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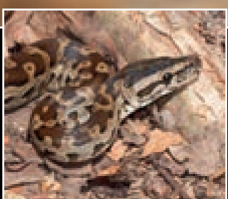
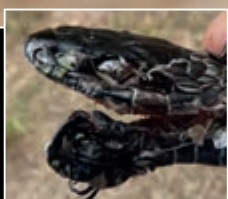
AHN

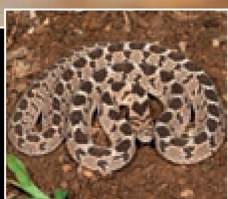
AFRICAN HERP NEWS



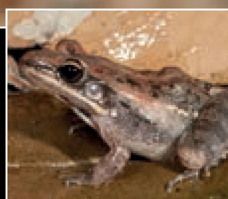
Southern Rock Python
Predation by Carnivores



Boomslang
Melanistic Coloration



Montane Egg-eater
Diet and Distribution



Mapacha Ridged Frog
Distribution

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The HAA is dedicated to the study and conservation of African reptiles and amphibians. Membership is open to anyone with an interest in the African herpetofauna. Members receive the Association's journal, *African Journal of Herpetology* (which publishes review papers, research articles, and short communications – subject to peer review) and *African Herp News*, the Newsletter (which includes short communications, natural history notes, book reviews, bibliographies, husbandry hints, announcements and news items).

NEWSLETTER EDITOR'S NOTE

Articles shall be considered for publication provided that they are original and have not been published elsewhere. Articles will be submitted for peer review at the Editor's discretion. Authors are requested to submit manuscripts by e-mail in MS Word '.doc' or '.docx' format.

The views and opinions expressed in articles are not necessarily those of the Editor.

COVER PHOTOGRAPH: *Chondrodactylus angulifer*
Photograph by: Shivan Parusnath.

AHN EDITORIAL

This edition of *African Herp News* consists primarily of the abstracts from the 12th HAA conference held in Gobabeb Research and Training Centre, Namibia from 20 – 22 November 2014. Reading through the abstracts gives one a great appreciation for the diversity of research being conducted on African herpetofauna. Whether you're interested in systematics, phylogenetics, spatial ecology, stable isotope ecology, dietary strategies, anti-predatory strategies, snakebite, climate-driven extinction risks, species conservation plans or all of the above (and more!), you'll want to give the abstracts a careful read. As you can see from the group photograph of conference attendees, herpetologists are a friendly, good-looking bunch. If you weren't there, now you know what you missed out on and can make plans to join us for the 13th HAA conference!

While we're talking about conferences, don't forget the World Congress of Herpetology (WCH) is having their next meeting in Hangzhou, China from 15 – 21 August 2016. If you're interested in attending the 8th WCH, visit the conference website (http://wch8.worldcongressofherpetology.org/) for more information and details. Due to the timing of the 8th WCH meeting, the 13th HAA conference is being planned for the first quarter of 2017. The 13th HAA conference is being organised by James Harvey and his committee and will be held in KwaZulu-Natal at a soon-to-be-disclosed location. More details will be coming soon so watch this space and keep an eye on the HAA Facebook page (https://www.facebook.com/Herpetological-Association-of-Africa-144176885638420/).

Lastly, I'd like to thank all those who have given us feedback on the new layout and how we can keep making the *African Herp News* better and better. Your comments and suggestions are appreciated and I am considering making some changes in 2017. With the new colour layout, I am continually looking for interesting cover photographs. One of the main challenges is finding a portrait photograph. Many of us compose landscape photographs of herpetofauna by default but the next time you're photographing an interesting animal or behaviour, see if you can get a few portrait photographs and send them through. The cover photograph does not have to come from a submitted article so don't hesitate to send me your best shots!

Gavin Masterson PhD
Editor: African Herp News, January 2016

12th Conference of the Herpetological Association of Africa, Gobabeb Research & Training Centre Namibia, 20-22 November 2014

Pythonidae
Python natalensis Smith, 1840
Southern Rock Python

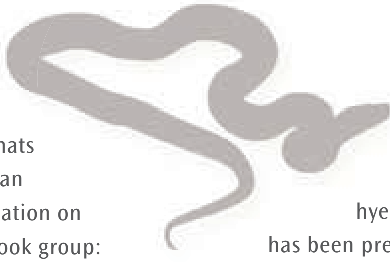

Photo for image reference provided by Johan Marais

PREDATION BY CARNIVORES

The advent of various formats of social media has led to an increase in reports of predation on African reptiles (see Facebook group: Predation Records – Reptiles and Amphibians). Here I present details of an incident of leopard predation on a Southern Rock Python, and then compare and contrast this with 15 other records of predation on this species by a variety of large carnivores that are available in various social media outlets (see web links below). It is known that various small carnivores, e.g. honey badger, banded mongoose, etc, kill and feed on snakes, including pythons. However, these are not discussed here, although such predation may represent a significant cause of mortality for young python. That large mammalian carnivores, e.g. lion, leopard, Cape hunting (painted) dog and hyena, consume African pythons has been previously noted (e.g. Broadley 1982, FitzSimons 1930). However, these reports are anecdotal and the circumstances associated with the predation event are usually poorly detailed. In such cases it is not obvious if the python was killed specifically for food, or if its death arose secondarily following co-option of prey it had just captured or even swallowed. In the latter the python may not even be eaten, but simply disemboweled and the prey taken from its stomach. Such an event is not strictly predation on the python, although the subtle distinction is moot with respect to python mortality.

Figure 1. Python natalensis A. Smith 1840 (Illustrations of the Zoology of South Africa, Smith, Elder & Co., London 840)

INCIDENT

On 23 August 2014 an adult female Southern Rock Python (*Python natalensis* Smith, 1840), with a total length of approximately 4 m, was observed being eaten by a well-known adult male leopard (the 'Airstrip Male', *Panthera pardus*) in the Mala Mala Game Reserve, Sabi Sands Conservancy, Mpumulanga Province, South Africa. It was observed in flood debris and granite boulders on the side of a dry stream bed, just above its confluence with the Sand River (24° 47' 19" S, 31° 31' 44" E; 317 m a.s.l.). The python, including the contained developing ova (number known, Fig. 1), was subsequently consumed at intervals over 2-3 days by the leopard. The partially eaten python was hidden in thick brush when unattended (Fig. 2).

Figure 1. Adult male leopard eating half-developed python ova.

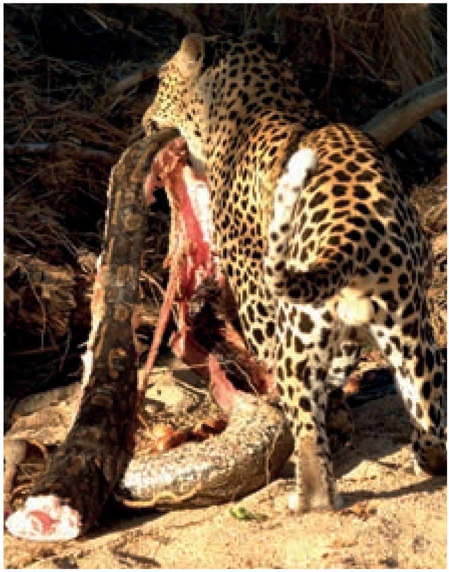

Figure 2. Leopard hiding partially consumed python in thick brush.

Figure 3. Leopard with python; note damage to leopard's left eye.

The leopard was born in June 2006, and had been observed to kill two other pythons in the few years prior to the current incident (pers. comm. M. Meyer, 23 October 2014; specific details are not available). In September 2013 the leopard was effectively blinded in the left eye (Fig. 3) during a fight with another male. Previously the individual fed largely on small antelope such as steenbok, duiker and impala, but was known to have even killed an adult male kudu (September 2012 pers. obs.). Despite its eye injury it is reported to have regularly killed its normal mammalian prey. As it was observed to eat pythons prior to its injury, the predation detailed here is therefore unlikely to have been an opportunistic switch to less mobile prey items following the accident.

