put up a defensive display which included inflating the throat and body with air, gaping the mouth, lashing the tail, and hissing loudly. Like the adults, juveniles also attempted to bite when handled and lashed their tails, but only feebly so. When a large specimen was held firmly in the hands, its struggles ceased and the reptile shammed death. One of the adults was subdued with a stick, shamming death after the first blow was struck (V. Ncobo pers. comm.). Once captured it will adopt this ruse on practically every occasion it feels threatened, permitting itself to be roughly handled without any response whatsoever, but will make a frantic dash for freedom when an opportunity for escape is presented. It was not recorded ejecting its cloacal contents, which apparently it may also do to discourage potential predators (Branch 1988a).

The individual which was stepped on at night while it was hiding under a mat of cut grass at the fish ponds, was presumably using this habitat as a shelter, and reacted by plunging into the water. It appeared to have been attracted to the ponds by the large number of frogs which had come to breed there. A decapitated adult was discovered in a cattle camp approximately 100 metres from the Cwaka River. According to M. Manquele (pers. comm.), locals dislike leguaans for their habit of raiding poultry coops to feed on eggs; although they will not eat this reptile's flesh, locals will occasionally kill specimens for the fat and skin which is used for the treatment of burns and for adornment, such as wrist bands.

With the exception of the juveniles, all leguaans investigated were infected with ticks. Large ticks were concentrated in the pits behind the fore- and hindlimbs, particularly the inguinals, and in the region of the cloaca (see Plate 20). An adult tick was found between the digits of the right forelimb of a subadult. Smaller, nymphal ticks were found scattered over the tail, dorsum and head, especially in the nostrils and ear apertures.

Five adult ticks were removed from the inguinals and cloaca of the one adult leguaan, and were identified as four male and one female Leguaan Tick Aponomma exornatum. A total of 10 ticks were removed from another specimen, comprising six male and four female A. exornatum, and 20 ticks from a third specimen, comprising 12 female and eight male A. exornatum.

SPECIES: Stellio atricollis (A. Smith, 1849). Tree Agama.

RANGE: Zimbabwe, Ovamboland (northern Namibia), north and eastern Botswana, Transvaal, Mozambique and Natal (FitzSimons 1943); East Africa to Natal, Transvaal lowveld, eastern Botswana (Lobatsi) and Owamboland (Branch 1988a).

PREFERRED HABITAT: Trees and bushes in open bushveld and savanna; open savannah, particularly with Brachystegia and Acacia trees (Branch 1988a).

SPECIES OCCURRENCE: A common species. A total of nine specimens were collected, and at least three more sighted, of which seven are preserved: OSCA R8, R36, R54, R61, R62, R69 and R71. R8 and R36 were collected from unspecified habitats at OSCA before the initiation of the survey. R54 was collected from the tarred road near the Cwaka River bridge in November 1986; R61 was collected from a Coral Tree Erythrina lysistemon adjacent to the tarred road leading to the gate in October 1986; R62 was collected from a Cypress Tree

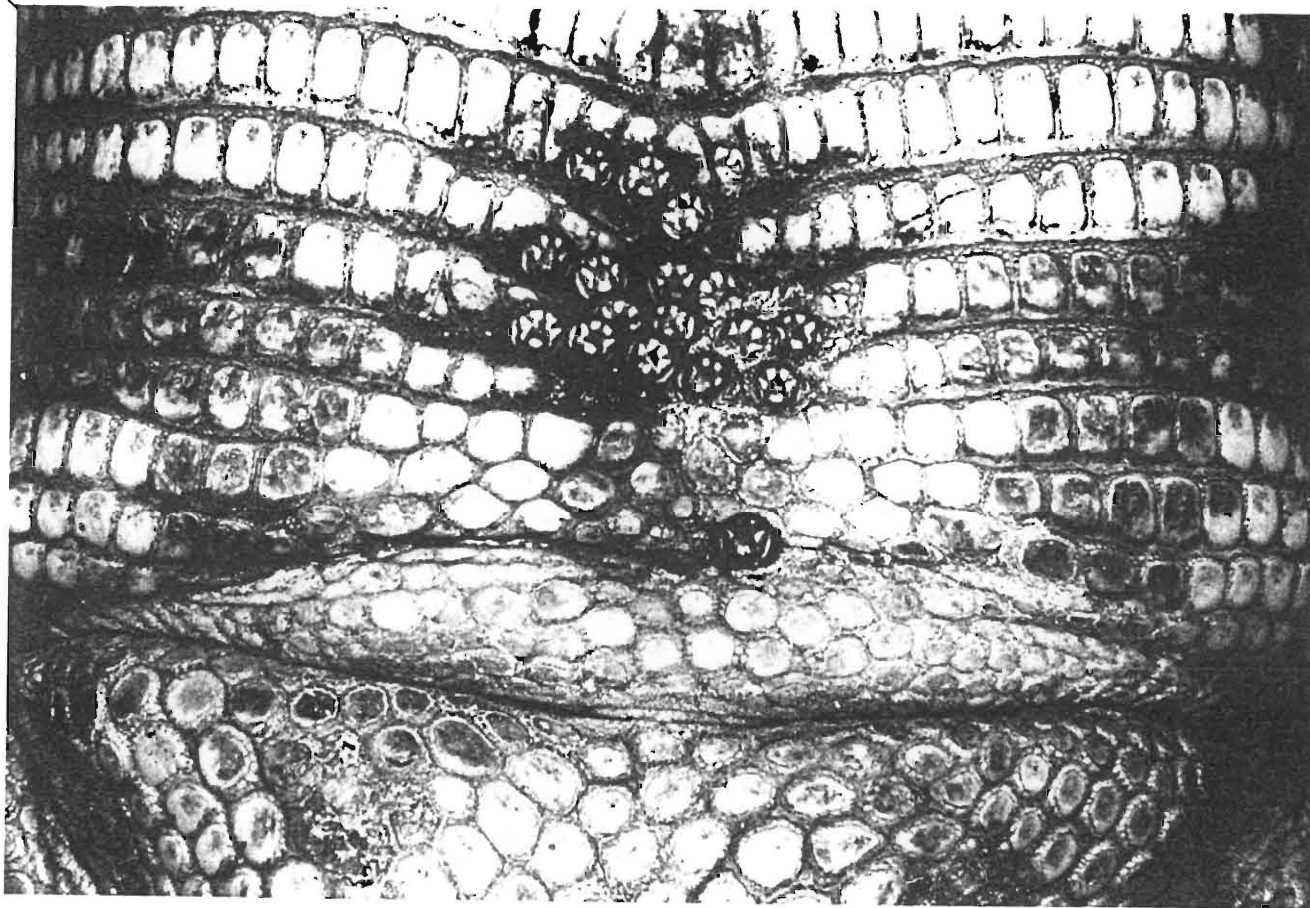


Plate 20. Adult Leguaan Ticks *Aponomma exornatum* concentrated in the cloacal region of an adult Water Leguaan *Varanus n. niloticus* (2,2 x life size).

(Cupressaceae) near the main complex in July 1986; R69 was collected from the interior of a staff member's house in January 1987; and R71 was collected from an Acacia karroo in the game park in October 1986. A further two specimens were collected from the brick walls of the veterinarian centre in May and June 1987 respectively. Documented sightings were recorded from an Acacia robusta near the dairy in October 1986, from the brick wall of a staff member's house in July 1987, and from coral trees near a staff member's house in December 1988.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 27. R8, R36 and R54 are adult males, and R61, R62, R69 and R71 are adult females; two of the specimens collected and subsequently released were a subadult male and a subadult female, respectively.

The mean T.L. of the adult males (n=3) was 279 (range 277 - 280) mm, B.L. 121 (118 - 125) mm, T. 158 (152 - 162) mm and B.D. 33,7 (26 - 47) mm.

The mean T.L. of the three adult females (n=3; tail of A69 truncated) was 280 (range 235 - 320) mm, B.L. 118,3 (99 - 131) mm, T. 147,3 (136 - 154) mm and B.D. 43,7 (36 - 48) mm. The female with the truncated tail provided a B.L. of 100 mm and B.D. 30 mm.

The subadult male (n=1) provided a T.L. of 165 (69 + 96) mm and B.D. 19 mm; the subadult female (n=1) provided a T.L. of 162 (64 + 98) mm and B.D. of 19 mm.

The mean mass of three adult females (n=3, excluding R69) was 60,40 (range 34,34 - 84,92) g; the subadult male (n=1) weighed 12,80 g and the subadult female (n=1) 9,87 g respectively.

TAXONOMIC CHARACTERISTICS: The OSCA specimens conformed to the description of S. atricollis as provided in FitzSimons (1943) and Branch (1988a). The sex-related colour patterns were similar to that provided by FitzSimons (1943), as were the x-shaped series of markings on either side of the backs of subadults. According to Branch (1988c), there are possibly up to six poorly defined subspecies in east and central Africa, with only the nominate form atricollis occurring in southern Africa.

FIELD NOTES: Two of the preserved specimens were dead at the time of collection. The first of these (R69) was brought into a house and killed by a domestic cat, and the fresh loss of portion of its tail was ascribable to predation by this feline. The second (R54), collected from the tarred road near the Cwaka River bridge, was a blue-headed male found during intermittent showers. There were no external signs of injury and cause of death could not be established. The majority of other specimens were collected or sighted while they were

basking in the sun, and proved to be agile when approached, except for one specimen (R61) which was collected on a cool, windy and cloudy day and was particularly sluggish.

This species is almost exclusively arboreal, though on one occasion it was seen leaving a tree to forage on the ground. On approach this lizard will keep the trunk between itself and the observer, and if threatened further, will scuttle up the tree trunk well out of reach. The claws permit this reptile to hold on tenaciously to branches, and dislodging them from even small trees, which included shaking branches vigorously, proved difficult. This agama will gape its mouth and bite furiously when handled. The tail of this species is not fragile, and adults could be suspended in mid-air by their tail-tips. Locals are afraid of this lizard, which they call "ibanda", as they believe it is poisonous.

A number of specimens were kept in captivity for varying periods of time where they readily fed on short-horned grasshoppers, termites, beetles and moths. This species does not do well in captivity, however, and the condition of many specimens quickly deteriorated.

R71, gravid at the time of collection, laid seven eggs in captivity at the end of January 1987. All the eggs were dehydrated at the time of discovery and could not be accurately measured, though they all exceeded a length of 20 mm. This lizard's condition deteriorated rapidly and she died approximately fourteen days after depositing her eggs.

R61, also gravid at the time of capture, displayed considerable colour change while in captivity. From the typical female colour described by FitzSimons (1943), she became yellow along the vertebral region with orange to brick-brown dorso-laterally. The head became a yellowish-green with green patches on the neck and along the upper forelimbs. The throat coloration ranged from light blue to a brilliant peacock blue. This agama died in December 1986 in an emaciated condition, weighing 67,45 g (17,47 g less than her original weight), which is a 20,57 % loss in body weight since the date of her capture. She contained 11 eggs, all attached to one another by a transparent glutinous membrane (see Plate 21). The eggs were white, oval shaped and with a soft membrane. They measured 23-24 x 15-16 mm and weighed from 2,42 - 2,56 g each, constituting from 39,46 - 41,75 % of the mass of the agama at the time of her death.

A single long, thin parasitic worm was found in the membranous tissue between the intestinal tract and body cavity of R69. This parasite has been identified as a nematode. A number of

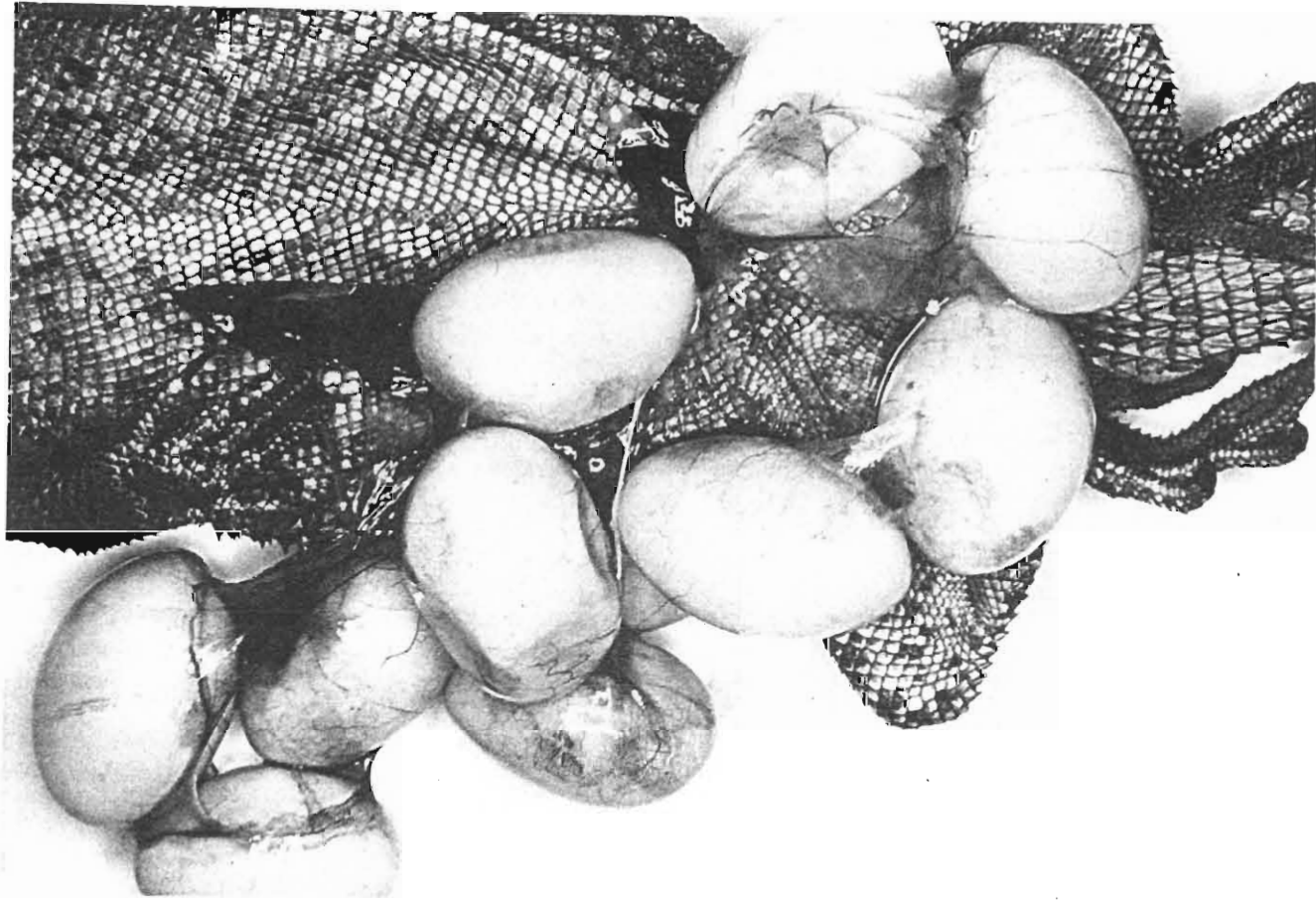


Plate 21. Gravid Tree Agama *Stellio atricollis* (R61) with 11 eggs attached by a glutinous membrane (1,7 x life size).

agamas examined were infested with bright orange to red mites (Acarinae), provisionally identified as Pterygosomid mites.

SPECIES: Chamaeleo dilepis dilepis Leach, 1819. Flap-necked Chamaeleon.

RANGE: Mozambique, Zimbabwe, Natal, Transvaal, north and eastern borders of the Kalahari and northern part of Namibia (FitzSimons 1943; Branch 1988a).

PREFERRED HABITAT: Trees, bushes and shrubs in open forest, bushveld and savanna; savannah woodland, entering coastal forest in Zululand (Branch 1988a).

SPECIES OCCURRENCE: A common species. Three specimens were collected and two sighted, of which one was sacrificed and preserved: R102. R102 was collected from the game park by A. Steyn (pers. comm.) before the initiation of the survey. W. Prinsloo (pers. comm.) recalls sighting a specimen crossing the tarred road before the start of the survey, while R. Shibambu, G. Nukeri and J. Hughes (in litt.) record collecting a specimen in February 1988, and sighting another in a small tree near the main complex also in February 1988. An adult specimen was found (not preserved) in the gut of a Brown House-Snake Lamprophis fuliginosus (T.L. ca. 700 mm) in September 1987.

SIZE, SEX, MEASUREMENTS AND MASS: R30 is an adult male. This specimen provided a T.L. of 154 (72 + 82) mm and B.D. 22 mm. Apparently all other specimens sighted and collected were adults.

TAXONOMIC CHARACTERISTICS: The relatively large size, helmet-shaped head and well developed, flap-like dermal occipital lobes distinguished this species, excluding possible confusion with the dwarf chamaeleons Bradypodion nemorale or B. setaroi. According to Branch (1988c), there is great controversy over the taxonomy of Chamaeleo dilepis with 5 - 6 subspecies having been described, with only ruspolii from Somalia being well defined. The southern African populations have been referred to as a varietal form, and not a subspecies, of C. dilepis by FitzSimons (1943), namely quilensis, whereas others (Bruton and Haacke 1980; Patterson and Bannister 1987) refer southern African material to dilepis dilepis.

FIELD NOTES: The specimen collected by R. Shibambu and G. Nukeri (pers. comm.) was kept in captivity, but apparently it did not do well, refusing to eat the insects with which it was presented. A determined effort was made to locate this species during the survey, to the

extent of involving agriculture and animal husbandry students and labourers, but without success. The slow movements and cryptic coloration of this arboreal lizard make this species particularly difficult to find.

SPECIES: Acontias plumbeus Bianconi, 1849. Giant Legless Skink.

RANGE: Mozambique, eastern and north eastern Transvaal, Swaziland, Zululand, and northern Natal (FitzSimons 1943) with isolated relict populations occurring on the eastern escarpment of Zimbabwe and at East London (Branch 1988a).

PREFERRED HABITAT: Forested areas (Branch 1988a); apparently similar to A. meleagris which is usually found in sandy soil admixed with vegetable matter, and often exposed when turning over stones and logs (FitzSimons 1943).

SPECIES OCCURRENCE: An uncommon species. Two specimens were collected: TM 68574 and OSCA R5. TM 68574 was collected from the college grounds (undated) by A. Steyn (donated to TM in April 1989); OSCA R5 was collected from a compost heap at the nursery in May 1986.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 28. R5 is an adult male (n=1) with a T.L. of 335 (296 + 39) mm and B.D. 12 mm; TM 68574 is an adult female (n=1) with a T.L. of 415 (385 + 30) mm and B.D. 20 mm. These specimens were not weighed.

TAXONOMIC CHARACTERISTICS: The specimens displayed the typical scalation and morphology for A. plumbeus as provided in FitzSimons (1943) and Branch (1988a). The fleshy pinkish-brown with dense spotting of darker brown of R5 approaches FitzSimons' (1943) "sometimes brown with more or less dense spotting of darker brown", but differs from Branch's (1988a) "blue-black to black, often with a steel-grey snout". The snout of R5 was a homogenous fleshy colour, lighter than the dorsum.

FIELD NOTES: R5 was discovered while turning compost with a garden fork with which it was spiked in the back. The wound was treated with antibiotic powder. The skink was kept in a vivarium, but died a few days later presumably from the injury. The gut of TM 68574 contained large amounts of sediment, but no identifiable prey items.

SPECIES: Scelotes brevipes Hewitt, 1925. Hewitt's Monodactyle- or Dwarf Burrowing Skink.

RANGE: Zululand, northwards into Mozambique and the eastern Transvaal (FitzSimons 1943; Branch 1988a).

PREFERRED HABITAT: Alluvial soil or under rocks and logs; rocky grassland and alluvial sand (Branch 1988a).

SPECIES OCCURRENCE: An uncommon species. A total of four specimens were collected, of which three are preserved: OSCA R34, R39 and R41. R34 was collected from gravel soils at the nursery in August 1986; R41 and R39 were collected from rock outcrops surrounded by grassveld in the game park in August and September 1986 respectively; the unpreserved specimen was collected from under leaf litter in the garden of a staff member's house in February 1987.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 29. R39 and R41 are unsexed adults; R34 and an unpreserved specimen were unsexed juveniles. R34 provided a B.L. 48 mm (T. truncated) with B.D. 2 mm. R39 measured a T.L. 115 (60 + 55) mm with B.D. 5 mm. R41 provided a B.L. 66 mm, T. 31 mm (shows evidence of having been truncated) with B.D. 4 mm. The unpreserved specimen measured a T.L. 64 (36 + 28) mm with B.D. 2 mm, and weighed 0,19 g.

TAXONOMIC CHARACTERISTICS: The scalation and colour pattern of all specimens examined fall within the range of characteristics for S. brevipes as provided in FitzSimons (1943) and Branch (1988a). The dorsal coloration was bronze with each scale dark-centred, ranging from grey to black; the belly was light grey, and the tail gunmetal blue, the tip often almost black.

FIELD NOTES: The greater portion of the tail of R34 was chopped off with a spade when the skink was unearthed during the digging of foundations at the nursery. R39 was dead at the time of collection. It was collected from a rocky grassveld habitat which was burned the previous day, and is presumed to have succumbed to the heat of the fire.

R41 attempted to avoid being captured by burrowing into the soil when the rock under which it was found was removed. It showed evidence of having lost portion of its tail; the tail

tapers abruptly into a sharp point and was noticeably darker than the rest of the skink.

SPECIES: Mabuya homalocephala depressa (Peters' 1854). Peter's Black-flanked Skink.

RANGE: Natal and Zululand, northwards to eastern Transvaal (Kruger National Park) and Mozambique (FitzSimons 1943; Branch 1988a).

PREFERRED HABITAT: Sandy grass- and shrub-covered veld (FitzSimons 1943).

SPECIES OCCURRENCE: A rare species. Only one specimen was sighted at the entrance of the veterinarian centre in February 1987.

SIZE, SEX, MEASUREMENTS AND MASS: The specimen sighted was an adult; no further data.

TAXONOMIC CHARACTERISTICS: This limbed skink was identified on its flattish appearance, shiny olive-grey to black dorsum and blackish dorso-lateral band, and relatively sluggish movements when compared to M. striata striata and M. varia. FitzSimons (1943) and Branch (1988c) recognise four subspecies of homalocephala from southern Africa, namely homalocephala, peringueyi, smithii and depressa, with only depressa occurring in northern Natal.

FIELD NOTES: Unfortunately this specimen was sighted only once, and although an attempt was made to catch it, it escaped down a hole. No further sightings were made.

SPECIES: Mabuya varia (Peters, 1867). Common Variable Skink.

RANGE: Along the southern coastal areas of the Cape Province to the south-eastern Cape Province, extending northwards throughout the eastern half of southern Africa (FitzSimons 1943), and west to Namibia (Branch 1988a).

PREFERRED HABITAT: Rocky or stony localities, but when such are not available, they are to be found on the ground and under grass tufts and tree trunks or in any convenient hole in

the ground (FitzSimons 1943); varied, from grassland to arid and mesic savannah (Branch 1988a).

SPECIES OCCURRENCE: An uncommon species. Only two specimens were collected: OSCA R31 and R53. R31 was collected from inside the veterinarian centre in August 1986 and R53 was collected from an open patch of ground near the veterinarian centre in November 1986.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 30. Both specimens are adult males.

The mean B.L. of the two males (n=2; tails of both specimens truncated) was 55 (range 54 - 56) mm and B.D. 11 (10 - 12) mm.

TAXONOMIC CHARACTERISTICS: Both specimens display the scalation and colour pattern diagnostic for M. varia as described in FitzSimons (1943) and Branch (1988a). The white lateral stripe running from below the eye, through the ear onto the groin is distinctive.

FIELD NOTES: R53 was basking in the sun at the time of capture and wriggled furiously, quickly autotomising its tail. Skinks fitting the general description of M. varia were sighted in rocky habitats in the game park, but their occurrence could not be confirmed.

SPECIES: Mabuya striata striata (Peters, 1844). Common Striped Skink.

RANGE: From Natal northward to the Transvaal lowveld, south-east Zimbabwe and Mozambique (Branch 1988a).

PREFERRED HABITAT: Common in and around human habitations, where they live in stone walls, roofings, outbuildings, refuse heaps and rockeries (FitzSimons 1943); varied, from mangrove swamp to arid savannah (Branch 1988a); among rocks and boulders, and in trees (pers. obs.).

SPECIES OCCURRENCE: A common skink in and around places of human habitation, but also frequently found in natural habitats. Approximately 17 specimens were collected, and many more sighted, four of which are preserved: OSCA R7, R35, R51 and R86. Specimens were collected or sighted from walls of buildings, wooden fences, creosoted poles, loose rocks, leaf litter, grassveld habitats in the game park, and a wild fig tree (Ficus sp.) on the banks of

the Cwaka River throughout the study period, though mainly in autumn, spring and summer. R86 was collected from the gut of a short-snouted grass-snake *P. s. brevirostris* in May 1987.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 31. R7, R35, R51 and one other specimen collected and released were adult females; three specimens collected and released were adult males; R86 and two other specimens were unsexed adults; and one specimen collected and released was an unsexed subadult.

The mean T.L. of eight adults (n=8; sexes not differentiated) was 206,8 (range 157 - 255) mm, B.L. 85,1 (67 - 97) mm, T. 121,6 (90 - 155) mm and B.D. 20,6 (15 - 28) mm; another adult (n=1) with a truncated tail provided a B.L. of 87 mm and B.D. 22 mm.

One subadult (n=1) provided a T.L. of 110 (44 + 66) mm and B.D. 9 mm.

The mean mass of six adults (n=6) was 20,98 (range 10,46 - 28,15) g; the subadult (n=1) weighed 2,07 g.

TAXONOMIC CHARACTERISTICS: The scalation of OSCA *striata* examined fits the diagnosis for this skink as described in FitzSimons (1943) and Branch (1988a). The colour pattern is variable, but falls within the range of colour pattern for *M. striata* as described in FitzSimons (1943). Juveniles are generally a homogenous dark brown without any speckling, whereas adults are more variable, ranging from olive brown (common) to greyish and blackish-brown, often spotted or speckled with pale brown, yellow or white. The dorso-lateral stripes are white or cream-coloured, and not yellow. The throats of all adults examined were moderately to heavily suffused with grey or black; on occasion, grey to black flecks were spread over the chest, belly and tail. The throats of breeding males are also suffused with orange.

Mertens (1955) split the species *striata* (FitzSimons 1943) into three subspecies, namely nominate *striata*, *sparsa* and *spilogaster*. Broadley (1977a) subsequently revised the complex, recognizing a further two subspecies, *wahlbergii* and *punctatissimus*. However, the speckled subspecies *spilogaster* was found to be ecologically separated from *striata* with which it occurred sympatrically and was subsequently elevated to full species (Broadley 1977a). Branch (1988a) accepts Broadley's (1977a) revision. Based on scalation, size, colour-pattern and distribution, the OSCA population is referable to the subspecies *striata*.

FIELD NOTES: This adaptable skink was active throughout the year, particularly in the late mornings and afternoons on sunny and warm days when it was seen sunbathing and foraging. It can scale whitewashed cement and brick walls, wooden fences, creosoted poles and rocks with relative ease, quickly scurrying into the nearest crack or crevice when disturbed. It was observed foraging over considerable distances from these more or less permanent retreats, feeding on a variety of arthropods, including small beetles and bugs, praying mantids, flies, termites, and ants and their larvae.

Large numbers of these skinks were sighted on the walls of buildings. One sunny morning in December 1988, seventeen specimens were counted on the partially vegetated brick wall of a staff member's courtyard. The wall was partially overgrown with creepers and measured 4,5 x 2,2 metres. A case of cannibalism was observed; a large adult chased a smaller individual into a crack, and subsequently emerged with a tail in its jaws which it consumed.

This skink was often found in close association with the gecko L. c. capensis and occasionally with the agama S. atricollis. Breeding males, with bright orange throats, were observed in March, April and May. These males were territorial, advancing on any intruders who ventured into their territories. Large adults, which are robust and muscular, will not hesitate to bite when handled. A large male, in breeding colours, emitted a series of short squeaks and bit furiously when captured.

Three adult females (R7, R35 and R51), collected in July, August and October respectively, all contained ova at various stages of development. R7 contained 17 small ova, the largest of which measured 3,3 x 3,0 mm; R35 contained three small ova, measuring 2,2 x 1,5 mm; and R51 contained two large ova, measuring 6,7 x 4,4 mm.

In captivity, P. s. brevirostris, L. fuliginosus and N. mossambica readily fed on this skink. Large specimens proved difficult prey to overpower, however, thrashing wildly and biting when seized before being constricted or succumbing to the effects of the venom. R86 was partially digested with only its tail fully intact when removed from the gut of R85 (P. s. brevirostris with a T.L. of 635 mm).

SPECIES: Panaspis wahlbergii (A. Smith, 1849). Wahlberg's Snake-eyed Skink.

RANGE: Natal, Zululand, Transvaal, northern Botswana, and Damaraland and Kaokoveld (northern Namibia) (FitzSimons 1943); through Natal and Transvaal to central and east Africa, and entering northern Botswana and Namibia (Branch 1988a).

PREFERRED HABITAT: Sheltered grassy spots, termite hills, under stones and rotting logs or among fallen leaves and brushwood lying in moist shady places (FitzSimons 1943) in arid and mesic savannah (Branch 1988a).

SPECIES OCCURRENCE: An uncommon species. Only two specimens were collected: OSCA R16 and R74. R16 was collected from the riverine habitat in the game park in July 1980; R74 was collected from the gut of a Cape Wolf-Snake Lycophidion capense capense collected from the game park in February 1987.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 32. Both specimens are unsexed adults. R16 provided a T.L. 68 (41 + 27; tail shows evidence of having been truncated) mm and B.D. 5 mm. R74 provided a T.L. 70 mm and B.D. 5 mm.

TAXONOMIC CHARACTERISTICS: R16 displays the scalation and colour pattern typical of P. wahlbergii as described in FitzSimons (1943) and Branch (1988a). R74, although partially digested, also shows the typical scalation and colour pattern of this species.

FIELD NOTES: R16 has a short tail which tapers abruptly, suggesting that a portion of the tail has been lost and only partially regenerated. The regenerated portion of the tail was also considerably lighter than the rest of the skink, and was without the usual brown colour with black flecks.

R74 was disgorged by a subadult wolf-snake L. c. capense (R82 with a T.L. of 180 mm) within 20 hours of the snake being collected from Lipia bush between the water purification plant and the Cwaka River. R74 had been swallowed head first and it was disgorged when the snake was handled.

SPECIES: Chamaesaura macrolepis (Cope, 1862). Large-scaled Snake-Lizard.

RANGE: Natal and Zululand into Swaziland and eastern Transvaal (FitzSimons 1943) with an isolated population on Chimanimani Mountains in Zimbabwe (Branch 1988a).

PREFERRED HABITAT: Grassveld and mountain plateaus (Branch 1988a).

SPECIES OCCURRENCE: An uncommon species. Only two specimens were collected, of which one was sacrificed and preserved: OSCA R57. R57 was collected from ploughed soil under a Horsetail Tree Causarina equisetifolia in December 1986; the other was collected from a dry cement canal surrounded by grassveld in the game park in July 1987.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 33. R57 is an unsexed juvenile, and the specimen released was an unsexed adult. R57 provided a B.L. of 43 mm, (T. 100 mm, truncated) and B.D. 4 mm. The adult yielded a T.L. 525 (105 + 420) mm and B.D. 6 mm. R57 weighed 0,53 g and the adult 6,57 g.

TAXONOMIC CHARACTERISTICS: The scalation and colour pattern of both specimens fall within the range of characteristics for C. macrolepis as described in FitzSimons (1943) and Branch (1988a). The juvenile was a light brown ground colour without any distinctive markings; the adult was light brown with two dark brown dorso-lateral stripes running the length of the dorsum. Inferior to the brown stripes, an orange stripe followed by a light grey stripe ran almost the entire length of the dorsum, fading imperceptibly posteriorly. A narrow dark stripe ran through the eye of the adult.

FitzSimons (1943) and Branch (1988a) have recognised three southern African species of Chamaesaura, with macrolepis readily distinguishable from anguina, which has been recorded from Mkuzi Game Reserve (Pooley 1965), by its lack of forelimbs.

FIELD NOTES: The adult was collected from the cement canal in the game park during a veld fire, and appeared to have fallen in during its efforts to escape the flames. The tail of R57 was freshly truncated, presumably having occurred during the ploughing of the grass patch surrounding the tree immediately before the lizard was caught. The partially digested remains of unidentifiable insects were found in the gut.

SPECIES: Tetradactylus africanus africanus (Gray, 1838). African Long-tailed Seps.

RANGE: Pondoland (Maputaland) northwards (sic!) into eastern Orange Free State, Natal and Zululand (FitzSimons 1943); Natal (Pondoland and Zululand) to southern Cape (Branch 1988a).

PREFERRED HABITAT: Savanna grassveld and open bushveld; montane grassland (Branch 1988a).

SPECIES OCCURRENCE: A rare species. Only one specimen was collected: OSCA R44. This specimen was collected from savanna grassveld in the game park in September 1986.

SIZE, SEX, MEASUREMENTS AND MASS: R44 is an adult male. It provided a T.L. of 344 (79 + 265) mm and B.D. 8 mm. It was not weighed.

TAXONOMIC CHARACTERISTICS: The voucher specimen fulfills the diagnostic characteristics of T. a. africanus as described in FitzSimons (1943) and Branch (1988a), except that the sides of the neck inferiorly and posteriorly were a brilliant sky-blue. FitzSimons (1943) recognised two subspecies, namely africanus (Gray, 1838) and fitsimoni Hewitt 1915, the latter distinguished by the absence of forelimbs and by usually having only three supracilliaris. FitzSimons (1943) and Branch (1988a) give the range of fitsimoni as coastal areas of southern Cape or southern and eastern Cape respectively. Branch's (1981) reference to T. t. fitsimoni, ranging from George to Port Elizabeth, should have been T. a. fitsimoni, though this is subsequently corrected in Branch (1988a).

FIELD NOTES: R44 was collected as it fled a veld fire and writhed vigorously on capture. It has a typical serpentine mode of progression (lateral undulations of the body), and was able to cover short distances at speeds similar to that recorded for many grass snakes Psammophis spp. The blue neck markings probably indicate breeding colours.

SPECIES: Typhlops bibronii (A. Smith, 1846). Bibron's Blind Snake.

RANGE: Eastern Cape Province to Natal, Swaziland and Transvaal, occurring more rarely in the northern Cape Province, the Orange Free State and the eastern highlands of Zimbabwe (Broadley 1983); Transvaal and southern Natal to Albany district of the eastern Cape with a relict population occurring in eastern Zimbabwe (Branch 1988a).

PREFERRED HABITAT: Soft sandy or loamy soils in grassveld; highveld and coastal grassland (Branch 1988a).

SPECIES OCCURRENCE: A rare species. Only one specimen was collected: OSCA R18. According to A. Steyn (pers. comm.), it was collected (undated) from the bridge over the Cwaka River.

SIZE, SEX, MEASUREMENTS AND MASS: R18 is an unsexed adult. This snake (n=1) provided a T.L. of 330 (323 + 7) mm and B.D. 11 mm with the T. included into the T.L. 47 times.

TAXONOMIC CHARACTERISTICS: The lepidosis, based on the head shield configuration and number of rows of scales at midbody, and colour pattern, albeit faded, of R18 is within the range for T. bibronii as described in Broadley (1983) and Branch (1988a). There are 33 rows of scales at midbody and the body diameter is included 30 times into the T.L.

FIELD NOTES: No information available.

SPECIES: Leptotyphlops scutifrons scutifrons (Peters, 1854). Peter's Worm- or Thread-Snake.

RANGE: Throughout the northern half of southern Africa and extending southwards to the Orange Free State and northern and north-eastern Cape (Broadley 1983); throughout the subcontinent, except most of the Cape, southern and coastal Namibia and southern Mozambique Plain (Branch 1988a).

PREFERRED HABITAT: Soft sandy, loamy and gravel soils or under rocks or rotting logs in grassveld and bushveld; grassland, coastal bush, and mesic and arid savannah (Branch 1988a).

SPECIES OCCURRENCE: A common species. A total of 16 specimens were collected, of which seven are preserved: OSCA R33, R40, R49, R90, R92, R93 and R94. The majority of specimens were collected from vegetated or rock-strewn soils in gardens or in the game park, while others were collected from the entrances or interior of houses and other buildings throughout the year, but particularly after downpours in the summer months. One specimen was collected from a pit trap in savanna grassveld in the game park in December 1988.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 34. All the specimens collected were unsexed, comprising five adults and eleven subadults.

The mean T.L. of five adults (n=5) was 127,8 (range 108 - 165) mm, B.L. 116,2 (99 - 148) mm, T. 11,6 (9 - 17) mm and B.D. 2,2 (2 - 3) mm with the T. included into T.L. 11,2 (9,2 - 13,9) times.

The mean T.L. of eleven subadults (n=11) was 64,1 (range 55 - 90) mm, B.L. 58,5 (49 - 82) mm, T. 5,6 (4 - 8) mm and B.D. 1,1 (1 - 2) mm with the T. included into the T.L. 11,6 (9,2 - 14) times.

The mean mass of five adults (n=5) was 0,39 (range 0,26 - 0,54) g; the mean mass of six subadults (n=6) was 0,09 (0,05 - 0,20) g.

TAXONOMIC CHARACTERISTICS: All the OSCA specimens examined fall within the range of characteristics for L. s. scutifrons as described in Broadley (1983). It is distinguishable from L. conjunctus, a species which is recorded from northern Natal (Maputaland/KwaZulu) (Bruton and Haacke 1980; Broadley 1983), by its wide rostral and short tail (Branch 1988a), though De Waal (1978) considers L. conjunctus to be a doubtful taxon and places it in the synonymy of L. scutifrons. As a result of the confusion, details of this scenario are discussed later.

Due to the very small, polished, uniform and sub-equal size of the scales of this snake, no attempt was made to count the number of scales between the rostral plate and caudal spine. Most specimens were a homogenous glossy black above and below, but occasionally greyish-to brownish-black with all scales dark edged, often paler below. The headshield configuration of specimens was investigated with the aid of a hand lens with a 9X magnification, and conformed to that for Leptotyphlops scutifrons scutifrons as described in Broadley (1983). Moreover, the tail length of OSCA material, which divides 9,2 to 14 times into total length, falls within the range for L. s. scutifrons (9 to 20 times, usually 11,5 to 16 according to Broadley 1983) and outside the range for either L. conjunctus conjunctus or L. c. incognitus (8,5 to 14 and 7,5 to 13 times, respectively). It is further distinguishable from L. conjunctus by its wide rostral and short tail (Branch 1988a); two of the specimens sent to W.R. Branch were identified as L. s. scutifrons (W.R. Branch in litt.). Trinomials are required as L. scutifrons merkeri (Werner) is considered to be a northern subspecies (Broadley and Watson 1976: in Broadley 1983).

