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## **DIVERSITY AND BIOGEOGRAPHY OF HERPETOFAUNA OF THE TANA RIVER PRIMATE NATIONAL RESERVE, KENYA**

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### **ABSTRACT**

Herpetofaunal surveys of the Tana River Primate National Reserve were conducted between December 1998 and January 2002 to generate a species list. Systematic search-and-seize, visual encounter survey and pitfalls with drift fence methods were used. Additional data derived from the collection of the National Museums of Kenya and the literature were also used. A total of 40 species comprising 16 amphibians (all anurans), and 24 reptiles (14 lizards, 1 crocodile, 8 snakes, 1 tortoise) were recorded.

### **INTRODUCTION**

Accumulation of distribution data normally advances understanding of zoogeographic and ecological patterns of local herpetofaunas. Some areas, however, remain relatively poorly known. This is particularly true of the lower Tana River region. Herpetological studies in the region began in the British colonial era but these were mainly limited to taxonomic descriptions (*e.g.* Loveridge, 1936a,b, 1957).

The forests of the lower Tana River support a high biodiversity. Zoogeographically, the riverine forests of the Tana River Primate National Reserve (TRPNR) are an extension of the lowland coastal forests (see Burgess and Clarke, 2000), a well known biodiversity hot spot (Andrews *et al.*, 1975; Myers *et al.*, 2000). However, the Tana River region also supports several endemic vertebrates not known from the coastal region, including two endemic species of primates: the Tana River red colobus *Colobus rufomitratu*s Peters, 1879 and the Tana River mangabey *Cercocebus galeritu*s Peters, 1879 (Andrews *et al.*, 1975).

The Tana River Delta region, the floodplain just south of the reserve from Garsen, is the only section of the river basin that received attention from early herpetological collectors. Arthur Loveridge collected material in this region in 1934 including many taxa that remain

poorly known today (Loveridge, 1936a,b) such as the Tana River writhing skink *Lygosoma tanae* Loveridge, 1935 known from one other collection in Tanzania; the mabuya-like writhing skink *Lygosoma mabuiiformis* (Loveridge, 1935), which occurs also in southern Somalia (Spawls *et al.*, 2002); the mud-dwelling caecilian *Schistometopum gregorii* (Boulenger, 1894) also recorded from the Rufiji area in Tanzania (Channing & Howell, 2006) and the endemic Tana River caecilian, *Boulengerula denhardtii* Nieden, 1912, recently resurrected from the synonymy of *Schistometopum gregorii* by Wilkinson *et al.* (2004). Some of these species are probably rare, while others might be overlooked and thus undercollected. In general baseline information on biodiversity in the TRPNR and its surrounding habitats remains both patchy and scanty (Bennun & Njoroge, 1999). Nevertheless, despite these gaps in knowledge, the overall patterns of species richness, faunal affiliations, and endemism exhibited by the herpetofauna is worth noting. The goal of this study was to generate a species list of amphibians and reptiles and to describe their distribution and abundance in different forest patches and habitats of the reserve. Additional data were incorporated from earlier collection and voucher specimens deposited mainly at National Museums of Kenya, Nairobi and from the literature to supplement the results of the present survey.

## DESCRIPTION OF STUDY SITE

The area of focus for our work is the Tana River Primate National Reserve. It is located on the lower reaches of the river, in Tana River district, Coast Province, Kenya. It is located between the district headquarters town of Hola and Garsen near the Tana River delta, between 1°11'–1°54'S and 40°05'–40°11'E. (figure 1) covering an area of 171 km<sup>2</sup> astride the Tana River (Bennun & Njoroge, 1999).

The reserve was gazetted in 1976 to protect two endemic and endangered species of primate, the Tana River red colobus and the crested mangabey. However, due to a loss of forest habitat, even the populations of these primates have declined (Marsh, 1981). The diverse habitats range from riparian forest, woodland, grassland, bushland to different forms of wetlands (ox-bow lakes, ponds, marshes, ditches, trenches) in addition to the river itself. The riparian forest has been reported as having had ancient links to the Congo basin forest during the Miocene period (Butynski & Mwangi, 1994). It is one of Kenya's biodiversity hotspots as well as a major faunal link between northern and southern biogeographic zone species (Marsh, 1981). There are a total of 71 forest fragments in the riverine ecosystem, of which only 16, covering just 10 km<sup>2</sup>, fall within the reserve (Bennun & Njoroge, 1999). The reserve is managed by Kenya Wildlife Service as trust land under the jurisdiction of Tana River County Council. The climate is described as intermediate between the humid coastal biome and the semi-arid hinterland (Bennun & Njoroge, 1999). Vegetation consists of variably scattered *Acacia* woodland and evergreen *Dobera-Salvadora* communities (Andrews *et al.*, 1975). The inhabitants of the area include the Pokomo, Somali, and Orma communities. The Pokomo are a sedentary riverine community whose livelihood depends on farming, bee-keeping and fishing. On the other hand, the Somali and the Orma groups are mainly nomadic pastoralists who also practice subsistence farming. These activities, besides general land degradation, have been cited as threats to biodiversity conservation (Ochiago, 1990). Large scale irrigation schemes and hydro-electric dams upstream are also believed to have caused negative impacts on the ecological characteristics of the lower reaches of the Tana River basin (Butynski & Mwangi, 1994).