OTHER PYTHON – CARNIVORE ENCOUNTERS

Details of the 16 python-carnivore encounters discussed are summarized in Table 1. Of the 16 encounters analysed 13 (81%) were with leopards, of which four incidents including two leopards, with three of these reported to include a female and her large cub. The other probably involved young siblings fending for themselves. Only one encounter involved lion, whilst the remaining two encounters involved hyena, one of a group of six, the other a solitary adult. All of the encounters involved pythons over 1.5 m, with most being between 3.0-4.0 m (<3 m: 3; 3-4 m: 9; >4 m: 4). In 11 (69%) of the 16 encounters the python was killed, with only four of the pythons managing to escape after being attacked or after being ignored (the fate of one other is unknown). No large stomach contents were visible in 12 of the pythons and therefore the incident was unlikely to have been stimulated by co-option of prey milled by the pythons. Of the four remaining encounters, two involved pythons that had just killed prey but which they had not yet begun to swallow. The first (Web 10, below) involved two lionesses attracted to the distress calls of a female impala (*Aepyceros melampus*) as it was being constricted by a python. On approach one of the lionesses pulled at the hind quarters of the dead impala, whereupon the python uncoiled and left its prey and moved quickly into cover. It made no aggressive or defensive behaviours towards the lion, implying that the python had made a 'cost-benefit' assessment of the danger of defending its prey with respect to the danger of being itself attacked. The departing python was ignored by the lionesses, which took the impala and presumably consumed it (the video ends). The second encounter (Web 4) involved an adult leopard that approached a python as it was uncoiling from a small impala that it had just killed. On confrontation with the leopard the python backed slowly into bush and struck repeatedly at the approaching leopard. It also gave a distracting defensive tail display, in which the tail was curled into the air highlighting the white ventral surface. The leopard gave a number of paw strikes towards the python's head, but unfortunately the recording ends at this stage and it is not known if the python was killed or allowed to retreat, or if it or its prey, was consumed. Two other incidents both included the death of the pythons. In a brief series of photographs (Web 7), an adult leopard killed a python with had a conspicuous stomach content. After killing the python it is not stated if the leopard subsequently consumed the python, its stomach contents (prey unknown), or both. Again at Mala Mala reserve, an adult leopard killed a 3-4 m python with full stomach and carried it in to a tree (Web 5). The stomach content (a subadult impala) then fell from the open stomach during transfer in the tree, and was seized on the ground by an adult hyena. The python was subsequently consumed by the leopard.

During four incidents with early recordings of the predator's behaviour towards the python, in one (Web 10) the lion predators were only interested in the python's prey and allowed the snake to retreat. This it did quickly, with no threat or defensive tail display. Three other encounters (Web 3, 8 and 12) involved adult leopards, but none appeared to be predation attempts on the python. They all involved the python striking at, and giving defensive tail displays towards the potential predators. In two of these encounters the leopards give paw beats at the pythons, but no sustained attack resulted and the pythons in both instances were allowed to escape. In the last encounter (Web 2), a female leopard sparred with and killed a python whilst watched by her cub. The leopard positioned herself out of range from the python strikes, was not distracted by its tail display, and killed it with lateral paw strikes to the head. The mother displayed caution in its attacks and the incident may involve, in part, training of the watching cub. The python was subsequently eaten over two days.

One incident (Web 12) involved a non-predation encounter between a young leopard and small python (<2 m). The mother ('Safari') of the leopard, however, was reported (Sean Matthewson, pers. comm., October 2014) to be a "prolific python killer'. In 15 months (2004-2005) she was observed to kill "five breeding-sized rock pythons", none of which had killed or recently consumed prey. On one occasion she killed a male and female python that were reported to be mating, but neither was consumed. All three other pythons were killed and eaten, the last being a gravid, 4 m female which was stashed in a tree and consumed by the mother and her cubs. The leopard was subsequently blinded by a male leopard while defending her cubs, but this was not observed to affect her hunting ability or prey selection, which remained primarily impala. It was reported that this female leopard only started killing and eating pythons after one had killed and eaten a litter of her cubs. The significance of this remains subjective.

DISCUSSION

From the brief summaries presented here, it is evident that among the documented interactions, leopards were responsible for the greatest number of python mortalities, killing pythons in 10 of 13 of the encounters. Two of these encounters involved leopards known to have killed and often eaten pythons previously (one of the five other documented killings, including that of a mating pair of pythons). In only two of 18 cases of leopard-python interactions was prey co-option involved, and in one case the python was also killed and eaten (the fate of the other python was unknown). By contrast, recorded interactions (3) with lion and hyena usually involved the co-option of prey killed by the python, and only once involved predation of the snake, and this was in a period of environmental stress (drought). Leopards have the broadest diet of the larger predators with 92 prey species recorded in sub-Saharan Africa (Mills & Harvey, 2001). In most studies (e.g. Le Roux & Skinner 1998, Stander *et al.* 1997, Power 2002, Henschel *et al.* 2005, Ott *et al.* 2007, Swanepoel 2008, Schwarz & Fisher 2008) leopards were found to prey predominately upon small to medium-sized ungulates, preferring species from habitat mosaics, e.g. the forest/savanna ecotone, and within a weight range of 10–40 kg (Hayward *et al.* 2006). In more open habitats, e.g. Marahoué National Park, central Coté d'Ivoire (Bodendorfer *et al.* 2006), smaller prey items (hares, hyrax, large rodents and birds) made up a larger proportion of the diet. In all these studies reptiles were rarely listed as prey items (Table 2, mean 1.61 % of 830 food items), and in only one study was a single python killed (Stander *et al.* 1997).

The Southern African Python is a giant snake that hunts, overpowers and consumes large prey items. It shares African habitats with diverse large mammalian carnivores, with which it competes for similar prey resources. Inter-species conflict is well-documented between large African mammalian carnivores as they defend or attempt to co-opt large prey items that may have involved significant time, energy and effort to kill. Within these predator-prey interactions (Owen-Smith & Mills 2008) or in African predator trophic niche analyses (Hayward *et al.* 2008), pythons are not usually considered. Moreover, large mammalian carnivores and pythons have mutually interactive trophic relationships, in which either may serve as predator or prey. These interactions deserve fuller attention. The increasing number of predatory interactions captured in the social media, although likely biased towards larger pythons and more sensational encounters, nonetheless present opportunities for analysis of these rare events. They allow fuller insight into these rare interactions, and greater understanding of the role and survival of giant snakes in the presence of large carnivores.

ACKNOWLEDGEMENTS

I thank the numerous game rangers at Mala Mala for their many interesting discussions and observations over the years, particularly Matt Mayer who positioned our vehicle superbly in order that the attached images here could be taken. Sean Matthewson (Arathusa property, northern Sabi Sands) is also thanked for kindly supplying additional observations on a series of leopard-python encounters that he witnessed.

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WEBSITE RECORDS OF PYTHON-CARNIVORE INTERACTIONS

1http://www.dailymail.co.uk/news/article-1352461/Unlucky-python-ends-tug-war-2-leopards.html - Mala Mala, Mpumulanga Province, South Africa: the Matshipini female leopard and son kill and play with the carcass of a 2m python but do not eat it; no obvious prey in stomach.

2 https://www.youtube.com/watch?v=H269kie2028 – Inyati Game Reserve, South Africa, May 2013: during day an adult female leopard with half-grown cub attacks a 3-4m python with no visible prey bulge; as it tries to back away the python curls its tail into air, highlighting the white ventral surface, which may be a defensive strategy to deflect attack away from head and body to the more visible tail (e.g. 41-80 second mark on video). Female kills the python and with cub cautiously inspect the dead python. Python was eaten over a two day period (details of incident at http://inyatigamelodge.com/tag/africa/).