Of interest is the work of De Waal (1978) who experienced difficulty in separating L. conjunctus conjunctus from L. s. scutifrons in the Orange Free State. Other workers have experienced similar difficulties in Natal (G. Alexander pers. comm.), while Broadley (1983) has stated that it is possible that conjunctus may prove to be a southeastern subspecies of L. scutifrons. Bruton and Haacke (1980) list four Leptotyphlops taxa from Maputaland, possibly with a fifth also occurring there (incertae sedis), including conjunctus incognitus and scutifrons. These two latter taxa are therefore parapatric, perhaps even sympatric in Maputaland at least, since both are recorded from Ubombo (Bruton and Haacke 1980). Broadley (1983) has remarked that in the regions where conjunctus incognitus and scutifrons are sympatric, these two taxa can usually be separated on the total length/tail length ratio. But de Waal (1978) has found that the total length/tail length ratio cannot be used as a diagnostic character to separate conjunctus conjunctus from scutifrons in the Orange Free State, since this feature is sex related (ratio < 11,5 in males, > 11,5 in females). Because he found it impossible to distinguish scutifrons from conjunctus conjunctus in the Orange Free State, De Waal (1978) has concluded that the status of conjunctus incognitus Broadley and Watson, 1976, is doubtful as this taxon occurs sympatrically with scutifrons scutifrons in south-eastern Africa and, therefore, that conjunctus is synonymous with scutifrons. Broadley (1983) has countered by stating that de Waal's findings imply that some areas (eg. Botswana) are inhabited only by females, while others (eg. eastern highlands of Zimbabwe) have all-male populations (= conjunctus incognitus). Furthermore, he remarks that it is possible that typical conjunctus is merely a south-eastern subspecies of scutifrons whereas incognitus is a full species. Unfortunately, the OSCA material does not throw much light on resolving the confusion between these taxa, and must, perforce, remain provisionally identified as L. s. scutifrons.

FIELD NOTES: This fossorial snake was collected during the digging of foundations in soils, and while gardening or lifting rocks. It regularly invaded homes after heavy downpours, particularly at night. The largest specimen in the series was collected from a bucket in one of the savanna pit traps.

This snake wriggled and coiled when handled. It also propelled itself over compact surfaces at considerable speed. When placed in water it swam easily, propelling itself through the water in typical serpentine manner (lateral undulations of the body) with the head and anterior portion of the body above the water's surface.

This snake will often flick its tongue, which is fleshy-grey in colour, while moving over the surface of the soil. Many specimens also displayed the peculiar habit of lifting the head and forepart of the body off the ground and pointing it directly into the air while keeping the rest

of the body motionless. A certain degree of colour change was also noted. An adult specimen was a homogenous black colour when removed from a damp, dark brown soil, but when placed in a dry, light brown soil became a lighter greyish-black colour. Also, saturated specimens were a darker colour.

SPECIES: Python sebae natalensis A. Smith, 1840. African Rock Python.

RANGE: Largely restricted to the northern and north-eastern regions of southern Africa; the north-eastern Cape Province, northern Namibia, Botswana, Zimbabwe, Mozambique, Transvaal, Swaziland, Zululand and Natal, and formerly also occurring in the eastern Cape Province where the last specimen was captured in the Bathurst district in 1927 (Broadley 1983). Recently it has been re-introduced into the Andries Vosloo Kudu Reserve (P. Burdett pers. comm.) in the eastern Cape.

PREFERRED HABITAT: Moist, rocky, well-wooded valleys, plantations and bush country, but seldom if ever far from permanent water (Broadley 1983; Branch 1988c); usually open savannah regions, particularly rocky areas and riverine scrub (Branch 1988a).

SPECIES OCCURRENCE: A common species. Five specimens were sighted, and the mutilated carcass of a sixth investigated during the study period, while a number of confirmed observations were made prior to the survey. One specimen was observed in savanna grassveld in the game park in August 1986; the second was sighted in a thicket in a cattle camp immediately opposite the game park in May 1987; the third was sighted swimming in the Cwaka River near the bridge in November 1987; the fourth was sighted feeding on a juvenile Grey Duiker (Sylvicapra grimmia) in the game park in April 1988; and the fifth was a specimen killed near the compound by a labourer in November 1988. The mutilated carcass of a specimen was discovered under a canopy of riparian trees near the Cwaka River in the game park in May 1987. W. Prinsloo (pers. comm.) reports sighting this species thermoregulating after sunset on the tarred road near the Cwaka River bridge in 1984 and 1985.

SIZE, SEX, MEASUREMENTS AND MASS: No accurate data are available. All specimens sighted were subadults and adults, ranging in T.L. from ca. 1500 - 4000 mm.

TAXONOMIC CHARACTERISTICS: Although no voucher specimens were available, the identification of this taxa in the field was not problematic for there is no other snake in

southern Africa which reaches the proportions of *P. s. natalensis*. The stout build, blotchy light to dark brown ground colour, distinct head, deeply pitted lower labials and small, smooth scales (Broadley 1983; Branch 1988a + c) distinguishes this constrictor from all other snakes.

FIELD NOTES: With the exception of the specimen killed near the compound, all observations were made within two hundred metres of the Cwaka River. All that remained of the carcass found in the game park was a mutilated and degutted section which measured approximately 1500 mm long with a girth of 310 mm. The carcass was between three and four days old at the time of investigation. The snake had been decapitated, skinned and all the internal organs and a large portion of the body were removed. A game guard was found responsible for the death and mutilation of the snake, and on questioning admitted to killing the snake in situ and removing the trophies and organs for medicinal and ritual purposes. The culprit was handed over to a tribal court who fined him two goats, which is considered a severe penalty for the killing of a reptile (F. Sigwebele pers. comm.). The snake killed by the labourer was apparently also used for ritual and medicinal purposes.

The python sighted swimming in the Cwaka River was apparently struggling against the current created by the heavy downpours and subsequent floods of 1987. It had presumably been flushed from the riverine vegetation during the flood. The python feeding on the Grey Duiker was observed under a tree (*Acacia* sp.) in the game park. It was first sighted by trainee nature conservation officers who photographed it with the head and forebody of the antelope in its mouth. Due to the disturbance caused by the trainees and subsequent arrival of game guards, the snake disgorged its meal and retreated.

The salted skin of an adult specimen from OSCA is lodged in the trophy room of the veterinarian centre; the date of, and circumstances surrounding the snake's death are not known, other than it was killed and skinned prior to the survey.

SPECIES: *Lamprophis aurora* (Linnaeus, 1754). Aurora House-Snake.

RANGE: The southwestern Cape to the eastern Cape and thence northwards to Lesotho, southern Natal, Orange Free State and Transvaal (Broadley 1983); highveld of the Transvaal and Orange Free State, extending into Natal and the eastern Cape with isolated records from the southern Cape and Cape escarpment (Branch 1988a).

HABITAT: Terrestrial habitats not far from its preferred prey of rodents and lizards, and often found closely associated with places of human habitation; in grassland, entering coastal bush and fynbos (Branch 1988a).

SPECIES OCCURRENCE: An uncommon species. Only two specimens were collected, both prior to the survey: OSCA R19 and R24. No dates are available and the localities provided are the grounds of OSCA.

SIZE, SEX, MEASUREMENTS AND MASS: R19 is an adult female (n=1) with a T.L. of 656 (571 + 85) mm and B.D. 17 mm. The T. is included into the T.L. 7,7 times. R24 is a mutilated subadult male with everted hemipenes. It has a truncated tail, and is therefore not measurable.

TAXONOMIC CHARACTERISTICS: The two specimens fall within the range of characteristics diagnostic for this species as described in Broadley (1983) and Branch (1988a) though, due to mutilation, it was no possible to carry out a lepidosis of R24. The ventral and subcaudal counts of R19 of 181 and 39 respectively are within the range for this species; Broadley (1983) provides a ventral range of 165 - 185 and subcaudal range of 35 - 58 (46 - 58 in males and 35 - 48 in females). The colour pattern of both specimens was badly faded and cannot be described, though the characteristic beaded stripe (yellow in live specimens) on the back was still visible.

FIELD NOTES: No information available.

SPECIES: Lamprophis inornatus Duméril and Bibron, 1854. Olive-brown- or Black House-Snake.

RANGE: From the western Cape Province, eastward along the coastal areas to Natal, and thence inland to the eastern and central Transvaal (Broadley 1983); coastal belt from southwestern Cape to East London, extending through Natal lowlands on to Transvaal highveld (Branch 1988a).

PREFERRED HABITAT: Similar to L. fuliginosus (Broadley 1983); that is, practically any terrestrial habitat, but often attracted to, and found in and around, human settlements; in moist coastal bushveld and fynbos, extending into grassveld (Branch 1988a).

SPECIES OCCURRENCE: A rare species. Only one specimen was collected: OSCA R25. This specimen was collected prior to the survey and the exact date or locality are not known, other than it was collected from the OSCA grounds.

SIZE, SEX, MEASUREMENTS AND MASS: R25 is a subadult male (n=1) with a T.L. 470 (375 + 95) mm and B.D. 12 mm. The T. is included into the T.L. 4,9 times.

TAXONOMIC CHARACTERISTICS: The voucher specimen provided a midbody scale row of 23, with 176 ventrals and 61 subcaudals, which is within the range for this species; Broadley (1983) provides a midbody scale row of 23 (rarely 21 or 25), ventrals 170 - 196, but seldom less than 175, and subcaudals 45 - 70, usually from 58 to 70 in males and 45 to 60 in females. The colour of the specimen cannot be described due to it being faded.

FIELD NOTES: No information available.

SPECIES: Lamprophis fuliginosus (Boie, 1827). Brown House-Snake.

RANGE: Throughout southern Africa (Broadley 1983; Branch 1988a).

PREFERRED HABITAT: Widespread in practically any terrestrial habitat, but often attracted to, and found in and around, human settlements (Broadley 1983); common in highveld grassland and arid karroid regions, but found everywhere, and tolerant of urban sprawl (Branch 1988a).

SPECIES OCCURRENCE: A common species. A total of nine specimens were collected, of which two are preserved: OSCA R37 and R52. These specimens were collected from a dense stand of grass opposite the nursery in June 1987; from the balancing dam excavations on top of the hill behind the compound in May 1987; from the trunk of a tree at the entrance to one of the students' dormitories in March 1987; from a grass patch at the piggery in April 1987; from a grass patch opposite one of the students' dormitories in October 1986 (R52); from under a plate of disintegrating corrugated iron opposite a staff members' house in August 1986; from the premises of the staff houses in September 1987; and from a Coral Tree (Erythrina lysistemon) next to a classroom in April 1988. The locality and date for one of the specimens (R37) were not recorded, other than the snake was collected from the OSCA premises prior to the survey.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 35. R52 (mutilated) is an adult female, and R37 and two other specimens collected and released were subadult females; two specimens collected and released were subadult males; and a further three specimens collected and released comprised two unsexed adults and one unsexed subadult. Discrete measurements are available for six specimens.

Before mutilation, the adult female (n=1) provided a T.L. of 1000 (860 + 140) mm and B.D. 25 mm with the T. included into the T.L. 7,1 times.

The three subadult females (n=3) provided a mean T.L. of 391,7 (range 295 -470) mm, B.L. 340 (250 - 420) mm, T. 51,7 (45 - 60) mm and B.D. 7,7 (6 - 10) mm with the T. included into the T.L. 7,7 (6,6 - 9,4) times.

The subadult males (n=2) provided a mean T.L. of 337,5 (range 295 - 380) mm, B.L. 276,5 (245 - 308) mm, T. 61 (50 - 72) mm and B.D. 7,5 (6 - 9) mm with the T. included into the T.L. 5,6 (5,3 - 5,9) times.

The mean mass of two subadult females (n=2), the one containing a meal, was 28,42 (range 13,21 - 43,62) g; the mass of two subadult males (n=2) was 11,42 (8,67 - 14,17) g; and the mass of an unsexed subadult (n=1) with a T.L. of ca. 280 mm was 7,90 g.

TAXONOMIC CHARACTERISTICS: All specimens examined fell within the range of characteristics for L. fuliginosus as described in Broadley (1983). Small specimens were reddish-brown above while adults were dark brown in colour; they all displayed pale streaks on the side of the head, usually continuing dorso-laterally approximately one third down the length of the body. R37 provided a scale count of 217 ventrals and 53 subcaudals (range of 186 - 228 ventrals and 45 - 71 subcaudals for species, according to Broadley 1983).

FIELD NOTES: A specimen with a T.L. of 470 mm, collected from a dense stand of grass, contained a large skink Mabuya sp. in its gut. Although roughly handled, this specimen did not attempt to bite or disgorge its prey whose configuration showed plainly through the distended interstitial skin. It weighed 43,62 g with its meal. This specimen was kept in captivity where it digested its meal over the next 16 days. It was then weighed again, yielding a mass of 33,84 g, 9,78 g or 22,4% less than the day it was captured.

Another specimen, with a total length of 700 mm, contained an adult Flap-necked Chameleon Chamaeleo dilepis dilepis in its gut. The specimen from the Coral Tree was found on top of

the tree, and was mobbed by noisy Black-eyed Bulbuls Pycnonotus barbatus. It was collected as it was about to alight into the roof of the classroom and was released into the game park.

A specimen with a T.L. of 380 mm, collected from the excavations for the balancing dam, received an injury to the lower back and repeatedly bit the author when handled. The snake remained irritable throughout the two weeks it was kept in captivity where its injury was doctored with antibiotic powder before it was released.

Another specimen, with T.L. of 410 mm, made intimidatory strikes when captured, but soon settled down in captivity and readily fed on Cape Dwarf Geckos L. c. capensis and Tropical House Geckos H. m. mabouia, even taking dead specimens which were wriggled in the hand. Gecko prey were fully digested in five to nine days. Toads Bufo and Schismaderma spp. were offered on a number of occasions, but were always refused.

R52, killed by students, measured a T.L. of 1000 mm, but was allowed to rot and only the head and a short section of the body were retrieved and preserved. A large, unidentifiable rodent was found in its gut (cf. Otomys sp., N. Mkhabela pers. comm.), but was also allowed to decompose.

A young specimen with a T.L. of 280 mm and mass of 7,90 g, shed its skin on two occasions while in captivity. The first skin was shed three months after capture, the second five weeks later. Sloughing followed shortly after meals. Both skins when dry weighed 0,07 g, constituting 1,1% of the mass of this snake.

SPECIES: Lycophidion capense capense (A. Smith, 1831). Cape Wolf-Snake.

RANGE: Throughout southern Africa, but absent from the western and central Cape Province, and southern and western Namibia (Namib Desert) (Broadley 1983; Branch 1988a).

PREFERRED HABITAT: Damp situations under stones or vegetable debris (Broadley 1983) usually in grassveld or open bushveld, and entering coastal bush and fynbos in the Cape (Branch 1988a).

SPECIES OCCURRENCE: A rare species. Only one specimen was collected: OSCA R82. This specimen was collected from a patch of moribund grass and Lipia bush in the game park immediately below the water purification plant in February 1987.

SIZE, SEX, MEASUREMENTS AND MASS: R82 is a subadult female (n=1) with a T.L. of 180 (160 + 20) mm and B.D. 6 mm. The T. is included into T.L. 9 times. She weighed 3,02 g (with meal).

TAXONOMIC CHARACTERISTICS: The voucher specimen falls within the range of characteristics for this taxon as described in Broadley (1983) and Branch (1988a); the scalation of 176 ventrals and 29 subcaudals is within the range of females, for which Broadley (1983) provides 176 - 194 ventrals and 25 - 35 subcaudals. The coloration was purplish-brown above with the dorso-lateral scales white-tipped. The interstitial skin was fleshy pink. The eyes were small, brown with vertically elliptic pupils, and protruded slightly from, and were not included within, the head (compare with illustration of TM 6162 - Nylstroom in Broadley 1983). Tiny white infuscations occurred on the snout, labials and oculars.

Six subspecies of capense are recognised (Branch 1988a), three of which occur in southern Africa; these three subspecies, namely nominate capense, vermiculatum and multimaculatum differ from each other in respect of colour pattern and ventral or subcaudal counts.

FIELD NOTES: This rather sluggish snake did not attempt to bite when handled. Approximately 20 hours after capture and while being handled, it regurgitated a partially digested adult Snake-eyed Skink P. wahlbergii (R74 with a T.L. of ca. 70 mm). The tongue of this snake was a light fleshy pink.

This snake sloughed a complete skin two weeks after capture which weighed 0,03 g when it was completely dry, constituting 1,0% of the mass of this snake. The snake disappeared undetected into a strip of bark and was found dead, probably of starvation, seven weeks after being placed in a vivarium.

SPECIES: Mehelya capensis capensis (A. Smith, 1847). Cape File-Snake.

RANGE: The eastern half of southern Africa, from Natal northwards and across the northern half of Botswana to Namibia; in the east from Natal, through Transvaal, Zimbabwe and Caprivi Strip to northern Namibia (Branch 1988a).

PREFERRED HABITAT: Terricolous situations, especially in savanna grassveld and open bushveld, rarely far from its prey which includes snakes, lizards, frogs and toads, and small mammals (Broadley 1983); mainly savannah, but entering coastal forest and arid regions (Branch 1988a).

SPECIES OCCURRENCE: An uncommon species. A total of three specimens were collected, of which two are preserved: OSCA R11 and R17. Little information is available on these preserved specimens other than they were collected from the OSCA premises before the initiation of the survey. An unpreserved specimen was killed on a walkway in front of the dining hall in June 1986.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 36. R11 is a badly preserved adult male, with a T.L. of ca. 1000 mm; R17 is a subadult female (n=1) with a T.L. of 305 (268 + 37) mm and B.D. 7 mm with the T. included into T.L. 8,2 times. The specimen killed was an unsexed adult with a T.L. exceeding 1000 mm.

TAXONOMIC CHARACTERISTICS: All the specimens examined were characteristic of M. c. capensis as described in Broadley (1983) and Branch (1988a). R11 and R17 provided ventral and subcaudal counts of 209 and 204 (mean 206,5; n=2), and 49 and 45 (mean 47; n=2) respectively, within the range for this taxon (193 - 224 ventrals and 44 - 58 subcaudals) as described in Broadley (1983). Branch (1988a) has pointed out that three subspecies of capensis are recognised, with only the nominate form occurring on the southern African subcontinent.

FIELD NOTES: The unpreserved specimen was killed and mutilated by students as it slid across the walkway in front of the dining hall just after sunset. This species is thought to be highly venomous by many of the students.

SPECIES: Mehelya nyassae (Günther, 1888). Black File-Snake.

RANGE: Natal, Zululand, Swaziland, Mozambique, Transvaal, Zimbabwe, Botswana and Namibia; eastern regions from Natal to Kenya, and extending through Botswana to central Namibia (Branch 1988a).

PREFERRED HABITAT: Terricolous situations, especially in savanna grassveld and open bushveld, not far from its preferred prey of lizards, particularly skinks; savannah, entering coastal forest (Branch 1988a).

SPECIES OCCURRENCE: An uncommon species. Only one specimen was collected: OSCA R96. This specimen was collected from an unspecified site at OSCA in spring 1987. A. Steyn (in litt.) reports collecting a specimen from under a log in the game park for which he has a photographic record.

SIZE, SEX, MEASUREMENTS AND MASS: R96 is an adult female (n=1) with a T.L. of 410 (332 + 78) mm and B.D. 11 mm; the T. is included into the T.L. 5,3 times.

TAXONOMIC CHARACTERISTICS: The scalation and colour pattern of the voucher specimen conforms with the description of M. nvassae as provided in Broadley (1983) and Branch (1988a). R96 has 174 ventrals and 57 subcaudals (165-184 ventrals and 51-77 subcaudals for the species according to Broadley 1983). Above, a homogenous purple-brown with pinkish interstitial skin and yellowish-white below.

FIELD NOTES: R96 was well padded with yellow fatty tissue and contained the femur of a large grasshopper in her gut.

SPECIES: Duberria lutrix lutrix (Linnaeus, 1758). Southern Slug-Eater.

RANGE: Apparently confined to the eastern half of southern Africa, that is south of the Limpopo River, and extending along the coastal and adjoining districts from the extreme southwestern Cape eastwards into Natal and inland to the Transvaal (Broadley 1983); Cape fold mountains, through the eastern Cape to Natal and Transvaal (Branch 1988a).

PREFERRED HABITAT: Damp localities, such as occur along the well wooded and forested slopes of the coastal mountains, where it may be found under stones, dead wood and leaf mould (Broadley 1983); savannah, entering coastal bush and fynbos (Branch 1988a).

SPECIES OCCURRENCE: A rare species. A. Steyn (in litt.) reports collecting a specimen from the garden of his house and subsequently releasing it. No further specimens recorded.

SIZE, SEX, MEASUREMENTS AND MASS: The specimen was apparently an adult (A. Steyn in litt.)

TAXONOMIC FEATURES: This relatively small species with a reddish brown to light brown dorsum, greyish flanks, and often with a dark, stippled vertebral pattern (Broadley 1983; Branch 1988a), can hardly be confused with any other snake.

FIELD NOTES: This record is accepted since this species range quite conceivably includes OSCA where suitable moist habitats, and prey of slugs and snails, are available. This species occurs as far north as Maputaland where it has been recorded at Tewate, St. Lucia Estuary (Bruton and Haacke 1980).

SPECIES: Psammophylax rhombeatus rhombeatus (Linnaeus, 1754). Spotted or Rhombic Skaapsteker.

RANGE: Cape Province, Transkei, Natal, Lesotho, eastern Orange Free State, southern and central Transvaal and western Swaziland, with relict populations in little Namaqualand and Namibia (Broadley 1943); widespread in the highveld, entering coastal Natal and southern Cape, with scattered records in Little Namaqualand and Namibia (Branch 1988a).

PREFERRED HABITAT: Open grassveld from coast to mountain top (Broadley 1983); highveld grasslands and fynbos, entering karroid areas (Branch 1988a).

SPECIES OCCURRENCE: A rare species. A. Steyn (in litt.) reports collecting and photographing this species at OSCA.

SIZE, SEX, MEASUREMENTS AND MASS: No data available.

TAXONOMIC CHARACTERISTICS: The rhombic-like spots in longitudinal series and coloration of greyish to olive brown (Broadley 1983; Branch 1988a) quickly distinguishes this relatively gracile, medium-sized snake.

FIELD NOTES: This record is accepted as the range of P. r. rhombeatus quite conceivably includes OSCA where suitable habitats for this snake exist. This relatively gracile, terrestrial

snake, with its distinctive rhomboidal pattern, is readily distinguishable from other species.

SPECIES: Psammophis sibilans brevirostris Peters, 1881. Short-snouted Grass-Snake.

RANGE: Highveld and middleveld of the Transvaal, extending into south-eastern Botswana and the northern Cape Province, Swaziland, south-west Mozambique (Lebombo Range), KwaZulu, Natal and Transkei; there are also relict populations in Zimbabwe (Broadley 1983).

PREFERRED HABITAT: Moist savannas and grasslands; highveld and montane grassland (Branch 1988a).

SPECIES OCCURRENCE: A common snake. A total of six specimens were collected, and one sighted: OSCA R13, R15, R79, R85, R88 and R98. R13 is an undated specimen collected from the OSCA grounds prior to the survey; R15 was collected from an unknown site at OSCA by Steyn in September 1980; R79 was collected from the mowed lawn in front of the main hall in October 1986; R85 was collected from a garden in front of one of the students' dormitories in May 1987; R88 was collected from the walkway opposite one of the classrooms at the main complex in June 1987; and R98 was collected from the tarred road opposite the game park. One specimen was sighted in a grass stack opposite the students' dormitories in October 1988.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 37. R13 and R85 are adult males; R15 and R98 are adult females; R79 is an unsexed adult; and R88 is a subadult male.

One adult male (n=1) provided a T.L. of 780 (570 + 210) mm and B.D. 11 mm with the T. included into the T.L. 3,7 times; the other male (n=1) provided a B.L. of 505 mm (tail tip truncated) and B.D. 12 mm.

One adult female (n=1) provided a T.L. of 805 (575 + 230) mm and B.D. 10 mm with the T. included into the T.L. 3,5 times; the other female (n=1) provided a B.L. of 620 mm (tail truncated) and B.D. 16 mm. The unsexed adult (n=1) provided a B.L. of 600 mm (tail truncated) and B.D. 19 mm.

The subadult male (n=1) provided a T.L. of 448 (313 + 135) mm and B.D. 7 mm with the T. included into the T.L. 3,3 times.

One adult male (n=1), with tail tip truncated, yielded a mass of 46,90 g; the unsexed adult (n=1), with truncated tail, weighed 81,06 g; and the subadult (n=1) weighed 9,13 g.

TAXONOMIC CHARACTERISTICS: The scalation of all six specimens falls within the range of scalation for P. s. brevirostris as provided in Broadley (1983). The mean number of ventrals for six specimens (n=6) was 150,5 (range 149 - 153) and three specimens (n=3) provided a mean subcaudal count of 90,3 (89 - 92). The narrow range and low ventral count of the series (146-167 for 185 specimens examined by Broadley 1977) is suggestive of a north-south clinal gradient. The dorsal pattern of all specimens also conforms to Broadley's (1983) description and are similar to that of a live specimen from Pretoria illustrated in Broadley (1977, 1983), though ventrally there is considerable variation. The ventral colour of the four fresh specimens (R79, R85, R88 and R98) was yellow and not white as stated by Broadley (1983). All six specimens displayed a lateral series of black dots on the ventrum, which gave the impression of broken lines, which either terminated at the cloaca or faded insensibly on the tail. The ventral scales of R15, R79 and R85 were also randomly flecked to varying degrees with fine black spots.

Broadley (1977), in his review of the genus Psammophis in southern Africa, recognised two subspecies of sibilans from the subcontinent, namely leopardinus and brevirostris. Despite the similarities in scalation, he distinguished leopardinus from brevirostris primarily by the chain-like pattern on the anterior quarter to three-quarters of the body. The subspecies appear to be geographically isolated from each other, leopardinus occupying central and north-western Namibia and southern Angola, while brevirostris occurs in the eastern portion of the subcontinent. The Kalahari probably constitutes the physical barrier between these two disjunct populations.

FIELD NOTES: R79 was kept in a vivarium for over four months where it fed readily on Common Striped Skinks M. s. striata, but refused all offers of toads Bufo and Schismaderma spp. It was also offered Black Bulbul hatchlings Pycnonotus barbatus whose combined mass was 43,82 g, but after showing initial interest which included tentative strikes, ignored the birds. This snake became progressively emaciated and died twenty four hours after taking two small striata skinks. The truncated tail and an old injury to the body which takes the form of a long incision across the dorsum, are indicative of an escape from the talons of a raptorial bird.

It would appear that R85, like R79, lost portion of its tail while escaping from a predator. The gut contained a partially digested skink M. s. striata (R86 with a T.L. of ca. 150 mm). R13 contained the partially digested remains of a gracile, short-limbed scincid lizard (cf.

Panaspis wahlbergii) which measured a T.L. of 82 mm; the T. was 50 mm long. R15 contained the remains of two scincid lizards, one of which was identifiable as M. varia.

SPECIES: Psammophis phillipsii (Hallowell, 1844). Olive Grass-Snake.

RANGE: Northern Namibia, Botswana, northern and eastern Transvaal, eastern Swaziland and KwaZulu (Broadley 1983); northern part of the southern African region, extending south along the Natal coast (Branch 1988a).

PREFERRED HABITAT: Moist savannas and grasslands, especially riparian habitats, swamps, reedbeds and cultivated areas (Broadley 1983); moist savannah and low-lying grasslands (Branch 1988a).

SPECIES OCCURRENCE: A common species. A total of six specimens were collected: TM 68570, TM 68624, TM 68630 and OSCA R12, R80 and R95. TM 68570, TM 68624 and TM 68630 were collected from the OSCA grounds (undated) prior to the survey (donated to TM by A. Steyn in April 1989); the locality and date for R12 are also not known, other than the specimen was collected from the OSCA grounds prior to the survey; R80 was collected from long pioneer grass below the veterinarian centre in March 1987; and R95 was collected from the tarred road surrounded by savanna grassveld in November 1987.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 38. R80 is an adult male; TM 68570, TM 68624, TM 68630 and R95 are adult females. R12 (n=1) is a mutilated adult of indeterminable sex, with a T. of 337 mm. R80 (n=1) provided a B.L. of 1035 mm (tail chopped off) and B.D. 27 mm.

The mean T.L. of the four females (n=4) was 1527,5 (range 1320-1805) mm, B.L. 1087,5 (925-1285) mm, T. 440 (395-520) mm and B.D. 33,5 (30-35) mm. The T. was included into the T.L. on average 3,5 (mean 3,3-3,6) times.

The mass of the male (R80) was 348,28 g.

TAXONOMIC CHARACTERISTICS: The scalation and colour pattern of all the specimens examined falls within the range of characteristics of P. phillipsii as described in Broadley (1977, 1983). The male (n=1) provided a ventral count of 167; the four females (n=4) provided a mean ventral count of 163,8 (range 160-169) and a mean subcaudal count of 99,8

(range 98-103); R12 gave a subcaudal count of 86 (body mutilation precluded a ventral count). These counts are within the range for this taxon (151-183 ventrals and 82-110 subcaudals for 659 specimens examined by Broadley 1977). The dorsal coloration ranged from dark olive-brown to olive-grey anteriorly becoming a light olive-brown to yellowish posteriorly; there were no dorso-lateral stripes or a stippled vertebral line peculiar to sibilans brevirostris from which the specimens could be readily distinguished. The dorsal scales were either black-edged or flecked with small black dots, especially anteriorly but disappearing on the tail, occasionally to form longitudinal lines. The head coloration was either a homogenous olive-brown/olive-grey or mottled with black. The labials and chin shields were spotted in black. The ventral colour was yellow with random black dots, but laterally formed conspicuous rows of black dots or streaks, similar to P. s. brevirostris.

Broadley (1977) discovered that specimens from southern Mozambique and KwaZulu have lower ventral counts (151 - 174) than those from the rest of this taxon's range, probably suggestive of a clinal gradient from north to south. The OSCA material fits this pattern. Apart from the scalation and colour pattern, the size of phillipsii was a further criterion for separating it from sibilans brevirostris; the largest phillipsii (n=3) measured a T.L. of 1805 (1285 + 520) mm while the largest sibilans brevirostris (n=6) measured a T.L. of 805 (600 + 205) mm.

Broadley (1977) has brought attention to the possibility of hybridization between sibilans brevirostris and phillipsii, particularly in some areas of the Transvaal and Natal. Based on the present small series, there is no evidence at OSCA of introgression between these two sympatric populations, suggesting that they behave as good species at OSCA at any rate.

FIELD NOTES: R80 was mistaken for a highly poisonous species and killed for such (H. Allen pers. comm.). The tail was severed and lost when repeated blows were delivered to the snake. An adult pentastomid (Porocephalidae) was found between the body wall and intestinal tract approximately two-thirds down the length of the body.

R95 was killed by a vehicle while crossing the tarred road from one grassveld habitat to the next on a hot afternoon with the ambient temperature reading 34°C (W. Prinsloo in litt.). This specimen with a T.L. of 1805 (1285 + 520) mm is the largest female of this taxon ever recorded, exceeding the previous largest specimen (UM 13381 - Beitbridge, Zimbabwe) with a T.L. of 1500 (1020 + 480) mm. It is exceeded in B.L. only by a male from Norton (NMZ 3893) which has a B.L. of 1415 mm (tail truncated). R95 contained the remains of two vlei rats Otomys sp. (cf. angoniensis), one of which was an adult (G. Palmer pers. comm.). This specimen was well padded with fat.

A well preserved, almost completely intact adult vlei rat Otomys sp. (cf. angoniensis, irroratus, laminatus; A. Maddock pers. comm.) was found in the gut of TM 68570, while the hind claws and hairs of an unidentified rodent was found in the gut of TM 68624. Both snakes were well padded with yellow fat tissue.

SPECIES: Aparallactus capensis A. Smith, 1849. Black-headed Snake or Cape Centipede-Eater.

RANGE: Predominantly the eastern part of southern Africa as far south as the eastern Cape, including Mozambique, Zimbabwe, Swaziland, Transvaal, Natal, Zululand, Orange Free State and eastern Botswana, with isolated collections from Namibia; eastern regions, from Port Elizabeth to Zimbabwe, northern Botswana and Caprivi Strip with an old record from central Namibia (Branch 1988a).

PREFERRED HABITAT: Termitaria, among roots of shrubs or grass and under stones or logs in open bush or savanna grassveld (Broadley 1983); varied, including highveld and montane grassland, savannah and coastal bush (Branch 1988a).

SPECIES OCCURRENCE: An uncommon species. Two specimens were collected, of which one is preserved: OSCA R47. The date and site for R47 are not known, other than it was collected from the OSCA grounds prior to the survey; the unpreserved specimen was collected from damp soil under a rock on the banks of the Cwaka River in the game park in August 1987.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 39. Both specimens were unsexed adults. The mean T.L. of these specimens (n=2) was 221 (range 212 - 230) mm, B.L. 172 (169 - 175) mm, T. 49 (43 - 55) mm and B.D. 5 (no range) mm with the T. included into T.L. 4,6 (4,2 - 4,9) times. The mass of the unpreserved specimen was 3,02 g.

TAXONOMIC CHARACTERISTICS: The voucher and the other specimen examined fell within the range of characteristics for A. capensis as described in Broadley (1983). The ventral and subcaudal counts of the voucher specimen of 139 and 48 respectively, are well within the range for this species, with counts of between 126 - 186 and 29 - 63 respectively (Broadley 1983). Both specimens had black heads and contiguous black nuchal bands. The

dorsum of the unpreserved specimen was a dark greyish-brown, slightly lighter dorso-laterally, and was without a vertebral line. The ventrum was dirty white to yellow.

According to Branch (1988a), the genus Aparallactus is distributed throughout subSaharan Africa where some 11 species are recorded, four of which occur in southern Africa. Only one, A. nigriceps, an endemic about which very little is known, occurs in southern Mozambique; it is distinguished from A. capensis, with which it shares a similar colour pattern by the nape collar which is twice as broad (Branch 1988a), and by its lower ventral (108 - 123) and subcaudal (20 - 35) counts. Broadley (1983) could not distinguish the western subspecies bocagii Boulenger from the typical form, which Loveridge (1944) did on the basis of higher ventral scale counts (131 - 167 versus 168 - 191). Broadley (1983) has suggested that ventral counts seem to be influenced by altitude with montane specimens having low counts, and those from the lowveld and river valleys having higher ones. The voucher specimen does not fit this pattern, but a larger OSCA series is required before the situation can be properly evaluated.

FIELD NOTES: The unpreserved specimen did not attempt to bite when first handled, but wriggled furiously. When placed in a basin of water it swam with relative ease in typical serpentine manner (lateral undulations of the body). The tongue was greyish-black anteriorly and light fleshy-orange posteriorly.

SPECIES: Atractaspis bibronii A. Smith, 1849. Bibron's Stiletto- or Side-stabbing Snake.

RANGE: Mozambique and Zimbabwe south to Natal, and west to the northern Cape Province and Namibia (Broadley 1983); throughout the northern regions of southern Africa, to Natal south coast, and with scattered inland records (Branch 1988a).

PREFERRED HABITAT: Uncompacted soils, old termitaria and under stones in highveld grassland and semi-desert to coastal bush (Broadley 1983; Branch 1988a).

SPECIES OCCURRENCE: An uncommon snake. Three specimens were collected, of which two are preserved: OSCA R30 and R97. The unpreserved specimen was collected from crumbly soil at the nursery where excavations were being dug in April 1986; R30 was collected from the tarred road by A. Steyn (undated); and R97 was collected from the concrete courtyard of a staff member's house in August 1987.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 40. R30 and R97 are adult males; the unpreserved specimen was a juvenile with a T.L. of ca. 200 mm. The two adults (n=2) provided a mean T.L. of 526,5 (range 513 - 540) mm, B.L. 491,5 (476 - 507) mm, T. 35 (33 - 37) mm and B.D. 11 (10 - 12) mm. The T. was on average included into the T.L. 15,2 (range 13,9 - 16,4) times. The mass of the larger male was 18,77 g.

TAXONOMIC CHARACTERISTICS: The two preserved and one unpreserved specimen fulfil the criteria diagnostic for A. bibronii as described in Broadley (1983) and Branch (1988a). R30 provided a scale count of 21 scales at midbody, 215 ventrals (pseudo-ventral intruding between ventral 2 and 3) and 23 single (unpaired) subcaudals; R97 also yielded 21 scales at midbody, a ventral scale count of 228 and a subcaudal count of 24 single scales, which is within this taxon's range (ventrals 196 - 260 and subcaudals 18 - 28 according to Broadley 1983). The uninverted hemipenes of R30 and R97 extended to the 9th and 8th subcaudal respectively, bifurcating at the 5th. The colour of R30 was badly faded and cannot be described. Both R97 and the specimen released differ, however, from Broadley (1983) and Branch (1988a) in respect of colour pattern: the dorsal colour was a shiny dark grey with random dark brown to black flecks scattered on both the head and dorsum. The ventrum was also grey, but considerably lighter than above.

A number of workers (Bourgeois 1961, 1963, 1968; Kochva 1967; Minton 1968; in Broadley 1983) have shown that the genus Atractaspis was wrongly placed in the Viperidae. The common names "burrowing adder" or "mole viper" are therefore no longer applicable. Branch (1978) and Broadley and Blake (1979) proposed the names "side-stabbing snake" and "stiletto snake" respectively to describe the manner in which this snake inflicts a bite. More recently, Branch (1988a and pers. comm.) proposed the name "burrowing asp" to describe both the fossorial habits and dangerous properties of this snake, but this was resisted by Broadley (1989) who pointed out that the term "asp" is applied to various adders.

Broadley (1983) follows Dowling and Duellman's (1978) arrangement in placing the genus Atractaspis in the tribe Aparallactini of the subfamily Lycodontinae, whereas Branch (1988a) places Atractaspis in the subfamily Atractaspidinae, which includes the genera Aparallactus, Macrelaps, Amblyodipsas, Chilorhinophis, Homoroselaps and Xenocalamus. Branch (1988a) has referred to the confused taxonomy of the genus Atractaspis, for which about twelve species are known from subSaharan Africa. There are three species occurring in southern Africa, only one of which, duerdeni, is endemic.