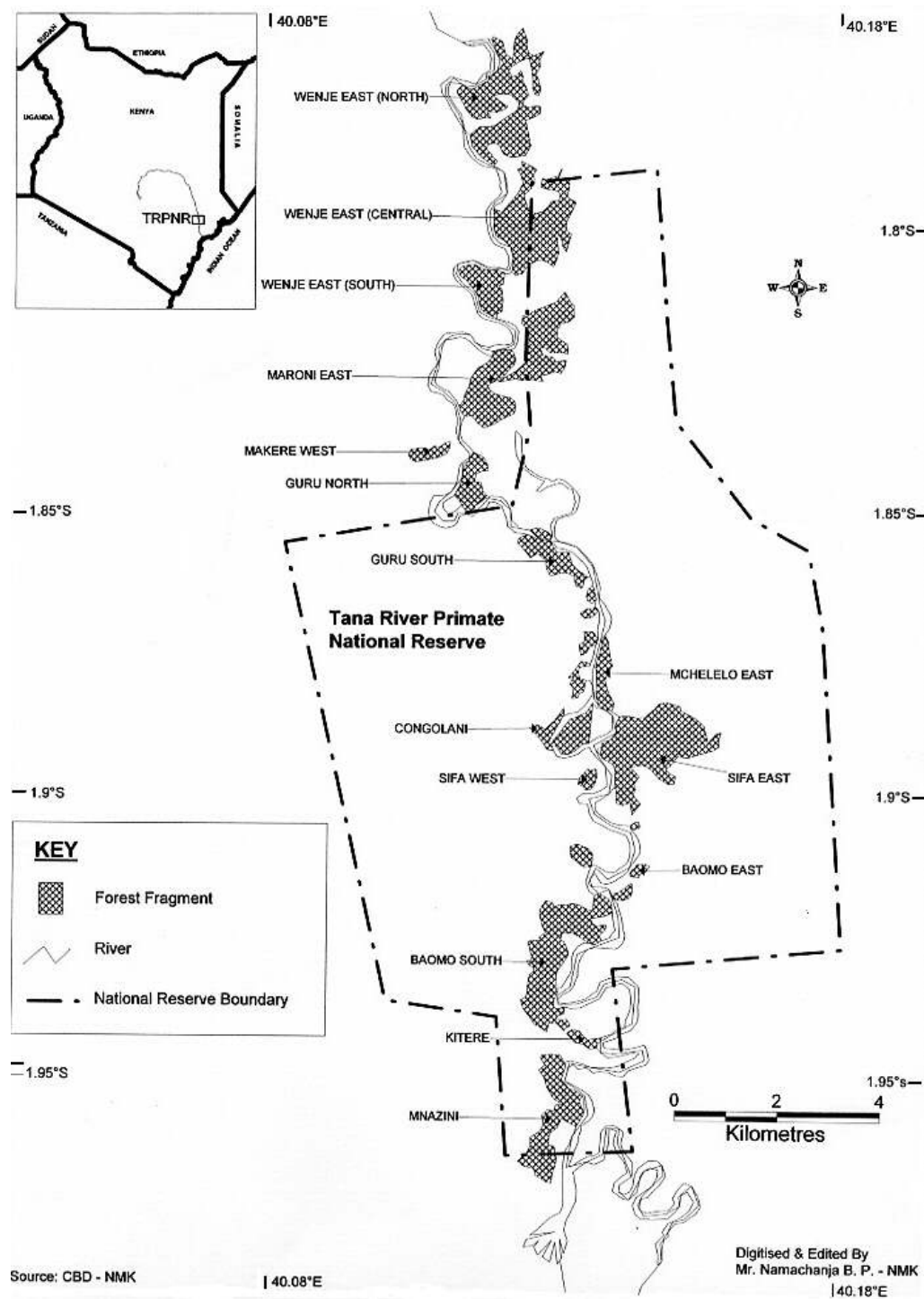


Figure 1. Map of Tana River Primate National Reserve showing the forest fragments. Inset: A map of Kenya showing the location of the reserve.

## MATERIALS AND METHODS

### Selection of the sampling sites

Surveys were done between 10–19 December 1998, 22 September–3 October 2000 and 3–12 January 2002. Attempts were made to sample all the major forest fragments within the reserve. Typically, one forest patch was sampled per day, whereas night sampling was conducted sporadically.