3 http://www.witness.co.za/index.php?showcontent&global%5Bid%5D=88283 - and https://www.youtube.com/watch?v=fcYUTVnOH80 - Kruger National park, Phabeni Gate region, 3 September 2014: adult leopard watches 3-4m python with no obvious gut content crawling from water hole onto bare bank; approaches head carefully and paw slaps several times; python retreats backwards towards water; leopard circles around to head and paw slaps and grabs top of head in jaw, pulling snake away from water; releases python which escapes in to water, with brief tail display.

4 https://www.youtube.com/watch?v=objHIGCsm_M - Sabi Sabi PGR, Mpumulanga Province, South Africa, 2009: adult leopard comes across 3-4m python at fresh impala kill before it has started swallowing its prey; python retreats backward into bush and is cautiously attacked by leopard, with paw strikes to the head; python strikes and gives tail display; recording ends and it is not noted if python is killed, and it and/or prey consumed.

5 http://www.maryloujohnsonremax.com/TheFlyingLiger/MalaMala2012/Leopard2012.html - Mala Mala, Mpumulanga Province, South Africa: '12ft' python with 'adult impala' (subadult from image) in stomach killed by leopard, November 2012; taken into tree after arrival of adult hyena, and impala gut contents fell out and taken by hyena; leopard continued to eat python.

6 http://www.sabisabi.com/blog/2803/nottins-female-kills-an-immense-colossal-african-rock-python/ - Sabi Sabi, Mpumulanga Province, South Africa, June 2013: adult female leopard ('Nottins female') kills 4m python (no prey item in gut); partially consumed on ground then taken into tree for later meal.

7 http://www.sareptiles.co.za/forum/viewtopic.php?f=19&t=14330&p=93418 - Campbell, A. August 2008: adult leopard catching and eating 4m+ python with large stomach content visible; no further details.

8 http://blog.londolozi.com/2009/09/female-leopard-hunts-massive-african-rock-python/ - Londolozi, Mpumulanga Province, South Africa, Laburn, R. 2009: adult female leopard attacks large python (approx. 4m), catching it by head when it strikes but then releases; as python retreats into bush holds coiled tail up in distraction; leopard paw hits several times and then leaves alone and departs.

9 http://www.djuma.com/blog/?itemid=162 - Djuma PGR, Sabi Sands, Mpumulanga Province, South Africa, 25 December 2009: two leopards kill 2-3m python and takes into tree to eat after hyena appears.

10 http://blog.londolozi.com/2014/05/a-lioness-steals-an-impala-kill-from-a-python/ - Londolozi, Mpumulanga Province, South Africa, Laburn, R. 25 May 2009: python (3-4m) kills adult female impala; dying barks from impala as constricted attract two adult lioness; lioness grabs hindquarters of prey and python releases prey and quickly moves off with neither python nor lioness attacking or striking at each other; python gives no tail display; lioness share prey.

11 http://news.mongabay.com/2010/0105-hance_hyena.html - Amboseli region, Kenya, Hance, J. 2010: Six hyena and jackal kill 12ft python, during drought.

12 https://www.facebook.com/photo.php?fbid=10203913087620262&set=pcb.10152641945138571&type=1&theater - young adult male leopard ('Quarantine') playing with a small (<2m) python, Arathusa property, northern Sabi Sands; python not consumed. His mother ('Safari' was recorded to have killed 5 adult rock python (S. Matthewson, pers. comm.).

13 https://www.youtube.com/watch?v=qFgLe3snSDc - A pair of leopard (Mother and ½ grown cub) investigate 3-4 m python in bush at termite nest. Action obscured but female grabs python on neck (may also be struck by python) and then released after a short (4-5 second) tussle, during which the. Python pulled from the bush and has an obviously broken neck. The leopard cautiously inspects the injured python, when the video ends (skynewsofficial16 video uploaded 23 Jan 2014).

14 https://www.youtube.com/watch?v=wrZBkxiluBY - A female leopard ('Metsi') with 2/3rd grown cub kills python (3-4m) and drags it away – presumably to eat; Savannah Lodge, Sabi Sands, May 2013.

15 https://www.facebook.com/guntherwildlifephotos/photos/pcb.1624693377777932/1624693274444609/?type=1&theater - A series of three photos showing a recent impala kill by *Python natalensis* being stolen by a young spotted hyena while the python is trying to consume it; Ngala, Greater Kruger National Park; May 2015.

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COLUBRIDAE

Dispholidus typus (Smith, 1828)

BOOMSLANG

Photo for image reference provided by Johan Marais

MELANISTIC COLORATION

On 23 July 2015 at approximately 12h45 a large Boomslang, *Dispholidus typus* (A. Smith, 1838) was found dead on the R242 approximately 18km west of Metoro, Ancouabe District, Cuanda Norte Province, Mozambique (13° 03' 20.2" S, 39° 44" 14.4" E, 419 m a.s.l.). The specimen measured approximately 1.6m total length, and had a uniform black coloration, except for small light green blotches on the upper and lower labials, loreal, and anterior chin shields (Fig. 1). The specimen was badly damaged but the following scale counts were recorded: ventrals 178, anal divided, subcaudals 115, midbody scale rows 19, dorsal scales elongate and heavily keeled (Fig. 2). These features, and the large eye, support its assignment to the species. Confusion with *Thrasops jacksoni* is unlikely as this species has 187-214 ventrals, 129-155 subcaudals (Broadley & Wallach 2002), and a relatively smaller eye. It is also unknown from Mozambique and has not been recorded within 1000km of Metoro. A tissue sample was retained, but the specimen was not collected.

Hughes (2014) gave an extensive review of melanism in the Boomslang, dismissing many early reports of black specimens (e.g., Spawls & Branch 1995; Spawls *et al.* 2002; Alexander & Marais 2007). He concluded "On present evidence it is likely that uniformly black specimens are found only in the area of the Usambara Mountains, Tanzania." While the presence of small light green blotches on some head scales of the present specimen may exclude it from being described as 'uniformly black', most researchers would consider this pedantic and readily accept it as a black Boomslang. The discovery of this specimen in northern Mozambique supports Ionides' (in Loveridge 1955) records of melanistic Boomslang at Liwale in southern Tanzania. It also indicates that Hughes (2014) may be wrong in dismissing Peter's (1882) record of a black specimen from Sena in the Zambezi River Valley as simply due to discoloration after preservation.

It should be noted that although a number of subspecies of Boomslang have been proposed, the taxonomic status of these remains unresolved. In a molecular phylogeny of the genus, Eimemacher (2012) identified at least four distinct clades that he concluded represented distinct species, i.e. *D. viridis* (A. Smith, 1938) from southern Africa, north and west of the Great Escarpment; *D. kivuensis* Laurent, 1955, from the Rift valley region; *D. punctatus* Laurent, 1955, from Angola, northern Zambia and adjacent Democratic Republic of the Congo; and *D. typus* (A. Smith, 1828), which is restricted to south of the Great Escarpment, South Africa, from the southwestern Cape to eastern KwaZulu-Natal. However, he presented (Eimemacher 2012) evidence for additional taxa from East Africa, but cautioned that more thorough sampling was needed before taxonomic recommendations could be made. This caution applies to the melanistic specimens from northern Mozambique (reported here) and from Liwale, southern Tanzania (Loveridge 1955), which fall between the range of *D. viridis* and the putative East African taxa indicated by Eimemacher (2012).

Figure 1. Head of a melanistic Boomslang (*Dispholidus typus*) showing the uniform black coloration except for a few light green blotches on some head scales.

Figure 2. Midbody region of a melanistic Boomslang (*Dispholidus typus*) showing the elongate and keeled dorsal scales.