FIELD NOTES: The author initially misidentified the juvenile which, because of its atypical shiny grey coloration, was mistaken for an Amblyodipsas, and was bitten on the left

forefinger within moments of handling the specimen. The bite was effected with a raking motion of the head, the skin being pierced by one of the fangs. The bite caused bleeding and an immediate burning sensation. Oral suction was applied. Within moments the site of the bite discolored and swelled noticeably. Within ten minutes the finger had become swollen and stiff, and the swelling began to increase to the hand. While removing the snake from the container in which it was collected, it delivered a second bite to the ring finger of the left hand. As with the first bite, a burning pain and swelling followed soon after. Five hours later both bitten fingers were stiff and swollen; the hand had also swollen considerably, preventing the author from lowering his hand below the elbow without intense throbbing. This condition persisted for almost four days before the swelling finally subsided, and apart from slight discoloration at the sites of the bites where superficial sloughing took place, no further symptoms or disability were experienced.

R30 was a road victim. R97 was collected early in the morning, suggesting it had been active during nocturnal hours. It was lethargic when coaxed into a sack and was dead a few hours later. There were no outward signs of injury. Dissection of the gut revealed a multitude of small, white larvae, which appeared as cystlike bodies, on the outside of the alimentary canal. These parasites have been provisionally identified as Porocephalus subulifera (Porocephalidae) (M. Visser in litt.).

SPECIES: Prosymna ambigua stuhlmannii (Pfeffer, 1893). East African Shovel-snout.

RANGE: Eastern portion of southern Africa, from Mozambique and Zimbabwe through to the Transvaal, Swaziland and Zululand; East Africa south to Zululand (Branch 1988a).

PREFERRED HABITAT: Moist savanna where it is usually found under rocks and logs (Broadley 1983); savannah, extending into wooded hills (Branch 1988a).

SPECIES OCCURRENCE: An uncommon species. Two specimens were collected: OSCA R60 and R100. R60 was collected from a mixture of soil and compost in a garden adjoining a staff member's house in October 1986; R100 was collected from a pit trap in the game park in December 1988.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 41. R60 is an adult male and R100 is an adult female.

The adult male (n=1) provided a T.L. of 193 (160 + 33) mm and B.D. 6 mm with the T. included into the T.L. 6,4 times; the adult female (n=1) provided a T.L. of 162 (146 + 16) mm and B.D. 5 mm with the T. included into the T.L. 10,1 times.

The adult female (n=1) provided a mass of 1,88 g.

TAXONOMIC CHARACTERISTICS: The scalation of R60 and R100, yielding a ventral count of 129 and 140 and a subcaudal count of 30 and 21 respectively, is within the range of *P. a. stuhlmannii* (ventrals 124 - 164 and subcaudals 17 - 39) as described in Broadley (1983). The dorsal pattern of both specimens was dark grey with a series of small, irregularly spaced white dots occurring on the neck and back, fading on the tail. The snout was bright yellow. The ventrum was a homogenous light greyish-white. The tail terminated in a spike.

According to Branch (1988a) there are twelve species recorded from subSaharan Africa, seven of which occur on the subcontinent of which three are endemic. Three subspecies of *ambigua* have been recognised, with only the southern subspecies *stuhlmannii* occurring in southeastern Africa. Although Broadley (1983) places the genus *Prosymna* under the subfamily Lycodontinae, Branch (1988a) has left them *incertae sedis*, suggesting that their taxonomic relationship or affinities with other colubrids are not clear.

FIELD NOTES: R60 was exposed while digging in the garden. It was kept in a small vivarium with damp, uncompacted soil and humus in which it burrowed with ease. The tongue was fleshy-pink.

R100 was collected from one of the pit (bucket) traps situated in the savanna grassveld habitat. Both this and the other specimen occasionally displayed the peculiar habit of flattening the anterior portion of the body dorso-ventrally while stationary or moving slowly across the ground.

SPECIES: *Philothamnus hoplogaster* (Günther, 1863). Green Water Snake.

RANGE: The eastern portion of southern Africa to Natal, southwards down the eastern half of the sub-continent to the eastern Cape Province (Broadley 1983); east Cape coast, through Natal, Transvaal and southern Mozambique to Zimbabwe (Branch 1988a).

PREFERRED HABITAT: Coastal plains to the higher inland savanna and montane forests near water, frequenting marshes, ponds and rivers (Broadley 1983); varied, coastal bush, fynbos, and arid and mesic savannah (Branch 1988a).

SPECIES OCCURRENCE: An uncommon species. Only one specimen was collected and preserved: OSCA R22. This specimen was collected from an unspecified OSCA locality by Steyn in January 1978. A. Steyn (in litt.) also records collecting a specimen (undated) from the banks of the Cwaka River just below the Cwaka Dam for which he has a photographic record.

SIZE, SEX, MEASUREMENTS AND MASS: R22 is an adult female (n=1) with a T.L. of 550 (375 + 175) mm and B.D. 7 mm with the T. included 3,1 times into the T.L.

TAXONOMIC FEATURES: The P. hoplogaster voucher specimen (R22) is characteristic of this species as described in Broadley (1983), with the 4th and 5th labials entering the eye orbit, a midbody scale row of 15, and 151 ventrals and 106 subcaudals. The high number of subcaudals is peculiar in the light of Broadley's (1983) statement "subcaudals 73 - 106, but exceptionally exceeding 100 in southern African specimens" and is difficult to interpret. Only a larger series can determine whether or not hoplogaster from the region of OSCA show a consistently high subcaudal count. The colour is badly faded, dulling to a dark grey, but is randomly spotted with black which is most concentrated on the dorsum above the tail. R22 is a female with the tail included 3,1 times into the total length; it is therefore outside Broadley's (1983) tail length/total length sex ratio of 3 to 3,3 times in males and 3,3 to 3,8 times in females. There is no evidence of the tail having been truncated.

FIELD NOTES: R22 contains an indeterminable number of small ova, the largest of which measures 2 x 1,2 mm. The Cwaka riverine environment is ideal for this species where suitable prey, including frogs, toads, lizards, small fishes and a multitude of insects have been recorded.

SPECIES: Philothamnus semivariiegatus semivariiegatus (A. Smith, 1840). Spotted or Variegated Bush-Snake.

RANGE: Eastern Cape Province northwards into Natal, Zululand, Mozambique, Transvaal, Zimbabwe, Botswana, northern Cape and central and northern Namibia; northern regions of

southern Africa, extending into the Kalahari and northern Cape, reaching Namaqualand in the west and Port Elizabeth in the east (Branch 1988a).

PREFERRED HABITAT: Open forest, bushveld and savanna; open forest or savannah, extending into arid regions (Branch 1988a).

SPECIES OCCURRENCE: A common species. Six specimens were collected and preserved prior to the survey, while a total of twelve specimens were collected or sighted during the study period, of which two are preserved: TM 68638, OSCA R20, R21, R26, R27, R28, R73 and R87. The exact sites and dates for R20, R21, R26, R27 and R28 are not known other than these specimens were collected from the OSCA grounds prior to the survey. TM 68638 was collected from an undisclosed site at OSCA in August 1985. R73 was collected from the quadrangle garden at the main office complex in November 1986; R87 was collected from the walkway in front of the main hall after it had alighted from a tree in March 1987. Other specimens were collected or sighted from a large creeper against the wall of the library in August 1986; a wooden fence pole in the game park in August 1986; the vegetated quadrangle at the main office complex in October 1986; a Hibiscus shrub opposite one of the students' dormitories in November 1986; an Impatiens plant in front of the Home Economics classroom in December 1986; a large cypress tree (Cupressaceae) opposite the main hall in February 1987; an Acacia tree Acacia karroo midway between the veterinarian centre and the game park in May 1987; a grass patch opposite the dining hall in November 1987; and a small Hibiscus bush opposite the students' dormitories in December 1987.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 42. TM 68638 and R27 are adult males; R20, R21, R26, R73 and R87 are adult females; and a further five specimens collected and released were unsexed adults. One specimen collected and released was a subadult female, while a further four specimens collected and released were unsexed subadults. Discrete measurements are available for seven specimens.

Four adult females (n=4) provided a mean T.L. of 798,3 (range 738 - 845) mm, B.L. 539,5 (493 - 585) mm, T. 258,8 (245 - 275) mm and B.D. 8,5 (8 - 9) mm with the T. included into the T.L. 3,1 (3,0 - 3,3) times. Another adult female (n=1), with tail tip truncated, provided a B.L. of 620 mm and B.D. 10 mm.

Two adult males (n=2) provided a mean T.L. of 750 (range 745-755) mm, B.L. 480 mm (no range), T. 270 (265-275) mm and B.D. 8 mm (no range) with the T. included into the T.L. 2,8 (2,7-2,8) times.

One subadult female (n=1) provided a T.L. of 390 (270 + 120) mm and B.D. 4 mm with the T. included into the T.L. 3,3 times.

Two adult females (n=2) provided a mean mass of 20,22 (range 12,02 - 28,42) g; the subadult female (n=1) weighed 4,48 g, and an unsexed subadult (n=1) with a T.L. of ca. 500 mm weighed 12,54 g.

TAXONOMIC CHARACTERISTICS: The *P. s. semivariiegatus* series from OSCA displays the typical variegated or banded pattern of this taxon as described in Broadley (1983) and Branch (1988a). The ventral scale counts of eight specimens ranged from 170 - 185 (mean 178,1: n=8) and the subcaudal counts of six specimens ranged from 114 - 129 (mean 123,0: n=6) showing that some specimens are outside the established range for this taxon; Broadley (1983) provides a ventral and subcaudal range for this taxon of 175 - 204 and 122 - 166 respectively. The low ventral and subcaudal counts of OSCA material is difficult to interpret, though it suggests that there is a possible north-south cline in ventral and subcaudal counts, those populations from the south having considerably lower counts than populations from the north or, alternatively, that scalation is related to altitude or some other environmental parameter. It is also interesting to note that Broadley (1983) gives the average lengths of adults at 1 metre; the largest specimen in the OSCA series provided a total length of 900 mm.

According to Branch (1988a), there are 18 species of *Philothamnus* distributed throughout subSaharan Africa, with five occurring in southern Africa, only one of which, *natalensis*, is endemic. It is worthy to note that *natalensis*, for which two subspecies, typical *natalensis* and *occidentalis* have been recognised, is sympatric with both *hoplogaster* and *semivariiegatus* over most of its range, particularly in the Transvaal, Mozambique, KwaZulu and Natal.

FIELD NOTES: This snake is an alert and agile species. Many of the specimens were basking at the time of collection, but propelled themselves through bushes and trees in a flash when disturbed, making capture difficult. In undisturbed instances of locomotion, this snake will glide through foliage with the greatest of ease. On occasions when this snake was flushed from the undergrowth, it would quickly seek out the nearest bush or tree into which to escape. On the ground this snake moves as swiftly as psammophine snakes, keeping the head and forebody off the ground. A number of specimens disappeared into the roofs of buildings when disturbed.

Not one of the specimens collected attempted to bite when first handled. One specimen did, however, adopt a defensive posture, inflating the throat and forebody, though not quite to the

same degree as the Boomslang Dispholidus typus typus, to show the interstitial skin and vivid blue flecks on the tips of the dorsal scales.

This species did not do well in captivity. Many specimens ignored offers of dwarf geckos L. c. capensis, house geckos H. m. mabouia, striped skinks M. s. striata, House Sparrows Passer domesticus, and toads B. gutturalis and S. carens. Only two specimens actually fed in captivity, taking L. c. capensis and H. m. mabouia prey. Small geckos were seized, chewed and swallowed head first with relative ease, but large H. m. mabouia put up desperate struggles, often inflicting bites on the snakes and hanging on until they succumbed from the effects of the venom. (In a study of P. natalensis venom, which was analysed by P. Christiansen, Branch (1986b) refers to the toxic oral secretions of this fangless species; the observations by the present author suggest that P. s. semivariiegatus also produces venom, which is probably haemolytic in action). One gecko ceased its struggles only 45 minutes after being bitten. These reptile prey were digested in seven to eleven days. An adult L. c. capensis with a T.L. of ca. 64 mm (partially digested) and the portion of the tail (29 mm long) of a limbed scincid lizard (cf. Mabuva sp.) were found in the gut of R28.

An adult specimen placed in a vivarium housing an adult Twig Snake Thelotornis capensis capensis (T.L. 1200 mm) immediately showed signs of distress and fled from corner to corner when the Twig Snake inflated its throat, flicked its bright orange tongue and made short advances on it.

In captivity a subadult specimen displayed the peculiar behaviour of jerking its head from side to side while perched on a branch. These short, jerky movements were performed at the rate of approximately 16 motions every 10 seconds, the distance between the two lateral points of movement measuring approximately 8 mm. There were no other snakes or prey items in the vivarium at the time. Another specimen, an adult, made soft but audible blowing sounds when handled, the throat bulging slightly on each occasion. This blowing behaviour was not recorded for any other specimens.

R26 and R28 have the tips of their tails truncated, possibly having occurred during the capture of these snakes. R20, R21 and R26 were gravid females. R20 contained 19 small ova, the largest of which measured 4,7 x 2,3 mm; R21 contained an indeterminable number of ova of variable size, the largest of which measured 8,8 x 2,8 mm; and R26 also contained an indeterminable number of ova, the largest measuring 4,8 x 2,4 mm.

SPECIES: Crotaphopeltis hotamboeia (Laurenti, 1768). Red-lipped or Herald Snake.

RANGE: The eastern half of southern Africa to the western Cape Province (Broadley 1983; Branch 1988a).

PREFERRED HABITAT: Damp localities and frequently found in gardens and in the vicinity of houses and outbuildings (Broadley 1983); in savannah and open woodland (Branch 1988a), but also in fynbos (pers. obs.).

SPECIES OCCURRENCE: An uncommon species. A total of three specimens were collected, of which two are preserved: OSCA R14 and R23. The exact dates and sites for R14 and R23 are not known, other than they were collected from the OSCA grounds prior to the survey. The unpreserved specimen was collected from the grounds of a staff member's house in April 1986.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 43. R14 is a subadult female; R23 a small adult male; and the unpreserved specimen was an unsexed juvenile. R14 provided a T.L. of 290 (245 + 45) mm and B.D. 8 mm with the T. included into the T.L. 6,4 times. R23 provided a T.L. of 560 (477 + 83) mm and B.D. 14 mm with the T. included into T.L. 6,7 times. The subadult provided a T.L. of 124 (103 + 21) mm and B.D. 4 mm with the T. included into T.L. 5,9 times. The mass of the juvenile was 1,27 g.

TAXONOMIC CHARACTERISTICS: The two preserved and one unpreserved specimen displayed the scalation and colour pattern typical of C. hotamboeia as described in Broadley (1983). The ventral and subcaudal scale counts of 156 and 35, and 160 and 41 for R14 and R23 respectively, fall well within the range for this species (139 - 174 ventral and 24 - 47 subcaudals) as provided by Broadley (1983). The OSCA material has white labials, and not red typical of the eastern Cape and Natal populations. The juvenile was greyish-green above with scattered white specks which formed fine transverse bars.

FIELD NOTES: The juvenile was caught and brought indoors by a domestic cat.

SPECIES: Telescopus semiannulatus semiannulatus A. Smith, 1849. Eastern Tiger Snake.

RANGE: Mozambique, Zimbabwe, Transvaal, Zululand, Natal, Swaziland, Botswana, northern Cape and northern Namibia, with a solitary record from East London which requires confirmation (Broadley 1983).

PREFERRED HABITAT: Terricolous or occasionally arboreal situations in open bushveld, grassveld and sandveld (Broadley 1983); savannah and sandveld (Branch 1988a).

SPECIES OCCURRENCE: A rare species. Only one specimen was collected: OSCA R89. This specimen was collected from the walkway in front of the dining hall in June 1987.

SIZE, SEX, MEASUREMENTS AND MASS: R89 is an adult male with a T.L. of 530 (425 + 105) mm and B.D. 8 mm with the T. included into the T.L. 5 times. This specimen weighed 18,29 g.

TAXONOMIC CHARACTERISTICS: The voucher specimen falls within the range of characteristics for T. s. semiannulatus as described in Broadley (1983). The scale counts of 199 ventrals and 64 subcaudals are within the range for this taxon (190 - 244 ventrals and 51 - 83 subcaudals, usually 53 - 75 in southern Africa, according to Broadley 1983) as are the number of black bars (total 37, 28 on back and 9 on tail; range for taxon 22 - 52 with 24 - 46 on body and 4 - 14 on tail, according to Broadley 1983). The 17th bar was U-shaped and dorso-laterally the mustard colour was flecked with black.

According to Branch (1988a), there are six species of Telescopus, two of which occur in southern Africa of which one, beetzii, is endemic. Both Broadley (1983) and Branch (1988a) recognise two subspecies of semiannulatus, the typical form and polystictus, the latter distinguished from typical semiannulatus by an average higher ventral count and consistently more crossbands (or transverse spots) on the body and tail. The western subspecies polystictus intergrades with the nominate form in central Namibia, while beetzii and polystictus appear to be parapatric in southern Namibia and the northern Cape.

FIELD NOTES: This specimen was sluggish when encountered and did not attempt to bite when handled. It subsequently proved to be ill, drawing its body into a concertina-like pattern to form rigid undulations. There were no outward signs of injury. Sunning the snake did not improve its condition, and it died two days later. The gut was densely infested with

cystlike porocephalid larvae, probably Porocephalus subulifera (M. Visser in litt.).

SPECIES: Dispholidus typus typus (A. Smith, 1829). Boomslang or Back-fanged Tree-Snake.

RANGE: Throughout southern Africa, but absent from such dry areas as the Great Karoo, Little Namaqualand, Great Namaqualand and the Namib (Broadley 1983); occurring in the northern parts of southern Africa and extending along the east and south coast to Cape Town (Branch 1988a).

PREFERRED HABITAT: Wooded regions, including bushveld, savanna and fynbos, but excluding rain forests; open bush and savannah, and also found in sparsely wooded grassland in the eastern Cape (Branch 1988a).

SPECIES OCCURRENCE: A common species. A total of five specimens were collected, and a further six positively sighted, of which two are preserved: OSCA R6 and R76. R6 was collected from leaf litter below an Acacia tree Acacia karroo in June 1986; R76 was collected from under a slab of concrete at the veterinarian centre in August 1986. All other specimens were collected or sighted from a large Coral Tree Erythrina lysistemon opposite the main hall in April 1986; an Acacia tree Acacia nilotica in the game park in October 1986; a gravel road between the main complex and staff houses in December 1986; a large Acacia tree Acacia robusta in the northern portion of OSCA near the compound in February 1987; a Horsetail Tree Casaurina equisetifolia near the main complex in March 1987; a Wild Fig Tree Ficus sycomorus opposite the veterinarian centre in May 1987; a large Flamboyant Tree Delonix regia in the garden of a staff member's house in May 1987; and from a large unidentified tree in the garden of a staff member's house in August 1988.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 44. Of the eleven specimens collected or sighted, ten were adults. R76 and two other specimens collected and released were adult males; seven specimens collected and released or sighted could not be positively sexed. R6 is a subadult male. Discrete measurements are available for four specimens.

Three adult males (n=3) provided a mean T.L. of 1135 (range 975 - 1380) mm, B.L. 812,3 (687 - 990) mm, T. 322,7 (288 - 390) mm and B.D. 15,7 (12 - 22) mm with the T. included into the T.L. 3,5 (3,4 - 3,6) times.

The subadult male (n=1) provided a T.L. of 670 (475 + 195) mm and B.D. 11 mm with the T. included 3,4 times into the T.L.

The three adult males (n=3) yielded a mean mass of 125,02 (range 41,00 - 252,02) g.

TAXONOMIC CHARACTERISTICS: The two preserved specimens and other specimens examined displayed the characteristics diagnostic for D. t. typus as described in Broadley (1983). Field identifications were based on the relatively short head and large eye, keeled and overlapping scales, colour pattern of green or brown, and arboreal habits of this snake. The ventral and subcaudal counts of 174 and 178 (mean 176: n=2) and 131 and 141 (mean 136: n=2) for R6 and R76 respectively, are within the range for this taxon (ventrals 164 - 201 and subcaudals 104 - 142, according to Broadley 1983). The coloration of the OSCA population varies from brown through to a mottled olive-brown and green to leaf green which appears to typify savanna populations in southern Africa, differing noticeably from black and yellow specimens (usually males) from the valley bushveld of the eastern Cape or black, yellow and green specimens (again, usually males) from the fynbos regions of the southwestern Cape (pers. obs.). Two subspecies of this monotypic genus are recognised, the typical form which is widespread throughout southern Africa, and punctatus which occurs in Zaire, Angola and Zambia. According to Broadley (1983), punctatus is distinguished by low subcaudal counts and distinctive coloration.

FIELD NOTES: All adults sighted were in excess of one metre in length and occurred in predominantly two colour phases: green or brown. Of the ten adult specimens collected or sighted, six were of the green colour phase; one of the adults collected, however, had mottled patches of light green on a predominantly olive-brown dorsum. Both this specimen and R76, which was a leaf green colour, were males and therefore it was not possible to conclusively link sex with colour, though males are usually green and females usually brown (Broadley 1983). The subadult specimen, R6 with a T.L. of 670 mm, displayed many of the typical juvenile features such as a greyish-brown dorsum, blue and yellow spotting of the dorso-lateral scales behind the head, and an emerald green iris.

Six of the specimens collected from or sighted in trees were mobbed by birds whose calls initially attracted the author's attention to these snakes. In all instances it was the Black-eyed Bulbul Pycnonotus barbatus which chattered loudly at this snake's presence, and was on one occasion joined by a Scarlet-chested Sunbird Chalcomitra senegalensis to produce a raucous noise. One of the snakes had a grossly distended gut, and remained quite immobile while the birds darted around it. Two other specimens, the one adopting a coiled position on top of foliage, also remained motionless throughout the birds' protestations.

Two snakes were collected simultaneously from the same Horsetail Tree. The one specimen was inspecting the contents of a bulbul nest and was being trailed by the other at the time of collection. Both these specimens were kept in captivity for four weeks but refused to eat, ignoring offers of geckos H. m. mabouia and L. c. capensis, and House Sparrows Passer domesticus.

A green adult with T.L of ca. 1200 mm, while being mobbed by bulbuls in a large unidentified tree, was shot with a dart from a blow pipe. Dissection of this specimen revealed two intact bird's eggs and a fledling (P. Waugh and J. Hughes pers. comm.). The carcase was not preserved.

A brown phase adult with a T.L. of ca. 1400 mm was observed feeding on an adult female House Sparrow in a Coral Tree. When approached, this snake disgorged its meal and attempted to flee, but was killed (V. Ncobo pers. comm.).

The specimen sighted in the Acacia tree in the game park, a brown phase adult with a T.L. of ca. 1200 mm, was initially observed crossing burned grassveld before ascending the tree. It lunged at a large short-horned brown locust (Acrididae) in what appeared to be a deliberate attempt to secure it, but the insect took to flight.

R6 was found dead under an Acacia tree after a spell of cold weather. There were no external signs of injury. This subadult was well padded with fatty tissue and it contained in its gut part of the thigh, tibia and tarsals of a hyperolid frog (cf. H. m. taeniatus). R76 was found hibernating in a coiled position under a slab of concrete. It was kept in captivity for over six months during which time it refused all offers of food, including small birds, hatchlings, geckos, lizards, frogs and short-horned locusts.

This species is normally of a docile disposition, but on occasion will inflate its throat and forebody noticeably to show the interstitial skin. In such a state it is inclined to bite. R76 bit the author on the forefinger while being handled, and without first inflating the throat, the back fangs making deep grooves into the flesh when the snake was pulled away. Although the wound bled freely, further assisted by oral suction, no symptoms of envenomation were experienced.

SPECIES: Thelotornis capensis capensis A. Smith, 1849. Southern Vine- or Twig-Snake.

RANGE: Natal, Swaziland and the Transvaal, north to southwestern Botswana, southern Zimbabwe and southern Mozambique, where it intergrades along the perimeter of its range with both T. c. oatesii and T. c. mossambicanus (Broadley 1983).

PREFERRED HABITAT: Wooded savanna and open bushveld; savannah and coastal forests (Branch 1988a).

SPECIES OCCURRENCE: An uncommon snake. Two specimens were collected, but not preserved, while a third was sighted. One individual was collected from the game park fence in November 1986 and the other from an Ilala Palm Hyphaene natalensis at the fish ponds in March 1987. Another specimen was sighted in a Hibiscus shrub opposite the dining hall in September 1988.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 45. All three specimens were unsexed adults. The two collected specimens (n=2) provided a mean T.L. of 1175 (range 1150 - 1200) mm, B.L. 752,5 (750 - 755) mm, T. 422,5 (395 - 450) mm and B.D. 18,5 (18 - 19) mm with the T. included on average 2,8 (2,7 - 2,9) times into T.L. The average mass (n=2) was 45,98 (35,53 - 56,43) g.

TAXONOMIC CHARACTERISTICS: Although a scale count of the two adults was not performed, they displayed the characteristics diagnostic for T. c. capensis as described in Broadley (1983). The head shield markings (black streaks and spots) were well represented, and were similar to the markings of T. c. capensis (UM 17530) from Sinkukwe, Zimbabwe (Fig. 146, p. 256 in Broadley 1983). Although the dorsal pattern of both specimens was similar, the coloration differed from an ash-grey in the one specimen to a pale pinkish-brown to grey in the other. According to Branch (1988a), the genus contains two species; T. kirtlandii is restricted to the rain forests of central and west Africa, while T. capensis, for which three subspecies are recognised (Broadley 1983 and Branch 1988a), occurs in southern Africa. The three subspecies, namely typical capensis, oatesii and mossambicanus are distinguished on subtle differences in head shield coloration and markings, ventral scale counts and size. All three subspecies intergrade along their contact zones.

FIELD NOTES: The specimen collected from the game park fence was basking at the time of capture. Although the other specimen was collected from an Ilala Palm, it probably sought refuge in this tree after being flushed from surrounding Acacia trees which were being hacked down by labourers. Both specimens were kept in captivity. The one specimen (mass

35,53 g) accepted a striped skink M. s. striata. It was also offered two juvenile White-Throated Swallows Hirundo albigularis albigularis, weighing 28,72 g and 27,20 g respectively, which it struck, chewed, and partially swallowed head first before rejecting them.

The other specimen (mass 56,43 g) was offered an adult female House Sparrow Passer domesticus which it seized and attempted to swallow tail first, but the bird became stuck in the throat and was subsequently disgorged. It was also offered a young Speckled Mousebird Colius striatus with a mass of 22,83 g which it struck and partially swallowed head first before rejecting it. On the same day it was offered the mousebird, it was also presented with a juvenile Lesser Striped Swallow Cercopis abyssinca unitatus with a mass of 11,79 g which it consumed, head first. Seven days later it was offered three Black Bulbul hatchlings Pycnonotus barbatus whose combined mass was 43,82 g, but the snake showed no interest in these prey items. The undigested remains of the striped swallow were voided 13 days later. This snake shed a complete skin which weighed 0,73 g when completely dry, representing 1,3 % of the total mass of the snake.

Generally this snake is of a docile disposition, but when angered will inflate its throat to three or four times its normal size and rapidly flick its black-tipped orange tongue. When an adult Spotted Bush-Snake P. s. semivariatus was introduced into a vivarium with one of these snakes, it inflated its neck, flicked its tongue and made a series of short advances on the bush-snake, causing the latter to show distress which included retreating to the corners of the vivarium until it was removed.

SPECIES: Dasypeltis scabra (Linnaeus, 1758). Common or Rhombic Egg-Eater.

RANGE: Throughout southern Africa (Broadley 1983; Branch 1988a).

PREFERRED HABITAT: Terrestrial and arboreal situations not far from their food of eggs, especially birds' eggs; absent only from true desert and closed-canopy forest (Branch 1988a).

SPECIES OCCURRENCE: A rare snake. Only one specimen was collected, prior to the survey: OSCA R46. This specimen was collected from an unspecified site at OSCA in October 1980.

SIZE, SEX, MEASUREMENTS AND MASS: R46 is an unsexed juvenile (n=1) with a T.L. of 225 (187 + 38) mm and B.D. 5 mm with the T. included 5,9 times into the T.L.

TAXONOMIC CHARACTERISTICS: R46 displays the typical colour pattern and scalation of D. scabra as described in Broadley (1983). Due to mutilation, it was not possible to perform an accurate ventral and subcaudal scale count.

FIELD NOTES: No information available.

SPECIES: Naja mossambica Peters, 1854. Mozambique Spitting Cobra.

RANGE: Natal, Zululand, Swaziland, Mozambique, Zimbabwe, Transvaal, north-eastern Cape, Botswana and north-eastern Namibia; eastern regions, from southern Natal through the Transvaal and northern Botswana to north-eastern Namibia (Branch 1988a).

PREFERRED HABITAT: Savanna grassveld and bushveld; also cleared areas in former forest (Branch 1988a).

SPECIES OCCURRENCE: A common species. A total of 25 specimens were collected or sighted, of which ten are preserved: OSCA R2, R3, R4, R55, R65, R66, R67, R75, R77 and R99. R2 was collected from inside a students' dormitory in March 1986; R3 was collected from a staff member's garden in April 1986; R4 was collected from the lawn of a students' dormitory in April 1986; R55 was collected from under wooden nursery boxes behind the veterinarian centre in November 1986; R65 was collected from under pieces of scrap wood in the carpentry room in December 1986; R66 was collected from a length of iron pipe alongside the mechanic's workshop in January 1987; R67 was collected from a Hippopotamus skull on the veranda of a staff member's house in January 1987; R75 was collected from the lounge of a staff member's house; R77 was collected from the veranda of a staff member's home in March 1987; and R99 was collected from a patch of vegetation adjacent to a staff member's house in November 1988. The other, unpreserved specimens were collected from the entrance to the veterinarian centre in April 1986; under a stack of grass in a staff member's garage in August 1986; a grassveld habitat between the veterinarian centre and the game park in October 1986; a rack of shelves in the library in November 1986; a patch of lawn outside a classroom at the main complex in November 1986; the toilet floor of a staff member's house in February 1987; a patch of dry leaf litter at the old nursery site in February 1987; the cement courtyard of a staff member's house in April 1987; the garden of

a staff member's house in May 1987; a patch of lawn in front of a classroom near the main complex in May 1987; the interior of a staff member's house near the main complex in June 1986; a patch of lawn adjacent to a students' dormitory in June 1987; a flower bed opposite the boarding master's house in March 1988; the volleyball and netball playground in May 1988; and from a crack in the wall of the boarding master's house in September 1988. An indeterminable number of specimens were also sighted throughout the study period, mainly in and around places of human habitation.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 46. Of the 25 specimens collected or sighted, sixteen were adults, eight were subadults and one was a juvenile. R65, R66, R67, R75 and R77 are adult males; R99 is an adult female; and a further eleven specimens were unsexed adults. R2, R3, R4 and R55 are subadult males, and a further four specimens were unsexed subadults. Discrete measurements are available for eighteen specimens.

Eleven adults (n=11; sexes not differentiated) provided a mean T.L. of 951,4 (range 750 - 1290) mm, B.L. 771,3 (607 - 1070) mm, T. 180,1 (143 - 240) mm and B.D. 24,2 (18 - 32) mm with the T. included into the T.L. 5,3 (5,0 - 5,9) times.

Seven subadults (n=7; sexes not differentiated) provided a mean T.L. of 532,1 (range 425 - 650) mm, B.L. 429,4 (340 - 520) mm, T. 102,7 (85 - 130) mm and B.D. 14,4 (11 - 17) mm with the T. included into the T.L. 5,2 (5,0 - 5,5) times.

The mean mass of eight adults (n=8) was 209,55 (range 84,76 - 383,44) g; the mean mass of three subadults (n=3) was 39,60 (23,93 - 62,01) g.

TAXONOMIC CHARACTERISTICS: All specimens examined conformed to the description of N. mossambica as provided in Broadley (1983). The mean ventral scale count of ten specimens (n=10) was 184,1 (range 180 - 188) and the subcaudal count (n=10) was 61,6 (57 - 66), falling within the range for this species (177 - 205 ventrals and 52 - 71 subcaudals, according to Broadley 1983). The dorsal colour varied from predominantly brown to greyish-olive brown. The interstitial skin was greyish-black or black. The ventral colours were variable. Adults had a creamy white to yellowish ventrum often streaked with black, grey or brown (most adults) and occasionally infused with orange or pink (large adults). One subadult had a homogenous lemon yellow ventrum and another a metallic grey ventrum. The black bars on the throat were irregular and varied in width from two to three ventral scales to as many as eleven or twelve consecutive scales. The bars tend to be distinctive in smaller specimens, becoming paler and indistinct with age, particularly on adults with streaks and infusions.

Broadley (1983) provides a tail length/total length ratio of 5,0 to 6,5 for this species, but does not indicate if tail length is in any way sex-related. The OSCA series provided a ratio of 5,0 to 5,9 (n=18) which could not be sex-related, and thus it would appear as if the sexes of N. mossambica cannot be differentiated on proportional tail lengths.

The taxonomic classification of spitting cobras in southern Africa, once attended with considerable confusion, was stabilised by Broadley (1968a and 1974). Previously regarded as a subspecies of nigricollis by some authors (Visser 1966; Broadley 1968b), Broadley (1968a) elevated mossambica to a full species, placing three southern African forms as subspecies. Subsequently, however, Broadley (1974), after examining material from southern Angola and Namibia, noted that nigricincta Bogert and woodi Pringle were conspecific with N. nigricollis. He thus recognised typical nigricollis, which is distributed throughout central Africa, nigricincta which occurs in northern and southwestern Angola, and woodi which ranges from Porterville in the Cape Province to southern Namibia where it intergrades with nigricincta, as subspecies of nigricollis. Apart from differences in colour pattern, especially between nigricincta and woodi, the former which is distinctly banded and the latter a uniformly jet black above and below, there is a noticeable increase in ventral scales in this species from north to south. Typical nigricollis has a ventral scale range of 182 - 193, nigricincta from 192 - 226, and woodi from 221 - 228. There exists a good possibility of sympatry, or at least parapatry, between mossambica and typical nigricollis in Zambia and between mossambica and nigricollis nigricincta in northwestern Namibia.

FIELD NOTES: This species was collected both during the day and at night, and was active during both these periods. Diurnal forages appeared to be of limited duration, however, in three instances involving movement from one shelter to the next. This species was never observed basking, but this is probably ascribable to the fact that this snake is a nervous and alert species, and thus not easily seen engaged in this activity. A number of specimens were seen entering, or exiting from holes in the ground or cracks in the walls. Available evidence suggests that the majority of specimens entered buildings, particularly houses, at night, probably in search of prey. R2 with a T.L. of 540 mm was collected during crepuscular hours while feeding on a Red Toad S. carens (S.V.L. 64 mm) in the locker of a student's dormitory. It disgorged its meal before being captured. Two other specimens revealed their presence at night by hissing when approached.

On every occasion this snake was flushed from its shelter, it would attempt to escape and would only adopt a defensive posture when cornered. In the typical defense posture with head and forebody raised and neck flattened to produce a hood, it will not hesitate to "spit"

venom when advanced on. Only occasionally will it hiss when threatened, but will often expel air loudly during "spitting" behaviour. Of the seven specimens physically handled with a thick glove, only two resorted to biting. Three specimens shammed death in a similar manner to the Rinkhals Hemachates haemachates, two convincingly with the body going completely limp and the tongue lolling out. This behaviour was resorted to when the snakes were held firmly in the glove, but in every case the first reaction was to "spit" venom.

During the survey, a five-year old Caucasian boy was "spat" in the face by an adult snake (R77 with a T.L. of 920 mm) while the boy was playing in the garden. Apparently the boy did not see the snake. The boy received venom in the right eye which caused acute conjunctivitis, and although he received medical attention shortly after the event, his eye remained swollen for three days after which he fully recovered. The author received venom in both eyes from close range while collecting a specimen (R66 with a T.L. of 750 mm). A burning sensation was immediately experienced and, although the eyes were flushed with copious amounts of water, followed by milk and a 1:10 solution of South African Institute of Medical Research (S.A.I.M.R.) polyvalent anti-venom within minutes of the venom entering the eyes, vision was quickly impaired. The eyes were inflamed, swollen and light-sensitive for two days, but fully recovered on the third day. In this "illegitimate" case of envenomation the eyes were not rubbed, and a general practitioner who examined the author's eyes almost 28 hours after the event was satisfied that no permanent tissue damage had occurred (J. Roos pers. comm.).

Of the 25 specimens collected or sighted, only one displayed an atypical or peculiar feature. This specimen, with a T.L. of 1040 mm, had a distinctly blunted, robust, box-like snout. This oddly-shaped snout did not appear to retard the snake in any way, and in captivity it was able to locate its prey and feed in the manner usual for this species. This snake was donated to the Port Elizabeth Snake Park in June 1987.

The presence of two of the specimens from the staff houses was brought to the attention of residents by their domestic cats which apparently stared fixedly and twitched their tails at, but did not advance on, the snakes. B. Starkey (pers. comm.) reports attending to cattle with damaged eyes indicative of N. mossambica envenomation.

"Spitting" frequency and distances were recorded for a number of specimens. Unlike non-spitting cobras (cf. N. melanoleuca, N. nivea and N. haje), N. mossambica will usually tilt the head upward at an angle in line with or slightly above the head and shoulders of an advancing person and eject streams of venom for the face when the person is within range. One specimen, however, a large adult with a T.L. of 1290 mm, sprayed venom from a

concealed position without the usual hood-spreading behaviour. The venom is ejected in fine streams, but breaks up into small droplets when it has travelled a distance of 250 - 400 mm. A loud hiss is sometimes, though not invariably, emitted simultaneously with the ejection of venom, and on occasion the head is also thrown slightly forward. Close observation in captivity has shown that the mouth is parted, but not necessarily gaped wide open, prior to the ejection of venom which is achieved through muscular contraction, the jaws being closed slightly the instant the venom is ejected.

Under windstill conditions, the venom was recorded travelling a maximum distance of 3,4 metres. This record was achieved by an adult with a T.L. of 970 mm. Most spitting distances were between 2,7 and 3,2 metres long. A small specimen with a T.L. of 425 mm was recorded ejecting venom accurately for the face from a distance of just over two metres. This specimen also had the peculiar habit of twitching its tail while its body, having adopted a defensive posture, remained motionless. Furthermore, this species gave the impression of containing an almost inexhaustible supply of venom. An adult with a T.L. of 1210 mm delivered nine emissions of venom in 86 seconds during efforts to catch it.