Forest fragments on both the west and east bank of the river were included. On the west bank we sampled Mchelelo forest, Baomo forest & bushland, Guru North, Kipendi, Maroni, Mnazini South/North forest & woodland, Sifa, Kibaoni, Kitere forest & grassland, Wenje trading centre, Congolani central, Makere, Kivuko, Lake Kivuko, Lake Ponge and the river basin, while on the east bank we collected in the Guru and Sifa forests. The dates and the number of days spent in the major sites includes: Mchelelo West 1° 53'S, 40° 8'E 55m (5 days 10–14/12/1998); 2 days 9 & 25/9/ 2000 & 3 days 5, 8–9/1/2002), Kitere 1° 57'S, 40° 8'E 53m (1 day 15/12/1998, 2 days 25–26/9/2000); Baomo west 1° 50'S, 40° 50'E 36m (1 day 14/12/1998), Baomo bushland 1° 51'S, 40° 49'E 40m (2 days 5–6/12/2002), Kipendi B West 1° 49' S, 40° 7' E, 65m (1 day 8/1/2002), Sifa East 1° 53'S, 40° 8'E 68m (1 day 10/1/2002), Guru North 1° 51'S, 40° 7'E 58m (2 days 27 & 29/9/2000, 1 day 6/1/2002), Guru East 1° 53'S, 40° 8'E 48m (1 day 11/1/2002), Mnazini area 1° 58' S, 40° 8' E, 47m (4 days 11–13 & 15/12/1998, 1 day 25/9/2000, 1 day 5/1/2002), Lake Ponge area 1° 59' S, 38° 8' E, 44m (1 day 14/12/1998), Maroni West 1° 49' S, 40° 7' E, 44m, (1 day 29/9/2000, 1 day 2/10/2000), Congolani 1° 59' S, 39° 7' E, 43m (1 day 30/9/2000). Collection localities reported on the basis of previous work in the region are indicated in the text in association with the relevant species accounts.

### Herpetofaunal sampling

Systematic search-and-seize and visual encounter survey (VES) sampling methods described by Karns (1986) and Heyer *et al.* (1994) were used to generate species lists and to determine relative abundance as well as habitat use. The method involved selecting the habitats to be sampled and carrying out an intensive search of all the possible amphibian and reptile micro-habitats. Spatial boundaries were not set other than staying within the study habitat. A time limit of one to six hours was set for the search. Day searches were done mainly for reptiles and night searches for amphibians and nocturnal reptiles using spotlights.

Depending on the species captured and/or observed, the following standard data were recorded: locality, altitude, date, time, habitat characteristics, and any other biologically important information such as species sex and activity (mating, feeding, basking, calling, and resting).

### Trapping and other capture techniques

To supplement the efforts of search-and-seize method as well as to eliminate some problems and biases associated with this method, trapping techniques were employed. Alternating and/or straight-line drift fences and 17 litre plastic bucket pitfall traps were used (Karns, 1986; Heyer *et al.*, 1994; Sutherland, 1996). For reptiles, especially snakes and lizards, stunning by rubber band was used to immobilize moving animals, which were then picked up by hand for examination. Because of the limited total sampling time and the types of sampling techniques used, we expect that certain taxa occupying particular specialized habitat types may not have been surveyed adequately. This is particularly true

for fossorial and other cryptic forms, and we rely, in part, on literature records for these species.

What follows is an annotated list of amphibian and reptile species. We list localities and voucher specimens for each taxon. All the voucher specimens referred to in the paper are deposited in the National Museums of Kenya (NMK) Nairobi. NMK prefixes for voucher specimens used before the numbers in the text are A/- = amphibians, S/- = snakes and L/- = lizards. Nomenclature follows Frost (2004) for amphibians and Spawls *et al.* (2002) for reptiles, unless otherwise noted.

## SPECIES ACCOUNTS

### AMPHIBIA,

The broad distribution patterns noted in amphibian species accounts are derived from Frost (2004). Used also is the species distribution data worked out during the 2002–2004 Global Amphibian Assessment (GAA) by The World Conservation Union (IUCN)/SSC, Conservation International–Centre of Applied Biodiversity and NatureServe (<http://www.globalamphibians.org>).

#### Anura

##### Bufonidae

Guttural toad *Bufo gutturalis* Power, 1927

A common toad in eastern and southern Africa. The species was collected in Baomo forest in 1980 (NMK A/3797/1–2) by Mark S Easterbrook.

Flat-backed toad *Bufo maculatus* Hallowell, 1856

A toad common in most savannas in sub-Saharan Africa from west through central to east and southern Africa. Some specimens were collected from Mchelelo forest (NMK (A/3648 by Dr Luc De Vos in 1999; A/3889) in pit-fall traps while others were collected in Guru North (A/3901), Kipendi forest (A/3891) and Mnazini (Forozani) (NMK A/3881). This species appears to be the most common toad in the reserve.

Steindachner's toad *Bufo steindachneri* Pfeffer, 1893.

A sub-Saharan species that ranges from west Africa through central to east and southern Africa. In Kenya it is common in moist coastal forests where it is found in thick vegetation in swamps or other standing water. Specimens were collected in Mchelelo (NMK A/3631; 3633/1–2), Baomo West (NMK A/1636/1–5; 1637/1–34; 3385/1–22; 3391/1–38 by Mark S. Easterbrook in 1980; A/3632/1–2).