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LACERTIDAE
Meroles anchietae (Bocage, 1867)
SHOVEL-SNOUTED DUNE LIZARD

Photo for image reference provided by Johan Marais

SIZE, GROWTH AND LONGEVITY

On 18 December 2011, an adult male *Meroles anchietae* was captured and marked with four red beads ('RRRR') by DE at Station Dune (23° 34' 9.74" S, 15° 2' 30.10" E) in the immediate vicinity of Gobabeb Research Station, Namib Naukluft Park, Namibia during a mark-recapture study (unpubl. data). Individuals were permanently marked using a technique developed by Fisher & Muth (1989) where coloured beads are surgically attached to the base of the tail (Fig. 1), allowing identification by code (different combinations of coloured beads). When captured, snout-to-vent length (SVL) and tail length (TL) were determined using a millimeter ruler, sex was determined using a probe inserted into the cloaca, and mass was recorded to the nearest 0.1 g using a spring scale (Pesola®, PESOLA AG, Switzerland) (Table 1). On 6 January 2013, the same individual was recaptured in the same area by DE during another study (unpubl. data) that aimed to assess the influence of environmental and habitat factors on the foraging behavior of *M. anchietae*. Newly captured individual lizards were marked with beads as described above.

On 20 December 2014, 167 weeks (3 years, 11 weeks) after the first capture, individual 'RRRR' was recaptured again, this time by NI and again at Station Dune. By then, the lizard had grown 5.0 mm SVL since its first capture, from 46.0 to 51.0 mm SVL (Table 1). Over the course of this study six more marked individuals of *M. anchietae* were captured at least twice, measured and weighed. Lizard 'WWPP' was recaptured after one year and five months, while other lizards were recaptured after periods of less than one year. Growth of individual lizards was determined as length gain in mm SVL between the first and subsequent capture, and time (in weeks) that had passed since the last capture was noted. Growth rate was estimated as length gain divided by number of weeks since the last capture (Table 1).

Meroles anchietae follows an unusual reproductive strategy for a lacertid lizard. The species produces up to four clutches per year without having a specific breeding period but each clutch contains only one or (maximum) two large eggs (Goldberg & Robinson 1979: Robinson 1990: Branch 1998). Hatchlings are very large (SVL 25–27 mm) and mature quickly. The youngest reproductively-active females measure only 37 mm SVL at the age of approximately 4–6 months, while males mature at a SVL of about 40–42mm when they are 6–7 months old (Goldberg & Robinson 1979). At the age of 1–2 years females reach about 45 mm SVL. Adult males averaged larger (SVL 49.0 mm, mass 4.5 g) than females (SVL 44.0 mm, mass 3.1 g) in the study by Goldberg & Robinson (1979). Maximum size is reported as 55.0 mm SVL (Branch 1998). One exceptionally large male collected by SK from near Bogenfels in Namibia's Sperrgebiet (27° 3' 13.93" S, 15° 21' 34.13" E) was as large as 59.0 mm SVL (new size record) with a total length of 65.0 mm and mass of 5.6 g, and will be accessioned as SMR 10650 into the collection of the National Museum of Namibia in Windhoek.

By generalizing our growth data and the data collected by Goldberg & Robinson (1979), the male *M. anchietae* (individual 'RRKG', Table 1) captured at SVL 42.0 mm (age seven months following Goldberg & Robinson 1979) grew 4.0 mm in six months to reach SVL 46 mm. Thus the age when 'RRRR' was captured for the first time was approximately 13 months (7 months + 6 months). We can therefore estimate the age of 'RRRR', when captured the last time on 20 December 2014 with SVL = 51.0 mm, as being about 49 months (4 years, 1 month). As a consequence, individuals with SVL above 51 mm will most certainly be older than four years.

Alan Muth and Mark Fisher have monitored a population of *M. anchietae* at Gobabeb since 1997 and have allowed others (Robinson & Barrows 2013) to discuss some of their data. Their mark-recapture data suggests that most individuals probably live for only one year, with annual survival rates of only 6–18% (Robinson & Barrows 2013). This would suggest that our record is quite exceptional. However, of 59 individuals of M. anchietae measured in 2013 and 2014, 13.5 % (all males) were of 51.0 mm SVL and larger (unpubl. data SK). Still, ages of these individuals have never been confirmed and they were never recaptured. So far the observation of individual 'RRRR' over more than three years (it would be at least four years old) indicates a new longevity record for the species in the wild.

ACKNOWLEDGEMENTS

We thank Michael Bates (National Museum, Bloemfontein) for improving earlier drafts of this note.

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Photos Novald Iiyambo

Figure 1. Male *Meroles anchietae* with four red beads attached to its tail base (code 'RRRR'), photographed after the 3rd capture on 20th December 2014.

Table 1. Body measurements (snout-vent length [SVL], tail length [TL]) and mass for seven individuals of Meroles anchietae from Gobabeb, Namibia at time of first and subsequent captures. Growth rate is estimated as Growth [mm]/Period [weeks].
Abbreviations: R = red, B = blue, G = green, O = orange, K = black, W = white, P = pink, Y = yellow; r = regenerated tail.

CODE	SEX	FIRST CAPTURE	SVL [mm]	TL [mm]	MASS [g]	RECAPTURE	SVL [mm]	TL [mm]	MASS [g]	PERIOD [WEEKS]	GROWTH [mm]	GROWTH RATE
RRRR	MALE	18-12-11	46.0	53.0	3.3	06-01-13	50.0	54.0	4.6	58	4.0	0.07
RRRR	MALE	18-12-11	46.0	53.0	3.3	20-12-14	51.0	55 (r)	3.6	167	5.0	0.03
BBGO	MALE	09-01-13	41.0	NA	2.3	02-07-13	45.5	44.7	3.8	25	4.5	0.18
RRKG	MALE	21-12-12	42.0	NA	2.3	02-07-13	46.4	52.9	3.9	29	4.4	0.15
GGKG	MALE	14-01-13	50.0	48.0	3.8	13-07-13	50.7	55.7	5.6	22	0.7	0.03
WWPP	MALE	12-01-12	44.0	54.0	3.7	12-06-13	49.9	55.7	4.2	73	5.9	0.08
GGYB	MALE	11-01-13	51.0	60.0	4.0	02-07-13	54.3	50.7	7.0	25	3.3	0.13
BBYY	NA	07-01-12	44.0	40 (r)	3.2	09-11-12	48.2	34.7	3.9	44	4.2	0.10

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COLUBRIDAE
Dasypeltis atra Sternfeld, 1913
MONTANE EGG-EATER

Photo for image reference provided by Marius Burger

DIET AND DISTRIBUTION

At 07h00 on 25 February 2015 the first author observed an adult Montane Egg-eater (*Dasypeltis atra*) in the nest of a Cabanis's Greenbul (*Phyllastrephus cabanisi*) while swallowing an egg. The observation was made in an indigenous cloud forest fragment called Ngangao, in the Taita Hills, Taita-Taveta County, south-eastern Kenya (3° 21' 16.6" S, 38° 20' 14.6" E; 1817 m a.s.l.).

The snake had the barred dorsal colour pattern described and illustrated by Broadley & Bates (2009), where the dorsal saddles are for the most part joined to the lateral bars, typical of the savanna phase of this species. This species also occurs in melanistic (black above, grey below; typical of forests) or brown (cream to yellowish below; typical of grasslands) phases. While intensive biodiversity surveys of Taita Hills have been conducted in the past, resulting in detailed knowledge of the local herpetofauna (Bytebier 2001), this is the first time that *D. atra* has been recorded here. In addition, this record represents the most southerly locality for this species in Kenya. The savanna phase appears to be an adaptation to the retreating forest environment (Broadley & Bates 2009). As a specimen of this phase was reported from Ibaya Camp in Mkomazi Game Reserve, Tanzania (as *D. scabra*: Flemming & Bates 1999; correctly as *D. atra*: Broadley & Bates 2009), about 100 km south-west of Ngangao Forest, the present record might be the result of a further range expansion of this species and thus not represent a long-overlooked resident species. The Mkomazi record is the nearest other locality of any colour phase for this species.