All the preserved adults contained layers of yellowish fatty tissue, deposited primarily between the body cavity and intestinal tract. These fatty deposit were particularly thick in specimens R66, R67 and R75, all of whom were collected in January and February, the hottest months of the year. The gut of R66 contained the remains of three beetles, two of which were scarabid beetles Adoretus (Scarabaeidae), while the third was possibly a passalid beetle (cf. Passalidae) (M. Wright pers. comm.).

In captivity this snake was subjected to a number of food tests. Toads S. carens and B. gutturalis were readily taken. In every instance the toad was injected with venom while the snake held on, only swallowing the prey when all struggles had ceased, and always head first. These prey items appeared to be highly susceptible to N. mossambica venom, succumbing within minutes of being bitten. Two skinks M. s. striata and a house gecko H. m. mabouia were also readily taken. The skinks, both adults, put up desperate struggles and only succumbed to the effects of the venom five to six minutes after being struck, displaying greater resistance to mossambica toxins than the toads. A large adult, with T.L. of 1290 mm and mass of 383,44 g, was offered three Black Bulbul hatchlings Pycnonotus barbatus with a combined mass of 43,82 g. All three specimens were taken in quick succession, without holding on and injecting venom as is usual for this elapid. Another large adult, with T.L. of 1210 mm and a mass of 347,42 g, was offered an adult Angoni Vlei Rat Otomys angoniensis which it not only refused but appeared to be wary of, rearing up and spraying venom at the rodent. This behaviour was probably due to the bold approach of the rat. A number of small

adults were offered milkweed locusts (Pyrgomorphidae), locusts which are known to produce toxic substances, but these invertebrates were ignored.

A number of specimens were housed in the same vivarium where competition for prey, aggressive and submissive behaviour, intra-specific biting and envenomation, and cannibalism were recorded. Two large adults (T.L. 1290 mm and 1210 mm respectively) were kept together for almost three months and appeared to tolerate each other, feeding simultaneously on a few occasions, until one occasion when two toads were offered to them. The instant the two toads were placed in the vivarium, both specimens became agitated, and proceeded to seize each other on the upper body. They thrashed about, knocking into the sides of the glass panels with considerable force for almost a minute before they disengaged. Movements by the toads triggered further attacks, however, the snakes on this occasion biting to the head and neck. The smaller of the two snakes then fled to the corner of the vivarium where it adopted a submissive posture, coiling its body and pushing its head under the coils while the larger snake loomed over it with hood spread. The dominant snake then turned its attention to the toads which it consumed while the submissive snake remained in the corner. The two snakes were separated shortly thereafter. Both snakes had distinct fang-puncture marks and gashes on the head and neck, the dominant snake developing a large lump on the side of the neck within minutes of the fight. No further signs of envenomation were visible, and it would appear that little venom was injected by either snake when the bites were inflicted. Both snakes were irritable for some time after this event.

Two small adults, the one measuring a T.L. of 720 mm and the other a T.L. of 795 mm, were kept in the same vivarium for almost four months. When a third specimen, R65 with a T.L. of 835 mm, was also introduced in the third month, the two specimens attacked it, delivering bites to the head and body. The next morning R65 was found dead, its body grossly swollen, limp and oozing fluids, cytotoxic symptoms typical of N. mossambica envenomation.

These two snakes on one occasion competed fiercely for prey. When they were offered two toads, the one snake was bitten just behind the neck as it advanced on one of the prey items. The aggressor held on, preventing the bitten snake from seizing one of the toads which it still appeared eager to do. When an attempt was made to disengage these snakes, the bitten snake responded by ejecting venom. The aggressor held on for six minutes before releasing its hold, and then continued with its aggressive display by making intimidatory lunges at the other snake, eventually forcing it to retire to one of the corners of the vivarium. Here the submissive snake remained while the aggressor fed on the two toads. The submissive snake revealed small gashes caused by teeth or fangs, but no signs of envenomation were apparent.

It was while offering these snakes a further meal of toads that the larger specimen consumed the smaller one. Evidence suggests that this was a deliberate case of cannibalism, though it appears to have been precipitated by the presence of the toads. Both snakes had seized their prey in the jaws when the larger snake appeared to have been attracted by the struggles of a large toad (S. carens with a S.V.L. of 75 mm and mass 37,34 g) being fed on by the other snake. It released the toad in its jaws and advanced on the toad in the other snake's mouth. The feeding snake was then struck on the head by the larger snake, to which it responded by releasing its prey. However, the aggressor did not release its hold and started chewing on the other snake's head, the latter twisting furiously to dislodge the jaws, dragging the aggressor around the vivarium with it. However, within minutes it slowed visibly and while still struggling feebly, was slowly consumed. It took over seven minutes to swallow the snake after which the aggressor retired to the corner with its meal, ignoring the now dead toads. This specimen measured a T.L. of 950 mm when donated to the Port Elizabeth Snake Park in June 1986, having increased 165 mm in length in 10 months of captivity.

Complete sloughed skins were weighed. A specimen with a T.L. of 835 mm shed a skin which weighed 0,88 g; a specimen with a T.L. of 950 mm and mass of 152,00 g shed a skin which weighed 1,10 g; and a specimen with a T.L. of 1210 mm and mass of 347,42 g sloughed two skins weighing 3,23 g and 3,51 g respectively. These sloughed skins (n=3) constituted 0,72 - 1,01 % (mean 0,89 %) of the mass of these specimens (n=2).

An engorged female Snake Tick Aponomma exornatum was removed from the interstitial skin of the dorsum of one of the large specimens (T.L. of 1210 mm). The presence of this tick was noted only after the snake had been kept in captivity for seven months. It seems probable that the snake was introduced into the vivarium with a nymphal tick attached, though nymphs or eggs may have been introduced with soils and plants to decorate the vivarium.

SPECIES: Dendroaspis polylepis (Günther, 1864). Black or Black-mouthed Mamba.

RANGE: Transkei northwards through Natal, Zululand, Swaziland, Transvaal, Mozambique, Zimbabwe, Botswana and Namibia, and probably just entering the northern Cape; north parts of southern Africa (absent from desert), extending along Natal coast to Port St. Johns (Branch 1988a).

PREFERRED HABITAT: Lowlying savanna and open bush not exceeding an altitude of 1500 metres where it usually makes a permanent home in holes underground, such as abandoned termite hills, or in rock crevices or hollow trees (Broadley 1983); savannah and open coastal bush, usually below 1500 m (Branch 1988a).

SPECIES OCCURRENCE: An uncommon species. Two specimens were encountered during the study period, while A. Steyn (in litt.) and W. Prinsloo (pers. comm.) reported on at least four specimens collected from, or sighted at, OSCA prior to the survey. The first of the two specimens encountered during the study period was sighted on the branches of a dead Small Knobwood Tree Zanthoxylum capensis on the edge of the riverine forest in the game park in October 1986; J. Hughes (pers. comm.) reported driving over another on the tarred road in August 1988. A. Steyn reported on a specimen from the tarred road next to the entrance gate of OSCA (undated), a specimen from the student's dining hall (undated), and a specimen from the small Eucalyptus plantation near the rear gate of OSCA in April 1978, while W. Prinsloo observed at least one specimen on the tarred road opposite the game park in 1984 and 1985 .

SIZE, SEX, MEASUREMENTS AND MASS: No accurate mensural data are available. The specimen sighted was estimated at a T.L. of 2500 mm; A. Steyn (in litt.) lists three specimens as having T.L's. of ca. 500 mm, 1800 mm and 2500 mm respectively, while in all other instances the snakes were referred to as being large, exceeding T.L's. of 2000 mm.

TAXONOMIC CHARACTERISTICS: The coloration of gunmetal grey to olive-brown, often with diagonal crossbands posteriorly, coffin-shaped head and large size of this elapid (Broadley 1983; Branch 1988a) quickly distinguishes it from all other species.

FIELD NOTES: The specimen from the game park was basking in the tree at the time of observation. M. Mnguni, S. Dlova, and N. Madamalala (pers. comm.) reported that they had seen this same snake in this habitat some months previously, suggesting it has a semi-permanent retreat nearby. The present author endorses the name Black-mouthed Mamba for this species for the interior of the mouth is dark bluish-grey to black, whereas the skin coloration, even with old specimens, is rarely, if ever, black.

SPECIES: Dendroaspis angusticeps (A. Smith, 1849). Green Mamba.

RANGE: Eastern Zimbabwe, Mozambique, Zululand to southern Natal (Broadley 1983); restricted to Natal coastal regions and forests along eastern Zimbabwe escarpment (Branch 1988a).

PREFERRED HABITAT: Forests and thick bush (Broadley 1983); coastal bush, and dune and montane forest (Branch 1988a).

SPECIES OCCURRENCE: A rare species. A. Steyn (in litt.) and W. Prinsloo (pers. comm.) report collecting a specimen from a cattle camp in February 1984.

SIZE, SEX, MEASUREMENTS AND MASS: No accurate mensural data available. A. Steyn (in litt.) estimates the T.L. at 1400 mm.

TAXONOMIC CHARACTERISTICS: The emerald green coloration, often with yellow spots and bluish tinge, coffin-shaped head and relative stoutness of this arboreal elapid (Broadley 1983; Branch 1988a) quickly distinguishes it from other species.

FIELD NOTES: This specimen, which was kept as a pet at OSCA, apparently showed no aggression when collected (A. Steyn in litt.). Generally, this species is of a more docile disposition than D. polylepis. Due to its shy and retiring nature, arboreal habits and cryptic coloration, D. angusticeps is difficult to find.

SPECIES: Causus rhombeatus (Lichtenstein, 1823). Common or Rhombic Night-Adder.

RANGE: Northern Botswana, Zimbabwe, Mozambique, Transvaal, Swaziland, Zululand, Natal, Orange Free State, Lesotho and eastern and southern Cape (Broadley 1983); eastern regions of southern Africa, from Riversdale in the Cape, through Natal and Transvaal to Zimbabwe, northern Botswana and Caprivi Strip (Branch 1988a).

PREFERRED HABITAT: Damp localities from coastal plains to high altitudes, excluding forest areas, and often encountered near old termite hills, animal holes and heaps of stones and rubbish (Broadley 1983); mesic savannah (Branch 1988a).

SPECIES OCCURRENCE: A common snake. A total of thirteen specimens were collected, of which seven are preserved: R1, R38, R48, R50, R56, R68 and R83. One, R38, was collected from an unspecified site within the OSCA grounds prior to the survey. R1 was collected from a drain at the main office complex in March 1986; R48 was collected from a footpath adjacent to a students' dormitory in August 1986; R50 was collected from the entrance to a students' dormitory in October 1986; R56 was collected from a poultry coop in November 1986; R68 was collected from under a rock between the students' dormitories and the tennis courts in August 1986; and R83 was collected from a patch of lawn opposite a students' dormitory in August 1986. The other specimens were collected from nursery plants on a terrace behind the veterinarian centre in May 1986; a sheet of corrugated iron on a lawn near the main complex in September 1986; the entrance to one of the students' dormitories in October 1986; a cement walkway opposite a classroom at the main complex in October 1986; the walkway between the dining hall and main hall in October 1986; the bank of one of the fish ponds in August 1987; and from a patch of grass near the staff houses in September 1987.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 47. R48, R50, R56, R68 and another specimen collected and released were adult females; two specimens collected and released were adult males. R1, R38 and another captured and released specimen were subadult females; and R83 and a further two captured and released subadults were unsexed subadults. Discrete measurements are available for eight specimens.

Three adult females (n=3) provided a mean T.L. of 508,3 (range 450 - 595) mm, B.L. 457,3 (403 + 537) mm, T. 51,0 (47 - 58) mm and B.D. 22,7 (17 - 26) mm with the T. included into the T.L. 10,0 (9,6 - 10,3) times; another adult female (n=1), with a truncated tail, provided a B.L. of 485 mm and B.D. 24 mm.

Two adult males (n=2) provided a mean T.L. of 475 (range 470 - 480) mm, B.L. 427 (422 - 432) mm, T. 48 mm (no range) and B.D. 22 (18 - 26) mm with the T. included into the T.L. 9,9 (9,8 - 10,0) times.

Two subadult females (n=2) provided a mean T.L. of 350 (range 310 - 390) mm, B.L. 318,5 (283 - 354) mm, T. 31,5 (27 - 36) mm and B.D. 12,5 (12 - 13) mm with the T. included into the T.L. 11,2 (10,8 - 11,5) times.

One adult female (n=1) weighed 96,57 g; one adult male (n=1) weighed 76,94 g; and one unsexed subadult (n=1) with a T.L. of ca. 350 mm weighed 40,98 g.

TAXONOMIC CHARACTERISTICS: All specimens examined fell within the range of characteristics diagnostic for C. rhombeatus as described in Broadley (1983). The mean ventral count of six specimens (n=6) was 137,3 (range 134 - 139) and the mean subcaudal count of five specimens (n=5) was 21,6 (range 20 - 24), which are within the range for this species (134 - 155 ventrals and 20 - 33 subcaudals, according to Broadley 1983).

The ground colour ranged from dark grey to light grey, occasionally with a pinkish tinge. The rhomboidal pattern and V-shaped marking on the head varied from brown to black, and did not appear to be age or sex-related.

FIELD NOTES: Although the majority of specimens were collected during the day, most were inactive, either basking or hiding in shelters. Two specimens were collected during crepuscular hours and both were active at the time of collection. Generally this species is inoffensive, rarely hissing or attempting to bite when collected.

In captivity this species readily fed on toads S. carens and B. gutturalis. This snake often became excited when these prey items were presented, striking out the moment a toad moved, but on a number of occasions missing and in two instances this species was recorded inflicting bites on itself. In the one instance one of the fangs remained lodged in the body for almost ten seconds, but on both occasions there were no signs of envenomation. During feeding frenzies, specimens accommodated together occasionally struck each other. This occurred from what appeared to be bad judgement, but there were instances when a feeding snake was bitten by a non-feeding snake in an attempt to secure the former's prey or, alternatively, struck the toad already being consumed and either received or delivered a bite during the tug-of-war for the item. Two specimens died as a result of these bites. The one, R48 with a T.L. of 595 mm, died six days after receiving a bite on the head from a smaller specimen with a T.L. of 480 mm. R83 with a T.L. of 350 mm died within three days of receiving a bite to the body from a specimen of a size similar to itself.

This species will take a number of toads at one mealtime; a specimen with a T.L. of 470 mm and mass of 76,94 g was recorded feeding on three toads with a combined mass of 61,43 g. The toads were held onto when struck and were normally, though not invariably, swallowed head first. Toads were highly susceptible to C. rhombeatus toxins, and usually ceased all movements within three minutes of being bitten. Digestion was completed in approximately five to seven days. One specimen, R68 with a T.L. of 480 mm, died while in the process of swallowing an adult Red Toad S. carens.

The majority of preserved specimens were padded with thick layers of fat tissue. R48, R50 and R56, collected from August to November, were particularly well padded. One specimen, R38, contained sediment, grass stalks and pieces of unidentifiable invertebrates in its lower gut, items normally associated with the gut contents of toads.

Six of the females (n=6) with measurable tails provided a tail length/total length ratio ranging from 9,6 - 11,5 (mean 10,4). Broadley (1983) gives the length of tail from 7,6 to 12 times into total length and remarks that the tail is proportionately longer in males than in females. This implies that, with the exception of an adult male whose tail was not measured and another whose sex was determined by copulatory behaviour, at least ten of the fourteen specimens collected were females.

Courtship and mating was observed in captivity in October and November 1986, and again over the same period in 1987 (G. Nukeri and R. Shibambu pers. comm.). Mating was preceded by the male moving his head over the female in a series of short, jerking movements, at the same time liberally inspecting her with his flickering tongue. He often nudged her and also occasionally pushed his head under her body. He then coiled his tail around her and they locked together, the male inserting one of his hemipenes into the cloaca of the female. Little movement occurred during copulation, though once or twice the female did move slowly over short distances, dragging the male with her. The longest a mating pair was observed copulating was approximately twenty seven minutes.

Egg-laying was recorded for a female which was not observed involved in courtship and mating, and another which was involved in such activity. The unmated female, R68 with a T.L. of 480 mm, collected in August, laid eight eggs early in December. Twenty seven days later she laid another eight eggs, and a further two eggs were deposited two and five days later. Only the first batch of eggs were weighed and measured. They measured 24 x 16 mm and weighed 2,74 - 2,89 g each, though they were slightly dehydrated at the time of weighing. The eggs were not incubated and quickly shrivelled; consequently, it could not be established if they were fertile or not. This specimen died while swallowing an adult Red Toad almost four weeks after depositing her last batch of eggs. On dissection, she contained numerous small ova, the largest of which measured 2 x 1,2 mm.

The other female laid 16 eggs in December, all of which also quickly shrivelled. R1 contained a large, but indeterminable number of small ova, the biggest of which measured 3 x 1,7 mm; R48 contained an indeterminable number of ova, the biggest of which measured 7,2 x 3,8 mm; R50 contained 17 ova larger than 5 mm in length and many more smaller ova;

and R56 contained nine large ova, averaging 14 x 7 mm, and a number of smaller ova, in the oviduct.

A number of specimens sloughed complete skins. An adult with T.L. of ca. 480 mm shed two skins in seven months, weighing 0,82 and 0,61 g respectively; an adult with T.L. of 595 mm and mass of 76,94 g shed one skin during four months of captivity which weighed 1,07 g; an adult with T.L. of 470 mm shed two skins during an eight month period in captivity which weighed 0,51 g and 0,69 g respectively; another adult with T.L. of 480 mm shed two skins during five months of captivity, weighing 0,26 and 0,50 g respectively; and finally, a subadult with T.L. of 350 mm and mass of 40,92 g shed three skins in eight months, weighing 0,24 g, 0,26 g and 0,30 g respectively. The sloughed skins constitute 0,59 - 1,39% (mean 0,84%) of the mass of two of these specimens (n=2).

Two engorged female Snake Ticks Aponomma latum were removed from the interstitial dorsal skin of an adult specimen with a T.L. of 470 mm seven months after the snake was put in captivity. A large parasitic pentastomid worm Leiperia cincinnalis (provisional, after Zumpt 1961; M. Visser pers. comm.), which measured a total length of 81 mm with an average body width of 9 mm, emerged from the mutilated head of R56 with a B.L. of 485 mm when the snake was preserved in formalin. This parasite had apparently taken up residence in the snake's lung. Approximately ten long, thin ascarids (family Ascaridae) were found in the intestinal wall of this snake.

SPECIES: Bitis arietans arietans (Merrem, 1820). Puff-Adder.

RANGE: Throughout southern Africa.

PREFERRED HABITAT: Practically any terricolous environment with the exception of tropical forests and true deserts (Broadley 1983); absent only from desert and mountain tops (Branch 1988a).

SPECIES OCCURRENCE: An uncommon species. Only two specimens were collected, and one sighted, of which one is preserved: OSCA R70. R70 was collected from the floor of a students' dormitory in March 1986; the other specimen was collected from under a pile of creosoted poles at the stores in January 1987. A third specimen was sighted on broken rock and sand beside a savanna thicket near the Cwaka River in August 1987.

SIZE, SEX, MEASUREMENTS AND MASS: See Table 48. R70 is a subadult female and the other specimen was a subadult male; the observed specimen was an unsexed subadult. The subadult female (n=1) provided a T.L. of 370 (347 + 23) mm and B.D. 25 mm with the T. included into T.L. 16,1 times. The subadult male (n=1) provided a T.L. of 420 (375 + 45) mm and B.D. 45 mm with the T. included into the T.L. 9,3 times. The subadult female (n=1) weighed 40,71 g and the subadult male (n=1) 132,27 g.

TAXONOMIC FEATURES: The specimens were characteristic of B. a. arietans as described in Broadley (1983) and Branch (1988a). The voucher specimen (R70), badly decomposed, provided a ventral and subcaudal count of 138 and 17 respectively, which is within the range for this taxon (123 - 147 ventrals and 14 - 38 subcaudals; 25 and over in males and less than 24 in females, according to Broadley 1983). The coloration of the OSCA specimens was considerably darker and duller than those from the southern and southwestern Cape (pers. obs.).

FIELD NOTES: R70 was collected while it was in the process of swallowing an adult Red Toad Schismaderma carens. On the date of capture this specimen provided a T.L. of 230 mm, and up until the date that it died ten months later, it gained 140 mm in length on a diet of toads (Bufo gutturalis and S. carens). This specimen died soon after swallowing and subsequently regurgitating an adult S. carens.

The other specimen disgorged the partly digested remains of an adult S. carens within minutes of being collected, and accounts for the large body diameter of this snake when it was measured. In captivity both specimens readily fed on both S. carens and B. gutturalis. These prey were usually held onto in a manner similar to that recorded for C. rhombeatus before being swallowed, normally head first; on occasion, however, toads were bitten and quickly released, and were consumed only when they had succumbed to the venom. Toads appeared to be highly susceptible to B. a. arietans venom, usually ceasing all movements within minutes of being bitten. Digestion of these amphibian prey items was rapid, taking from four to seven days.

Both specimens sloughed skins in captivity. R70 sloughed one skin during 10 months of captivity which weighed 0,39g. The other specimen shed one skin during almost five months of captivity. This skin weighed 1,71 g. These skins constitute 0,96 - 1,24% (mean 1,10%) of the total weight of these snakes (n=2).

HERPETOLOGICAL RESEARCH IN NATAL: An Overview

There are 672 known amphibian and reptile taxa recorded from southern Africa. The South African region specifically has a rich and diverse herpetofauna with 23 families, including at least 115 genera. No less than 301 species of reptiles and 95 amphibian species, containing a total of 488 recognised taxa, have been recorded from the region (Branch 1988c).

Generally, Natal has fared reasonably well in respect of herpetological research when compared to other regions in southern Africa. FitzSimons (1943, 1962) included many records from Natal in his authoritative accounts of southern African lizards and snakes; Poynton (1964) likewise included many records from Natal in his monographic account of the amphibians of southern Africa. More recently, Poynton (1980) and Bruton and Haacke (1980) have documented the amphibians and reptiles occurring in Maputaland respectively; Bourquin and Channing (1980) have reported on the amphibians occurring in the Drakensberg; Lambiris (1988a) has provided a detailed review of the amphibians of Natal, while a number of occasional papers have been published on the herpetofauna of Natal (Bourquin 1987; Cott *et al.*; Hughes 1972, 1974, 1982; Haagner 1986; Poynton 1986; Poynton and Bass 1970; Pooley 1965, 1969; Pickersgill 1984).

Natal as a whole has a comparatively high species diversity. Lambiris (1988a) describes 76 amphibian taxa from Natal, though Bourquin (1989) lists only 70. Distributionally, no less than 24 amphibian taxa have been recorded from the Drakensberg by Bourquin and Channing (1980); Poynton (1980) records 45 amphibian taxa from Maputaland; and Alexander (unpublished) lists 29 amphibian taxa from municipal Durban.

A total of 161 reptile taxa occur in Natal, comprising 13 chelonians, 76 snakes, 69 lizards, 2 amphisbaenians and 1 crocodile (Bourquin 1989). Of these, some 112 taxa have been recorded from Maputaland (Bruton and Haacke 1980); 42 taxa are recorded from the Drakensberg (Bourquin and Channing 1980), while no less than 43 taxa have been documented from municipal Durban (Alexander unpublished).

Maputaland has more reptile and amphibian taxa combined than the Kruger National Park (114 and 34 taxa respectively, Pienaar *et al.* 1976 and Pienaar 1978, despite the vastly greater area of the latter (1 948 528 ha vs 825 000 ha). Bruton and Haacke (1980) suggest that Maputaland's diverse reptile fauna is ascribable to several factors, including the variety of unspoilt habitats; the warm, wet climate; and position at the southern end of a "tropical peninsula". Poynton (1980) has noted that Maputaland offers an almost fully developed tropical amphibian fauna for study. He has also shown that there is a dramatic subtraction of

tropical forms south of Mtunzini, but that such a fall-off cannot be wholly, or perhaps even primarily, explained in terms of geology, topography, climate or other environmental parameters. Thus, one of the greatest challenges facing the herpetologist in Maputaland is to provide positive data for correlations between environmental patterns and distribution patterns.

In respect of threatened herpetofauna, Branch (1988c) have recognised two sensitive areas in Natal, namely Maputaland and the Drakensberg. An area stressed as important by numerous authors (Poynton 1964 and 1980; Bruton and Haacke 1980) as a transition zone between temperate and tropical herpetofaunas, Maputaland contains no less than 25 taxa listed in the South African Red Data Book - Reptiles and Amphibians (Branch 1988c), including nine vulnerable, three rare, one restricted and twelve peripheral. The large species diversity in Maputaland, but the lack of any endangered species, is a reflection of the little urbanisation or industrial development of the region (Branch 1988c). There are a number of large conservation areas in Maputaland, including Ndumu, Mkuze, Hluhluwe and Umfolozi Reserves which provide sanctuaries for many of the Red Data Book species. Indeed, of the 231 taxa recorded from Natal, no less than 212 (91.8%) are recorded from Natal Parks Board reserves (Bourquin 1989).

The Natal Drakensberg is inhabited by a number of restricted endemics and one rare species (Branch 1988c). This sensitive area is well conserved by the Natal Parks Board (15% of Phillips' 1973 bioclimatic region 5: montane; Grimsdell and Raw 1984).

ABUNDANCE OR SCARCITY RATINGS

The use of abundance or scarcity ratings in this study is not without problems. The terms "common", "uncommon" and "rare" were used to indicate how frequently or infrequently a particular species was found. These ratings are, of course, subjective and reflect the situation after 17 months of fieldwork, plus whatever information was available prior to the study, and after the author was transferred, in the form of specimens or written accounts. This does not permit conclusive statements to be made about the status of each species; this can only be achieved through intensive collecting over long periods of time in order to understand the population dynamics and seasonal variations in amphibians and reptiles.

A number of biases were inherent to, or became manifest during, the study, especially since the vast majority of species were collected opportunistically. Those species associated with places of human habitation were more likely to be recorded than those which occurred only in natural, undisturbed environments. The larger, conspicuous species were also more likely to be noticed than the smaller, inconspicuous species. Terrestrial reptile species were more likely to be found than aquatic, fossorial or arboreal species, while strongly vocal water-breeding amphibian species were more likely to be found than weakly or non-vocal, or terrestrial-breeding, species. Diurnal species were more likely to be recorded than crepuscular or nocturnal species. Some species occupied a variety of habitats and therefore were more likely to be recorded than those species with specific habitat requirements.

The use of the terms "common", "uncommon" and "rare" do at least indicate trends, however, and therefore are useful. For instance, the frequent sightings of toads Schismaderma carens and Bufo gutturalis in and around places of human habitation, and the sounds of their mating calls at water bodies in the summer months, strongly suggests that these species are indeed common. Their populations are large and vigorous, a statement supported by the large number of specimen recordings in the various age classes, including larvae of S. carens in particular. Similar statements can be made for such reptile species as Lygodactylus capensis capensis, Mabuya striata striata, Leptotyphlops scutifrons scutifrons and Naja mossambica.

However, the fact that only one specimen of the frog Arthroleptis wahlbergii was recorded does not necessarily mean that the species is truly rare, in the demographic sense of the word, as it was rated in the results. What does appear to be true is that this species is restricted to a particular habitat; that is, it is a sylvicolous species, as are the species Leptopelis natalensis and L. mossambicus which were rated as uncommon since not only were voucher specimens of these latter species collected, but their calls were recorded too. Within its preferred habitat, which was infrequently sampled, A. wahlbergii may prove to be common, yet this

can only be established through long-term study and intensive collecting. Similar arguments can be presented for such "rare" species as Strongylopus fasciatus fasciatus, Hemisus guttatus, Mabuva homalocephala depressa, Tetradactylus africanus africanus, Typhlops bibronii, Lamprophis inornatus, Lycophidion capense capense, Duberria lutrix lutrix, Psammophylax rhombeatus rhombeatus, Telescopus semiannulatus semiannulatus and Dasypeltis scabra. The single collections or sightings of these species not only exposes the random, fortuitous findings in this study, but also reflects the scant knowledge there is regarding the ecology of these animals, particularly activity patterns and habitat preferences. This is highlighted by the study of Bruton and Haacke (1980) in Maputaland, who found that the serpentine cordylids Chamaesaura macrolepis and T. a. africanus, the former which was rated uncommon at OSCA, predominated in the "dry" grasslands to the north of Lake Sibaya. Although only one specimen each of C. macrolepis and T. a. africanus were collected from OSCA game park during veld burning, these species may prove to be considerably more common; certainly the grassveld habitat in the game park and cattle camps appear capable of supporting large populations of these lizards.

An important point about the abundance or scarcity ratings is that it gives an indication of the conservation status of those species recorded from OSCA, albeit for the area of OSCA only although extrapolations with respect to other Zululand areas are possible too. The conservation status of the OSCA reptiles are not to be confused with those species listed in the Red Data Book - Reptiles and Amphibians (Branch 1988c), which is discussed later.

In conclusion, the use of abundance or scarcity ratings is useful in terms of indicating the frequency with which amphibian and reptile species are encountered, albeit randomly. These ratings cannot be used to give a discrete or absolute measure of their status because of the inherent biases in the collecting methodology, and because information about the ecology and behaviour of many of the species is lacking.

COMPOSITION AND DIVERSITY

The known reptile and amphibian fauna of OSCA consists of 72 taxa, comprising 28 amphibians, 2 chelonians, 13 lizards, 28 snakes and 1 crocodile. The diversity of this fauna is compared in Table 6 with that of four areas which have been collected intensively, namely Maputaland, Kruger National Park (KNP), Addo Elephant National Park (AENP) and the Cape of Good Hope Nature Reserve (CGHNR).

The higher diversity of amphibians and reptiles from Maputaland compared to KNP has been discussed by Bruton and Haacke (1980). The diversity of the OSCA herpetofauna is, at least in part, ascribable to the variety of habitats at OSCA, the relatively unaltered nature of many of the habitats, the geographical location of OSCA at the southern end of the Zululand coastal plain, and the warm and wet subtropical climate. The relatively high diversity of amphibians recorded from OSCA (28 taxa) compared to AENP (16 taxa) and CGHNR (14 taxa) is largely a factor of climate. According to Darlington (1957), Poynton (1964) and Grimsdell and Raw (1984), frog diversity appears to be related to temperature and rainfall, the more tropical regions containing more species. The diversity of snakes is related to temperature too, the more tropical regions containing more species, which is reflected in the number of species recorded from OSCA (28) compared to the AENP and CGHNR (15 and 21 respectively). The relatively low number of lizard species recorded from OSCA (13) is ascribable to the absence of large rock outcrops and large, open sandy areas. There are no rupicolous species recorded from OSCA.

Table 6

RELATIVE COMPOSITION AND DIVERSITY OF THE OSCA HERPETOFAUNA

TAXA	a	b	c	d	
	OWEN SITOLE COLLEGE OF AGRICULTURE (6,7 sq. km.)	MAPUTALAND (8250,0 sq. km.)	KRUGER NATIONAL PARK (19488,5 sq. km.)	ADDO ELEPHANT NATIONAL PARK (77,3 sq. km.)	CAPE OF GOOD HOPE NATURE RESERVE (77,5 sq. km.)
Amphibians	28	45	34	16	14
Lizards	13	41	51	14	11
Snakes	28	56	51	15	21
Amphisbaenids	0	2	6	0	0
Chelonians	2	12	5	4	4
Crocodylians	1	1	1	0	0
Total	72	157	148	49	50

Data from: a Bruton and Haacke (1980); Poynton (1980)

b Pienaar et al. 1976; Pienaar et al. 1983; Jacobsen and Pienaar 1983; Pickersgill 1984.

c Branch and Braack (1987)

d Wright and Hoffmann (in prep.)

POSSIBLE OCCURRENCES OF SPECIES

Based on present distributional information in major texts (FitzSimons 1943; Poynton 1964; Bruton and Haacke 1980; Broadley 1983; Wager 1986; Boycott and Bourquin 1988; Branch 1988a; Lambiris 1988a), the following taxa may possibly occur at OSCA:

AMPHIBIA

Bufo garmani Meek, 1897 - Olive Toad

Breviceps adpersus adpersus Peters, 1882 - Bushveld Rain Frog

Breviceps mossambicus Peters, 1854 - Mozambique Rain Frog

Ptychadena mascariensis mascariensis (Duméril and Bibron, 1841) - Mascarene Grass Frog

Ptychadena porosissima (Steindachner, 1867) - Striped Grass Frog

Cacosternum boettgeri (Boulenger, 1882) - Common Caco

Hemisus marmoratus marmoratus (Peters, 1854) - Mottled Shovel-nosed Frog

Kassina maculata (Duméril, 1853) - Red-legged Kassina

Afrixalus spinifrons spinifrons (Cope, 1862) - Natal Leaf-folding Frog

Hyperolius nasutus Günther, 1864 - Long Reed Frog

Hyperolius pickersgilli Raw, 1982 - Pickersgill's Reed Frog

REPTILIA

Geochelone pardalis (Bell, 1828) - Leopard or Mountain Tortoise

Kinixys belliana belliana (Gray, 1831) - Lowveld Hinged Tortoise

Pelusios sinuatus (Smith, 1838) - Serrated Terrapin

Pelusios rhodesianus Hewitt, 1927 - Black-bellied Terrapin

Pelusios castanoides castanoides Hewitt, 1931 - Yellow-bellied Terrapin

Afroedura pondolia marleyi FitzSimons 1930 - Pondo Flat Gecko

Homopholis wahlbergii (A. Smith, 1849) - Wahlberg's Velvet Gecko

Pachydactylus capensis vansonii FitzSimons, 1933 - Cape Gecko

Pachydactylus maculatus Gray, 1845 - Spotted Gecko

Bradypodion nemorale Raw, 1978 - Zululand Dwarf Chamaeleon

Bradypodion setaroi Raw, 1976 - Setaro's Dwarf Chamaeleon

Scelotes arenicola (Peters, 1854) - Zululand Dwarf Burrowing Skink

Scelotes inornatus mossambicus (Peters, 1882) - Mozambique Burrowing Skink

Scelotes inornatus inornatus (Smith, 1849) - Natal Burrowing Skink

Mabuya capensis (Gray, 1830) - Cape Skink

Ichnotropis squamulosa Peters, 1854 - Common Rough-scaled Lizard

Ichnotropis capensis Peters, 1854 - Cape Rough-scaled Lizard

Nucras taeniolata ornata (Gray, 1864) - Ornate Sandveld Lizard

Gerrhosaurus flavigularis Wiegmann, 1828 - Yellow-throated Plated Lizard
Gerrhosaurus major Duméril, 1851 - Rough-scaled Plated Lizard
Chamaesaura anguina (Linnaeus, 1758). Cape Snake-Lizard
Varanus exanthematicus albigularis (Daudin, 1802) - Rock Monitor or Veld Leguaan
Leptotyphlops conjunctus conjunctus (Jan, 1861) - Cape Worm- or Thread-Snake
Leptotyphlops conjunctus incognitus Broadley and Watson, 1976 - Incognito Worm-or Thread-Snake
Leptotyphlops distanti (Boulenger, 1892) - Distant's Worm- or Thread-Snake
Lycodonomorphus rufulus (Lichtenstein, 1832) - Brown Water Snake
Lycophidion semiannule Peters, 1854 - Eastern Wolf Snake
Pseudaspis cana (Linnaeus, 1754) - Mole Snake
Macrelaps microlepidotus (Günther, 1860) - Natal Black Snake
Amblyodipsas concolor (A. Smith, 1849) - Natal Purple-glossed Snake
Amblyodipsas polylepis polylepis (Bocage, 1873) - Common Purple-glossed Snake
Xenocalamus transvaalensis Metheun, 1919 - Transvaal Quill-snouted Snake
Homoroselaps dorsalis (A. Smith, 1849) - Striped Harlequin Snake
Prosymna sundevallii lineata (Peters, 1871) - Lineolate Shovel-snout
Prosymna janii (Bianconi, 1862) - Mozambique Shovel-snout
Philothamnus angolensis Bocage, 1882 - Angolan or Northern Green Snake
Philothamnus natalensis natalensis (A. Smith, 1848) - Natal Green Snake
Dasypeltis inornata A. Smith, 1849 - Southern Brown Egg-Eater
Naje haje annulifera Peters, 1854 - Egyptian Cobra
Naja melanoleuca Hallowell, 1857 - Forest Cobra
Causus defilippii (Jan, 1862) - Snouted Night Adder
Bitis gabonica gabonica (Duméril and Bibron, 1854) - Gaboon Adder

With one exception, all the above taxa have been recorded within 100 km of OSCA. The exception is A. concolor which shows a scattered distribution in Natal, having only been recorded from Durban in the south and from Hluhluwe Game Reserve in the north (Broadley 1983).

There may be a number of reasons for the apparent absence of taxa. The first may be a collecting bias. Certain habitats were not as intensively collected as others, nor were all habitats sampled every season, which might have resulted in certain taxa being overlooked. The list is so long as to strongly suggest that undersampling is the overriding reason.

Second, there may not have been suitable habitats for many of the taxa, or the habitats may not have been large enough to support populations of the taxa. Third, certain taxa may not

be able to tolerate competition with others with similar niche requirements, thereby excluding sympatry. Fourth, opportunistic collecting often involves a good deal of luck; many taxa were collected fortuitously, while others, for whatever reasons, may have eluded attention: the occurrence of no less than 12 taxa is based on single specimens or sightings. Lastly, other environmental parameters, such as altitude, soil type and availability of prey, to name but a few, may have been responsible for the exclusion of taxa. However, until more ecological and distributional information is gathered, the reasons for the apparent absence of taxa from OSCA must perforce remain speculative.

FROG SPECIES DIVERSITY IN RELATION TO BIOCLIMATIC REGIONS

In an effort to overcome the problem of insufficient data on the distribution of frogs and to establish frog species diversity in relation to bioclimatic regions and conservation in Natal, Grimsdell and Raw (1984) proposed extrapolating the distribution of species on the basis of ecological zones. Two systems of zonation are currently available, namely that of Acocks (1975) based on vegetation types, and that of Phillips (1973) based on bioclimatic regions. Grimsdell and Raw (1984) opted for Phillips' zonation as this attempts to combine topography, climate and vegetation along with other environmental parameters.

Of the 69 frog taxa recorded from Natal and Zululand (Grimsdell and Raw 1984), 48 were recorded from Phillips' (1973) bioclimatic region 1: coastal lowlands. This represents approximately 70% of all the taxa recorded from Natal and Zululand. The coastal lowlands account for no more than 11% of the entire area of Natal and Zululand. The large number of taxa from the coastal lowlands must, however, be analysed against the following information:

1. Frog diversity appears to be related to temperature and rainfall, the more tropical regions containing more species (Darlington 1957; Poynton 1964; Grimsdell and Raw 1984).
2. Many tropical taxa reach the end of their distribution in the coastal lowlands of Zululand (Poynton 1964; Poynton 1980).