Spiny toad *Bufo xeros* Tandy, Keith & Duff-Mackay, 1976

This species is widely distributed in sub-Saharan Africa as far south as Tanzania. Collected in 1999 at Mchelelo area (NMK A/3641/1–2; A/3896/1–3) and Baomo bushland (A/3888/1–5).

##### Microhylidae

Red-banded rubber frog *Phrynomantis bifasciatus* (Smith, 1847)

A species mainly distributed from east and central and southern Africa. It has been collected from Baomo forest in 1980 by Mark S. Easterbrook (NMK A/1978).

**Petropedetidae**

East African puddle frog *Phrynobatrachus acridoides* (Cope, 1867)

A sub-Saharan species that ranges from the Sahel to east and southern Africa and is found in moist and dry savannas and forests (Channing, 2004). Some specimens were collected from the edge of the Mchelelo forest (NMK A/3895), Guru North (A/3643/1–2), Baomo West (A/1635/1–16 in 1980 by Mark S. Easterbrook; A/3644/1–2), L. Ponge (A/3642/1–2, Maroni West (A/3765) and Kipendi forest (A/3892/1–2) on the shores of an ox-bow lake where they were quite abundant.

**Ranidae**

Galam white-lipped frog *Amnirana galamensis* (Dumeril & Bibron, 1841)

A sub-Saharan African species occurring in savannas from Senegal to Mozambique. Specimens collected from Baomo forest in 1980 by Mark S. Easterbrook (A/1634/1–5; 3384/1–6).

Common Mascarene ridged frog *Ptychadena mascareniensis* (Dumeril & Bibron, 1841)

A sub-Saharan species also occurring on the Seychelles and Mascarene Islands, where it has been introduced (Vences *et al.*, 2004a). Specimens were collected in Baomo forest in 1980 by Mark S. Easterbrook (A/1639/1–13; 3217/1–4; 3218; 3389/1–6; 3625/1–4; 3626/1–2; 3627; 3628/1–5; 3649/1–3).

Broad-banded ridged frog *Ptychadena mossambica* (Peters, 1854)

A species of the moist savanna of east Africa south to southern Africa. Individuals were observed and some collected in Baomo bushland (A/3884/1–5), Guru North (A/3886/1–5), Guru East (A/3899/1–3), Mchelelo forest edge (A/3897/1–2), Sifa East (A/3898), Lake Ponge, Kitere, Baomo West, L. Ponge and Mnazini.

Schilluk ridged frog *Ptychadena schillukorum* (Werner, 1907)

A sub-Saharan species sporadically distributed from Senegal, Sudan, Egypt, Ethiopia, and south through Kenya, Tanzania to Malawi and Mozambique. In Kenya common in the moist coastal strip. Some specimens were collected from Baomo (A/1638/1–3; 3387; 3390/1–2; in 1980 by Mark S. Easterbrook; A/3885/1–6), Mchelelo forest (A/3622) and Lake Ponge (A/3621/1–2).

Savanna plain ridged frog *Ptychadena anchietae* (Bocage, 1867)

An eastern and southern African species that ranges from Ethiopia, Democratic Republic of Congo through East Africa south to Angola and the Republic of South Africa. This is the most common grass or ridged frog in the country occurring in both dry and moist savanna. Specimens were collected in Guru North (A/3636/1–7; 3887/1–3), Guru East (A/3900), Baomo West (A/3386/1–5; 3388/1–8 in 1980 by Mark S. Easterbrook; A/3638), Mchelelo forest edge (A/3634/1–2; 3894/1–11), Lake Ponge (A/3637) and Mnazini (A/3635/1–3; 3766/5–7); Kitere (A/3766/1–4). It was commonly observed on the shores of Kipendi forest ox-bow lake.

African or edible bullfrog *Pyxicephalus edulis* Peters, 1854

Distributed in moist coastal strip from Somalia, Kenya, Tanzania, Mozambique to the Republic of South Africa. A single juvenile was collected near a swamp at Bahati area of

Mnazini (A/3882). This is the first record for the occurrence of this species in the reserve and further inland along the river basin.