Cabanis's Greenbuls use leaf litter, moss and dried grass to build open cup-shaped nests in shrubs, climbers or small trees such as *Chassalia discolor*, *Culcasia scandens*, *Dracaena steundneri* and *Uvaria* sp. In Taita Hills, the start of the breeding season coincides with the onset of short rains and usually continues from mid-October until the end of March. Clutches usually comprise two eggs and are incubated by the female for 17 days (Keith *et al.* 1992; Spanhove *et al.* 2014). This nest was completely built when it was discovered on 7 February at a height of 86 cm above the ground in a dense climber. Cabanis's Greenbul is one of only a small number of bird species that breeds within the dense forest interior (Brooks *et al.* 1998). The nesting bird was therefore easily recognised as *P. cabanisi* based on the shape, size and height of the nest, the shape, size and colour pattern of the eggs

(Keith *et al.* 1992, Callens 2012), and direct observation of the female while incubating her eggs on the nest. Incubation started on 10 February when a clutch of two warm eggs (25.6 X 17.1 mm and 24.6 X 16.9 mm) were found (Fig. 1). When inspecting the nest on 21 February 2015 both eggs appeared cold and the nest was slightly tilted. While the cause is unknown, it is assumed that the nest was abandoned. When confirming this abandoned state on 25 February 2015, the snake was encountered on the nest. While being photographed it dropped to the forest floor and moved slowly out of sight with the egg still in its throat (Fig. 2).

Egg-eaters are well-known specialist predators of bird eggs, generally regarded as nocturnal hunters; and may account for very high rates of predation of bird eggs in some areas (see Bates & Little 2013). Although more is known about the species of birds' eggs preyed on by *D. scabra* (Bates & Little 2013), little is known about the eggs utilised by *D. atra*, a species widespread in East and North-east Africa (Gans 1959: '2M', '2B' and '2Bx' colour phases of '*D. scabra*'; Broadley & Bates 2009). Pitman (1974) noted egg-eaters (possibly *D. atra*) feeding on weaver bird eggs in Uganda, but to our knowledge the present note represents the first record of a particular bird species on whose eggs this snake preys in the wild. Furthermore, while egg-eaters optimise their opportunities by preying on freshly-laid eggs and eggs with partially-developed embryos (see Bates & Little 2013), this record represents a case of predation on an old abandoned egg.

Photo D. Van de Loock

Figure 1. The Cabanis's Greenbul (*Phyllastrephus cabanisi*) nest shortly after the female started incubating her clutch of two eggs. Eggs were warm and the nest was undisturbed. One egg was later eaten by an adult Montane Egg-eater (*Dasypeltis atra*) after the nest was abandoned.

Photo D. Van de Loock

Figure 2. Montane Egg-eater (*Dasypeltis atra*) from Ngangao Forest, Taita Hills, south-eastern Kenya, in the process of swallowing the egg of a Cabanis's Greenbul (*Phyllastrephus cabanisi*).

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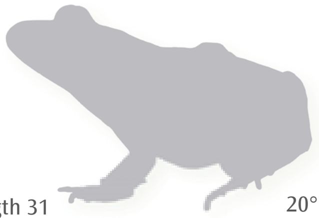
Ptychadenidae
Ptychadena mapacha Channing, 1993
Mapacha Ridged Frog in Namibia



Ptychadena mapacha, described by Channing in 1993, is a medium-sized (maximum snout–vent length 31 mm) relatively short-legged, ptychadenid species with minute dark dorsal markings and an distinct unbroken ridge beginning at the upper lip and extending back to the upper arm (Channing 1993; Du Preez & Carruthers 2009). Its distribution is currently restricted to the type locality, Katima Mulilo in the Mapacha area in the eastern Caprivi Strip of northeastern Namibia, in the Kwando River basin. However, it is expected to occur in south-western Zambia, southeastern Angola, and northern Botswana (Channing 2001). Because it is so poorly known, *P. mapacha* is listed as Data Deficient (IUCN SSC Amphibian Specialist Group 2014). Examination of specimens assigned to *Ptychadena* sp. at the National Museum of Namibia, Windhoek (NMN, formerly SMWN) revealed three specimens corresponding to *P. mapacha* from Omaramba Omatako, 3 km N of Vicota (18° 12' S; 20° 15' E) in the Rundu District of the Kavango-East Region. All individuals (NMN 26259, NMN 26260, NMN 26261, Fig. 1A) were collected 21 April 1998 by N.H.G. Jacobsen. The specimens exhibit the diagnostic unbroken ridge extending from the upper lip posteriorly the arm that distinguishes the species from the similar *Ptychadena schillukorum*. In addition, the several flat granules on the posterior flanks distinguish these specimens from the similar *Ptychadena mossambica* (Fig. 1B-C). Specimens NMN 26259 and NMN 26161 have a snout–vent length of 32 and 31 mm respectively, making the first the largest known individual of the species. This new record extends the species' range approximately 440 km to the west and represents the second vouchered locality for this species.

Photo for image reference provided by Johan Marais

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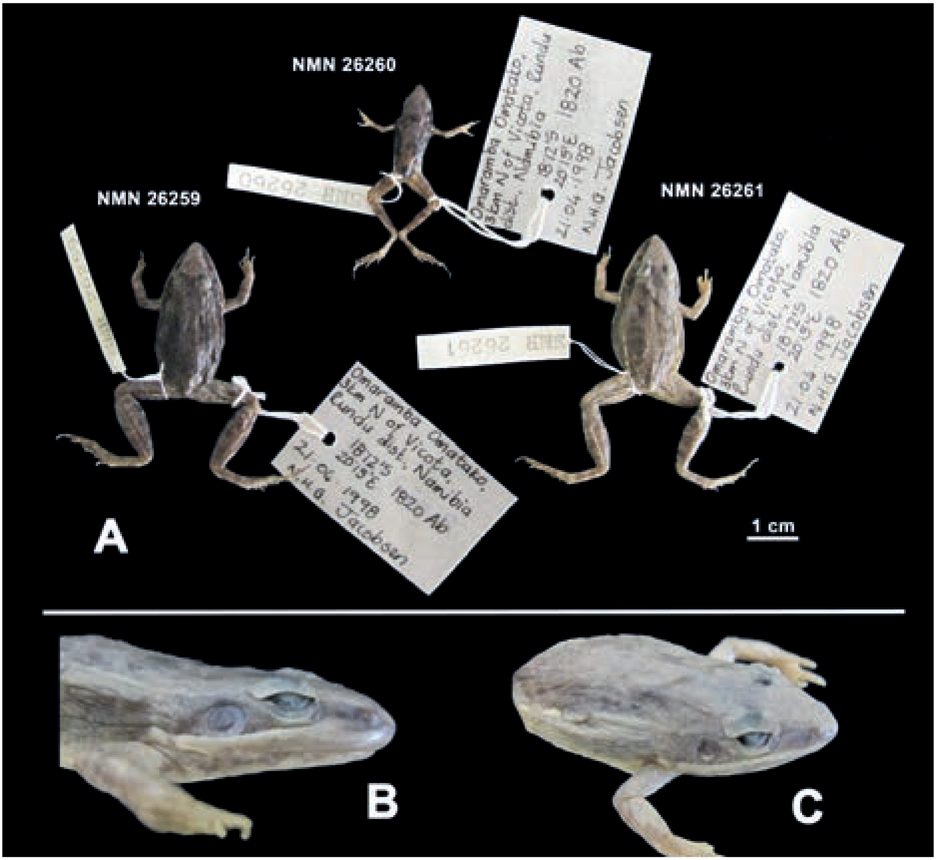

Figure 1. (A) Specimens of *Ptychadena mapacha* from Omaramba Omatako, 3 km N of Vicota, Rundu District, Kavango-East Region. Scale bar in cm. Magnification (B) of unbroken ridge extending from the upper lip, below the tympanum, posterior to the arm insertion and (C) the few flat granules on the posterior flanks, both diagnostic characters of this species.