Of the 48 taxa recorded from Phillips' (1973) coastal lowlands, excluding the recently described Hyperolius pickersgilli, 27 have been found at OSCA. With the exception of Tomopterna cryptotis, all of these taxa have been recorded from the coastal lowlands. T. cryptotis is usually associated with savanna away from coastal areas, and is a marginal species at OSCA.

Certain taxa have not been recorded from OSCA probably as a result of insufficient sampling, inappropriate habitat or competition (Bufo garmani, Breviceps adpersus adpersus, B. mossambicus, Ptychadena mascariensis mascariensis, P. porosissima, Cacosternum boettgeri, Hemisus marmoratus marmoratus, Kassina maculata, Hyperolius nasutus and H. pickersgilli) while others have distributional ranges which probably, or definitely, do not include the region of OSCA (Xenopus muelleri, Bufo rangeri, Bufo vertabralis fenoulheti, Breviceps verrucosus verrucosus, Strongylopus grayii, Ptychadena mossambica, P. taenioscelis, Phrynobatrachus acridoides, Natalobatrachus bonebergi, Arthroleptis stenodactylus, Afrivalus spinifrons and Hyperolius marmoratus verrucosus).

According to Grimsdell and Raw (1984), there are 16 partial endemics, six true endemics and seven marginal taxa in Natal and Zululand. Partial endemics refers to those species which chiefly occur in Natal and Zululand but which extend beyond the boundaries of the province to some extent; true endemics refers to those species which occur in the province only and nowhere else; marginal species refers to those species which occur primarily outside the province, but whose range includes a portion of the province. In terms of conservation priority, marginal species have a much lesser importance rating than the endemics or partial endemics.

The following species recorded from OSCA are partial endemics to Natal and Zululand:

Tomopterna natalensis

Arthroleptis wahlbergii

Hemisis guttatus

Leptopelis natalensis

Hyperolius semidiscus

The following taxon recorded from OSCA is a true endemic to Natal and Zululand:

Hyperolius marmoratus marmoratus

Grimsdell and Raw (1984) have shown that a large percentage of endemics occur in the coastal lowlands (50 - 59%) whereas few occur in the uplands or lowlands away from the coast (14 - 36%) (Phillips' bioclimatic regions 6 - 11). In terms of conservation area (Natal Parks Board reserves) as percent of bioclimatic region, the montane, lowlands away from the coast and coastal lowlands (Phillips' bioclimatic regions 1, 5, 7, 9, 10 and 11) are well represented (15%, 7% and 6%, respectively). They have shown that the most important bioclimatic regions for endemics, namely the coastal hinterland and the mist belt (Phillips' bioclimatic regions 2 and 3), fare poorly, being represented by only 0,1% and 0,5% of conservation areas, respectively.

Grimsdell and Raw's (1984) approach suggests that the use of bioclimatic regions is useful in providing a broad, regional picture of frog distribution in Natal and Zululand. They point out, however, that although their analysis appears to be useful in deciding on regional priorities as regards land for conservation, it cannot be used for deciding on regional priorities within a specific bioclimatic region, where, for example, other considerations such as uniqueness of habitat, minimum population size and population genetic factors (Greig 1979) must assume a high importance.

The following taxa recorded from OSCA are widespread in northern Natal/Zululand:

Xenopus laevis laevis

Bufo gutturalis

Schismaderma carens

Phrynomerus bifasciatus bifasciatus

Pyxicephalus adspersus edulis

Tomopterna natalensis (partial endemic to Natal)

Rana angolensis

Ptychadena oxyrhynchus

Ptychadena anchietae

Phrynobatrachus natalensis

Phrynobatrachus mababiensis

Cacosternum nanum nanum

Arthroleptis wahlbergii (partial endemic to Natal)

Hemisus guttatus (partial endemic to Natal)

Leptopelis natalensis (partial endemic to Natal)

Leptopelis mossambicus

Kassina senegalensis

Afrixalus brachycnemis brachycnemis

Afrixalus fornasinii

Hyperolius argus

Hyperolius tuberilinguis

Hyperolius pusillus

The following taxa recorded from OSCA are marginal in northern Natal/Zululand:

Tomopterna cryptotis

Strongylopus fasciatus fasciatus

Chiromantis xerampelina

Hyperolius semidiscus

Hyperolius marmoratus marmoratus

Hyperolius marmoratus taeniatus

Tomopterna cryptotis is primarily a dry savanna species, commonly associated with the inland regions of Natal and tending to avoid the wetter, coastal regions. It has been recorded from Mkuze, Hluhluwe and Umfolozi Game Reserves (Lambiris 1988a), but probably does not

extend much further along the coastal area than the southern end of the Zululand coastal plain. It was originally thought to occur only as far south as Mkuzi in Zululand (Poynton 1964).

Strongylopus fasciatus fasciatus is a temperate species which breeds in winter in warm areas. It has been recorded in Zululand from as far north as Ndumu Game Reserve and from the coastal region at St. Lucia (Lambiris 1988a). However, it does not appear to be a common frog at these localities and it seems reasonable to assume that it reaches its northern limit in Zululand.

Chiromantis xerampelina is a wet savanna species, widely distributed throughout Zululand at localities such as Ndumu, Mkuze, Hluhluwe and Umfolozi Reserves, and St. Lucia (Lambiris 1988a). However, it has not been recorded from localities further south than Empangeni (Lambiris 1988a) and it seems likely that the southern limit for this species is the southern end of the Zululand coastal plain.

Hyperolius semidiscus is widely distributed along the coastal regions of Natal, but tends to avoid the northern portion of Zululand. The most northern localities for this species include Mtunzini, Richards Bay, Eshowe, Mseleni and Dukuduku Forest (Lambiris 1988a). It seems probable that this species reaches its northern distribution limit in Zululand.

Hyperolius marmoratus marmoratus and H. m. taeniatus have been regarded as marginal in the area of OSCA because both forms appear to reach their distributional limits in Zululand where they intergrade. H. m. marmoratus reaches its northern limit in Zululand where it has been recorded from Mtunzini, Richards Bay, Empangeni, Eshowe, Hluhluwe Game Reserve, St. Lucia and Dukuduku Forest, whereas taeniatus reaches its southern limit in Zululand where it has been recorded from St. Lucia, Dukuduku Forest, 18 km from Empangeni, and Hluhluwe River Mouth (Lambiris 1988a). Hybrids have been collected from St. Lucia (Poynton 1964) and Mtunzini (Lambiris 1988a).

In conclusion, it is apparent that OSCA has a interesting variety of tropical and non-tropical forms, characterized by the presence of both H. m. marmoratus and taeniatus.

ZOOGEOGRAPHY

Poynton (1964), in an attempt to classify the southern African amphibian fauna according to zoogeographical units, proposed the use of the terms "tropical", "transitional" and "Cape" (=temperate) to indicate the distribution patterns of each taxa. This approach was based on the striking differences in distribution which existed between the taxa occurring in the north-east lowlands and those occurring in the southwestern Cape, especially when the localities for each taxon were plotted on maps. Poynton (1964) found that the amphibian populations of southern Africa are polarized into two main faunal groups, the one centred in the north-east, and the other in the south-west. For instance, he found that the southwestern Cape itself has a rich fauna, but 20 of the 26 taxa occurring there are endemic. Moreover, the distribution maps showed that of the great diversity of taxa which occur in the north-east, not one extended into the southwestern Cape.

Poynton (1964) referred to the north-eastern faunal assemblage as the tropical fauna. He based the term "tropical" on Köppen's (1931) climatic classification, and referred to a tropical form as one which has a substantial part of its range in an area experiencing a tropical climate; that is, where the coldest month has a mean temperature of over 18°C. The tropical fauna is then the aggregation of such forms. Poynton (1964) noticed that there was a tendency for certain forms to keep to the western side of the lowlands, and these forms he classified as "quasi-tropical".

The "Cape" fauna, according to Poynton (1964), refers to those forms which are non-tropical in distribution, and whose centre of distribution is the southwestern Cape.

Finally, the "transitional" forms are, according to Poynton (1964), those forms which occupy the overlapping subtraction margins of both the tropical and Cape faunal centres. Poynton (1964) is careful in the use of this term, for he does not wish it to be confused with meaning that the tropical fauna literally undergoes a "transition" to a temperate fauna, but that it is to be used in a zoogeographical sense in that the "transitional" fauna is endemic to the subtraction margins of the two regional faunas. He also points out that forms endemic to the transition zone can themselves be roughly grouped into a number of zoogeographical units. For instance, those units that are adjacent to the tropical centre and which lie in the richest part of the tropical subtraction margin can be called "tropical transitional" faunas; those units that lie in cooler areas, where the Cape subtraction margin is more in evidence, can be called "temperate transitional" faunas; and finally, those units which cover a wide range including both tropical and warm temperate areas, are best described as "general transitional" faunas.

Poynton's (1964) zoogeographical units are useful in terms of establishing distributional patterns, and may assist in throwing light on the phylogenetic relationships of taxa. It has many advantages over dividing areas into vegetation types or even biomes, and then describing the taxa which occur in each; such ecological approaches tend to conceal the overall distributional patterns. First, as Poynton (1964) himself points out, an unmistakable conformity does exist in the distribution of taxa. This is remarkable in the face of the great complexity of environmental and biological factors affecting each taxa. Second, the zoogeographical units are based on the distribution patterns themselves, and are not worked out with reference to some preselected geographical division (Poynton 1964). If one accepts that the units should not be rigidly imposed, it provides a useful and workable tool for the zoogeographical classification of southern Africa's amphibian fauna.

On the basis of Poynton's (1964) zoogeographical scheme, the amphibian fauna recorded from OSCA can be classified as follows:

Tropical: Bufo gutturalis, Phrynomerus bifasciatus bifasciatus, Pyxicephalus adspersus edulis, Tomopterna cryptotis, Ptychadena oxvyrhynchus, Ptychadena anchietae, Phrynobatrachus mababiensis, Chiromantis xerampelina, Leptopelis mossambicus, Kassina senegalensis, Afrixalus brachycnemis, Afrixalus fornasinii, Hyperolius argus, Hyperolius tuberilinguis, Hyperolius pusillus and Hyperolius marmoratus taeniatus.

Quasi-tropical: Schismaderma carens, Rana angolensis and Phrynobatrachus natalensis.

Transitional: Tomopterna natalensis, Strongylopus fasciatus fasciatus, Cacosternum nanum nanum, Hemisus guttatus, Arthroleptis wahlbergii, Leptopelis natalensis, Hyperolius semidiscus and Hyperolius marmoratus marmoratus.

Cape temperate: Xenopus laevis laevis.

Of the 28 amphibian taxa recorded from OSCA, sixteen (57%) display a tropical distribution, three (11%) a quasi-tropical distribution, eight (28%) a transitional distribution, and one (4%) a Cape or temperate distribution. This closely corresponds with the zoogeographical affinities of the amphibian fauna of Maputaland. Of the 45 taxa recorded from Maputaland (Poynton 1980), 29 (65%) are tropical, five (11%) are quasi-tropical, 10 (22%) are transitional and one (2%) is a Cape or temperate taxon. The slightly higher percentage of tropical taxa and lower percentage of transitional and Cape taxa in Maputaland compared with that from OSCA is related to a progressive subtraction of tropical taxa in the Maputaland/Zululand region, which is discussed later.

The first point to be made is that the amphibian fauna recorded from OSCA shows predominantly tropical affinities with only one Cape or temperate taxon, Xenopus laevis laevis, occurring in the area. The distribution of this tropical fauna is typically enormous. No less than seven taxa (Ptychadena anchietae, Phrynomerus bifasciatus bifasciatus, Pyxicephalus adspersus edulis, Tomopterna cryptotis, Kassina senegalensis, Hyperolius argus and Hyperolius pusillus) occur as far north as Somalia and a further eight taxa (Bufo gutturalis, Ptychadena oxvrhynchus, Phrynobatrachus natalensis, Phrynobatrachus mababiensis, Chiromantis xerampelina, Afrivalis fornasinii, Afrivalus brachycnemis brachycnemis and Hyperolius tuberilinguis) as far as Kenya (Lanza 1981). Schismaderma carens ranges north to Tanzania (J. Poynton pers. comm.).

The second point is that there is a precipitous subtraction of tropical taxa in Zululand, especially toward the southern end of the Zululand coastal plain near Mtunzini, a particularly well-collected area. This subtraction was first noted by Poynton (1961) and was subsequently discussed by him (1980) in his study of the zoogeography of the amphibians of Maputaland. Although some of the taxa thought to have their southern distributional limits further north than OSCA have subsequently been collected from OSCA and at localities further south (Tomopterna cryptotis, Chiromantis xerampelina and Hyperolius marmoratus taeniatus), there is indeed a dramatic reduction in the number of tropical taxa within, and immediately to the south of, Maputaland/Zululand. For instance, no less than 20 tropical taxa recorded from Maputaland are absent from Durban.

The reason for the profound subtraction is baffling. A number of authors (Poynton and Bass 1970; Van Dijk 1971; Poynton and Broadley 1978) have investigated environmental parameters which might have brought this about, including geology, topography and water types, rainfall and evaporation, seasonality, temperature, physical history, vegetation, predators and prey, and competition between tropical and non-tropical faunas. Poynton (1980) concedes, however, that none of these factors appears to be wholly responsible, or perhaps even primarily responsible, for the overall distribution pattern. This is largely because ecological information is lacking. For instance, little data is available on what environmental conditions are required by a particular species to maintain viable populations in a particular area. Until such time as detailed ecological studies are carried out, the factors responsible for the distributional patterns of the tropical, transitional and temperate faunas will remain concealed.

In their study of the reptiles of Maputaland, Burton and Haacke (1980) proposed a different zoogeographical classification scheme from Poynton (1964). Their units, apparently based on

the work of FitzSimons (1943, 1962 and 1975), Pienaar (1978), and Poynton and Broadley (1978), are Cape Temperate Fauna, Temperate Transitional, Tropical Wide Ranging, Western Tropical Transitional, Eastern Tropical Transitional and Tropical Coast Littoral. A map showing the extent of the zoogeographical zones is available in Bruton and Haacke (1980).

Bruton and Haacke's (1980) zoogeographical systemization has been adopted by other authors (Branch and Braack 1987; Branch 1988b). Although it is used here for comparative purposes, it is done so with reservations. First, Bruton and Haacke (1980) give no explanation of, or justification for, their zoogeographical zones. Second, as noted by Poynton (in litt.), their "Eastern Tropical Transitional" unit makes no sense in including northern Mozambique and the Malawi lowlands, which carry a full-blown East African fauna, since it takes out any meaning of the term "transitional". It is largely for this reason that this system could not be used for amphibians, particularly the tropical taxa: it simply does not work.

Based on the classification proposed by Bruton and Haacke (1980), the OSCA reptile fauna can be zoned as follows:

Tropical Wide Ranging (TWR): Pelomedusa subrufa, Crocodylus niloticus, Hemidactylus mabouia mabouia, Lygodactylus capensis capensis, Varanus niloticus niloticus, Stellio atricollis, Chamaeleo dilepis dilepis, Panaspis wahlbergii, Mabuya varia, Mabuya striata striata, Leptotyphlops scutifrons scutifrons, Pvthon sebae natalensis, Lamprophis fuliginosus, Lycophidion capense capense, Mehelya capensis capensis, Psammophis phillipsii, Aparallactus capensis, Atractaspis bibronii, Prosymna ambigua stuhlmannii, Philothamnus hoplogaster, Philothamnus semivariegatus semivariegatus, Crotaphopeltis hotamboeia, Telescopus semiannulatus semiannulatus, Thelotornis capensis capensis, Dispholidus typus typus, Dasypeltis scabra, Naja mossambica, Dendroaspis angusticeps, Causus rhombeatus and Bitis arietans arietans.

Tropical East Coast Littoral (TCL): Scelotes brevipes and Mabuya homalocephala depressa.

Eastern Tropical Transitional (ETT): Kinixys natalensis, Acontias plumbeus, Chamaesuara macrolepis, Mehelya nyassae and Psammophis sibilans brevirostris.

Temperate Transitional (TT): Tetradactylus africanus africanus and Typhlops bibronii.

Cape Temperate Fauna (CTF): Lamprophis aurora, Lamprophis inornatus, Duberria lutrix lutrix and Psammophylax rhombeatus rhombeatus.

The zoogeographical affinities of the OSCA and Maputaland reptiles, with a summary for the Kruger National Park, are provided in Table 7. Of the 44 reptile taxa recorded from OSCA, thirty one (70%) display a TWR distribution, two (5%) a TCL distribution, five (11%) an ETT distribution, two (5%) a TT distribution, and four (9%) a CTF distribution. Of the 112 taxa recorded from Maputaland (Bruton and Haacke 1980), sixty (54%) are TWR, fifteen (13%) TCL, twenty five (22%) ETT, two (2%) WTT, five (4%) TT, four (4%) CTF, and one (1%) is of unknown zoogeographical affinity (Leptotyphlops incertae sedis). The affinities of the Maputaland reptiles are similar to those from the Kruger National Park.

One of the striking differences between the zoogeographical affinities of the OSCA and Maputaland reptiles is that OSCA has proportionately more TWR and CTF taxa, and fewer TCL and ETT taxa. Part of the explanation for this is that OSCA, situated near the southern end of the Zululand coastal plain, is climatically less tropical than Maputaland and therefore is less marginal for temperate species. Furthermore, the TCL reptiles are largely or entirely confined to the Mozambique Plain, and many do not range as far south as the southern end of the plain. Likewise, many of the ETT species undergo a precipitous subtraction in Maputaland. No less than 37 TWR, TCL and ETT taxa are absent by the time Durban is reached.

No matter what zoogeographical units are used to establish the patterns of distribution or affinities of each taxon, one fact is unmistakably clear. There is a precipitous subtraction or falling-off of mostly tropical species from northern Zululand (Maputaland) to southern Zululand, especially toward the southern end of the Zululand coastal plain. This trend continues along the coastline to Durban. Furthermore, although more temperate species occur along this gradient from north to south, the overall number of taxa drops quite dramatically. Thus, only 72 amphibian and reptile taxa have been recorded from municipal Durban (Alexander unpubl.), equalling the number of taxa recorded from OSCA.

Finally, OSCA provides important temporal and spatial data on the herpetofauna of the area. It is also an area which has provided a considerable number of additional locality records, permitting a better understanding of the distribution patterns of the different taxa. Although at this stage it has not been possible to directly correlate the occurrence of taxa with environmental parameters, such as rainfall, temperature or vegetation type, if indeed such direct correlations between environmental patterns and distribution do exist (Poynton and Broadley in press), further detailed ecological and zoogeographical studies at specific localities

Table 7

The zoogeographical affinities of the Owen Sitole College of Agriculture and Maputaland reptiles, with a summary for the Kruger National Park.

		Tropical		Tropical Transitional		Temperate Transitional (TT)	Cape Temperate Fauna (CTF)	Unknown
		Wide Ranging (TWR)	East Coast Littoral (TCL)	Eastern (ETT)	Western (WTT)			
Owen Sitole College of Agriculture	Lizards	8	2	2	0	1	0	0
	Amphisbaenians	0	0	0	0	0	0	0
	Snakes	21	0	2	0	1	4	0
	Chelonians	1	0	1	0	0	0	0
	Crocodiles	1	0	0	0	0	0	0
	Total	31	2	5	0	2	4	0
	% of grand total (44)	70	5	11	0	5	9	0
Maputaland*	Lizards	14	8	11	2	4	2	0
	Amphisbaenians	0	1	1	0	0	0	0
	Snakes	34	6	12	0	1	2	1
	Chelonians	11	0	1	0	0	0	0
	Crocodiles	1	0	0	0	0	0	0
	Total	60	15	25	2	5	4	1
	% of grand total (112)	54	13	22	2	4	4	1
Kruger* National Park	Total	56	13	22	6	2	2	0
	% of grand total (100)	56	13	22	6	2	2	0

*Data for Maputaland and Kruger National Park from Bruton and Haacke (1980).

in Zululand will bring new evidence to light. As mentioned by Poynton (1980), Maputaland offers quite outstanding opportunities for basic zoogeographical research and an unusually wide scope for ecological studies; opportunities which cannot be surpassed, surely, in any other area in the world.

PARASITES

Parasitological studies on reptiles are in their infancy in southern Africa, due largely to the importance attached to research on parasitic organisms in commercially important animals, particularly livestock. Apart from the largely taxonomic works on reptile ticks by Theiler (1945a, 1945b and 1962) and Kaufman (1972), and general accounts on ticks and mites in Zumpt (1961), there is little literature available on reptile ectoparasites.

Endoparasites of African herpetofauna are poorly known taxonomically and there are no texts on endoparasites infecting southern African reptiles specifically. Apart from the dated work of Heymons (1935) on the pentastomids, and the general account of endoparasites which are known to infest reptiles in Zumpt (1961) and Riley (1986), literature on endoparasites is also scant. Moreover, ecological investigations on the effects of parasites, and more specifically the effects of pathological organisms harboured by parasites, on their hosts are lacking.

Ectoparasites

Bright orange to red mites infecting lizards from OSCA, particularly Hemidactylus mabouia mabouia, Lygodactylus capensis capensis and Stellio atricollis, were provisionally identified as Pterygosomid mites. An account of the life history of these parasites is provided by Zumpt (1961).

The Leguaan Tick Aponomma exornatum Koch 1844, batches of which were identified from subadult (R63) and adult Water Leguaans Varanus niloticus niloticus collected from OSCA, is apparently a wide ranging species, occurring throughout central, eastern and southern Africa (Theiler 1945a and 1962) and northern Africa (Kaufman 1972). According to Theiler (1945a), both varanids V. niloticus and V. exanthematicus are the normal hosts and, in the South African zoological survey collection, A. exornatum has been collected off these reptiles from all four provinces of South Africa and Botswana.

A. exornatum has also been collected from a crocodile Crocodylus niloticus from Lake Victoria, an unidentified snake from Zimbabwe (nymphae only), a giant legless skink Acontias plumbeus from the Sorgwana (Sodwana?) district in Zululand, and an African python Python sebae and dogs from unspecified localities (Theiler 1945a). Other mammalian hosts have also been recorded by Kaufman (1972). Theiler (1945a) is of the opinion that the crocodile, sharing its habitat with V. niloticus, is a secondary host, and that all other records represent cases of purely accidental hosts, a statement supported by Kaufman (1972). A. exornatum

has been shown to harbour the rickettsia Coxiella burneti and the protozoan haemogregarines of reptiles (Theiler 1962).

A. exornatum can cause the death of captive varanids (V. e. albigularis and V. n. niloticus) through asphyxiation. This discovery was reported on by Young (1965) who found that A. exornatum will infect its host to the extent that the nasal passages become totally occluded, causing dyspnoea and eventually death by suffocation. Numerous tick nymphs were found in the nasal passages of adult V. n. niloticus from OSCA, but no passages were occluded by these parasites.

Young's (1965) comment that this tick may be responsible for the mortality of many varanids in nature is conjecture as there are no field observations in the literature to support this. Moreover, captive conditions are often unsuitable for varanids, rendering them more susceptible to tick proliferation which is borne out by the large number of heavily infested individuals observed in many reptile parks (pers. obs.).

The Snake Tick Aponomma latum Koch 1844, specimens of which were collected from an adult Mozambique Spitting Cobra Naja mossambica and an adult Night Adder Causus rhombeatus from OSCA, is apparently a widespread species, occurring throughout Africa south of the Sahara (Theiler 1945b; Theiler 1962) with one record from Yemen in eastern Asia (Kaufman 1972). A zoological survey conducted by Theiler (1945b) has shown that A. latum has no predilection for any one group of snakes, though it does seem to show a preference for larger species (Theiler 1962), and lists over 13 species from Uganada in the north to the Cape Province in the south as hosts of this tick. Subsequent research (Theiler 1962; Kaufman 1972) suggests that many more snake species are hosts; Kaufman (1972) produced a list of no less than 51 identifiable species. Other squamates recorded as hosts are the lizards Acontias meleagris, A. plumbeus, V. e. albigularis and V. n. niloticus; mammalian hosts (an insectivore Crociodura, a rat Rattus chrysophilus and a porcupine) were also recorded (Theiler 1945b; Theiler 1962; Kaufman 1972). Kaufman (1972) suggests that mammalian hosts are not common for Aponomma species and therefore probably represent examples of accidental parasitism.

Theiler's (1945b) reference to a "blind lizard" Acontias meleagris from Sorgwana (Sodwana?) in Zululand as an accidental host is almost certainly based on the incorrect identification of the lizard, or an incorrect locality. A. meleagris, for which two subspecies are known, namely typical meleagris and orientalis, is restricted to the western and eastern Cape. The Giant Legless Skink A. plumbeus is the only Acontias species recorded from Zululand. Furthermore, Theiler's (1945b) remark that a Python sebae (subsp. natalensis) record from

Natal probably represents a case of an accidental host cannot be substantiated. The majority of snakes parasitized by A. latum are terrestrial species which would include the python, even though it is also often attracted to, and occurs in, water bodies (Bruton 1979; Broadley 1983; Hoffmann 1989; and pers. obs.). Furthermore, A. latum has been recorded from other pythons, including Python regius (Theiler 1962; Kaufman 1972). It is not known what pathological organisms A. latum harbours.

Endoparasites

One of the greatest problems facing the researcher in the study of endoparasites is that it is often difficult to identify organisms at different stages of their life history. Larval phases often differ considerably from adults which in turn may display sexual dimorphism. This is particularly true with the pentastomids (class: Pentastomida, Heymons 1935; order: Pentastomida, Zumpt 1961). Also there are often no definite characteristics which can be used to distinguish larvae of similar species or even genera. The identification of endoparasites is further complicated by a lack of ecological information regarding the intermediate hosts of these organisms.

The single long, thin parasite found in the membranous tissue between the intestinal tract and body cavity of an adult female Stellio atricollis (R69) from OSCA has been identified as a nematode. Due to an absence of literature, further information on the identification of this parasite is lacking.

The ten long, thin worm-like parasites collected from the membranous tissue between the intestinal tract and body cavity of Causus rhombeatus (R56) collected from OSCA have been provisionally identified as ascarids (order: Ascaroidea), probably of the family Ascaridae.

The numerous small, white parasites found on the outside of the alimentary canal of an adult male Atractaspis bibronii (R97) and an adult male Telescopus semiannulatus semiannulatus (R89) are pentastomid larvae of the family Porocephalidae, probably Porocephalus subulifera (Zumpt 1961) (see Fig. 6-8). Adult P. subulifera have been found in Naie haie, Mehelva capensis, Bitis gabonica and Causus rhombeatus, while larvae have been found in the lung of the Vervet Monkey (Ceropithecus aethiops) (Zumpt 1961).

According to Zumpt (1961), the Pentastomida are parasitic in the lungs, nasal and pharyngeal passages, nasal sinus, coelom and intestine of vertebrates, chiefly reptiles, and may thus have an ancient origin in the Palaeozoic. They are seldom found in birds, mammals or fish and

Figure 6. Parasites on the outside of the alimentary canal of Atractaspis bibronii

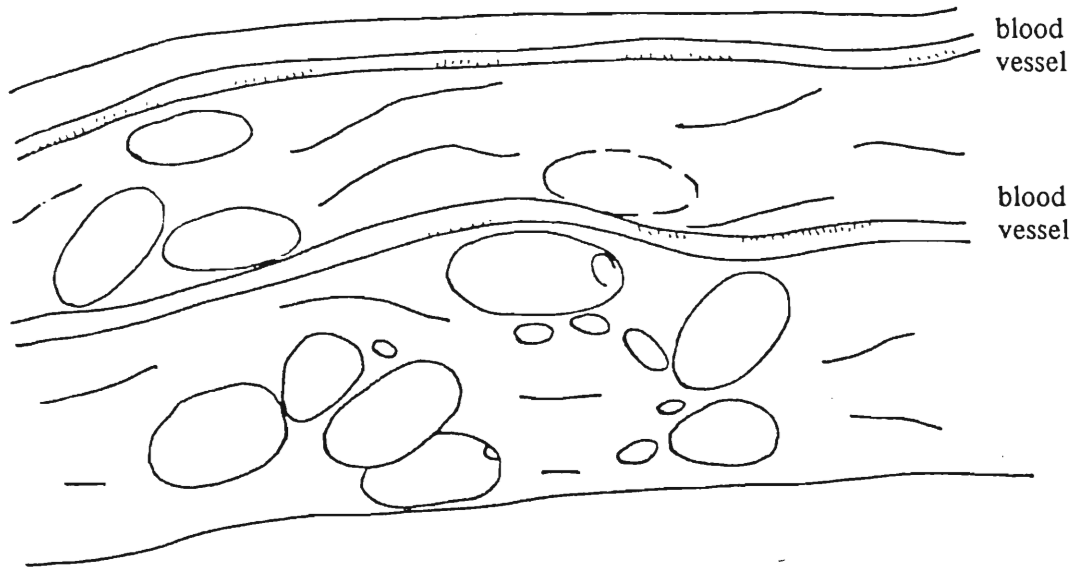
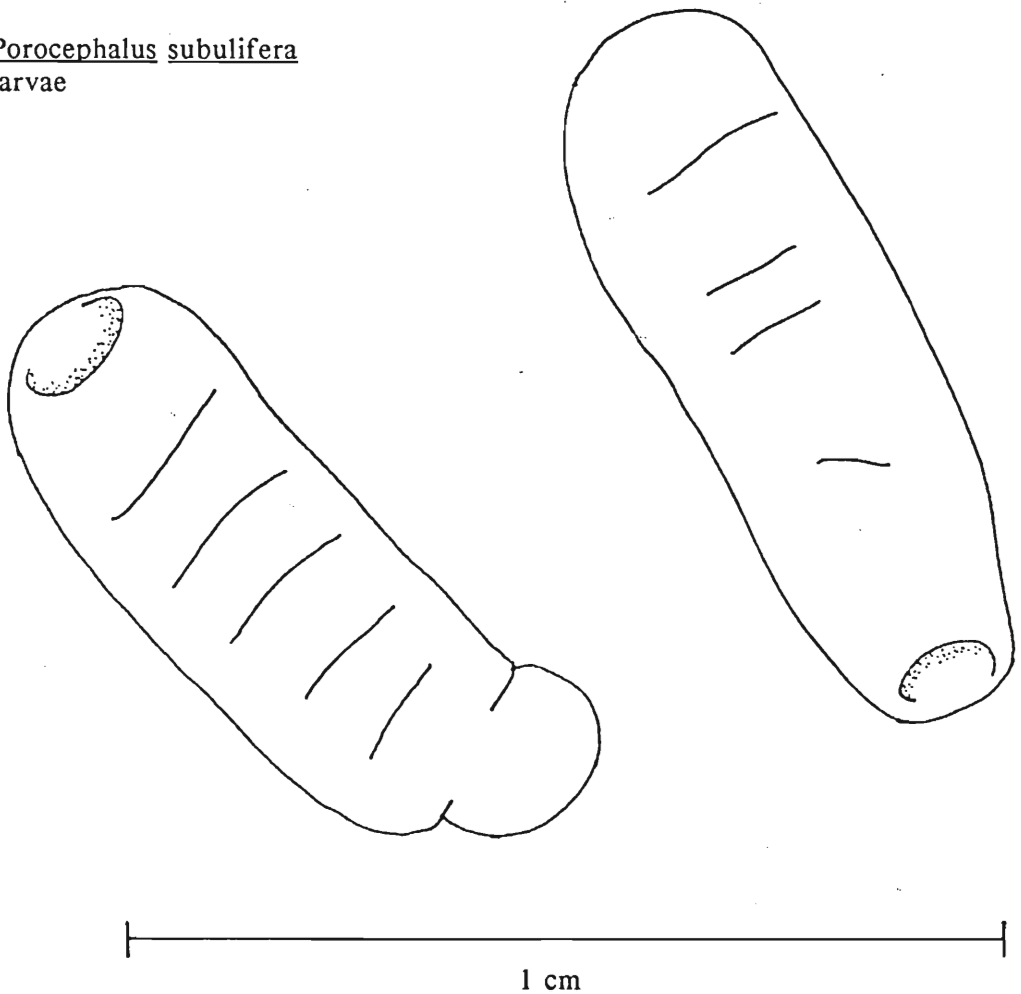


Figure 7. Porocephalus subulifera larvae



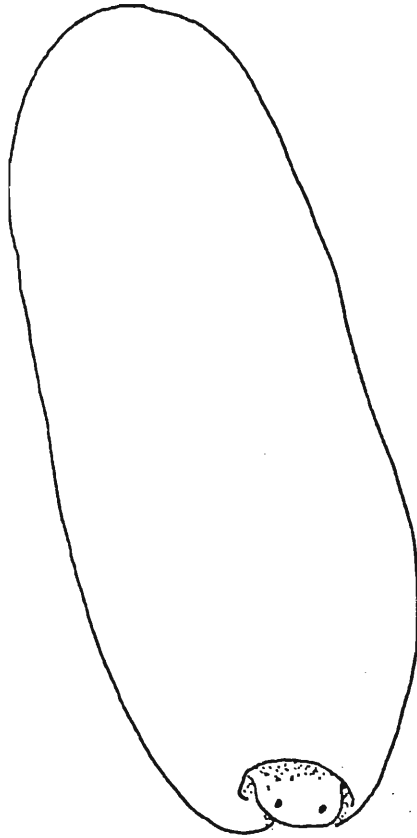


Figure 8. Porocephalidae larvae from Teloscopus semiannulatus semiannulatus

then usually in the immature nymphal and larval stages; these vertebrates thus serve as intermediate hosts (Zumpt 1961).

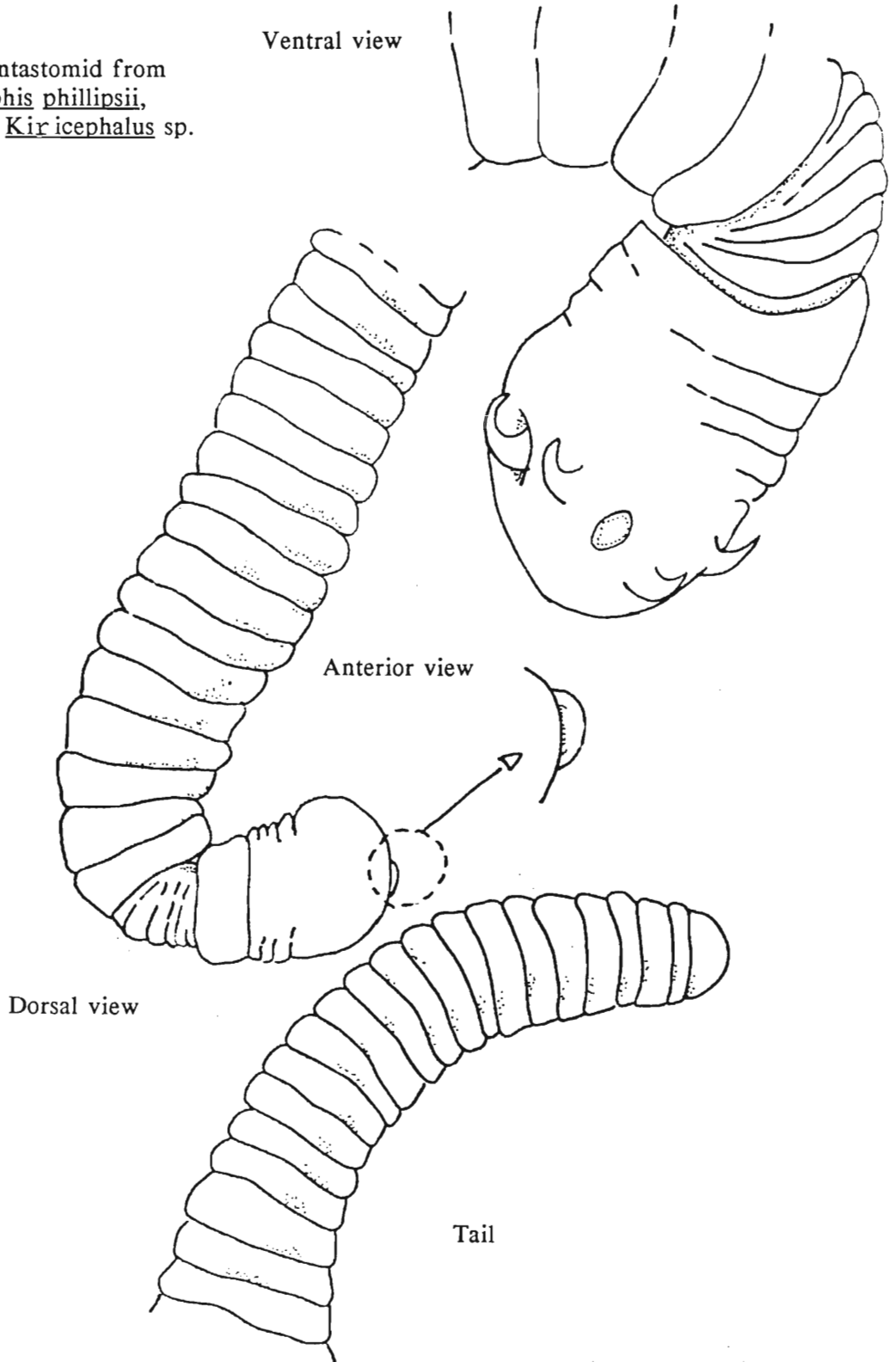
With reference to the Porocephalidae specifically, the parasites are facultative and there is a wide choice of intermediate hosts; the final host is a predatory reptile or mammal, the intermediate hosts numerous small herbivorous or omnivorous mammals serving as food for the final host, though intermediate hosts can be, and often are, omitted (Zumpt 1961).

Evidence from North, Central and South American snakes indicates that the genus Porocephalus utilizes mammals as intermediate hosts (Riley 1986). A number of Porocephalus spp. infect American pit-vipers (family Crotalidae) while one, P. clavatus, parasitizes constricting snakes (family Boidae) utilizing larger mammals (Riley and Self 1979; Self and Cosgrove 1972: in Riley 1986). P. subulifer, the best known of the two African species, infects file snakes Mehelya spp. (Fain 1961: in Riley 1986) which are primarily ophiophagous; Riley and Self (1979: in Riley 1986) have recovered encysted infective nymphs and freely mobile worms from a large number of snake intermediate hosts comprising three families. This unusual snake-snake life cycle has the complication that mammals may be, or are definitely, involved as intermediate hosts. As there is no good character which will effectively separate infective nymphs of different Porocephalus species, and specific identity is lacking, more ecological and experimental evidence is necessary.