### **Rhacophoridae**

Kellers' or northern foam nest tree frog *Chiromantis kelleri* Boettger, 1893

A species distributed from the dry lowland savannas of Kenya and Tanzania (Channing & Howell, 2006). It is known to aestivate under the *makuti* thatched houses during the dry season where it can be easily collected. One specimen was collected in Baomo bushland (A/3890) and five from Mnazini, Kibaoni bushland (A/3629/1–5). Formally a subspecies of Peters' or central foam-nest tree-frog *Chiromantis petersii* Boulenger, 1882 (Loveridge, 1957; Schiøtz, 1999). These authors give varying and even overlapping distribution for these two species. Loveridge (1957) recognized two subspecies, *Chiromantis petersii petersii* in Kenya to be restricted to drylands south of the equator and *Chiromantis petersii kelleri* to the north of the equator in Northern Frontier district. Schiøtz, (1999) also recognises the two subspecies and states that *Chiromantis petersii kelleri* ranges from southern Tanzania (Lake Rukwa) to northern Somalia and Ethiopia. Poynton (2000) recognizes these two to be discrete species through critical re-examination of a number of separating characters. Largen (2001) pointed out that *Chiromantis kelleri* has long been considered as a subspecies of *Chiromantis petersii* Boulenger, 1882, but the two taxa seem very different, the former being appreciably larger, having more extensive webbing between the outer fingers, different ventral colouration and perhaps larger digital discs. An examination of the voucher specimens at NMK show that the two species overlap in distribution particularly in south-eastern Kenya with *Chiromantis kelleri* confined to drier areas.

Eastern foam-nest tree-frog *Chiromantis xerampelina* Peters, 1854

Distributed from coastal Kenya and northern Namibia south to KwaZulu Natal, Republic of South Africa. In Kenya this is a coastal biome tree-frog preferring moist lowland forests. Seven specimens were collected on the edge of Mchelelo forest (A/3537; 3630/1–2; 3893/1–3).

### **Hyperoliidae**

Fornasini's leaf folding spiny frog *Afrixalus fornasinii* (Bianconi, 1849)

A species that ranges from coastal Kenya southward through Tanzania, Mozambique, Malawi to the eastern Republic of South Africa. Specimens collected in the TRPNR were found on leaves and also in wet axils of bananas near the river in Mnazini (A/3623; 3624/1–4).

Translucent tree frog *Hyperolius pusillus* (Cope, 1862)

Distributed from southern Somalia south along the coastal lowlands to the Republic of South Africa. A tree frog with sporadic distribution in the savanna areas of coastal and south-eastern parts of the country. Four specimens were collected in a swamp in Baomo bushland where males were competitively calling (A/3883/1–3).



**REPTILIA****Testudines****Testudinidae**

Leopard tortoise *Geochelone pardalis* (Bell, 1828)

Widespread in semi desert, dry and moist savanna. This species occurs in sub-Saharan Africa from Sudan to the southern Cape (Branch, 1988). A lone male was observed in an area near Wenje, on the reserve boundary.

**Squamata****Lacertilia****Gekkonidae**

White-headed dwarf gecko *Lygodactylus picturatus* (Peters, 1870)

Wide ranging species from coastal Kenya and Tanzania where replaced by other species in this complex. In Kenya it is common in moist coastal forest but has a distribution spreading along the Tana River up to the Nyambene Hills (Spawls *et al.*, 2002). This dwarf gecko is quite abundant in the reserve. It occurs in virtually all forest patches on trees, branches and even dead logs (L/2389/1–8; 2436/1–3; 2440, 2442, 2431, 2445, 2448).

Tree gecko *Hemidactylus platycephalus* Peters, 1854

This species has a wide range in the savannas from Somalia south to Mozambique, west into Malawi, eastern Zambia and eastern Zimbabwe and also Madagascar and the Comoro islands (Welch, 1994a). This species and *H. mabouia* are micro-sympatric and very similar in appearance. However, *H. platycephalus* is possibly more common than *H. mabouia* in the TRPNR, occurring in many trees, especially large ones, in all the forest patches in the region (L/2390/1–13, Guru North, Maroni & Congolani); L/2443/1–2, Guru North). The taxonomic history of this taxon has been reviewed by Vences *et al.* (2004b).

Tropical house gecko *Hemidactylus mabouia* (Moreau de Jonnés, 1818)

A species with a cosmopolitan distribution in the tropics frequenting human habitation (Welch, 1994a, Powell *et al.*, 1998). The species is very common within the Mchelelo research camp on the *makuti* thatched *bandas* but it is also present on trees, especially those with hollows, in all the forest fragments (L/2449 from Guru East).

**Family Chamaeleonidae**

Graceful chameleon *Chamaeleo gracilis* Hallowell, 1842

A species with a wide distribution from Senegal and Gambia east through DRC, Central African Republic and Uganda, Kenya, northern Tanzania and Somalia (Nečas, 2004; Spawls *et al.*, 2002). This is a moist and dry savanna chameleon with sporadic distribution in Kenya. Common in south-eastern and northern parts of the country, but very rare along the coastal strip where *C. dilepis* dominates. A single male was collected in a grassed bushland at Bahati area in Mnazini (L/2437). This is the first record for this species in the area.

Flap-necked chameleon *Chamaeleo dilepis* Leach, 1819

A widely distributed sub-Saharan species from Cameroon east to Kenya and south to northern Namibia, Botswana, and northeastern Republic of South Africa (Welch, 1994b). This is a common savanna species in south-eastern and coastal strip of Kenya. Two specimens were collected in Mchelelo forest (L/2391; 2444).