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PIPIDAE
Xenopus muelleri (Peters, 1844)
TROPICAL PLATANNA IN SOUTH AFRICA

On 13 and 14 March 2015, several observations of *Xenopus muelleri* were made during a rapid faunal survey (BioBlitz) of the farms Zandrivier 559 LQ and Vygeboomspoort 560 LQ, near Lephalale in Limpopo Province. The individuals were identified as *X. muelleri* based primarily on the length of the subocular tentacles being more than half the diameter of the eye, which is a distinctive characteristic of this species (Du Preez & Carruthers 2009). Photographic evidence of these observations was submitted to the Animal Demography Unit (ADU) Virtual Museum (VM) (http://vmus.adu.org.za) (Fig. 1) along with the observation geographic coordinates (Table 1). A single individual was collected, humanely euthanized and accessioned at the Ditsong Museum under permit number 0094-MKT001-00003.

Our observations of *X. muelleri* (Table 1) fall well outside the known geographic distribution range for this species in South Africa (Channing 2001, Minter *et al*. 2004, Du Preez & Carruthers 2009). The closest verified record in South Africa originates from quarter degree grid cell (QDGC) 2229AA, approximately 195 km to the northeast. It is unclear whether our observations of *X. muelleri* represent a true geographic range expansion for this species or just reflects limited sampling in this region. This species is known to occur along a large stretch of the Limpopo River in eastern South Africa (Channing 2001, Minter *et al*. 2004) and it is expected to occur along the entire stretch of this river in Mozambique (Du Preez & Carruthers 2009). The Limpopo River could therefore be expected to provide easy dispersal opportunities for this species into the western part of Limpopo Province, from which it is currently thought to be absent. Four of our *X. muelleri* observations came from the Mogol River, a major tributary of the Limpopo River, raising the possibility that these individuals may have dispersed here naturally. The other two records came from a pan, which is linked to the Mogol River during floods. An examination of Minter *et al*. (2004) and the ADU VM database indicates that there are very few amphibian records for the QGDCs that cover the Limpopo River from Lephalale to QGDC 2229AA (Fig. 2). Only 55 individual amphibian records representing 14 species are listed for the ten QDGCs shown in Fig. 2 and these records do not include an observation for either *X. muelleri* or *X. laevis*. This poor numerical representation of observation records for this region of South Africa raises the possibility that *X. muelleri* may simply have been overlooked in the Limpopo River and its tributaries of north-western Limpopo Province due to poor sampling coverage (see Botts *et al*. 2015 and references therein for discussion on sampling

Figure 1. Photographic evidence of the observed *Xenopus muelleri* individuals near Lephalale, Limpopo. The numbers are ADU VM accession numbers.

irregularities). The true extent of *X. muelleri* distribution in South Africa may therefore require revision. If this is indeed a range expansion rather than insufficient sampling, such a range expansion would run counter to the general range reduction of South African amphibians (70% of species assessed in Botts *et al*. 2015). This range expansion observation does however represent a relatively small expansion in relation to the very large (~ 6 million km^2) known geographical range of this species, which occurs along the east coast of Africa and as far north as Chad and as far west as Côte d'Ivoire (IUCN 2013).

Table 1. Location and museum accession details for the observations of *Xenopus muelleri*.

ADU VM ACCESSION NUMBER	DITSONG MUSEUM ACCESSION NUMBER	HABITAT	LATITUDE (S)	LONGITUDE (E)
4171	–	PAN	23° 48′ 24.216″	27° 46′ 28.464″
4172	–	PAN	23° 48′ 24.216″	27° 46′ 28.464″
3828	–	MOGOL RIVER	23° 45′ 50.580″	27° 44′ 33.774″
4178	–	MOGOL RIVER	23° 45′ 50.580″	27° 44′ 33.774″
4179	–	MOGOL RIVER	23° 45′ 50.580″	27° 44′ 33.774″
4180	TM 86216	MOGOL RIVER	23° 45′ 50.580″	27° 44′ 33.774″

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Ursula Verburgt and Marnus Erasmus are thanked for their help during fieldwork and data processing. Enviro-Insight provided the funds for the herpetofauna component of the BioBlitz 2015 rapid fauna survey, from which this data originates. Darren Pietersen is thanked for accessioning the collected specimen at the Ditsong Museum. Finally, we thank the editor and anonymous reviewer for their helpful comments which improved the text considerably.

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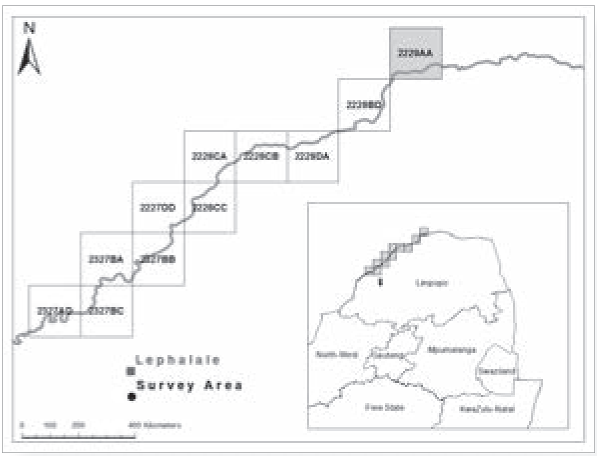

Figure 2. The locations of Lephalale and the survey area in relation to the closest known observation for *Xenopus muelleri* (2229AA). QDGCs along the Limpopo River, for which no records of *X. muelleri* have been reported, are also indicated.

Herpetological Association of Africa

12th Conference

GOBABEB, NAMIBIA

Plenaries & Guest Speakers

Primates and snakes: An 80 million year dialog?

Harry W. Green
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Abstract.– In this lecture I will describe evidence and uncertainties in an emerging theory that 1) As first constricting predators and, much later, venomous adversaries, snakes have significantly influenced the origin and subsequent radiation of primates, especially in terms of the neurobiology of vision and fear; 2) the origin of front-fanged venom injection radically changed the nature of snake encounters with their own predators, such that visually- and acoustically-oriented, cognitively sophisticated adversaries promoted the evolution of serpentine defensive displays and mimicry; 3) As visual, acoustic, cognitive, and *weapon-wielding adversaries*, primates have substantially affected snake evolution, including perhaps favoring origin of the only long-distance weaponry among all serpents. These long-term, bi-directional evolutionary relationships both challenge and potentially inspire efforts to appreciate and conserve snakes.

Key Words.– snakes, primates, venoms, predator-prey relationships, evolution

Discovery of a new Tiger Snake in the central and northern Namib

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Abstract.– Gobabeb was established because Dr Charles Koch was greatly impressed by the entomological biodiversity of the Namib. However, during summer evenings the chorus of different barking geckos is an indication of the herpetological diversity of this area. A while ago the discovery of a new Tiger Snake (*Telescopus finkeldeyi*) in the northern Namib in Angola led to intensive investigations of major herpetological collections. This showed that the new species was first encountered in Namibia while trying to decide on a site for this research station.

Shifting Sands of Time
History and future of Gobabeb

Mary Seely
Gobabeb Research and Training Centre & Desert Research Foundation of Namibia

Ever since the University of California, Berkeley, and the Transvaal Museum, Pretoria, embarked on an expedition through the southern Namib and Kalahari, an interest was generated in the herpetology and the entomology of the area. Dr Charles Koch then continued expeditions through the Transvaal Museum that extended from the Olifants River in South Africa to well north of the Curoca River in Angola and all of Namibia in between.

As a result of these expeditions Dr Koch and the Transvaal Museum agreed to support a research centre in the Namib for which Gobabeb was thought to be an appropriate site. Wulf Haake and Bob Brain were two of the active herpetologists in the early days.

Through time the emphasis shifted from biodiversity to encompass geomorphology including sand dune dynamics, climate contributing to understanding of climate change and ongoing monitoring of the biota of the fog ecosystem.

With independence of Namibia the emphasis at Gobabeb shifted to education and training but all the time including the results of all types of research. Herpetology continues to be one of the focal points of this research and education at Gobabeb.