The parasite collected from between the body wall and intestinal tract of an adult male Psammophis phillipsii (R80) from OSCA was a pentastomid, provisionally identified as Kiricephalus. It was an adult pentastomid with a definite head with four hooks, two situated anteriorly and two posteriorly (see Fig. 9). The mouth was oval, and was situated between the anterior pair of hooks. Two segments were present in the head immediately in front of the neck. The neck was constricted and segmented. The region of the trunk was thicker than the head in diameter. The tail was inconspicuous and tapered abruptly. Kiricephalus species, particularly K. pattoni from North and Central America and K. coarctatus from South-East Asia, infect a large number of snake definitive and intermediate hosts (Riley 1986).

The parasite collected from the mutilated head of an adult female Causus rhombeatus (R86) from OSCA is the pentastomid Leiperia cincinnalis (see Plate 22). It was an adult specimen and is assumed to have occupied the lung prior to being flushed out when the snake was killed. It has a flattened body, twisted into a spiral shape (see Fig. 10). No segments were present. The front end had what appeared to be feeble lobopodial projections which aided in the identification of this parasite.

Figure 9. Adult pentastomid from Psammophis phillipsii, probably Kiricephalus sp.



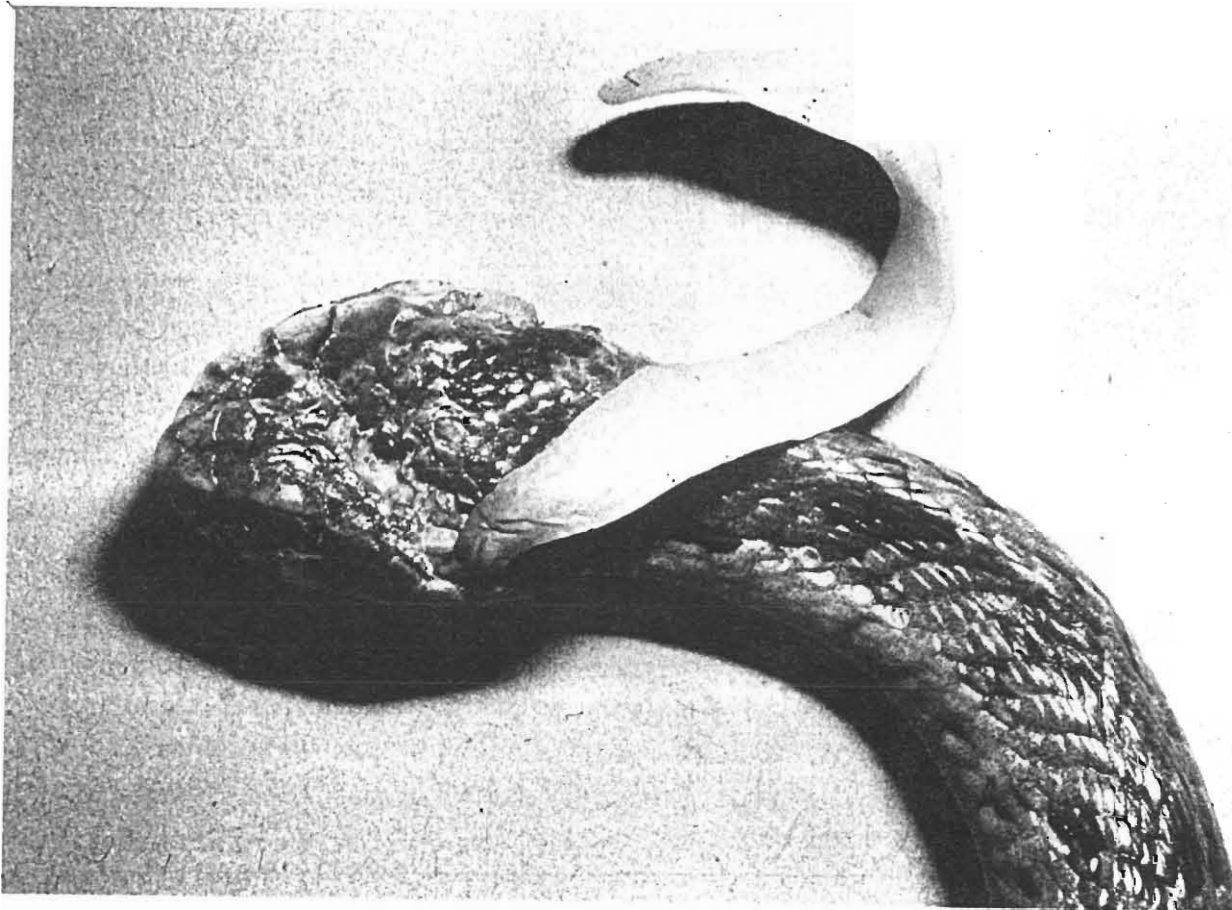
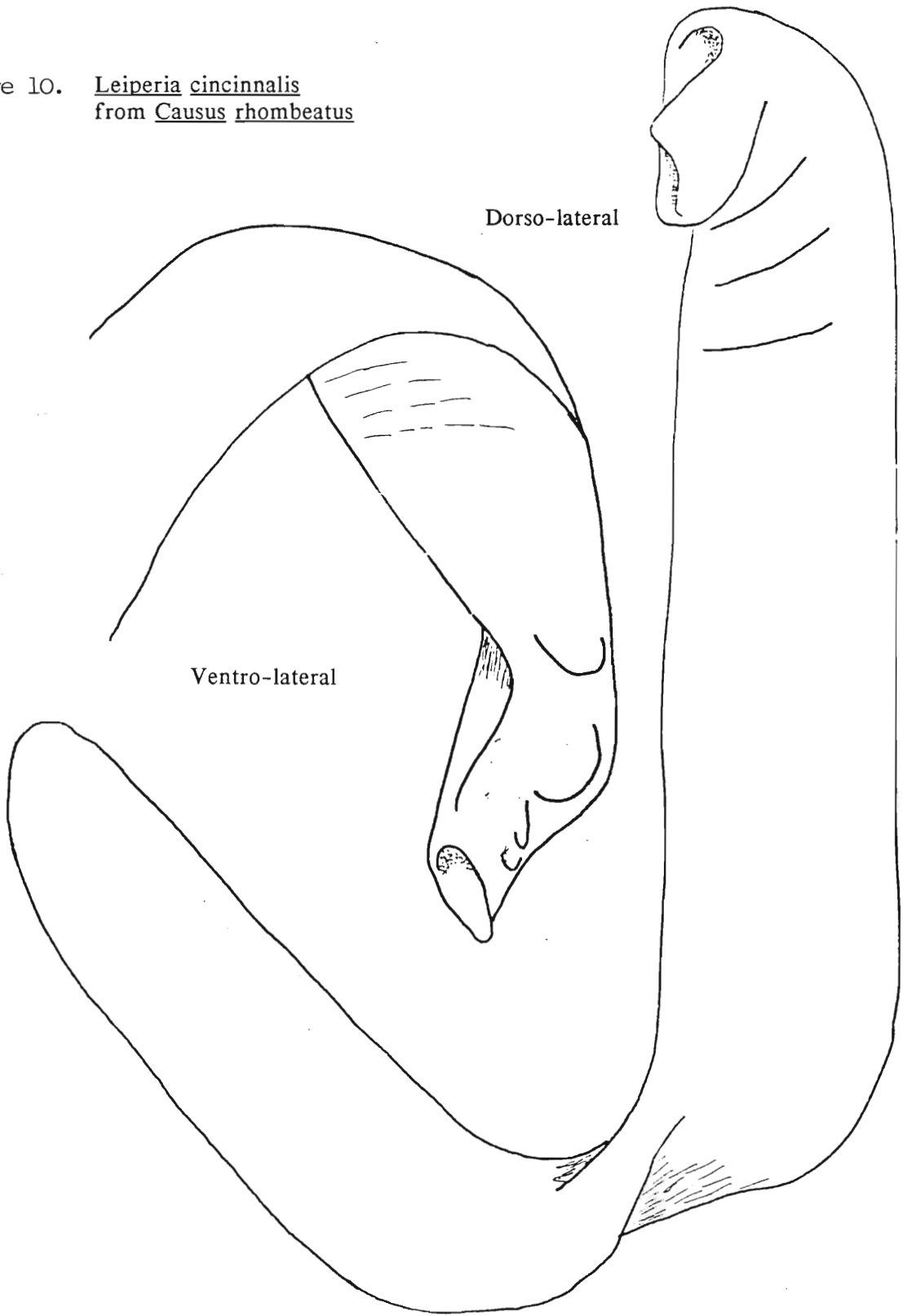


Plate 22. A pentastomid *Leiperia cincinnalis* emerges from the mutilated head of an adult female Night Adder *Causus rhombeatus* (R86) (1,6 x life size).

Figure 10. Leiperia cincinnalis
from Causus rhombeatus



The genus Leiperia is found in the lungs of crocodiles; the immature stages occur in fishes, crocodiles and sporadically in snakes (Zumpt 1961). Up until the present study, L. cincinnalis had only been found in the lungs of the African (Nile) Crocodile Crocodvulus niloticus (Zumpt 1961).

The classification of pentastomids, according to Heymons (1935), is as follows:

Class: Pentastomida

Order 1: Cephalobaenida

Family: Cephalobaenidae

Family: Reighardiidae

Order 2: Porocephalida

Family: Porocephalidae

Subfamily: Sebekinae

Genus: Leiperia

Subfamily: Sambonidae

Subfamily: Porocephalinae

Genera: Porocephalus, Kiricephalus

The life cycle implications for both Kiricephalus and Leiperia cincinnalis are the same for Porocephalus subulifera and other Porocephalidae. This means that, as with A. bibronii and T. s. semiannulatus, P. phillipsii and C. rhombeatus also feed on mammals, which are intermediate hosts. M. Visser (in litt.), however, is of the opinion that P. phillipsii and C. rhombeatus may prey on (young?) Atractaspis and Telescopus spp. This is difficult to substantiate as P. phillipsii feeds almost exclusively on rodents, lizards, frogs and birds, though the occasional snake is taken (Branch 1988a). C. rhombeatus preys primarily on frogs, especially toads, though rodents may also be taken (Broadley 1983). There is no documented evidence of this species feeding on snakes. Once again, more ecological information is necessary.

The pathological effects of endoparasites on their definitive hosts are controversial and inconclusive. Based on widely disseminated literature on the subject, Riley (1986) remarks that there is little evidence that pentastomids are responsible for significant pathology in naturally infected definitive hosts, although this does not necessarily apply to captive hosts. However, a number of authors (Fantham and Porter 1953; Hazen et al. 1978; Boyce et al. 1984; Awachie 1974; in Riley 1986) refer to instances of lung obstruction, lung destruction, haemorrhaging in the lungs or lung inflammation in a variety of reptiles as a result of pentastomid infection, occasionally resulting in the death of the host. Certainly pentastomid

infections, through the damage of lung epithelium, may allow secondary infections to become established, infections which may prove fatal (Riley 1986).

**SOUTH AFRICAN RED DATA BOOK SPECIES - REPTILES AND AMPHIBIANS
(RDB-RA)**

McLachlan's (1978) South African Red Data Book - Reptiles and Amphibians (RDB-RA) has been extensively revised by Branch (1988c). With the exception of Afrivalus aureus (syn. Afrivalus brachycnemis brachycnemis) which has been accredited rare species status (Lambiris 1988b) and which the present author considers a doubtful taxon, there are no amphibians from OSCA with RDB-RA status.

There are three RDB-RA reptile species which have been recorded from OSCA. These are the Natal Hinged Tortoise Kinixys natalensis (rare, Boycott 1988), the African Rock Python Python sebae natalensis (vulnerable, Branch 1988d) and the Nile Crocodile Crocodylus niloticus (vulnerable, Jacobsen 1988).

Kinixys natalensis is afforded general protected species status only under Natal and KwaZulu nature conservation legislation (Ordinance 15 of 1974). The greatest single threat to this species is habitat degradation, including shifting cultivation, silviculture and frequent, uncontrolled veld fires (Boycott 1988). At OSCA specifically, this species is threatened by frequent fires and agricultural practices, especially the use of machinery: cattle camps and the game park are burned on average every alternate year to maintain a veld sub-climax. Although no direct evidence is available, the use of tortoises for ritual purposes is another potential threat.

Python sebae natalensis is a protected indigenous reptile in Natal and KwaZulu (Ordinance 15 of 1974). This snake is under threat for a number of reasons. Its skin is still in demand for the fashion trade; it is sought after for the pet trade; its fat and skin are used by witchdoctors for medicinal or "muthi" purposes; and it is still condemned by unenlightened farmers who are intolerant of this snake's role as a predator (Branch 1988d). At OSCA specifically, this snake is killed for its medicinal and supposed aphrodisiac properties.

Crocodylus niloticus is a protected species in Natal and KwaZulu (Ordinance 15 of 1974). The threats to this reptile are habitat destruction, including the unseasonal release of large volumes of water from major dams which may flood nesting banks, and competition with man for the same resources such as alleged incompatibility of crocodiles with livestock production (Jacobsen 1988). There are presently no direct threats to this reptile at OSCA, though its continued survival in the main water bodies at OSCA to which it seems to occasionally wander and take up residence, is ultimately dependent on its status in the major waterways of the region, particularly the Nseleni River.

NICHE SEGREGATION AND MODE OF LIFE

Niche segregation amongst snakes, lizards and amphibians recorded from OSCA is represented in Tables 8-10. Factors such as size, activity patterns, habitat preferences, foraging strategy, food items or prey, and breeding strategy have a considerable effect on the ecological segregation of reptiles. Size, breeding habitat and breeding strategy, call sites and tadpole development, on the other hand, have a strong influence on the segregation of amphibians.

Temporal variation, or different activity patterns, is one parameter which may exclude direct competition between similar-sized reptile taxa. Nineteen snake taxa (68%) recorded from OSCA display diurnal activity patterns, eight (28%) display nocturnal activity patterns, and only one (4%), namely Python sebae natalensis, shows both diurnal and nocturnal activity patterns. The heat sensory pits situated in the snout of P. s. natalensis equips it well to locate prey at night, though it will feed at daytime too (pers. obs.).

Ten (77%) lizard taxa are diurnal, one (8%) is nocturnal, and two (15%), namely Acontias plumbeus and Scelotes brevipes, probably display both diurnal and nocturnal activity patterns; for instance, the absence of any difference between day and night rates of oxygen consumption by Acontias (Brownlie and Loveridge 1983) is strongly suggestive of dual activity patterns, though more ecological information is necessary. Both chelonians recorded from OSCA, namely Kinixys natalensis and Pelomedusa subrufa, and the crocodylid Crocodylus niloticus, display diurnal activity patterns.

The vast majority of snakes (26 taxa or 93%) produce eggs; that is, they are oviparous, while only two taxa (7%), namely Duberria lutrix lutrix and Bitis arietans arietans, produce live young; that is, they are viviparous, or more specifically ovoviviparous (Broadley 1983) since the eggs are retained within the female's body until fully incubated.

Eight (62%), possibly nine (69%) of the lizard taxa, if one includes Tetradactylus africanus africanus for which more reproductive data are necessary, are oviparous, while four (31%) are ovoviviparous. Both chelonians and the crocodylid recorded from OSCA are oviparous.

Except for minor variations in the type and size of insect species taken, and differences in feeding times and habitats occupied, lizards may also employ different hunting strategies. Schoener (1971) has identified "sit and wait" foragers and active searchers, to which Arnold (1984) has added another strategy, which he describes as the "slow visual scan". Briefly, the "sit and wait" strategy is adopted by most chamaeleons and involves adopting an inactive, sedentary position and awaiting prey; the active search technique is employed by most limbed

Table 8

NICHE SEGREGATION AMONG AMPHIBIANS FROM THE OWEN SITOLE COLLEGE OF AGRICULTURE

SPECIES	* MAX. SIZE	a BREEDING HABITAT	b CALL SITES	c TADPOLE DEVELOPMENT
<u>Xenopus laevis laevis</u>	102/102	Ponds/Dams/Seeps	Underwater	Rapid
<u>Bufo gutturalis</u>	80/97	Ponds/Dams	Near edges of water; partly concealed	Rapid
<u>Schismaderma carens</u>	85/86	Ponds/Dams	Edges of water (floating); exposed	Rapid
<u>Phrynomerus bifasciatus</u> <u>bifasciatus</u>	49/68	Rainwater pans	Edges of water; exposed	Rapid
<u>Pyxicephalus adspersus</u> <u>edulis</u>	84/140	Rainwater pans	In shallow water; exposed	Rapid
<u>Tomopterna cryptotis</u>	51/51	Rainwater pans	Near edges of water; exposed	Rapid
<u>Tomopterna natalensis</u>	35/48	Ponds/Seeps/Rainwater pans	Near edges of water; exposed or concealed	Rapid
<u>Rana angolensis</u>	60/81	Ponds/Dams/Rivers	Edges of water; partially submerged	Slow
<u>Strongylopus fasciatus</u> <u>fasciatus</u>	- /50	Ponds/Dams/Seeps/Rivers	Near edges of water; concealed	Slow
<u>Ptychadena oxyrhynchus</u>	54/60,5	Rainwater pans	Near edges of water; exposed	Moderate
<u>Ptychadena anchietae</u>	45/52	Seeps/Dams/Rivers/ Rainwater pans	Near edges of water; exposed	Moderate
<u>Phrynobatrachus natalensis</u>	16/29	Seeps/Ponds	Perimeter of water; concealed	Rapid
<u>Phrynobatrachus mababiensis</u>	11/19	Ponds/Dams	Edges of water; concealed	Rapid
<u>Cacosternum nanum</u> <u>nanum</u>	24/25	Ponds/Seeps/Rainwater pans	Edges of water; concealed	Very rapid
<u>Chiromantis xerampelina</u>	61/87	Ponds/Dams/Rivers	Above edges of water; exposed	Rapid
<u>Arthrolepis wahlbergii</u>	27/38	Ponds	Near edges of water; concealed	Moderate?
<u>Hemisus guttatus</u>	- /80	Ponds/Rainwater pans	Near edges of water; concealed (burrow)	Moderate?
<u>Leptopelis natalensis</u>	45/47(61,5)	Rivers	Above edges of water; exposed	Slow?

Table 8 (continued)

NICHE SEGREGATION AMONG AMPHIBIANS FROM THE OWEN SITOLE COLLEGE OF AGRICULTURE (continued)

SPECIES	* MAX. SIZE	a BREEDING HABITAT	b CALL SITES	c TADPOLE DEVELOPMENT
<u>Leptopelis mossambicus</u>	30/50	Rivers	Above or removed from edges of water; exposed	Slow?
<u>Kassina senegalensis</u>	43/52	Ponds/Dams	Near edges of water; semi-concealed	Moderate/Slow
<u>Afrivalus brachycnemis</u> <u>brachycnemis</u>	24/22,5	Ponds/Dams	Overhanging edges of water; exposed	Moderate
<u>Afrivalus fornasinii</u>	31/39	Ponds/Dams	Overhanging edges of water; exposed	Moderate
<u>Hyperolius semidiscus</u>	35/35	Rivers	Overhanging edges of water; exposed	Moderate
<u>Hyperolius argus</u>	35/35	Ponds	Overhanging edges of water; exposed	Moderate
<u>Hyperolius tuberilinguis</u>	39/35,5	Ponds/Dams	Overhanging edges of water; exposed or semi-concealed	Moderate
<u>Hyperolius pusillus</u>	20/20	Ponds/Dams	Overhanging edges of water; exposed	Moderate
<u>Hyperolius marmoratus</u> subsp.	30/30(29,5)	Ponds/Dams/Rivers	Overhanging edges of water; exposed	Moderate

Very rapid: < 20 days
 Rapid: 20 - 50 days
 Moderate: 50 - 100 days
 Slow: > 100 days

* Max. size of OSCA specimen/Max. size in Poynton (1964)

a,b,c Data from Poynton (1964); Passmore and Carruthers (1979); Wager (1986); and pers. obs.

Table 9

NICHE SEGREGATION AMONG LIZARDS FROM THE OWEN SITOLE COLLEGE OF AGRICULTURE

SPECIES	MAX. SIZE ^a	ACTIVITY PATTERNS	HABITAT	HUNTING	BREEDING
<u>Hemidactylus mabouia</u> <u>mabouia</u>	132/170	Nocturnal	Arboreal	slow scan	eggs
<u>Lygodactylus capensis</u> <u>capensis</u>	81/80	Diurnal	Arboreal	slow scan	eggs
<u>Varanus niloticus</u> <u>niloticus</u>	1440/2000	Diurnal	Semiaquatic	active search	eggs
<u>Stellio atricollis</u>	320/390	Diurnal	Arboreal	active search	eggs
<u>Chamaeleo dilepis</u> <u>dilepis</u>	154/350	Diurnal	Arboreal	sit and wait	eggs
<u>Acontias plumbeus</u>	335/550	Diurnal/Nocturnal	Fossorial	slow search	young
<u>Scelotes brevipes</u>	115/130	Diurnal/Nocturnal	Fossorial	slow search	young
<u>Panaspis wahlbergii</u>	70/110	Diurnal	Terrestrial	slow search	eggs
<u>Mabuya homalocephala</u> <u>depressa</u>	- /200	Diurnal	Terrestrial	active search	eggs
<u>Mabuya varia</u>	122/190	Diurnal	Terrestrial	active search	eggs
<u>Mabuya striata striata</u>	225/250	Diurnal	Arboreal/Terrestrial	active search	young
<u>Tetradactylus africanus</u> <u>africanus</u>	334/330	Diurnal	Terrestrial	active search	eggs?
<u>Chamaesaura macrolepis</u>	525/410*	Diurnal	Terrestrial	active search	young

a Max. size of OSCA specimen/Max. size in Branch (1988a).

* FitzSimons (1943) gives max. size of 584 mm (error in Branch 1988a).

Table 10

NICHE SEGREGATION AMONG SNAKES FROM THE OWEN SITOLE COLLEGE OF AGRICULTURE

SPECIES	a		HABITAT	b	
	MAX. SIZE	ACTIVITY PATTERNS		FOOD	BREEDING
<u>Typhlops bibronii</u>	330/460	Nocturnal	Fossorial	Invertebrates	eggs
<u>Leptotyphlops scutifrons scutifrons</u>	126/280	Nocturnal	Fossorial	Invertebrates	eggs
<u>Python sebae natalensis</u>	ca. 4000/5600	Diurnal/Nocturnal	Terrestrial/ Semiaquatic	Mammals/Birds/Lizards/ Crocodiles/Frogs/Fish	eggs
<u>Lamprophis aurora</u>	656/900	Diurnal	Terrestrial	Rodents/Lizards	eggs
<u>Lamprophis inornatus</u>	470/1300	Diurnal	Terrestrial	Rodents/Lizards/Snakes	eggs
<u>Lamprophis fuliginosus</u>	ca. 1000/1500	Diurnal	Terrestrial	Mammals/Lizards/Birds/ Frogs	eggs
<u>Lycophidion capense capense</u>	180/640	Diurnal	Terrestrial	Lizards	eggs
<u>Mehelya capensis capensis</u>	ca. 1000/1650	Diurnal	Terrestrial	Snakes/Lizards/Frogs/ Toads/Rodents	eggs
<u>Mehelya nyassae</u>	410/650	Diurnal	Terrestrial	Lizards	eggs
<u>Duberria lutrix lutrix</u>	- /430	Diurnal	Terrestrial	Snails/Slugs	young
<u>Psammophylax rhombeatus rhombeatus</u>	- /1460	Diurnal	Terrestrial	Rodents/Lizards/Frogs	eggs
<u>Psammophis sibilans brevirostris</u>	805/1350	Diurnal	Terrestrial	Rodents/Lizards	eggs
<u>Psammophis phillipsii</u>	1805/1740	Diurnal	Terrestrial	Rodents/Lizards/Frogs/ Birds/Snakes	eggs
<u>Aparallactus capensis</u>	230/410	Diurnal	Terrestrial	Invertebrates	eggs
<u>Atractaspis bibronii</u>	540/630	Nocturnal	Fossorial	Rodents/Snakes/Lizards/ Amphisbaenians	eggs
<u>Prosymna ambigua stuhlmannii</u>	193/300	Diurnal	Fossorial	Lizards' eggs	eggs
<u>Philothamnus hoplogaster</u>	550/960	Diurnal	Terrestrial/ Semiaquatic	Toads/Frogs/Lizards/ Fishes/Invertebrates	eggs

Table 10 (continued)

NICHE SEGREGATION AMONG SNAKES FROM THE OWEN SITOLE COLLEGE OF AGRICULTURE (continued)

SPECIES	a		HABITAT	b	
	MAX. SIZE	ACTIVITY PATTERNS		FOOD	BREEDING
<u>Philothamnus s. semivariiegatus</u>	900/1260	Diurnal	Arboreal	Lizards/Frogs	eggs
<u>Crotaphopeltis hotamboeia</u>	560/810	Nocturnal	Terrestrial	Toads/Frogs/Rodents/ Lizards	eggs
<u>Telescopus s. semiannulatus</u>	530/1050	Nocturnal	Terrestrial	Lizards/Birds/Rodents	eggs
<u>Dispholidus typus typus</u>	1380/2000	Diurnal	Arboreal	Lizards/Birds/Eggs/ Frogs/Toads/Rodents	eggs
<u>Thelotornis capensis capensis</u>	1200/1680	Diurnal	Arboreal	Lizards/Snakes/Frogs/ Toads/Birds	eggs
<u>Dasypeltis scabra</u>	225/1160	Diurnal	Terrestrial	Birds' eggs	eggs
<u>Naja mossambica</u>	1290/1500	Nocturnal	Terrestrial	Frogs/Toads/Lizards/ Snakes/Birds/Rodents/ Eggs/Invertebrates	eggs
<u>Dendroaspis polylepis</u>	ca. 2500/4300	Diurnal	Terrestrial	Rodents/Birds	eggs
<u>Dendroaspis angusticeps</u>	ca. 1400/2500	Diurnal	Arboreal	Birds/Rodents/Eggs	eggs
<u>Causus rhombeatus</u>	595/1000	Nocturnal	Terrestrial	Frogs/Toads/Rodents	eggs
<u>Bitis arietans arietans</u>	420/1200	Nocturnal	Terrestrial	Rodents/Lizards/Frogs/ Toads	young

a Max. size of OSCA specimen/Max. size in Branch (1988a).

b Data from Bruton and Haacke (1980); Broadley (1983); Branch (1988a); and pers. obs.

lizards such as skinks Mabuya, varanids Varanus and terrestrial, serpentiform lizards such as Tetradactylus and Chamaesaura, and involves actively looking for and pursuing prey; the "slow visual scan" is adopted by many geckos and is basically a compromise feeding strategy allowing the detection of slow-moving, cryptic prey in poor light conditions, while avoiding predation in poor light conditions; and finally, another category, referred to as a slow search, is peculiar to fossorial and short-limbed skinks such as Acontias, Scelotes and Panaspis and involves a slow olfactory search. One taxa from OSCA (8%) adopts the "sit and wait" hunting strategy, 2 taxa (15%) adopt the slow scan strategy, seven taxa (54%) adopt the active search strategy, and three taxa (23%) adopt the slow search strategy.

Generally snakes partition resources in a different manner to lizards. Snakes tend to be more food-dependent and less habitat-specific (Branch and Braack 1987). Whereas the vast majority of lizards feed exclusively on insects and other arthropods, many snake species have specific food preferences, which are often reflected in their common names, such as slug-eater, centipede-eater and egg-eater.

The call sites of amphibians is an important factor in the niche segregation of taxa, often precluding competition for call sites amongst similar taxa (cf. Rana, Strongylopus and Ptychadena) except in Afrixalus and Hyperolius where similar call sites are occupied. However, although species of Afrixalus and Hyperolius occupy similar call sites, subtle differences may exist in respect of the vegetation used, the elevation of the vegetation above the water, and the aspect of the vegetation from which calls are made. For instance, Hyperolius marmoratus marmoratus/taeniatus were often found calling from exposed positions on vegetation elevated a metre or more above the water's edge, whereas H. tuberilinguis tended to call from semi-concealed vegetation at lower elevations to H. m. marmoratus/taeniatus. This situation warrants further investigation.

The rate of tadpole development to a large degree dictates where different taxa breed. The choice of water bodies amongst amphibians is thus an important consideration in terms of the survival of the progeny; taxa with tadpoles which undergo rapid development often make use of temporary water bodies such as seeps and rainwater pans, whereas those with moderate or slow tadpole development use only permanent or semi-permanent water bodies such as ponds, dams and rivers. One taxon (4%) has a very rapid (less than 20 days) tadpole development, 10 taxa (35%) have a rapid (20-50 days) tadpole development, 10 possibly 12 taxa (35% or possibly 43%) have a moderate (50-100 days) tadpole development, one taxa (4%) has an intermediate moderate/slow (50 to more than 100 days) tadpole development, and two possibly four taxa (7% or possibly 14%) have a slow (more than 100 days) tadpole development.

The mode of life of reptiles from OSCA is compared with the mode of life of reptiles from Maputaland, the Orange Free State and the Kruger National Park in Table 11. Some species of snake and lizard are both terrestrial (associated with the surface of the ground, whether soil or rock) and arboreal, or terrestrial and aquatic/semiaquatic; they are included in both categories.

The low number of fossorial or subterranean taxa recorded from OSCA (six or 13,6%) relative to the other well collected areas is probably partly ascribable to an artefact of collecting and the generally gravelly nature of the soils. The high number of fossorial or subterranean taxa recorded from Maputaland specifically (26 or 23,2%) is largely due to the coastal dune forest which has a diverse fossorial reptile fauna consisting of nine snakes, two amphisbaenians and five lizards (Bruton and Haacke 1980); Pooley *et al.* (1973) also found an interesting subsoil herpetofauna in Ndumu Game Reserve, which included six snakes, one amphisbaenian and three lizards.

The low number of aquatic or semiaquatic taxa from OSCA (five or 11,4% of the total) compared to Maputaland (22 or 19,6% of the total) is due to two factors. First, not only does Maputaland have a large number of terrapins (four species, three of which reach their southern distributional limits in Maputaland, namely *Pelusios sinuatus*, *P. rhodesianus* and *P. castanoides castanoides*), but also it has four species of marine turtle (*Chelonia mydas*, *Eretmochelys imbricata*, *Caretta caretta* and *Lepidochelys olivacea*).

Second, the low number of aquatic or semiaquatic snakes in particular recorded from OSCA (two species) compared to Maputaland (nine species) is due to a number of species reaching their southern distributional limits in Maputaland (*Lycodonomorphus whytei obscuriventris*, *Natriciteres variegata sylvatica* and *Philothamnus angolensis*), unsuitable habitats at OSCA or an artefact of collecting (*Lycodonomorphus rufulus*, *Philothamnus natalensis natalensis* and *Naja melanoleuca* which Bruton (1979) has recorded feeding on toads, frogs and fishes, including small fishes in shallow water in swamp forest), and the occurrence of a marine species off the Maputaland coastline, namely *Pelamis platurus*.

Based on figures in Table 11, the proportion of arboreal species recorded from OSCA appears similar to that for Maputaland (nine species or 20,5% of the total versus 24 species or 21,4% of the total). However, analysis of the results of the arboreal species listings from Maputaland proposed by Bruton and Haacke (1980), comprising 13 lizard taxa and 11 snake taxa, has resulted in disagreement with the present author. Only nine, possibly 10, lizard taxa could be reasonably referred to as arboreal or partially arboreal (*Homopholis wahlbergii*, *Afroedura pondolia marleyi*, *Hemidactylus mabouia mabouia*, *Lygodactylus capensis capensis*, *Stellio*

Table 11

THE MODE OF LIFE OF REPTILES FROM THE OWEN SITOLE COLLEGE OF AGRICULTURE (OSCA), MAPUTALAND (MAP) (BRUTON AND HAACKE 1980), THE ORANGE FREE STATE (OFS) (GREIG AND BURDETT 1976; DE WAAL 1978) AND THE KRUGER NATIONAL PARK (KNP) (PIENAAR 1978).

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Number of species																

	Fossorial/Subterranean				Arboreal				Terrestrial				Aquatic/Semiaquatic			
	OSCA	MAP	OFS	KNP	OSCA	MAP	OFS	KNP	OSCA	MAP	OFS	KNP	OSCA	MAP	OFS	KNP

Lizards	2	8	9	4	5	13	3	9	6	18	31	31	1	2	1	1
Amphisbaenians	0	2	1	6	0	0	0	0	0	0	0	0	0	0	0	0
Snakes	4	16	14	17	4	11	2	7	20	28	24	21	2	9	2	5
Chelonians	0	0	0	0	0	0	0	0	1	2	3	2	1	10	0	2
Crocodylians	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1

Total	6	26	24	27	9	24	5	16	27	48	58	54	5	22	3	9

% of Grand Total	13,6	23,2	29,6	27,0	20,5	21,4	6,2	16,0	61,4	42,9	71,6	54,0	11,4	19,6	3,7	9,0
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atricollis, Chamaeleo dilepis dilepis, Bradypodion setario, Mabuya striata striata, Cordylus tropidosternum jonesii and perhaps Varanus exanthematicus albigularis which may infrequently utilize hollowed trees as retreats). Technically only six species of snake can be considered arboreal (Meizodon semiornatus semiornatus, Philothamnus semivariegatus semivariegatus, Dipsadoboa aulicus aulicus, Dispholidus typus typus, Thelotornis capensis capensis and Dendroaspis angusticeps, though infrequently Dasypeltis inornata, D. medici medici and D. scabra scabra may scale trees in search of birds' eggs).

According to M.N. Bruton (pers. comm.), the bias towards arboreal species may be due to a considerable amount of work done in forest canopy (Bruton 1979; Bruton and Haacke 1980), since every reptile species which he found in the bark of branches of trees was recorded as arboreal. If this is so, it is difficult to establish which species might have occasionally or infrequently been recorded in trees. M.N. Bruton (pers. comm.) has suggested that his arboreal recordings may be accurate for Maputaland, but cannot be extrapolated. It is conceivable that Bruton and Haacke (1980) erroneously referred most species found in habitats such as coastal dune forest and tropical dry forest as arboreal, even though many of the species recorded from these habitats do not display arboreal habits. The present author is inclined to classify only 16 reptile species recorded from Maputaland as arboreal (14,3% of the total), a figure equalling the number of arboreal species recorded from the KNP (16 species or 16% of the total).

As a result of Bruton and Haacke's (1980) bias towards arboreal species, the number of terrestrial species recorded from Maputaland by them (48 species or 42,9% of the total) is also inaccurate. The present author found that 57 species (50,9% of the total) could be reliably referred to as terrestrial, a figure differing only marginally from the number of terrestrial species recorded from the KNP (54 species or 54% of the total).

To sum up, it would appear that the mode of life of the reptile fauna recorded from OSCA, perhaps with the exception of a relatively depauperate fossorial or subterranean fauna, provides an accurate reflection of available habitats. The large number of terrestrial and arboreal species (27 species or 61,4% of the total and 9 species or 20,5% of the total respectively) can be linked to the savanna grassveld and well-wooded riverine habitats which predominate at OSCA. Furthermore, there are no true rock-dwelling species recorded from OSCA, suggesting that the isolated outcrops of rock (dolerite) as a habitat type are not large enough to support populations of rupicolous species.

HABITAT PREFERENCES AND UTILISATION OF ARTIFICIAL HABITATS

Amphibians at OSCA appear to be separated largely according to water body types. For instance, Cacosternum n. nanum, Phrynobatrachus natalensis and P. mababiensis are quick breeders, making use of temporary water bodies for reproduction, while the majority of species such as Bufo gutturalis, Schismaderma carens, Rana angolensis, Ptychadena oxyrhynchus, Chiromantis xerampelina and others require permanent water bodies for reproduction. With the exception of Leptopelis natalensis, L. mossambicus and Arthroleptis wahlbergii which appear to be restricted to the riverine vegetation by the occurrence of the dense vegetation, and in the case of the first two species by a permanent water body for breeding and by leaf litter in the case of A. wahlbergii, all other amphibians do not have particular vegetational requirements for their survival, though many do have preferences. For instance, Hyperolius pusillus shows a preference for water lilies, while H. semidiscus, H. tuberilinguis and Afrixalus fornasinii prefer reeds, but all will utilize other littoral vegetation, even grasses, for calling and mating.

Exactly what influence soils have on the occurrence of species at OSCA is not known, though van Dijk (1982) has attempted to show correlations between anuran distribution, rainfall and soils in southern Africa. Apart from Hemisus guttatus which is a true burrower, showing a preference for loamy soils, there are probably many taxa which aestivate in soils, utilizing whatever substrate is soft and friable enough to accommodate them. Empirical evidence of the aestivation of Pyxicephalus adspersus edulis in the soils of the horticulture (and probably other) fields, and that of Bufo gutturalis burrowing in soils while in captivity, attests to this. Hyperolius marmoratus subspp. and Tomopterna natalensis were found hiding under carpets of cut grass. It seems reasonable to assume that leaf litter and other decaying vegetation are also used by other taxa as places of refuge during the cool, dry season, and certainly as a protective diurnal hiding place during the hot, wet summer months.

The utilization of artificial water bodies by many species of amphibians suggests that these water bodies offer conditions which are not available at natural water bodies. Generally, water bodies such as Cwaka Dam, the cattle dams and fish ponds offer permanent, stable waters for breeding, while natural water bodies tend to be inconsistent and erratic. The Cwaka River is subject to periodic flooding, occasionally with considerable environmental damage, such as the flood waters associated with cyclone "Demoina" in 1984 and the floods of 1987. Amphibians would have to evacuate the riverine area if they do not wish to get swept away, and eggs and larvae would be utterly defenceless and destroyed. Practically all of the conditions required for breeding, including sufficient and stable waters, and vegetation for call sites, are available at the artificial water bodies. Being opportunistic animals, it would be

easy for species which would normally occupy the riverine environment to breed in either the Cwaka River or associated waters, to migrate to and take up residence at the fish ponds. These fish ponds, which are relatively recent features, were occupied by no less than 19 amphibian taxa (Xenopus laevis laevis, Schismaderma carens, Phrynomerus bifasciatus bifasciatus, Tomopterna natalensis, Rana angolensis, Ptychadena oxvrhynchus, P. anchietae, Phrynobatrachus natalensis, P. mababiensis, Cacosternum nanum nanum, Chiromantis xerampelina, Kassina senegalensis, Afrixalus brachycnemis brachycnemis, A. fornasinii, Hyperolius argus, H. tuberilinguis, H. pusillus, H. marmoratus marmoratus and H. m. taeniatus). Direct evidence of these ponds being used as breeding areas was available for 15 taxa, such as larvae (X. l. laevis and S. carens) and calling and/or mating (Ptychadena anchietae, Phrynobatrachus natalensis, P. mababiensis, C. n. nanum, C. xerampelina, K. senegalensis, A. b. brachycnemis, A. fornasinii, H. argus, H. tuberilinguis, H. pusillus, H. m. marmoratus and H. m. taeniatus), though through missed opportunities the count may well have been higher.