Kenya pygmy chameleon *Rieppeleon kerstenii* (Peters, 1868)

Distributed from northern Kenya through south-eastern south to northern Tanzania. Elsewhere in northern Somalia and eastern Ethiopia. Two subspecies are recognized in Kenya with *R. k. robecchi* sporadically distributed in the northern parts and *R. k. kerstenii* in the south-eastern parts and the coast (Spawls *et al.*, 2002). In the lower Tana the species has been recorded and collected at Mnazini area (L/263 by T.E. Mathews). This species was recently removed from *Rhampholeon* and designated as the type species of the newly erected genus *Rieppeleon* (Mathee *et al.*, 2004).

### Scincidae

The Afro-Malagasy skinks, formerly included in the New World genus *Mabuya* Fitzinger, have recently been assigned to the revived genus *Trachylepis* Fitzinger (Bauer, 2003).

Speckle-lipped skink *Trachylepis maculilabris* (Gray, 1845)

This species has a wide range in forest and savanna throughout west, central and east Africa as far as central Mozambique (Broadley & Cotterill, 2004). In Kenya it is distributed in the lowland coastal forests including Taita Hills as well as the rain-forests of western Kenya including the Lake Victoria basin. This species is the most common skink in the reserve, occurring in virtually all forest patches but rare in the bushlands. It is the most commonly seen skink at the Mchelelo research camp and Maroni forest. This is the first record for this species in the reserve upstream from the coast (L/2298; 2299; 2301; 2441 Mchelelo & L/2386/1–3 Maroni).

Tree skink *Trachylepis planifrons* (Peters, 1878)

An east and central African species known from Ethiopia, Somalia, Kenya, Tanzania, Uganda, northern Zambia, and south-eastern DRC (Spawls *et al.*, 2002). A common savanna species occurring in the coastal strip, southeastern and northern parts of the country. The species was observed and/or collected in the bushlands of Sifa, Guru East and North forests on short bush trees (L/2383 from Guru North & L/2446 from Guru East).

Striped skink *Trachylepis striata* (Peters, 1854)

This species ranges from Ethiopia to South Africa and west through northern Zambia to DRC (Broadley & Cotterill, 2004). A common species in both moist and dry savanna habitats in Kenya. Common in the Kenya highlands but with sporadic occurrence in southeastern, coast and northern parts. Some specimens were observed on short trees in Kipendi, Guru North Forest and one specimen was collected at Bahati in Mnazini (L/2439) and three from Guru North (L/2384/1–3). The species is not very common in the TRPNR. However, it appears to be locally abundant in human habitations, such as at Kipendi.

Short-necked skink *Trachylepis brevicollis* (Wiegmann, 1837)

This skink ranges from Sudan, Ethiopia, Eritrea and Somalia south through much of Kenya with some sporadic records in northern Tanzania (Spawls *et al.*, 2002). A low altitude

dryland species widely distributed in east and northern Kenya. The species appears to be uncommon in the reserve. Two individuals were observed in Sifa East and one collected from Guru North forest (L/2382).

Variable skink *Trachylepis varia* (Peters, 1867).

This skink ranges from the Sudan to South Africa and west to Namibia (Broadley & Cotterill, 2004). This species has been described as highly adaptable and occurs throughout the southern half of Kenya as high as 3600 m. Individuals were observed in the grassland of Guru North and Maroni West and two individuals collected from Guru North (L/2385/1–2).

### Lacertidae

Spekes' sand lizard *Heliobolus spekii* (Günther, 1872)

An East African species occurring from southern Ethiopia and Somalia through much of Kenya to northern Tanzania (Spawls *et al.*, 2002). In the reserve it is the most common sand lizard present in all forest patches. The reserve may host two subspecies separated by the Tana River, with *Heliobolus spekii spekii* (L/2388/1–2 Mchelelo & L/2438 Mnazini) on the west bank and *Heliobolus spekii sextaeniata* on the east bank (Loveridge, 1957).

Southern long-tailed sand-lizard *Latastia longicaudata* (Reuss, 1834).

This East African form ranges from southern Sudan, southern Ethiopia and Somalia south through much of Kenya to northern Tanzania (Spawls *et al.*, 2002). This is a common terrestrial sand lizard widespread in the Kenyan drylands. It is common in the reserve bushlands. Individuals were observed and one specimen collected in the Guru North (L/2387) and others recorded in Sifa East forests.

### Varanidae

Nile monitor *Varanus niloticus* (Linnaeus, 1766)

The most widespread lizard in Africa. Occurs in much of sub-Saharan Africa, extending from South Africa northward to Egypt (Branch, 1988; Spawls *et al.*, 2002; Broadley & Cotterill, 2004). A widespread monitor lizard in all suitable water courses, like rivers, swamps, lakes, and ponds. It is very common in the river and commonly observed on the river banks. Some individuals even frequent the Mchelelo research camp as scavengers.

### Serpentes

#### Typhlopidae

Zambezi blind snake *Rhinotyphlops mucruso* (Peters, 1854)

Ranges from coastal Kenya, south to Zimbabwe and central Mozambique and west through the southern provinces of the DRC to northern Angola (Broadley & Cotterill, 2004). The largest blind snake in the world (maximum 950 mm). Presence in the reserve is a range extension inland along the river basin. Two specimens were collected, one at Mchelelo research camp inside a shower room and another in a woodland forest along the road (S/3566).