Stable isotope ecology of Namib Desert lizards

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We used a stable isotope approach to examine the trophic niches of two species of sympatric, insectivorous lizards in the Namib Desert, the lacertid ***Pedioplanis husabensis***, and the gekkonid ***Rhoptropus bradfieldi***. We analyzed the carbon and nitrogen stable isotope ratios in plant tissues, available arthropod prey, and lizard tissues to map the movement of nutrients through plants, arthropods, and lizards, as well as to quantitatively estimate the size and position of ***P. husabensis***'s and ***R. bradfieldi***'s trophic niches. We found no to moderate levels of overlap in the trophic niches of these two lizard species and showed that the trophic niche of ***P. husabensis*** was 1.3 – 2.6 times larger, with a higher degree of trophic diversity among individual lizards, than that of R. ***bradfieldi***. We concluded that these sympatric species are coupled to non-overlapping avenues of nutrient flows through the use of isotopically distinct arthropod resources, and that despite the very high available biomass of C3 plant-based nutrients, these two lizard species rely heavily on a food web based on C4/CAM-based plant resources.

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Are ambush-foraging and thermoregulation mutually exclusive? A test using Puff Adders (*Bitis arietans*)

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Abstract.– Foraging mode has a pervasive impact on snake biology. For example, studies have related ambush foraging to snake morphology, anatomy, digestive physiology, metabolism, prey selection, spatial ecology and behaviour. However, few studies have considered the thermal implications of ambush foraging even though body temperature (T_b) is known to have a profound impact on performance in snakes. Several of the characteristics associated with ambushing foraging, such as immobile concealment while foraging, would seem to be incompatible with thermoregulatory behaviour. I searched for evidence of thermoregulation in the Puff Adder (*Bitis arietans*), an extreme ambush forager, using standard telemetry and bio-logging techniques. I assessed thermal profiles of Puff Adder T_b, using Peterson *et al*. (1993)'s defined thermoregulatory patterns, to detect evidence of thermoregulation. I assessed thermoregulation in each of the three Puff Adder seasons: feeding (October to February), mating (March to May) and resting (June to September). Puff Adders showed clear evidence of thermoregulation and regularly attained target T_b (~32 °C) during the day, especially during the feeding and mating seasons. Gravid females thermoregulated more carefully, attaining target T_b more consistently than other individuals. Puff Adders can, potentially, make thermal choices at three different scales: firstly by choosing lie-ups with appropriate thermal characteristics, secondly, by moving short distances from ambush lie-ups to thermally-buffered microhabitats, and thirdly, by using minor adjustments of body position. My study suggests that Puff Adders thermoregulate at all three levels and generates testable hypotheses for future behavioural studies.

Key Words.– foraging ecology, thermoregulation, target body temperature

Conservation strategies for KwaZulu-Natal's threatened anuran fauna

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Abstract.– KwaZulu-Natal hosts the highest frog diversity, and the second highest number of threatened frog species, in South Africa. Using the conservation research strategy developed for South Africa's threatened frogs as a guide, we have developed and implemented several conservation actions for the following species: the Kloof Frog, ***Natalobatrachus bonebergi*** (Pyxicephalidae), the Long-toed Tree Frog ***Leptopelis xenodactylus*** (Arthroleptidae) and Mistbelt Chirping Frog ***Anhydrophryne ngnongoniensis*** (Pyxicephalidae), all Red Listed as Endangered. In accordance with Ezemvelo KZN Wildlife's norms and standards, surveillance and monitoring plans have been developed and are being tested for each of these species (as well as Pickersgill's Reed Frog, ***Hyperolius pickersgilli***). For ***N. bonebergi***, a method using egg-clump counts provides a means of assessing breeding success and gives an indication of abundance. KZN Wildlife Honorary Officers at Vernon Crookes Nature Reserve volunteered their time to test the monitoring plan between November 2013 and June 2014, resuming in August 2014. Call surveys are being used to monitor ***L. xenodactylus*** and ***A. ngongoniensis***. In addition, distribution modelling has been conducted for each of these species to help guide surveys and assist in finding populations for monitoring and surveillance, assess threats and understand dispersal modes. A new project on ***A. ngongoniensis*** will commence in 2015, including implementation of recommended management practices and initiation of land-owner agreements to protect priority grassland habitat for this species.

Key Words.– conservation research, threatened frogs, monitoring, distribution modelling, citizen science

Phylogeny, taxonomy and biogeography of southern African leaf-toed geckos

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Abstract.– Leaf-toed geckos of mainland southern Africa were previously placed in the genera ***Goggia***, ***Afrogecko*** and ***Cryptactites***. Data from nuclear and mitochondrial genes, supported by morphology, reveal that ***Afrogecko*** is paraphyletic with respect to both ***Cryptactites*** and the Australian genus ***Christinus*** and that ***A. swartbergensis*** (Cape Fold Mountains) and ***A. plumicaudus*** (southern Angola) should be placed in monotypic genera — ***Ramigekko*** and ***Kolekanos***, respectively. ***Goggia***, endemic to

the Cape region of South Africa and adjacent parts of far southern Namibia, is only distantly related to this clade and is strongly supported as monophyletic. We estimated a multigene phylogeny for all species of *Goggia* in order to test for the presence of cryptic lineages and infer its biogeographic history. Patterns of relationship within *Goggia* support all species previously recognised on the grounds of morphology and allozymes, but additional taxa are also revealed. The large-bodied *G. microlepidota* is sister to a clade comprising all small bodied (*G. lineata* complex) forms. Within the *G. lineata* complex, the earliest divergence is between eastern and western sets of species and continued geographic isolation across the Cape Fold Mountains has played a major role in promoting speciation within the group. *Goggia lineata* itself is not monophyletic, and specimens from the Western Cape are assignable to a new species. In addition, a previously undescribed species is present in the Little Karoo. Additional deep genetic divergences, perhaps reflecting more cryptic species, are present within other currently recognized *Goggia* species.

Key Words.– *Goggia*, *Afrogecko*, *Kolekanos*, *Ramigekko*, molecular phylogenetics

Reptile Diversity in southwest Angola

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Abstract.– Desert and succulent semi-arid scrublands extend along the Atlantic lowlands from Namaqualand to southwest Angola. Numerous studies have highlighted the unique herpetofauna associated with these hyper- and semi-arid habitats, from which forty new species have been described in the last 50 years. Along the southern border of Namibia the Richtersveld-Sperrgebeit region straddles the Orange River, and the rugged landscape and geological complexity of the region hosts a herpetological hotspot. Similar topographic diversity occurs along the northern border of Namibia, where the Kunene River separates the Kaokoveld and desert habitats of adjacent Angola. In recent years this northern region has become increasingly accessible, permitting study of the poorly-known herpetofauna. Recent discoveries in SW Angola (2009-2013) include the description of three new lizards, and the discovery of other novelties that await description. These findings are combined with collections from earlier explorations and now permit a preliminary summary of the herpetofauna of this poorly-known region of Angola. This is compared and contrasted with that of the Richtersveld-Namaqualand region.