Perhaps with the exception of Cwaka Dam, another advantage of artificial water bodies is that they are generally better protected against large predators, especially reptiles. The fence between the fish ponds and the game park provides a physical barrier to possible predators from the riverine area, including Crocodylus niloticus (especially juveniles) and Varanus niloticus niloticus. Only one V. n. niloticus was encountered at the fish ponds, whereas this lizard was commonly sighted at the Cwaka River and Cwaka Dam. Furthermore, human activity at the ponds, or nearby at the water purification plant, during the day might well have been a deterrent to predatory birds, including herons and egrets.

The toads Schismaderma carens and Bufo gutturalis were attracted to places of human habitation primarily by food. These toads have taken advantage of lamp-lit situations to feed on the multitude of insects which are attracted by the electric lights. Many toads were found in or under human artefacts, such as building rubble, cracks in walls and even in plastic basin drainage pipes, suggesting that they take refuge in these situations during the day, and emerge at night to feed. Frenzied feeding took place over the summer season, particularly on warm, humid evenings which appeared to be correlated with an increase in insect activity.

Individuals of a number of amphibian taxa occasionally utilised artificial habitats for temporary refuge or as semi-permanent retreats. Phrynomerus bifasciatus bifasciatus was found under a wooden nursery tray and was also found occupying a plastic basin drainage pipe in a students' ablution block; Pyxicephalus adspersus edulis was found under a wooden nursery box; and Afrixalus fornasinii was found occupying the toilet cistern of a staff

member's house. Present evidence suggests that these amphibians occupied these situations fortuitously.

Many taxa utilised artificial water bodies close to places of human habitation for calling and breeding, or were dispersed in places of human habitation, presumably while en route to breeding or feeding sites. For instance, Xenopus laevis laevis, Rana angolensis, Ptychadena anchietae, Phrynobatrachus mababiensis and Cacosternum nanum nanum were recorded from culverts or canalised streams near human structures. Tomopterna natalensis was observed calling from culverts and a cement pond in the animal husbandry unit; Cacosternum nanum nanum was found in a water-filled bowl on a veranda; Chiromantis xerampelina was recorded from a tree near a students' dormitory and from a staff member's garden; Hemisus guttatus was collected from a compost heap near the nursery; Hyperolius semidiscus was collected from a tree near the students' dormitories; and H. tuberilinguis and H. marmoratus marmoratus x taeniatus were collected from the window panes of students' dormitories.

The only amphibian taxa which were not found in any way associated with places of human habitation, including water bodies, were Tomopterna cryptotis, Strongylopus fasciatus fasciatus, Ptychadena oxyrhynchus, Phrynobatrachus natalensis, Arthroleptis wahlbergii, Leptopelis natalensis, L. mossambicus, Kassina senegalensis, Afrivalus brachycnemis brachycnemis, Hyperolius argus and H. pusillus. A. wahlbergii, L. natalensis and L. mossambicus appear to be habitat-specific, occupying the riverine vegetation along the banks of the Cwaka River. Whether the other taxa are sensitive to human activities and places of human habitation, or were not recorded from places of human habitation as a result of an artefact of collecting, is not known but warrants further investigation.

A large number of reptile taxa were found loosely or closely associated with places of human habitation. By far the vast majority of lizards and snakes found loosely associated with places of human habitation were recorded in these situations accidentally; that is, their presence was ascribable to them foraging or seeking a mate.

Lizard taxa which appeared to specifically utilise places of human habitation were Hemidactylus mabouia mabouia, Lygodactylus capensis capensis, Stellio atricollis and Mabuya striata striata. The nocturnal gecko H. m. mabouia utilised buildings and other structures not only for feeding and shelter, but for breeding too, thereby displaying behaviour in accordance with its common name "Tropical House Gecko". This reptile has been recorded spreading in urban areas in Natal (Borquin 1987) and has recently been introduced into East London and Port Elizabeth in the eastern Cape (Branch 1988a). The diurnal gecko L. c.

capensis and skink and M. s. striata, were recorded basking and feeding on buildings and other structures, while S. atricollis was observed basking on walls only. It is interesting to note that FitzSimons (1943) refers to this latter species' habit of occupying trees in or near native kraals; the present author often observed S. atricollis basking and foraging on livestock bomas and wooden fences in Zululand.

Few snake taxa appeared to be specifically attracted to human sites. Although the vast majority of taxa were recorded from or near places of human habitation, this was largely fortuitous as the snakes were probably searching for prey, shelter or a mate. Snakes such as Leptotyphlops scutifrons scutifrons occurring in houses, Philothamnus semivariegatus semivariegatus alighting into roofs, Dispholidus typus typus hibernating under a slab of concrete, Bitis arietans arietans sheltering under creosoted poles, and many other instances of snakes occurring in or near structures, are cases in point. Many snakes also took advantage of tarred roads on which to thermoregulate, and a number of studies have shown that such situations offer good collecting opportunities (Branch 1988a).

Snakes which appeared to be attracted to human settlements include, as the common name implies, house snakes Lamprophis spp., the elapid Naja mossambica, and perhaps to a lesser degree the colubrid Duberria lutrix lutrix and adder Causus rhombeatus. Branch (1988a) has noted the ability of Lamprophis fuliginosus to tolerate urban sprawl, while Broadley (1983) has remarked on this species' attraction to human settlements in search of prey. These statements are confirmed by the present study. N. mossambica was on a number of occasions found taking up residence in human structures, and entering houses and other buildings. The large number of toads attracted to human settlements, upon which N. mossambica readily feeds, is certainly a factor which attracts this snake. The relatively high incidence of Causus rhombeatus in and around human settlements is also largely ascribable to the presence of toads. Duberria lutrix lutrix may also be attracted to gardens where its prey of slugs and snails often proliferate. Certainly this is evident in urban settlements in the southwestern Cape (pers. obs.).

In conclusion it would appear that human activities benefit certain amphibian and reptile taxa. The creation of artificial water bodies, such as the fish ponds and dams, offer relatively stable breeding sites for the vast majority of amphibian taxa in the study area. Furthermore, as noted by Poynton (1964), vegetational changes do not appear to affect the occurrence of certain species (Breviceps verrucosus verrucosus and Leptopelis natalensis), though the present study suggests that the disappearance of emergent or littoral vegetation, such as Typha capensis, may have an effect on the occurrence of Hyperolius spp. Electric lights associated with infrastructure benefitted toads B. gutturalis and S. carens indirectly through

their ability to attract insect prey. Many reptile taxa occurred in and around human settlements fortuitously, though the lizards H. m. mabouia, L. c. capensis, S. atricollis and M. s. striata took advantage of these situations for feeding, shelter, basking and/or breeding. Similarly, the snakes L. fuliginosus, C. rhombeatus and possibly D. l. lutrix are attracted to human settlements for food, while N. mossambica appeared to be attracted by the availability of both retreats and prey. L. s. scutifrons occurred in houses while foraging, or when their subterranean habitat was flooded by saturating rainfalls.

PREDATORS AND PREY

Adult frogs are carnivores and most species feed only on live moving prey. Exceptions are Xenopus laevis laevis and Pyxicephalus adspersus edulis which will consume dead animals, such as earthworms and other frogs.

The majority of frogs prey predominantly on insects and other arthropods. However, a few species, namely X. l. laevis and P. a. edulis, will also feed on other groups of live animals, including frogs. Rose (1962) has suggested that toads too, particularly Bufo gutturalis, are cannibalistic.

Frogs appear to be opportunistic predators, and a number of studies have shown them to be unselective feeders (Passmore and Carruthers 1980; pers. obs.). The size of items taken are naturally related to the size of the frog, and the largeness of its mouth. This, plus the fact that frogs occupy different habitats and forage over different areas, in many instances precludes interspecific competition. For instance, Leptopelis spp. are medium-sized, arboreal frogs and, at OSCA at any rate, are restricted to the riverine environment; Cacosternum nanum nanum is a small frog which displays a preference for ephemeral streams in grassveld; B. gutturalis is a large toad which appears to forage widely, away from water bodies, in grassveld and in or near places of human habitation; X. l. laevis is a medium-sized, totally aquatic frog. Grassveld species would prey on different components of the insect or other fauna than arboreal or aquatic species. And even where two similar species occur in the same habitat, direct competition may be eliminated by segregation. This appears to exist in the case of the toads B. gutturalis and Schismaderma carens, where spatial segregation takes place (at disturbed feeding sites at any rate) even though the exact mechanism which causes this is not understood.

Frog larvae have many enemies. Predators include dragonfly nymphs, water spiders, water scorpions, crabs, fishes, birds and other frogs (Wager 1986).

Adult frogs have many enemies too. Birds such as herons, egrets, kingfishers and fiscal shrikes will kill and eat frogs. Young crocodiles, leguaans and snakes are well-documented predators (Pienaar et al. 1983; Bruton and Haacke 1980; Broadley 1983; Wager 1986; and Branch 1988a), while terrapins, fishes and frogs will also account for many frogs. Empirical evidence from OSCA is that Philothamnus semivariiegatus semivariiegatus, Naja mossambica, Causus rhombeatus and Bitis arietans arietans are natural predators of frogs and that the latter three species, in captivity at least, are voracious predators of the toads B. gutturalis and S. carens. In Maputaland, Python sebae natalensis, Mehelya capensis capensis,

Philothamnus hoplogaster and Crotaphopeltis hotamboeia are documented frog predators (Bruton and Haacke 1980). Broadley (1983) recognises Lamprophis fuliginosus, Psammophylax rhombeatus rhombeatus, Psammophis phillipsii, Dispholidus typus typus and Thelotornis capensis capensis as further predators, in addition to Atractaspis bibronii (Branch 1988a). Thus, of the 28 species of snakes recorded from OSCA, 14 are recognised or potential frog predators.

The OSCA reptile fauna forms a complex food web. While some reptiles have a catholic diet and are best regarded as generalists, others are specialist feeders (see Table 9). The vast majority of reptiles are carnivores; all the snakes are predators, all the lizards are primarily or exclusively predators, while the two chelonians, Kinixys natalensis and Pelomedusa subrufa, are herbivorous and omnivorous respectively.

Many of the snake species avoid competition with each other in a number of ways. Size, habitat preferences, foraging strategy and diet all play a role. Thus those species which occupy subterranean or fossorial habitats are excluded from competition from those which occupy aquatic, arboreal, terrestrial or rocky habitats. Two fossorial species, namely Typhlops bibronii and Leptotyphlops scutifrons scutifrons, are examples of two snakes which occupy similar habitats, but differ in body size and gape of mouth, which limits L. s. scutifrons to small insects such as termites and their larvae, whereas T. bibronii may take similar but also considerably larger prey, including worms. To further illustrate the point, Dasypeltis scabra may occupy similar savanna habitats, and grow to a similar length, as Lamprophis spp., Crotaphopeltis hotamboeia and Causus rhombeatus, but will feed exclusively on birds' eggs, whereas the other snakes have varied diets and are not restricted to one food item. Similarly, L. fuliginosus will feed on mammals, lizards, birds and frogs, whereas C. rhombeatus will feed almost exclusively on frogs and toads, although the occasional rodent may be taken (Broadley 1983).

Many of the generalists are opportunistic predators and, apart from Mehelya capensis capensis which shows a partiality for other snakes, there are a number of species with cannibalistic tendencies. In Maputaland, Bruton and Haacke (1980) have recorded Psammophis phillipsii preying on such snakes as Philothamnus semivariegatus semivariegatus and Thelotornis capensis capensis, and Naja mossambica on Psammophis phillipsii. Further documented cases of cannibalism include that of Lamprophis inornatus on Philothamnus natalensis and other snakes; cobras Naja spp. on Psammophylax rhombeatus rhombeatus; P. phillipsii on Dendroaspis polylepis; and P. r. rhombeatus, Atractaspis bibronii, T. c. capensis, N. mossambica and Bitis arietans arietans on a variety of different snakes (Broadley 1983 and Branch 1988a).

Apart from the specialist feeders, such as Dasypeltis scabra which feeds exclusively on birds' eggs, Aparallactus capensis which feeds largely on centipedes, and Prosymna ambigua stuhlmannii which feeds mainly on geckos' eggs (Broadley 1983), the majority of other snakes have relatively diverse diets (see Table 9). Apart from frogs and toads, which constitute dietary items for as many as 14 snake species recorded from OSCA, mammals (particularly rodents) are eaten by 17 species, lizards (including lizards' eggs) by 19 species, birds (including birds' eggs) by 10 species, fishes by two species, and invertebrates by six species. Small crocodiles may occasionally be taken by Python sebae natalensis, while chelonians (especially hatchlings) may become food for a number of snakes, such as B. a. arietans (Branch 1988a).

It is difficult to establish the food preferences of generalists. In captive studies toads B. gutturalis and S. carens were readily devoured by N. mossambica, C. rhombeatus and B. a. arietans. However, the refusal of an Angoni Vlei Rat Otomys angoniensis by an adult N. mossambica does not signify disinterest; it suggests that in captivity factors like feeding time, approach of predator or prey, size of prey and so forth, vary in the wild and will ultimately contribute to a snake's decision to feed on, or avoid a prey item. Broadley's (1983) remark that N. mossambica will feed on grasshoppers and other invertebrates when hard-pressed is difficult to substantiate. A healthy, well-padded specimen contained the remains of three beetles in its gut, which suggests an instance of opportunistic feeding.

Apart from cannibalistic snakes, snakes have numerous other enemies. Man in particular is a threat to snakes, and his impact is discussed in the chapter on environmental perturbations and threats.

Other enemies of snakes include leguaans Varanus spp., raptorial birds, mammals and even large frogs, such as Pyxicephalus adspersus edulis. Branch (1976a) records a Bullfrog (P. adspersus) swallowing 17 newly-born Rinkhals Hemachatus haemachatus at a single sitting. Occasionally swimming snakes may also be swallowed by predatory fish (Broadley 1983; Bruton 1979; Bruton and Haacke 1980), while pythons have been known to fall victim to crocodiles Crocodylus niloticus (Broadley 1983). Bushpigs Potamochoerus porcas will kill pythons in protection of their young (Broadley 1983), while mongooses and cats will feed on a variety of snakes (pers. obs.).

With the exception of Varanus niloticus niloticus, the lizard fauna at OSCA appears to feed exclusively on arthropods, particularly insects. No species was observed supplementing its diet with vegetable matter which has been reported for some lizards, especially agamids

(Agamidae) (FitzSimons 1943). Empirical and experimental evidence (pers. obs.) suggests that termites, ants and their larvae are popular food items, followed by flies and small beetles. Again, intraspecific competition was largely excluded by the size, niche and activity patterns of each species (see Table 8). The skink Mabuva striata striata proved to be adaptable, occupying both terrestrial and arboreal habitats. Even in instances of micro-sympatry, direct competition was avoided. The slow-scan hunting strategy of the small gecko Lygodactylus capensis capensis contrasted quite remarkably with the active search strategy adopted by the big, robust skink M. s. striata.

The varanid V. n. niloticus differed from all other lizards not only by virtue of its large size and semiaquatic habits, but also by its diet. Although empirical evidence is lacking, many workers (FitzSimons 1943; Pienaar et al. 1983; Bruton and Haacke 1980; Broadley 1983; and Branch 1988a) have recorded this lizard's diet, which includes small mammals, crabs, molluscs, insects (including termites and ants), frogs, carrion, fish, birds and their eggs, crocodile eggs and hatchlings, and terrapin eggs and hatchlings. In captivity at OSCA, juveniles took termites and grasshoppers, while larger specimens accepted offers of river crabs and chicken eggs.

Lizards have innumerable enemies. Leguaans Varanus spp. fall prey to pythons and crocodiles (Branch 1988), and large raptorial birds such as the Black Eagle Aquila verreauxii (Steyn 1982; Boshoff et al. in prep.), Martial Eagle Polemaetus bellicosus (Steyn 1982; Tarboton and Allan 1984; Boshoff et al. in press) and Crowned Eagle Stephanoaetus coronatus (Steyn 1982; Tarboton and Allan 1984). Smaller species have predators which also include birds of prey, as well as a variety of snakes, small mammals and other lizards. Gut contents of snakes collected from OSCA reveal that Lamprophis fuliginosus will prey on Mabuva spp. and Chamaeleo dilepis dilepis; Lycophidion capense capense on P. wahlbergii; Psammophis sibilans brevisrostris on M. striata striata, M. varia and cf. Panaspis wahlbergii; Philothamnus semivariiegatus semivariiegatus on Lygodactylus capensis capensis and Mabuva spp. In captivity, a further two species, Naja mossambica and Bitis arietans arietans, also fed on lizards, while an additional 14 species of snakes from OSCA have been recorded feeding on lizards in Maputaland (Bruton and Haacke 1980) and elsewhere in southern Africa (Pienaar et al. 1983; Broadley 1983; and Branch 1988a). Mongooses and cats, including domestic cats, will also take lizards. Cannibalism was recorded for M. s. striata; exceptionally, M. varia may also feed on other lizards (Branch 1988a).

Pelomedusa subrufa is an aquatic omnivore which feeds on insects, snails, crabs, fish, tadpoles, frogs, birds, carrion and water plants (Pienaar et al. 1983; Boycott and Borquin 1988; Branch 1988a). In Maputaland, Bruton and Haacke (1980) have recorded this terrapin

feeding on ticks picked off wallowing animals. Due to its thin shell, it falls prey to crocodiles (Branch 1988a). Juveniles indubitably have many more enemies.

Kinixys natalensis is primarily a herbivore, though it probably feeds on insects, including millipedes (Glomeridae), and snails (Achetina) on occasion, items which have been recorded for other Kinixys spp. (Boycott and Borquin 1988; Branch 1988a). The full spectrum of its diet is poorly known due to its confusion with other Kinixys tortoises (cf. K. belliana belliana and K. b. spekii). Empirical evidence of predators is lacking; however, hatchlings may fall prey to ants (and other carnivorous insects), snakes, small carnivorous mammals and raptors. Potential predators of adults include the White-necked Raven Corvultur albicollis, crows Corvus spp. and the Black Eagle A. verreauxii, all of which are documented tortoise predators (Steyn 1982; Tarboton and Allan 1984; Hoffmann 1986). The biggest threat, however, is man, both directly and indirectly. His effect is discussed in the next chapter.

ENVIRONMENTAL PERTURBATIONS AND THREATS

Although speculative, it is suggested that such common species as Schismaderma carens, Bufo gutturalis, Lygodactylus capensis capensis, Mabuya striata striata, Leptotyphlops scutifrons and Naja mossambica are more likely to survive environmental perturbations than such species as Arthroleptis wahlbergii, Leptopelis natalensis, L. mossambicus, Crocodylus niloticus and Dendroaspis angusticeps. This is because the common species are more adaptable, occur in more habitats, and their populations are more vigorous, than the uncommon or rare species which are infrequently encountered and then only in specific habitats. For instance, the skink M. s. striata is both arboreal and terrestrial, and commonly occurs in savanna and riverine habitats as well as places of human settlement to which it appears to be particularly well adapted. By contrast, the crocodile C. niloticus is an infrequently encountered amphibious reptile which is restricted to the Cwaka River and Cwaka Dam; that is, it is habitat specific. The constant flooding of the Cwaka River and Cwaka Dam may, for instance, result in the local extinction of C. niloticus, whereas such events will have little effect on the common species. The destruction of the riverine vegetation may also have severe ramifications for those species which appear to be attracted to, or restricted to, such a habitat, particularly L. natalensis, L. mossambicus, A. wahlbergii and D. angusticeps. Also irregular rainfall and waters which dry up or heat up too quickly may also take their toll of frogs, especially their larvae.

Natural or spontaneous fires as an environmental perturbation may have a considerable short-term impact on certain reptile species. Exposure to heat and contact with flames during fires presents a serious threat, and the only means by which reptiles can survive such a threat is evasion. The tortoise Kinixys natalensis, being a relatively slow moving reptile, is particularly vulnerable to fires, though there may be others, such as the chamaeleon Chamaeleo dilepis dilepis, which may equally be at risk.

Controlled block burns probably have a minimal effect on most reptile populations because many species of snakes and lizards are able to flee to surrounding veld, while populations which are locally decimated may recover through recolonization from surrounding veld. The effect of block burns, however, particularly when fire management is practised frequently to maintain savannas at a sub-climax sere, may be quite severe on slow growing, and slow maturing reptiles such as the tortoise K. natalensis.

In a study on the reaction of the Angulate Tortoise Chersina angulata to fire in fynbos, Wright (1988) found that rock cover and related fire avoidance behaviour is an important aid to local survival of tortoises. In prime K. natalensis habitat at OSCA, namely savanna

grassveld, no rock cover was available. Observations of K. natalensis in the OSCA game park following fires suggests that this tortoise will seek shelter in dense bushes in an attempt to avoid the flames and heat. The success of this fire avoidance behaviour is not known and warrants attention, though at least two specimens which resorted to this behaviour were found burned to death. Frequent fires may prove to have a disastrous effect on the OSCA population of K. natalensis, though further quantitative studies on the survivability of this species to fires and recolonization potential following fires are required. Although the use of tortoises for ritual purposes is another potential threat, no evidence of this practise was recorded from OSCA.

The frequent fires in the game park and cattle camps may have a considerable short-term impact on the snake population. Snakes quickly flee fires (Broadley 1983), but probably more snakes are killed by predators as they attempt to escape a fire than by the fire itself. Because the veld is burnt in blocks, however, surrounding, unburnt veld will act as a refuge from which the snakes can successfully recolonise the burnt veld as it recovers.

The effect of fires on the lizard fauna at OSCA is not known. However, like many of the snake species, excepting perhaps the fossorial species, lizards tend to flee fires or seek rocks under, or burrows in, which to hide. An adult Scelotes brevipes, in a rocky habitat surrounded by grassveld in the game park, was killed by a veld fire. The speed and intensity of the fires will obviously be factors which will affect lizard mortalities. Following a fire in a fynbos reserve, large numbers of dead Mabuya capensis were encountered (pers. obs.), suggesting that even the relatively fleet, limbed skinks are vulnerable to swift fires. Slow lizards like chamaeleons would be particularly vulnerable to fires.

Machinery, such as tractors for ploughing, and vehicles for transporting labourers and produce to and from the agricultural lands, and for brush-covering in the game park, is a threat, especially to slow-moving reptiles. Present evidence suggests that K. natalensis has already disappeared from many of the agricultural lands. Four specimens, three from the game park and one from a cattle camp, displayed evidence of mechanical damage, including cracked bony plates and scutes.

Threats to the terrapin Pelomedusa subrufa appear to be minimal. Steep-sided depressions and cars have a potential for claiming victims; however, locals are averse to this reptile and leave it well alone. Because of this chelonian's ability to hibernate in mud during unfavourable conditions, and due to its ability to migrate from one body of water to the next, it is considered a hardy and adaptable species predisposed to surviving adverse conditions at OSCA.

Man is potentially the greatest threat to snakes. Although present evidence suggests that locals have not had a major impact on the snake population at OSCA, certain species do appear to receive more attention than others. N. mossambica, because of its recognised danger and common occurrence in disturbed areas, is often killed, particularly in and around buildings. P. s. natalensis is singled out and killed for its supposed aphrodisiac properties, and for medicinal and decorative purposes. Other snakes are also killed from time to time and, as one might expect, it is more commonly the larger (and therefore more conspicuous) terrestrial and diurnal species such as Lamprophis fuliginosus, Mehelya capensis capensis and Psammophis phillipsii.

The effect of kills on the recruitment of such vigorous and adaptable species as N. mossambica is probably minimal, but may be quite severe in the case of P. s. natalensis. This may be particularly true if one takes into account that large pythons are conspicuous and, because of their bulk, less able to make good their escape than other snakes. Their slow maturity (3-5 years, according to Branch 1988) and numerous predators (Broadley 1983) make them particularly vulnerable. The local extinction of P. s. natalensis in the eastern Cape, the last wild specimen of which was collected in the Bathurst district in 1927 (Broadley 1983), but which since has recently been reintroduced to the Andries Vosloo Kudu Reserve (Branch 1988d; P. Burdett pers. comm.), attests to the vulnerability of this snake at the hands of ignorant farmers and bounty-hunting locals.

Except for Varanus niloticus niloticus, which is occasionally killed by locals, the lizard fauna is largely ignored. There is no evidence to suggest that the leguaan, or any other lizard species, is threatened by man. The leguaan appears to cope well with catastrophes; healthy populations of this reptile were recorded soon after "Demoina" and the floods of 1987. The size, power, catholic diet, extensive foraging area, and ability to lay eggs in termitaria (FitzSimons 1943 and Branch 1988a), often considerable distances from water, are factors which permit this lizard to cope with adverse conditions.

The populations of the sylvicolous species of frogs, the crocodile and perhaps even the python will be adversely affected by constant flooding. Adult frogs may be able to escape to higher ground during flooding, but eggs and larvae will be defenceless and will get washed away. With constant flooding, these species may be driven to local extinction. Flooding may also affect pythons and crocodiles, in that it may physically wash them away and, in the case of crocodiles, destroy nests or cause eggs to rot. Present evidence suggests that crocodiles which inhabited the Cwaka Dam and Cwaka River in 1983 and 1984 were swept away by the floodwaters associated with cyclone "Demoina", and an adult python was observed struggling

against the current in the Cwaka River during the Natal-KwaZulu floods of 1987. The sylvicolous species of frogs survived these two environmental catastrophes, probably by moving to higher ground, though the effect that these events had on population numbers is not known. Specimens of L. natalensis and L. mossambicus were collected in March 1987 and January 1987 respectively, and both species were heard calling from riverine vegetation in January 1988; a specimen of A. wahlbergii was collected from under a forest canopy in the Cwaka riverine habitat in December 1988 which, at the very least, proves the survivability of these frogs to flooding.

ATTITUDES TOWARD, AND USES OF, AMPHIBIANS AND REPTILES

Generally, traditional Zulus appear to treat amphibians with caution, avoiding them whenever possible and refusing to handle them. This is largely because they believe that frogs and toads, collectively called "amaselasela" (singular "iselasela"), can spit lightning. Exactly how this myth originated is not known. Amphibians are normally active during, or immediately after, rains. In Zululand and other southern African regions of summer rainfall, downpours are often sudden, violent phenomena involving lightning and thunder. Lightning claims a number of lives every year in Zululand. Amphibian vocalisations can be particularly intense during these electric storms. Associating lightning strikes and amphibians is therefore probably based in bad observation, fear, and an inability to rationalise the processes involved in thunderstorm activity.

Notwithstanding their fear of amphibians, Zulus have no known ritual, medicinal or other uses for these animals. For instance, unlike the large west African frog Gigantorana (Conraua) goliath which is eaten by tribespeople, and the Bullfrog Pvxicephalus adpersus, which is regarded as a great delicacy by local Africans in Gazankulu and Venda (Pienaar et al. 1976), no amphibians are eaten by Zulus. Thus, due to both the fear of frogs and the fact that they are not utilised as a source of protein, plus the relatively primitive technology and resultant low environmental impact of these people, these amphibians have fared well at the hands of traditional Zulus. This is exemplified by the species richness of Zululand, and more specifically, the diversity and abundance of these animals at OSCA.

With a few exceptions, reptiles have also fared well. Snakes generally are feared by traditional or uninformed peoples, no matter what their cultural affiliations; in Zululand, snakes, collectively called "izinyoka" (singular "inyoka"), are no exception. At OSCA, most labourers tended to flee at the sight of a snake. Occasionally, however, boys will attack snakes with sticks and stones, but usually their efforts are not determined and they rarely succeed in killing them (M. Manquele pers. comm., and pers. obs). Educated Zulus, who are relatively well informed about snakes, do not usually display the fear of their traditional counterparts and may kill snakes they have found on their premises. It is particularly interesting to note that during the entire survey only two snakes, both venomous (Naja mossambica and Causus rhombeatus), were killed in buildings by Black lecturers, while seven snakes, five venomous and two harmless, were killed by White lecturers in or near buildings. This is significant if one takes into account that there were only three White lecturers and their families resident at OSCA, and over 15 Black lecturers and their families.

The Mozambique Spitting Cobra N. mossambica, colloquially known as the "iMfezi", the Puff-Adder Bitis arietans arietans ("iBululu"), the Black and Green Mambas Dendroaspis polylepis ("iMamba emnyama") and D. angusticeps ("iMamba eluhlaza") respectively, and the harmless Cape File Snake Mehelya capensis capensis ("umHlangwe") were the species most feared at OSCA, though most Zulus could identify only the first two species from specimens and illustrations with reasonable accuracy. It is interesting to note that adult green phase Boomslang Dispholidus typus typus and Spotted or Variegated Bush-Snakes Philothamnus semivariegatus semivariegatus were often mistaken for Green Mambas, which is a common mistake made by many laypeople at snake parks. Traditionally, if "iMamba emnyama" entered a kraal, it was believed to be a reincarnated ancestor, and was treated with utmost respect, the residents quickly leaving the kraal.

At least two Zulu men displayed an interest in the fats of dead snakes, particularly venomous species (N. mossambica and B. a. arietans), but also large constrictors (Python sebae natalensis). Strips of body fat were occasionally given to them and although it was difficult to elicit from them exactly what they wished to do with the tissue, they indicated it would be used for "muthi".

Although the constricting powers of the African Rock Python P. s. natalensis were known to many of the Zulus, this snake was generally not feared by the male labourers. The slaughter of an adult python, estimated to be at least four metres in length, by a game guard in the game park, and a subadult with a total length of approximately two metres by a labourer at the compound, testifies to this. These specimens were killed for "muthi" and trophies; furthermore, this snake is apparently associated with sexual powers, and may be used as an aphrodisiac (F. Sigwebele pers. comm.). According to G. Nukeri and R.S. Shibambu (pers. comm.), the fat of this snake is rubbed into the abdomen to increase sexual potency; the skin is also used to treat tummy disorders in babies. The skin is ignited, and while smouldering is brought to the child's nose for inhalation of the smoke; the skin is sometimes also used for making wristbands and wallets, and is regarded as a status symbol.

Zulus tolerate most lizards. They do, however, have a particular fear of the Tree Agama (Stellio atricollis) which they call "isibanda" (plural "izibanda") and which, presumably because of this lizard's bold colours (especially breeding males), is thought to be highly poisonous. Many Zulus also fear the Flap-necked Chamaeleon Chamaeleo dilepis dilepis.

Locals dislike monitor lizards (Varanus spp.), largely because of this reptile's behaviour of raiding chicken coops where they often consume eggs. Traditional Zulus, especially medicine-men or "izangoma" (singular "isangoma"), will kill this lizard and utilize the fats for

medicinal purposes. The skin is also removed for the manufacture of wristlets and other ornamentation. According to M. Manquele (pers. comm.), the flesh is not eaten but the fats are used in the treatment of burns. The reason for the killing and decapitation of a Water Leguaan Varanus niloticus niloticus in one of the cattle camps is not known, though it has been suggested that the head might well have been used for ritual and "muthi" purposes (R. Mfeka pers. comm.).

Most Zulus are indifferent to tortoises and terrapins, which they collectively refer to as "izimfudu" (singular "ufudu"), and leave them alone. However, traditionally the tortoise did have a ritual use; it was killed and buried in a hut to prevent cattle from wandering off or to bring rains (G. Nukeri and R.S. Shibambu pers. comm.). Whether or not this still occurs is not known; no evidence of tortoise collecting (Kinixys natalensis) was found. Labourers refused to handle terrapins (Pelomedusa subrufa), apparently because of the bad odour they produce.

Crocodiles (Crocodylus niloticus), colloquially called "izingwenya" (singular "ingwenya"), are well known to Zulus and apparently play a prominent role in Zulu myths and legends (M. Manquele pers. comm). In general discussions with labourers and students, crocodiles were regarded with awe, and greatly feared for their man-eating potential. However, few people were aware of the occurrence, or possible occurrence, of crocodiles in either the Cwaka River or Cwaka Dam. There was no evidence to suggest that this large amphibious reptile was in any danger from locals, though the potential threat this reptile poses to both man and livestock may create problems in the future.

It may be concluded, therefore, that amphibians and reptiles presently play a small role in Zulu life and, perhaps with the exception of the leguaan (V. n. niloticus) and python (P. s. natalensis) which are intentionally killed and used for adornment, ritual and "muthi" purposes, are rarely utilised in any considerable way. The effect of veld clearing, burning and other disturbances at OSCA in the past is difficult to assess, but the present species richness and relative abundance of species suggests minimal impact.

CONSERVATION

Nature conservation, in the true sense of the word, is the wise utilization of natural resources for present benefit and for future use. By definition, therefore, a natural resource should be used on a sustained basis so that it will always be available for the use of future generations too. The commercial exploitation of wildlife in the Twentieth Century, including amphibians and reptiles, is cause for concern. Where amphibians and reptiles are used as a source of food, or are in direct competition with man for food, or are a threat to man and his livestock, or stand in the way of development, their numbers are depleted and they are often brought to, or on the verge of, extinction.

The South African Red Data Book - Reptiles and Amphibians (RDB-RA) (Branch 1988c) lists many taxa which are vulnerable in the face of human actions. To achieve any measure of success for the continued existence of these RDB-RA species, it is important not only to establish nature reserves to provide sanctuaries for the animals, or to promulgate legislation in ordinances for the protection of these animals, but to educate the public. Conservation through education is the key to the future survival of our herpetofauna.

At OSCA specifically, there are many taxa which are protected in the 110 ha game park. The present author regards the area large enough to support viable populations of most of the taxa recorded from OSCA. At least one possible exception is the Nile Crocodile Crocodylus niloticus for which there are no breeding records. The mosaic burning programme is to be supported, though plot burns should be carried out less frequently to protect the RDB-RA Natal Hinged Tortoise Kinixys natalensis whose numbers appear to be declining as a result of too frequent fires. Other threats to K. natalensis have been discussed in the chapters on predators and prey, and environmental perturbations and threats respectively.

The occurrence of floods cannot be reliably predicted and there is little one can do in the face of such a natural event; present evidence suggests, however, that aquatic and semi-aquatic species, plus those that are sylvicolous in habits and confined to the Cwaka riverine vegetation, are adapted to such environmental perturbations, with perhaps the exception of C. niloticus. Nevertheless, provided C. niloticus remains a permanent inhabitant of the Nseleni River, the migration of this species back up the Cwaka River following a flood is very possible, and indeed appears to have happened in the past.

Due to traditional attitudes toward amphibians and reptiles generally, the OSCA herpetofauna has fared well at the hands of the local people. Present evidence suggests that there is perhaps only one species, however, which has been singled out by locals for its medicinal and

other properties, and is perhaps the only species threatened with local extinction. This is the African Rock Python Python sebae natalensis. The death of at least two adult specimens of this slow-maturing (3-5 years to reach sexual maturity, according to Branch 1988c), long-lived snake during the study period is cause for concern. The extinction of P. s. natalensis in the eastern Cape Province, where it was marginal due to climatic factors, was probably as a result of human impact; that is, as a combined result of the intolerant attitudes of both Black and White farmers' of this snake's role as a predator, but also as a result of its sought-after medicinal and supposed aphrodisiac properties, for there has been no significant change in the climate over the past two or three hundred years (if anything, there has been a warming effect). Due to increasing human population numbers, P. s. natalensis faces extinction in KwaZulu and other parts of Natal, though in recent years there has been some success with converting farmers, particularly sugar cane farmers, to appreciate the considerable role this constrictor can play in consuming large numbers of vermin, especially cane rats which cause considerable damage to crops.

The death of a large specimen in the game park by a game guard suggests that even the park does not provide a safe refuge for this snake. The game park is important for demonstrating ecological principles taught in the classroom, and for the important purpose of taking school groups into the area and teaching them about conservation. It is important too to educate the local people about the necessity to conserve wildlife, including pythons. This can be achieved by developing a sensible education programme for local people in their home language, including the powerful tool of the audio-visual, and organising a hike through the game park, pointing out the python's function as a predator in the ecosystem. The present author does not rule out the possibility of specimens occasionally being sacrificed for "muthi" and other purposes; indeed, this would be contrary to the principles of conservation. P. s. natalensis specimens could be provided only if the population can be sustained. However, alternatives should be sought, such as sacrificing specimens of more vigorous populations of reptiles, such as the Water Leguaan Varanus niloticus niloticus if this is found an acceptable substitute by the locals. Interference with traditional belief systems is often a sensitive issue, and enforcement of regulations should be resorted to only if education efforts fail to succeed.

In conclusion, apart from the need to educate in order to protect and conserve, and provided there are no plans to utilize the game park for purposes other than nature conservation, the OSCA herpetofauna does not require any special policy for its continued survival. This is because populations of amphibians and reptiles are generally self-regulating and do not require the often intensive management practices of mammals, particularly large mammals, which are to be found in many Zululand game parks and nature reserves.

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APPENDIX

Species tables with unworked mensural data of specimens collected from OSCA.