#### Pythonidae

All pythons are assigned to the family Pythonidae (McDiarmid *et al.*, 1999).

**Central African rock python *Python sebae* (Gmelin, 1789)**

A central and eastern African species. In East Africa widespread in Uganda but sporadic in both Kenya and Tanzania. In Kenya it occurs along the coastal strip, lower Tana River basin and the Lake Victoria basin (Spawls *et al.*, 2002). The species has been sighted in the area occasionally; its imprints were observed at the Mchelelo research camp.

**Colubridae****Cape brown house-snake *Lamprophis capensis* Dumeril & Bibron, 1854**

Found throughout eastern and southern Africa, extending into the horn of Africa being replaced in plateau areas of Kenya by *L. fuliginosus* (Boie, 1827) (Hughes, 1997). Four specimens were collected within Mchelelo forest (S/3449; 3521; 3568/1–2) and research camp.

**Spotted green bush-snake *Philothamnus punctatus* Peters, 1867**

Ranges from southern Somalia through Kenya mainly on the coastal strip including the Lower Tana River with some isolated records in northern parts, south through coastal Tanzania, inland to Lake Malawi and south to central Mozambique (Spawls *et al.*, 2002). One specimen was seen on a palm tree in Mchelelo forest not far from the river bank. One specimen was collected within Mchelelo research camp inside a *makuti* thatched *banda* and other specimens were observed in Mnazini woodland and Mchelelo (S/3450, 3566).

**South-eastern green snake *Philothamnus hoplogaster* (Günther, 1863)**

A species restricted to the coastal strip and south-eastern Africa. A single individual was seen in Guru East forest near the river bank bushes. Others were observed in Lake Vukoni (L/3522), Mnazini Kibaoni, and Baomo West (S/3451).

**White-lipped snake *Crotaphopeltis hotamboeia* (Laurenti, 1768)**

A Pan-African species. Abundant throughout the moist savannas and woodlands of East Africa, from sea level to 2500 m altitude. Elsewhere, south to southern Africa, north to Eritrea, west to Senegal (Spawls *et al.*, 2002). In the reserve the species was commonly found at night on the shores of swamps and ponds, possibly hunting for frogs. Some individuals were collected in Baomo bushland (S/3570), Mchelelo forest edge and Guru North (S/3571).

**Cross-barred tree snake *Dipsadoboa flavida broadleyi* Rasmussen, 1989**

This subspecies ranges from southern Somalia through coastal and southeastern Kenya south through Zanzibar Island and Tanzania south to Mozambique (Spawls *et al.*, 2002). This is tree snake recorded for the first time in the reserve. It has a restricted range on the coastal strip. Specimens were collected within the Mchelelo research camp mainly in the *makuti* thatched *bandas* (S/3527, 3569).

**Eastern stripe-bellied sand snake *Psammophis orientalis* Broadley, 1977**

Found in coastal thicket and moist savanna along the length of East African coast, a short distance up the Tana River, and south through coastal Tanzania. Elsewhere, inland to Malawi, Mozambique, and eastern Zimbabwe (Spawls *et al.*, 2002). One individual was observed in Mchelelo research camp and another in Kitere grassland.

## Crocodylia

### Crocodylidae

Nile crocodile *Crocodylus niloticus* Laurenti, 1768

The species occurs in rivers and lakes of sub-Saharan Africa south to eastern South Africa (Broadley & Cotterill, 2004). The reserve has a large viable population and crocodiles are regarded as the most significant problem animal by locals causing both human and livestock death. One suitable nesting site in use was found on the east bank of Sifa East forest and Guru North forest.

### Expected species

There were reports by non-herpetologists of a number of species in the reserve such as *Gerrhosaurus flavigularis* Wiegmann, 1828, *Varanus albigularis* (Daudin, 1802) (in reserve bushlands), *Thelotornis* sp. (in Mchelelo forest), *Naja melanoleuca* Hallowell, 1857 (Mchelelo forest), *Naja nigricollis* Reinhardt, 1843 (Sifa East forest), *Naja pallida* Boulenger, 1896 (Baomo bushland), *Bitis arietans* (Merrem, 1820) (Sifa East forest), *Causus resimus* (Peters, 1862) (Wenje). Their occurrence needs confirmation.