Table 1

Larval Xenopus laevis laevis

Specimen no.	Date	Habitat/Locality	Age class (Nieuwkoop and Faber 1986)	Sex m./f.	S.V.L. mm	S.L. mm	D.H. mm	mass g
A42 (4 larvae)	19/01/1988	Shallow water in fish pond.	51	-	25,3	-	12,0	-
			54	-	26,2	-	11,2	-
			59	-	31,5	6,2	13,9	-
			62	-	18,6	8,0	7,0	-

Table 2

Post-larval Xenopus laevis laevis

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	S.V.L. mm	S.L. mm	D.H. mm	mass g
A14	30/10/1986	Pool of murky water below water purification plant	Adult	m.	64	29	24	-
A15	30/10/1986	Pool of murky water below water purification plant	Adult	m.	58	25	19	-
.	19/07/1987	Cattle dam below staff houses	Adult	m.	67	28	20	27,84
A36	14/07/1987	Cattle dam below staff houses	Adult	f.	102	40	31	74,33

Table 3

Bufo gutturalis

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	S.V.L. mm	S.L. mm	D.H. mm	mass g
A4	01/08/1986	Grass opposite veterinarian centre	Adult	m.	56	22	21	-
-	23/02/1987	Students' dormitory	Subadult	-	39	17	16	-
-	23/02/1987	Students' dormitory	Adult	-	73	27	27	38,21
-	22/03/1987	Lawn near students' dormitory	Subadult	-	34	13	11	3,66
-	22/03/1987	Lawn near students' dormitory	Adult	-	68	25	26	25,62
-	25/03/1987	Lamp-lit lawn near students' dormitory	Adult	-	60	25	26	26,47
-	01/04/1987	Seepage opposite fish pond	Adult	-	60	24	25	27,98
-	01/04/1987	Seepage opposite fish pond	Subadult	-	37	14	15	4,73
-	30/03/1987	Nursery box near veterinarian centre	Adult	-	67	25	25	33,93
-	21/04/1987	Inside shoe in students' dormitory	Adult	-	79	28	28	42,95
A30	24/04/1987	Gravel near main complex	Adult	m.	64	25	24	24,19

Bufo gutturalis (continued)

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	S.V.L. mm	S.L. mm	D.H. mm	mass g
-	18/05/1987	Students' dormitory	Adult	-	67	27	25	31,34
-	02/06/1987	Students' dormitory	Adult	-	80	31	29	47,75
A71	07/12/1988	Canalised stream below roadside culvert	Juvenile	-	20	7	7	-

Table 4

Larval Schismaderma carens

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	S.V.L. mm	S.L. mm	D.H. mm	mass g
A63	08/12/1988	Fish pond	Larvae		17,3			
(37 larvae)					16,7			
					16,7			
					16,8			
					17,7			
					16,5			
					16,5			
					16,5			
					17,4			
					15,8			
					17,3			
					16,8			
					16,8			
					17,0			
					16,3			
					16,3			
					16,4			
					16,7			
					15,8			
					15,8			
					16,5			
					17,0			
					16,2			
					16,4			
					16,8			
					16,2			
					16,2			
					16,2			
					16,2			
					16,5			
					16,5			

Larval Schismaderma carens (continued)

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	S.V.L. mm	S.L. mm	D.H. mm	mass g
					16,8			
					16,8			
					17,0			
					16,3			
					16,3			
					16,3			
					16,0			

Table 5

Post-larval Schismaderma carens

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	S.V.L. mm	S.L. mm	D.H. mm	mass g
A2	-	-	Adult	m.	64	23	19	-
A6	12/08/1986	Lamp-lit veranda of house	Adult	m.	60	27	20	-
-	19/11/1986	Partially vegetated soil opposite veterinarian centre	Adult	-	63	23	18	-
-	18/12/1986	Moist undergrowth of unkempt garden	Adult	-	77	29	23	43,11
-	06/01/1987	Moist undergrowth of unkempt garden	Adult	-	71	30	25	38,56
-	07/01/1987	Moist undergrowth of unkempt garden	Adult	-	74	28	21	29,20
-	07/01/1987	Plant tray at nursery	Adult	-	79	33	24	45,17
-	17/02/1987	Lamp-lit walkway at main complex	Adult	-	69	28	27	33,74
-	16/02/1987	Lamp-lit walkway at main complex	Adult	-	62	27	28	25,38
-	19/02/1987	Lamp-lit lawn at students' dormitory	Adult	-	64	28	25	26,59
A16(b)	23/02/1987	Kitchen floor of staff house	Adult	f.	63	26	26	30,38

Post-larval Schismaderma carens (continued)

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	S.V.L. mm	S.L. mm	D.H. mm	mass g
-	23/02/1987	Lamp-lit lawn at students' dormitory	Adult	-	63	28	27	30,76
-	23/02/1987	Lamp-lit lawn at students' dormitory	Adult	-	81	30	29	56,34
-	23/02/1987	Lamp-lit lawn at students' dormitory	Adult	-	73	29	26	44,16
-	23/02/1987	Lamp-lit lawn at students' dormitory	Adult	-	66	27	25	32,01
-	02/03/1987	Crack in sandstone wall at veterinarian centre	Adult	-	85	34	32	59,42
-	02/03/1987	Lamp-lit lawn at students' dormitory	Adult	-	68	29	28	33,74
-	18/03/1987	Lawn at main complex	Juvenile	-	27	10	9	1,44
-	20/03/1987	Plant tray at nursery	Adult	-	58	22	19	14,78
-	22/03/1987	Lawn at students' dormitory	Adult	-	78	30	24	44,14
-	22/03/1987	Lawn at students' dormitory	Adult	-	82	33	28	46,49
-	22/03/1987	Lawn at students' dormitory	Adult	-	75	30	27	37,34
-	22/03/1987	Lawn at students' dormitory	Adult	-	59	25	21	24,06

Post-larval Schismaderma carens (continued)

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	S.V.L. mm	S.L. mm	D.H. mm	mass g
-	25/03/1987	Lamp-lit lawn at students' dormitory	Adult	-	69	29	27	31,72
-	27/03/1987	Kitchen floor of staff house	Subadult	-	37	16	13	4,45
-	10/04/1987	Garden undergrowth	Juvenile	-	20	7	7	0,66
-	22/04/1987	Gravel patch at main complex	Subadult	-	45	18	16	9,12
-	22/04/1987	Plant tray at nursery	Juvenile	-	26	10	9	1,78
-	22/04/1987	Plant tray at nursery	Juvenile	-	27	11	10	2,23
-	24/04/1987	Floor of veterinarian centre	Subadult	-	35	15	13	4,05
-	05/05/1987	Floor of veterinarian centre	Subadult	-	30	12	11	2,87
-	06/05/1987	Partially vegetated soil at main complex	Juvenile	-	28	11	10	2,09
-	13/05/1987	Floor of veterinarian centre	Subadult	-	32	13	11	2,82
-	14/05/1987	Shrub near soccer field	Subadult	-	45	20	17	8,51
-	20/05/1987	Nursery	Subadult	-	35	16	13	5,06
-	20/05/1987	Rubble at workshop	Subadult	-	46	19	16	8,96
-	20/05/1987	Rubble at workshop	Subadult	-	44	19	15	7,80

Post-larval Schismaderma carens (continued)

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	S.V.L. mm	S.L. mm	D.H. mm	mass g
-	20/05/1987	Rubble at workshop	Subadult	-	35	14	12	4,27
-	20/05/1987	Rubble at workshop	Subadult	-	35	14	12	4,27
-	20/05/1987	Rubble at workshop	Subadult	-	33	13	11	3,22
-	20/05/1987	Rubble at workshop	Subadult	-	30	12	10	2,39
-	05/06/1987	Cement block opposite veterinarian centre	Juvenile	-	29	13	11	2,55
-	13/07/1987	Kitchen floor of staff house	Adult	-	55	24	21	14,49
-	16/07/1987	Leaf litter under tree near staff house	Subadult	-	42	18	14	7,03

Table 6

Phrynomerus bifasciatus bifasciatus

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	S.V.L. mm	S.L. mm	D.H. mm	mass g
A21	07/01/1987	Outlet pipe of basin in ablution block	Adult	m.	41	13	13	5,34
A27	23/03/1987	Fish pond	Subadult	f.	36	11	11	3,16
-	07/04/1987	Plant tray at nursery	Adult	-	39	12	11	4,27
-	08/12/1988	Outlet pipe of basin in ablution block	Adult	-	40	13	13	5,53

Table 7

Pyxicephalus adspersus edulis

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	S.V.L. mm	S.L. mm	D.H. mm	mass g
A13	-	-	Juvenile	-	23	7	8	-
A16(a)	02/11/1986	Moist stack of grass at nursery	Adult	f.	84	32	34	-
-	30/12/1986	Grass slopes of Cwaka Dam	Adult	-	79	30	30	70,28
-	04/02/1987	Wood plant box at nursery	Adult	-	72	30	34	57,03
A22	21/03/1987	Grassveld in game park	Subadult	f.	50	18	21	14,12

Table 8

Tomopterna natalenis

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	S.V.L. mm	S.L. mm	D.H. mm	mass g
A7	21/08/1986	Irrigation canal in horticulture field	Adult	f.	36	16	14	-
A29	10/04/1987	Grass bank of fish pond	Adult	m.	35	18	14	5,39
A45	19/01/1988	Carpet of grass at fish pond seepage	Adult	f.	31	15	12	-
-	21/01/1988	Edge of cement pond at poultry coop	Adult	m.	30	15	12	-
-	05/12/1988	Moist garden undergrowth	Adult	f.	38	16	16	7,50
-	06/12/1988	Roadside culvert near veterinarian centre	Adult	m.	32	16	14	3,50
-	06/12/1988	Roadside culvert near veterinarian centre	Adult	m.	33	16	14	3,50
-	06/12/1988	Roadside culvert near veterinarian centre	Adult	m.	32	16	14	3,50
-	06/12/1988	Roadside culvert near veterinarian centre	Adult	m.	32	16	14	3,50
-	07/12/1988	Seep below nursery	Adult	f.	39	19	17	8,50

Table 9

Rana angolensis

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	S.V.L. mm	S.L. mm	D.H. mm	mass g
A1	-	-	Adult	m.	60	35	20	21,50
A54	06/12/1988	Roadside culvert near veterinarian centre	Subadult	-	31	19	9	3,00
A55	06/12/1988	Roadside culvert near veterinarian centre	Subadult	-	36	23	12	4,50
A57	06/12/1988	Grass bank of cattle dam at paddocks	Adult	m.	56	35	19	23,50
A64	08/12/1988	Rain-filled depression on bank of Cwaka River	Subadult	f.	42	28	14	7,50

Table 10

Ptychadena oxyrhynchus

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	S.V.L. mm	S.L. mm	D.H. mm	mass g
A12	-	Riverine habitat in game park	Adult	m.	51	35	17	-
A60	07/12/1988	Grass bank at fish pond	Adult	m.	52	39	17	15,50
A70	09/12/1988	Moist horticulture field	Adult	f.	57	43	21	28,00

Table 11

Ptychadena anchietae

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	S.V.L. mm	S.L. mm	D.H. mm	mass g
A37	14/07/1987	Earth drainage canal below horticulture field	Subadult	f.	28	20	10	2,07
A46	19/01/1988	Grass bank at fish pond	Adult	f.	45	30	14	-
A56	06/12/1988	Grass bank of cattle dam at paddocks	Subadult	m.	37	27	14	4,00
A61	07/12/1988	Grass under <u>Syzigium cordatum</u> opposite roadside culvert	Adult	f.	52	36	18	14,00
-	07/12/1988	Grass bank at fish pond	Adult	m.	42	28	15	9,50
-	07/12/1988	Grass bank at fish pond	Adult	f.	46	31	15	-

Table 12

Phrynobatrachus natalensis

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	S.V.L. mm	S.L. mm	D.H. mm	mass g
A32	01/07/1987	Vegetated seep in game park below water purification plant	Subadult	f.	13	7	5	0,24
-	20/08/1987	Rain-filled depression on bank of Cwaka River	Adult	f.	16	10	7	0,55
A44	19/01/1988	Grass-covered seep at fish pond	Adult	f.	16	9	6	-
A63	08/12/1988	Rain-filled depression on bank of Cwaka River	Adult	f.	18	9	5	0,50
A66	08/12/1988	Fish pond	Adult	m.	30	15	11	3,00

Table 13

Phrynobatrachus mababiensis

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	S.V.L. mm	S.L. mm	D.H. mm	mass g
A40	19/01/1988	Grass-fringed slope of cattle dam below staff houses	Adult	f.	11	6	4	-
A41	19/01/1988	Grass-fringed slope of cattle dam below staff houses	Adult	f.	11	5	4	-
A58	06/12/1988	Roadside culvert near veterinarian centre	Adult	m.	14	8	5	<0,50
A62	08/12/1988	Water-filled depression on bank of Cwaka River	Adult	m.	11	6	4	<0,50

Table 14

Cacosternum nanum nanum

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	S.V.L. mm	S.L. mm	D.H. mm	mass g
A28	23/03/1987	Stream below roadside culvert at veterinarian centre	Adult	m.	21	9	8	0,79
A31	01/07/1987	Ephemeral stream below the nursery, dominated by <u>Paspalum urvillei</u> and <u>Sporobolus pyramidalis</u>	Adult	m.	22	10	8	0,77
A33	01/07/1987	Ephemeral stream below the nursery, dominated by <u>Paspalum urvilles</u> and <u>Sporobolus pyramidalis</u> .	Adult	m.	24	10	9	1,00
A53	21/01/1988	Water-filled bowl on the veranda of staff house	Adult	f.	28	12	9	-
-	06/12/1988	Roadside culvert near veterinarian centre	Adult	m.	21	9	7	-

Table 15

Chiromantis xerampelina

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	S.V.L. mm	S.L. mm	D.H. mm	mass g
A24	22/03/1987	Riverine vegetation of Cwaka River	Adult	m.	61	29	19	14,11
-	17/12/1988	<u>Acacia</u> tree near students' dormitory	Adult	f.	77	37	24	41,00
-	08/12/1988	Garden of staff house	Adult	f.	76	37	24	32,00

Table 16

Kassina senegalensis

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	S.V.L. mm	S.L. mm	D.H. mm	mass g
A47	19/01/1988	Grass bank of fish pond	Adult	m.	43	14	14	-
-	06/12/1988	Grass bank of cattle dam at paddocks	Adult	m.	37	13	13	6,00

Table 17

Afrivalus brachycnemis brachycnemis

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	S.V.L. mm	S.L. mm	D.H. mm	mass g
A49	19/01/1988	Fringing vegetation of fish pond	Adult	m.	22	9	6	-
A50	19/01/1988	Fringing vegetation of fish pond	Adult	f.	23	8	6	-
A51	19/01/1988	Fringing vegetation of fish pond	Adult	m.	24	10	7	-
A67	08/12/1988	Fringing vegetation of fish pond	Adult	m.	19	7	6	-

Table 18

Afrivalus fornasinii

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	S.V.L. mm	S.L. mm	D.H. mm	mass g
A34	09/07/1987	Toilet cistern of staff house	Adult	f.	31	15	11	1,86
A35	09/07/1987	Toilet cistern of staff house	Adult	f.	30	15	10	1,67

Table 19

Hyperolius semidiscus

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	S.V.L. mm	S.L. mm	D.H. mm	mass g
A18	20/10/1986	<u>Syzigium cordatum</u> in game park	Adult	f.	33	19	12	-
A23	23/03/1987	<u>Psidium guajava</u> near students' dormitory	Adult	f.	34	18	12	1,73
-	14/04/1987	Grass near Cwaka River	Adult	m.	35	19	12	2,56

Table 20

Hyperolius tuberilinguis

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	S.V.L. mm	S.L. mm	D.H. mm	mass g
A3	01/08/1986	-	Subadult	-	26	13	9	-
-	09/12/1986	<u>Typha capensis</u> in Cwaka Dam	Adult	f.	39	19	12	4,32
A59	07/12/1986	Grass bank of fish pond	Adult	m.	30	16	11	<1,50

Table 21

Hyperolius marmoratus marmoratus/taeniatus

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	S.V.L. mm	S.L. mm	D.H. mm	mass g
A19	31/10/1986	Window pane of students' dormitory	Adult	m.	26	14	10	-
-	09/12/1986	<u>Typha capensis</u> in Cwaka Dam	Adult	m.	30	16	10	2,10
A26	22/03/1987	Grass bank of Cwaka Dam	Adult	m.	28	14	10	1,39
-	31/07/1987	Cement canal in game park	Adult	-	27	14	9	1,53
A43	19/01/1988	Carpet of cut grass covering seep at fish pond	Juvenile	-	20	9	6	-
A52	19/01/1988	Fringing vegetation at fish pond	Adult	m.	27	14	9	-
A20	07/11/1986	Bank of Cwaka River	Subadult?	m.	28	15	10	-

Table 22

Pelomedusa subrufa

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	C.C.L. mm	S.C.L. mm	S.W. mm	S.H. mm	mass g
-	08/12/1986	Small, shallow dam below dairy	Adult	f.	-	230	180	80	1900
-	13/08/1987	Pole foundation in game park below water purification plant	Adult	f.	-	235	185	80	1600
-	12/05/1987	Tarred road opposite ephemeral stream and culvert	Adult	m.	-	250	190	85	2100
-	21/08/1987	Vegetated bank of Cwaka River	Adult	m.	-	255	180	90	2100

Table 23

Kinixys natalensis

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	C.C.L. mm	S.C.L. mm	S.W. mm	S.H. mm	mass g
-	01/09/1986	<u>Acacia</u> veld in game park	Adult	m.	170	130	900	60	-
-	26/11/1986	Grassveld behind dairy	Adult	m.	137	109	825	58	256,08
-	12/07/1987	Grassveld between staff houses and cattle dam	Adult	m.	178	135	98	63	469,67
R102	09/12/1988	Grassveld in game park	Adult	f.	177	138	100	67	495,00

Table 24

Hemidactylus mabouia mabouia

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	T.L. mm	B.L. mm	T. mm	B.D. mm	mass g
-	20/08/1986	Window pane of classroom	Adult	-	ca 120	-	-	-	-
-	12/10/1986	Classroom wall	Subadult	-	ca 90	-	-	-	-
R81	19/03/1987	Window pane of students' dormitory	Adult	-	132	65	67	12	7,48
-	15/06/1987	Blackboard of classroom	Adult	-	98*	53	45*	11	3,08
R101	11/12/1988	Loose bricks near main hall	Juvenile	-	44	23	21	4	<0,50

* tail truncated

Table 25

Lygodactylus capensis capensis

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	T.L. mm	B.L. mm	T. mm	B.D. mm	mass g
R10	29/07/1986	Creosoted pole at nursery	Adult	f.	68	32	36	8	-
R42	24/08/1986	Wall at main complex	Adult	m.	70	30	40	6	-
R58	03/12/1986	Wall at veterinarian centre	Adult	f.	81	33	48	6	1,08
-	30/06/1986	Wall at veterinarian centre	Adult	-	ca 80	-	-	-	-
-	08/06/1987	<u>Pelargonium/Geranium</u> sp. at veterinarian centre	Subadult	-	ca 50	-	-	-	-
-	18/01/1988	Window of staff house	Juvenile	-	27	-	-	-	-

Table 26

Varanus niloticus niloticus

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	T.L. mm	B.L. mm	T. mm	B.D. mm	mass g
R9	-	-	Juvenile	-	295	113	182	22	-
R63	23/10/1986	Inside staff house	Subadult	f.	995	385	610	65	630,00
-	21/11/1986	Grassveld opposite soccer field	Adult	m.	1405	460	945	135	3900,00
R59	22/11/1986	Lawn opposite classroom	Juvenile	-	292	115	177	24	15,27*
-	11/12/1986	Road culvert near staff houses	Adult	f.	1450	555	895	125	-
-	30/04/1987	Cement courtyard of staff house	Adult	f.	1440	550	890	120	4200,00

* specimen dehydrated and emaciated

Table 27

Stellio atricollis

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	T.L. mm	B.L. mm	T. mm	B.D. mm	mass g
R3	-	-	Adult	m.	280	118	162	26	-
R36	-	-	Adult	m.	280	120	160	28	-
R62	29/07/1986	<u>Causarina equisetifolia</u> near main complex	Adult	f.	320	150	180	40	61,95
R71	30/10/1986	<u>Acacia karroo</u> in game park	Adult	f.	235	99	136	36	34,34*
R61	31/10/1986	<u>Erythrina lysistemon</u> opposite dairy	Adult	f.	285	131	154	48	84,92*
R54	09/11/1986	Tarred road near Cwaka River bridge	Adult	m.	277	125	152	47	-
R69	26/01/1987	Inside staff house - brought indoors by domestic cat	Adult	f.	200**	100	100**	30	-
-	19/05/1987	Brick wall at veterinarian centre	Subadult	m.	165	69	96	22	12,80
-	05/06/1987	Brick wall at veterinarian centre	Subadult	f.	162	64	98	19	9,87

* gravid

** tail truncated

Table 28

Acontias plumbeus

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	T.L. mm	B.L. mm	T. mm	B.D. mm	mass g
R5	09/05/1986	Compost heap at nursery	Adult	m.	335	296	39	12	-
TM 68574	(donated April 1989)	-	Adult	f.	415*	385	30*	20	-

* tail truncated

Table 29

Scelotes brevipes

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	T.L. mm	B.L. mm	T. mm	B.D. mm	mass g
R34	18/08/1986	Grass-covered gravel at nursery	Adult	-	-	48	-	2	-
R41	22/08/1986	Rocky outcrop in game park	Adult	-	97*	66	31*	4	-
R39	02/09/1986	Rocky outcrop in game park	Adult	-	115	60	55	5	-
-	08/02/1987	Litter - covered gravel patch at staff house	Subadult	-	64	36	28	2	0,19

* tail truncated

Table 30

Mabuya varia

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	T.L. mm	B.L. mm	T. mm	B.D. mm	mass g
R31	08/08/1986	Interior of veterinarian centre	Adult	m.	122*	56	66*	12	-
R53	02/11/1986	Gravel patch near veterinarian centre	Adult	m.	-	54	-	10	-

* tail tip truncated

Table 31

Mabuya striata striata

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	T.L. mm	B.L. mm	T. mm	B.D. mm	mass g
R7	23/07/1986	Concrete slab opposite veterinarian centre	Adult	f.	153*	87	66*	22	-
R35	22/08/1986	<u>Ficus</u> sp. on banks of Nseleni River	Adult	f.	157	67	90	15	-
R51	08/10/1986	Wall of building at main complex	Adult	f.	185	85	100	18	-
-	23/12/1986	Wall of dairy building	Subadult	-	110	44	66	9	2,07
-	07/01/1987	Wall of building at veterinarian centre	Adult	m.	197	77	120	18	10,46
-	06/02/1987	Loose rock at nursery	Adult	f.	195	85	110	28	28,15
-	09/04/1987	Interior of veterinarian centre	Adult	m.	205	87	118	17	17,34
-	11/05/1987	Interior of veterinarian centre	Adult	-	255	97	158	25	24,97
R86	18/05/1987	Found in gut of <u>Psammophis</u> <u>sibilans brevirostris</u> (R85) collected from garden opposite students' dormitory	Adult	-	150 ⁺	62	88	-	-
-	20/05/1987	Floor of workshop building	Adult	m.	247	92	155	24	22,46

Mabuya striata striata (continued)

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	T.L. mm	B.L. mm	T. mm	B.D. mm	mass g
-	06/12/1988	Savanna grassveld in game park	Adult	-	213	91	122	20	22,50

* tail truncated

+ partially digested

Table 32

Panaspis wahlbergii

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	T.L. mm	B.L. mm	T. mm	B.D. mm	mass g
R16	28/07/1980	Riverine vegetation in game park	Adult	-	68*	41	27*	5	-
R74	11/02/1987	Found in gut of <u>Lycophidion capense capense</u> (R82) collected from <u>Lipia</u> bush in game park	Adult	-	70 ⁺	-	-	5	-

* tail shows evidence of truncation

+ partially digested

Table 33

Chamaesuara macrolepis

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	T.L. mm	B.L. mm	T. mm	B.D. mm	mass g
R57	02/12/1986	Ploughed soil under <u>Causarina equisetifolia</u> opposite abattoir	Juvenile	-	143*	43	100*	4	0,53
-	31/07/1987	Dry cement canal in game park	Adult	-	525	105	420	6	6,57

* tail truncated

Table 34

Leptotyphlops scutifrons scutifrons

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	T.L. mm	B.L. mm	T. mm	T. into T.L. (x)	B.D. mm	mass g
R33	11/08/1986	Garden at staff house	Subadult	-	65	59	6	10,8	1	-
-	14/08/1986	Garden adjacent to students' dormitory	Subadult	-	56	52	4	14,0	1	-
R40	29/08/1986	Garden opposite classroom	Subadult	-	56	52	4	14,0	1	-
R49	19/09/1986	Soil patch opposite classroom	Subadult	-	60	54	6	10,0	1	-
-	01/03/1987	Interior of staff house	Subadult	-	65	59	6	10,8	1	0,08
-	21/03/1987	Yard opposite students' dormitory	Adult	-	115	104	11	10,5	2	0,54
-	31/03/1987	Grassveld in game park	Adult	-	126	114	12	10,5	2	0,26
-	04/05/1987	Concrete floor opposite veterinarian centre	Subadult	-	67	61	6	11,2	1	0,06
R90	26/06/1987	Interior of veterinarian centre	Subadult	-	66	60	6	11,0	1	0,07
-	02/07/1987	Entrance to staff house	Subadult	-	60	55	5	12,0	1	0,08
-	13/07/1987	Interior of staff house	Subadult	-	55	49	6	9,2	1	0,05
R92	13/08/1987	Rock-strewn bank of Cwaka River	Adult	-	125	116	9	13,9	2	0,35

Leptotyphlops scutifrons scutifrons (continued)

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	T.L. mm	B.L. mm	T. mm	T. into T.L. (x)	B.D. mm	mass g
R93	13/08/1987	Rock-strewn bank of Cwaka River	Adult	-	108	99	9	12,0	2	0,29
R94	13/08/1987	Xerophytic vegetation on rocky slope in game park	Subadult	-	90	82	8	11,3	2	0,20
.	18/01/1988	Interior of staff house	Subadult	-	65	60	5	13,0	1	-
.	12/12/1988	Grassveld in game park	Adult	-	165	148	17	9,2	3	<0,50

Table 35

Lamprophis fuliginosus

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	T.L. mm	B.L. mm	T. mm	T. into T.L. (x)	B.D. mm	mass g
R37	-	-	Subadult	m.	295	250	45	6,6	6	-
-	22/08/1986	Old zinc sheet on grass patch near main complex	Subadult	-	ca 280	-	-	-	-	7,90
R52	31/10/1986	Lawn opposite students' dormitory	Adult	f.	1000	860	140	7,1	25	-
-	22/03/1987	Tree at entrance of students dormitory	Subadult	f.	410	350	60	6,8	7	13,21
-	13/04/1987	Grass patch in piggery	Subadult	m.	295	245	50	5,9	6	8,67
-	08/05/1987	Reservoir excavation above compound	Subadult	m.	380	308	72	5,3	9	14,17
-	05/06/1987	Moribund grass opposite nursery	Subadult	f.	470	420	50	9,4	10	43,62 ⁺
-	19/09/1987	Lawn at staff house	Adult	-	ca 700	-	-	-	-	-
-	13/04/1988	<u>Erythrina lysistemon</u> opposite classroom	Adult	-	ca 800	-	-	-	-	-

+ with meal

Table 36

Mehelya capensis capensis

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	T.L. mm	B.L. mm	T. mm	T. into T.L. (x)	B.D. mm	mass g
R11	-	-	Adult	m.	ca 1000	-	-	-	-	-
R17	-	-	Subadult	f.	305	268	37	8,7	7	-

Table 37

Psammophis sibilans brevirostris

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	T.L. mm	B.L. mm	T. mm	T. into T.L. (x)	B.D. mm	mass g
R13	-	-	Adult	m.	780	570	210	3,7	11	-
R15	12/08/1980	-	Adult	f.	805	575	230	3,5	10	-
R79	22/10/1986	Lawn opposite main hall	Adult	-	-	600	-	-	19	81,06
R85	18/05/1987	Garden opposite students' dormitory	Adult	m.	635*	505	130*	-	12	46,90
R88	13/06/1987	Walkway opposite classroom	Subadult	m.	448	313	135	3,3	7	9,13
R98	-/10/1988	Tarred road surrounded by grassveld	Adult	f.	-	620	-	-	16	-

* tail truncated

Table 38

Psammophis phillipsii

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	T.L. mm	B.L. mm	T. mm	T. into T.L. (x)	B.D. mm	mass g
R12	-	-	Adult	-	-	-	337	-	-	-
R80	12/03/1987	Long grass below veterinarian centre	Adult	m.	-	1035	-	-	27	348,28
R95	03/11/1987	Tarred road opposite grassveld	Adult	f.	1805	1285	520	3,5	34	-
TM 68570	(donated April 1989)	-	Adult	f.	1495	1080	415	3,6	35	-
TM 68624	(donated April 1989)	-	Adult	f.	1490	1060	430	3,5	35	-
TM 68630	(donated April 1989)	-	Adult	f.	1320	925	395	3,3	30	-

Table 39

Aparallactus capensis

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	T.L. mm	B.L. mm	T. mm	T. into T.L. (x)	B.D. mm	mass g
R47	-	-	Adult	-	212	169	43	4,9	5	-
-	13/08/1987	Rocks on banks of Cwaka River	Adult	-	230	175	55	4,2	5	3,02

Table 40

Atractaspis bibronii

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	T.L. mm	B.L. mm	T. mm	T. into T.L. (x)	B.D. mm	mass g
R30	-	:	Adult	m.	513	476	37	13,9	12	-
-	18/04/1986	Gravel soil at nursery	Subadult	-	ca 200	-	-	-	-	-
R97	23/08/1987	Courtyard of staff house	Adult	m.	540	507	33	16,4	10	18,77

Table 41

Prosymna ambigua stuhlmannii

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	T.L. mm	B.L. mm	T. mm	T. into T.L. (mm)	B.D. mm	mass g
R60	05/10/1986	Garden at staff house	Adult	m.	193	160	33	6,4	6	1,88
R100	09/12/1988	Savanna grassveld in game park	Adult	f.	162	146	16	10,1	5	-

Table 42

Philothamnus semivariiegatus semivariiegatus

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	T.L. mm	B.L. mm	T. mm	T. into T.L. (x)	B.D. mm	mass g
R20	-	-	Adult	f.	820	545	275	3,0	9	-
R21	-	-	Adult	f.	845	585	260	3,3	9	-
R26	-	-	Adult	f.	790*	620	170*	-	10	-
R27	-	-	Adult	m.	745	480	265	2,8	8	-
R28	-	-	Adult	-	670*	450	220*	-	7	-
TM 68638	12/08/1985	-	Adult	m.	755	480	275	2,7	8	-
-	05/08/1986	Wooden pole along game park fence	Adult	-	ca 650	-	-	-	-	-
-	31/08/1986	<u>Bougainvillea</u> creeper on library wall	Adult	-	ca 900	-	-	-	-	-
-	07/10/1986	Garden at main office complex	Adult	-	ca 800	-	-	-	-	-
-	02/11/1986	<u>Hibiscus</u> shrub at students' dormitory	Adult	-	ca 800	-	-	-	-	-
R73	02/11/1986	Garden at main office complex	Adult	f.	790	535	255	3,1	8	28,42
-	13/11/1986	Shrub opposite classroom	Subadult	-	ca 500	-	-	-	-	12,54
-	22/12/1986	<u>Impatiens</u> flower opposite classroom	Subadult	-	ca 550	-	-	-	-	-

Philothamnus semivariiegatus semivariiegatus (continued)

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	T.L. mm	B.L. mm	T. mm	T. into T.L. (x)	B.D. mm	mass g
-	26/02/1987	Cypress tree opposite classroom	Adult	-	ca 600	-	-	-	-	-
R87	01/03/1987	Walkway opposite main hall	Adult	f.	738	493	245	3,0	8	12,02
-	18/05/1987	<u>Acacia karroo</u> between veterinarian centre and game park	Subadult	f.	390	270	120	3,3	4	4,48
-	07/11/1987	Garden opposite dining hall	Subadult	-	ca 450	-	-	-	-	-
-	02/12/1987	Shrub opposite students' dormitory	Subadult	-	ca 450	-	-	-	-	-

* tip of tail truncated

Table 43

Crotaphopeltis hotamboeia

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	T.L. mm	B.L. mm	T. mm	T. into T.L. (x)	B.D. mm	mass g
R14	-	-	Subadult	f.	290	245	45	6,4	8	-
R23	-	-	Adult	m.	560	477	83	6,7	14	-
-	23/04/1986	Lawn of staff house	Juvenile	-	124	103	21	5,9	4	1,27

Table 44

Dispholidus typus typus

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	T.L. mm	B.L. mm	T. mm	T. into T.L. (x)	B.D. mm	mass g
-	17/04/1986	<u>Erythrina lysistemon</u> opposite main hall	Adult	f.?	ca 1200	-	-	-	-	-
R6	07/06/1986	Leaf litter below <u>Acacia karroo</u> near entrance gate	Subadult	m.	670	475	195	3,4	11	-
R76	18/08/1986	Slab of concrete opposite veterinarian centre	Adult	m.	975	687	288	3,4	12	41,00
-	30/10/1986	<u>Acacia nilotica</u> in burnt savanna in game park	Adult	f.?	ca 1400	-	-	-	-	-
-	30/12/1986	Gravel road between staff houses and main complex	Adult	m.?	ca 1400	-	-	-	-	-
-	10/02/1987	<u>Acacia robusta</u> in veld below compound	Adult	m.?	ca 1500	-	-	-	-	-
-	30/03/1987	<u>Casaurina equisetifolia</u> near main complex	Adult	m.	1050	760	290	3,6	13	82,04
-	30/03/1987	<u>Casaurina equisetifolia</u> near main complex	Adult	m.	1380	990	390	3,5	22	252,02
-	12/05/1987	<u>Ficus sycomorus</u> opposite veterinarian centre	Adult	f.?	ca 1500	-	-	-	-	-
-	13/05/1987	<u>Delonix regia</u> in garden of staff house	Adult	m.?	ca 1000	-	-	-	-	-

Dispholidus typus typus (continued)

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	T.L. mm	B.L. mm	T. mm	T. into T.L. (x)	B.D. mm	mass g
-	08/08/1988	Large tree in garden of staff house	Adult	m.?	ca 1200	-	-	-	-	-

Table 45

Thelotornis capensis capensis

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	T.L. mm	B.L. mm	T. mm	T. into T.L. (x)	B.D. mm	mass g
-	26/11/1986	Game park fence surrounded by savanna	Adult	-	1200	750	450	2,7	19	35,53
-	17/03/1987	<u>Hyphaene natalensis</u> on bank of fish pond	Adult	-	1150	755	395	2,9	18	56,43

Table 46

Naja mossambica

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	T.L. mm	B.L. mm	T. mm	T. into T.L. (x)	B.D. mm	mass g
R2	24/03/1986	Interior of students' dormitory	Subadult	m.	540	434	106	5,1	17	-
R3	16/04/1986	Garden of staff house	Subadult	m.	495	397	98	5,1	15	-
R4	20/04/1986	Lawn opposite students' dormitory	Subadult	m.	530	434	96	5,5	13	-
-	25/04/1986	Cement block at entrance to veterinarian centre	Adult	- ca	850	-	-	-	-	-
-	08/08/1986	Hay stacks in garage of staff house	Adult	-	1210	970	240	5,0	32	347,42
-	21/10/1986	Savanna grassveld between game park and veterinarian centre	Adult	- ca	1000	-	-	-	-	-
R55	12/11/1986	Nursery box opposite veterinarian centre	Subadult	m.	565	458	107	5,3	15	-
-	13/11/1986	Rack of shelves in library	Adult	- ca	750	-	-	-	-	-
-	21/11/1986	Lawn opposite classroom	Adult	-	950	775	175	5,4	25	152,00
R65	27/12/1986	Scrap wood in carpentry room	Adult	m.	835	690	145	5,8	24	-
R66	07/01/1987	Piping opposite carpentry room	Adult	m.	750	607	143	5,2	19	84,76

Naja mossambica (continued)

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	T.L. mm	B.L. mm	T. mm	T. into T.L. (x)	B.D. mm	mass g
R67	07/01/1987	Hippoptamus skull on veranda of staff house	Adult	m.	830	665	165	5,0	20	136,23
-	03/02/1987	Interior of staff house	Adult	- ca	800	-	-	-	-	-
-	04/02/1987	Wooden fence at old nursery opposite horticulture field	Adult	-	1290	1 070	230	5,9	32	383,44
R75	19/02/1987	Interior of staff house	Adult	m.	900	727	173	5,2	22	177,34
R77	01/03/1987	Veranda of staff house	Adult	m.	920	740	180	5,1	26	212,75
-	19/04/1987	Courtyard at staff house	Adult	-	970	775	195	5,0	22	-
-	05/05/1987	Courtyard at staff house	Subadult	-	425	340	85	5,0	11	23,93
-	20/05/1987	Lawn opposite classroom	Subadult	-	520	423	97	5,4	14	32,85
-	15/06/1987	Lawn opposite students' dormitory	Subadult	-	650	520	130	5,0	16	62,01
-	22/06/1987	Interior of staff house	Adult	-	1040	850	190	5,5	26	182,46
-	17/03/1988	Garden opposite staff house	Adult	- ca	700	-	-	-	-	-
-	-/05/1988	Sports ground	Subadult	- ca	400	-	-	-	-	-
-	22/09/1988	Crack in wall in staff house	Juvenile	- ca	350	-	-	-	-	-

Naja mossambica (continued)

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	T.L. mm	B.L. mm	T. mm	T. into T.L. (x)	B.D. mm	mass g
R99	23/11/1988	Vegetation patch adjacent to staff house	Adult	f.	770	615	155	5,0	18	.

Table 47

Causus rhombeatus

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	T.L. mm	B.L. mm	T. mm	T. into T.L. (x)	B.D. mm	mass g
R1	07/03/1986	Drain at main office complex	Subadult	f.	390	354	36	10,8	13	-
R38	-	-	Subadult	f.	310	283	27	11,5	12	-
-	13/05/1986	Trays at nursery	Subadult	-	ca 300	-	-	-	-	-
R48	04/08/1986	Footpath leading to students' dormitory	Adult	f.	595	537	58	10,3	25	96,57
R83	10/08/1986	Lawn adjacent to students' dormitory	Subadult	-	ca 350	-	-	-	-	-
R68	24/08/1986	Rocks between sports field and students' dormitory	Adult	f.	480	432	48	10,0	26	-
-	15/10/1986	Walkway between main hall and dining hall	Adult	m.	470	422	48	9,8	18	76,94
R50	19/10/1986	Entrance to students' dormitory	Adult	f.	450	403	47	9,6	17	-
R56	13/11/1986	Poultry coop	Adult	f.	-	485	-	-	24	-
-	07/08/1987	Grass patch near staff house	Subadult	f.	ca 380	-	-	-	-	-
-	-/09/1987	Hole in bank of fish pond	Adult	f.	ca 440	-	-	-	-	-
-	23/09/1986	Sheet of corrugated iron on lawn near main complex	Adult	m.	480	432	48	10,0	26	-

Causus rhombeatus (continued)

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	T.L. mm	B.L. mm	T. mm	T. into T.L. (x)	B.D. mm	mass g
-	07/10/1986	Cement walkway opposite classroom	Subadult	-	ca 350	-	-	-	-	40,98

Table 48

Bitis arietans arietans

Specimen no.	Date	Habitat/Locality	Age class	Sex m./f.	T.L. mm	B.L. mm	T. mm	T. into T.L. (x)	B.D. mm	mass g
R70	28/03/1986	Interior of students' dormitory	Subadult	f.	370	347	23	16,1	25	40,71
-	05/01/1987	Pile of creosoted poles at the stores	Subadult	m.	420	375	45	9,3	33	138,27
-	19/08/1987	Rock and sand patch near savanna thicket at Cwaka River	Juvenile	-	ca 250	-	-	-	-	-