The following species have distributions and habitat requirements that make their occurrence in the reserve possible: Amphibians: *Boulengerula denhardti* Nieden, 1912, *Schistometopum gregorii* Boulenger, 1894, *Xenopus muelleri* (Peters, 1844), *Afraxalus pygmaeus* (Ahl, 1931), *Hyperolius argus* Peters, 1854, *Hyperolius parkeri* Loveridge, 1933, *Hyperolius tuberilinguis* Smith, 1849, *Kassina maculata* (Duméril, 1853), *Tomopterna cryptotis* (Boulenger, 1907); *Kassina senegalensis* (Duméril & Bibron, 1841); *Leptopelis flavomaculatus* (Günther, 1864); *Leptopelis concolor* (Ahl, 1929); *Arthroleptis stenodactylus* (Pfeffer, 1893); Lizards: *Lygosoma sundevalli* (A. Smith, 1849), *Lygosoma tanae* Loveridge, 1935, *Lygosoma mabuiiformis* (Loveridge, 1935), *Hemidactylus angulatus* Hallowell, 1852, *Heliobolus neumanni* (Tornier, 1905). Snakes: *Gongylophis colubrinus* (Linnaeus, 1758); *Crotaphopeltis braestrupi* Rasmussen, 1985, *Thelotornis* sp., *Dendroaspis polylepis* (Günther, 1864); *Dendroaspis angusticeps* (A. Smith, 1849); *Rhinotyphlops unitaeniatus* Peters, 1878; *Lycophidion depressirostre* Laurent, 1968; *Lycophidion capense* (A. Smith, 1831); *Rhamphiophis rostratus* Peters, 1854, *Dispholidus typus* A. Smith, 1829; *Prosymna stuhlmanni* (Pfeffer, 1893); *Hemirhagerrhis nototaenia* (Günther, 1864); *Hemirhagerrhis kelleri* Boettger, 1893; *Psammophis punctulatus* (Duméril & Bibron, 1841); *Psammophis mossambicus* Peters, 1882; *Rhamphiophis rubropunctatus* (Fischer, 1884); *Aparallactus lunulatus* (Peters, 1854); *Dasypeltis medici* (Bianconi, 1859); *Dasypeltis scabra* (Linnaeus, 1758); *Atractaspis bibronii* (A. Smith, 1849); *Psammophis biseriatus* Peters, 1881; Chelonians: *Kinixys belliana* (Gray, 1831); *Kinixys spekii* (Gray, 1863); *Pelusios sinuatus* (A. Smith, 1838).

## DISCUSSION

Our knowledge of the Tana River region herpetofauna still remains poor. This is one of the areas in Kenya that still needs more thorough herpetological work. What we have provided here is just an eye opener into what can be found through rapid assessment. Long term systematic sampling will undoubtedly lead to new records and possibly new species. Some of the species known only from early collections in the region have been collected elsewhere in eastern Africa such as *Lygosoma tanae*, *L. mabuiiformis*, *Crotaphopeltis braestrupi* and *Heliobolus neumanni* (Spawls *et al.*, 2002) and *Schistometopum gregorii* (Channing &

Howell, 2006) and the fact that we could not detect any of these species may be attributable to the limited sampling effort. The location of the region makes it an important biodiversity area. The Tana River region lies in a transition zone between the typical eastern and south-eastern fauna with close affinity to coastal biome species. The riverine flora and the bushland account for this mosaic.

A good number of amphibians may occur in the region that were not collected in our surveys. In part, this results from a paucity of collecting activity in the region during the night and rainy season. Species such as caecilians have specialized micro-habitat requirements and are only found through active digging in such habitats. For others their appearance is opportunistic, following the irregular rains or flooding.

The most speciose element in the reptile fauna is the lizard genus *Trachylepis*, with *Trachylepis maculilabris* being possibly the most abundant diurnal reptile in the riverine forest. Of special importance are the presumably rare species such as *Lygosoma tanae*, *L. mabuiiformis*, *Schistometopum gregorii*, *Crotaphopeltis braestrupi* and *Heliobolus neumanni*, which have not been collected in the area since the 1930's (Loveridge, 1957; Spawls *et al.* 2002).

Endemism in the region is very low at the species level. Only the caecilian *Boulengerula denhardtii*, recently resurrected as a full species by Wilkinson *et al.*, 2004, is endemic.

The herpetofauna of the region has a high affinity to the lowland coastal forests and even central African species. Notable examples are, *Dendroaspis angusticeps*, *Dispadoboa flavida broadleyi*, *Pyxicephalus edulis*, *Afrixalus forasini*, *Chiromantis xerampelina* (coastal forests), *Rhinotyphlops mucruso*, *Trachylepis maculilabris* and *Python sebae* (sub-Saharan Africa)

In conclusion, the work presented here reports new records for a number of species as indicated in the text. This rich herpetofaunal assemblage is as a result of high habitat heterogeneity that ranges from the grasslands, forest, woodland, to bushlands.

Andrews *et al.* (1975) analyzed the flora of the Tana region. They found that it consists mainly of endemic forms and several with an East African to Asian distribution, with few taxa having general African distributions. They observed the fauna to be consistent with this floral analysis. From our data on herpetofauna, two major geographical relationships of the lower Tana can be deduced: a large sub-Saharan Africa or at least widespread element, and an equally large element specific to the eastern forests. This implies that these forests, as a whole, have been isolated long enough from the central Africa forests to have developed a characteristic biota, and also suggest that the coastal forest was at one time more continuous.

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