Key Words.– Angola, reptiles, diversity

A preliminary review of the western forms of the *Gerrhosaurus nigrolineatus* Hallowell species complex (Sauria: Gerrhosauridae) in Africa

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Abstract.– A recent molecular analysis indicated that *Gerrhosaurus* actually comprises three genera – *Gerrhosaurus*, *Broadleysaurus* and *Matobosaurus*. Within *Gerrhosaurus*, *G. bulsi* was the sister species to a clade containing *G. nigrolineatus*, *G. auritus* and *G. intermedius*. These four species, with the probable inclusion of *G. multilineatus* (not included in the molecular analysis), formed a closely-related '*G. nigrolineatus* species complex' with a widespread distribution in Africa. West-Central African *G. nigrolineatus* were shown to be most closely related to *G. auritus* rather than to *G. nigrolineatus* from East and southern Africa; and the latter populations therefore represent a separate species for which the name *G. intermedius* is applicable. The results of this molecular analysis re-stimulated a morphology-based review of the *G. nigrolineatus* complex in western and south-western Africa initiated by the first author about 15 years ago. Although there is substantial overlap in scale counts, the various species can often be distinguished on the basis of their dorsal colour patterns, and *G. bulsi* also has a strongly armoured and spinose tail base. *Gerrhosaurus nigrolineatus* (Gabon, Congo, western D.R.C. and northern Angola) and *G. intermedius* (East and southern Africa, Angola and southern D.R.C.) differ with regard to colour pattern, degree of keeling on the soles of the feet, and numbers of longitudinal rows of dorsal scales. *Gerrhosaurus auritus* occurs mainly in Botswana and SW Zambia. Certainty on the status of *G. multilineatus* was particularly problematic as its vague description was based on a few subadults only, all of which were destroyed in a fire at the Museu Bocage in Lisbon in 1978. However, a recent examination of a large series of Angolan *Gerrhosaurus* at the American Museum of Natural History in New York by the second author provided insight into variation in tail spinosity and dorsal colour pattern, indicating that *G. bulsi* is in fact a junior synonym of *G. multilineatus* (Angola, Zambia and adjacent D.R.C.). We note that for widely distributed reptile taxa, unless detailed morphological analysis is conducted on museum material in the wake of molecular findings, zoogeography is rendered chaotic.

Key Words.– *Gerrhosaurus*, taxonomy, morphology, Africa

Effects of predation risk, competition and climatic factors on the activity patterns of *Ouroborus cataphractus* and *Karusasaurus polyzonus* (Squamata: Cordylidae)

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Abstract.– Weather fluctuations have considerable impact on life-history traits in ectothermic organisms. For instance, favourable ambient temperatures can promote activity, while variation in precipitation can stimulate activity through its effects on food availability, especially in arid environments. Under certain conditions, however, inactivity might have a selective advantage over activity, as it increases survival by reducing exposure to predators and lessening intraspecific competition for shared food resources. Consequently, competitive and predatory pressures should influence the effect of abiotic factors on activity patterns in ectotherms. Using remote camera traps we recorded long-term activity patterns in the two closely related sympatric cordylid lizards *Karusasaurus polyzonus* and *Ouroborus cataphractus*. The former species is a solitary fast-moving lizard, while the latter is a heavily armoured lizard that permanently lives in groups. The significant interspecific difference in anti-predator morphology and social behaviour allowed us to unravel the effects of predation, competition and weather on the activity patterns of the two study species. Our results show that activity in *K. polyzonus* predominantly occurs during the dry season, when ambient temperatures are favourable enough to permit activity. Unsurprisingly, temperature was the best predictor of activity in this species. In contrast, a peak in activity during spring, coinciding with high food availability, was observed in *O. cataphractus*. Individuals are inactive during most of the dry season or restrict their activity to early morning and late-afternoon. High activity peaks, however, were observed after occasional summer rainfall. Contrary to *K. polyzonus*, none of the weather variables served as good predictors of activity. The selective inactivity displayed by *O. cataphractus* appears to be a survival strategy related to the high intraspecific food competition and increased predation risk experienced during the dry season.

Key Words.– activity time, climatic predictors, group-living behaviour, sit-and-wait foraging

Digitizing Angolan and Namibian herpetological collections: Angolan collections in Portuguese natural history institutions

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Abstract.– Natural history collections are the main repository of biodiversity data. In recent years, initiatives such as GBIF and VertNet have made a great effort to digitize these data and make them available worldwide to researchers, conservationists, local and international authorities. Angola and Namibian collections are scattered across many museums in the world, and the majority are neither digitized nor georeferenced and thus not easily available to the scientific community. We recently initiated a project to digitize and georeference the Angolan and Namibian herpetological collections, and we present a first update on that work here. To date, we have digitized all the Angolan herpetological collections that exist in Portuguese natural history institutions. The majority of the Angolan herpetological collections, including the important Bocage type specimens, were lost in the fire that destroyed the collections of Museu Bocage, Lisbon in 1978. Today three Portuguese institutions still hold relevant Angolan collections: the Instituto de Investigação Científca Tropical (Lisboa), the Museu da Ciência (Coimbra), and the Museu de História Natural da Universidade do Porto (Porto). While these three collections are small, they hold collections from unique localities and some type specimens. We will present preliminary results and discuss the next states of this project.

Key Words.– Angola, georeferencing, biodiversity informatics, museum collections, Portugal

Investigator Norm N. Clature solves the Maluti Mystery

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Abstract.– This tale has it all. Dead bodies, missing evidence, mistaken identities, blood smears, an odd scientist, and at least three different groups supporting opposing views. It seems that there have been many claimants to the senior position in the mountain village of Mont-aux-Sources, although some have been harshly dealt with, and others ignored. The offspring from different branches in the family tree

resemble each other, and DNA evidence shows that offspring from one family were fathered by males from another family. Sifting carefully through the babble, examining all the available evidence, and following the rules, Norm succeeds in solving a puzzle that dates back nearly a century.

Key Words.– taxonomy, Maluti River Frog, Phofung River Frog, Drakensberg, *Amietia, Strongylopus*

Complex spatial genetic patterns and extensive secondary contact in the Spotted Sand Lizard (*Pedioplanis lineoocellata*)

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Abstract.– The Spotted Sand Lizard, *Pedioplanis lineoocellata*, is widespread across much of southern African found primarily in open habitats. Recent work uncovered four mitochondrial DNA clades which were previously unknown. The formation of these clades is thought to be linked to the Plio-Pleistocene glacial cycles. Furthermore, two of the most geographically widespread clades occur sympatrically in the Loeriesfontein region which has raised questions of possible hybridisation. To investigate gene flow between the latter two clades, samples were profiled at nine microsatellite markers and genetic patterns assessed using estimates of divergence and migration, and a discriminant analysis of principle components. While measures of genetic differentiation and the proportion of recent migrates at each population supports greater gene flow over a few 10s of kilometres and far less over 100s of kilometres, there was no isolation-by-distance pattern. This suggests that gene flow is influenced by barriers or environmental resistance to gene flow. Microsatellite genetic clusters did not match mitochondrial clades which was interpreted as evidence of recent gene flow between the two clades. Hybridisation at Loeriesfontein could not be detected because mitochondrial clades were not genetically distinct in terms of microsatellite loci investigated. Mitochondrial lineages may occur sympatrically at places other than Loeriesfontein but were not sampled by chance because of small sample sizes in the previous study. The regions of overlap between mitochondrial clades may be more extensive than previously thought. Further clarity regarding the formation of clusters awaits more comprehensive sampling.

Key Words.– Pedioplanis lineoocellata, microsatellite, mitochondrial DNA, gene flow, isolation-by-distance, hybridisation

The survival and dispersal of Cape *Xenopus* (Anura: Pipidae)

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Abstract.– The genus *Xenopus* (Anura: Pipidae) is a principally aquatic group of frogs occurring throughout sub-Saharan Africa. There are two species present in the south Western Cape; the widespread *Xenopus laevis* (Common Platanna) and the Endangered *X. gilli* (Cape Platanna). During the winter rains, *X. laevis* move into *X. gilli* sites where both species breed. This creates conditions for competition, hybridisation and direct predation. In this study we principally investigated the difference in survival between *X. laevis* and *X. gilli* during their shared winter occupancy and compare these to survival of an *X. gilli* population where *X. laevis* are removed (Cape of Good Hope Nature Reserve). In addition, we also investigated the difference in dispersal of these two species. Preliminary results indicate that *X. laevis* have higher survival than *X. gilli*, however there is no difference in the survival of the two *X. gilli* populations. We also show that *X. laevis* (Mean: 312 ± 89 m; Max: 439 m) have dispersed further that *X. gilli* (Mean: 241 ± 151 m; Max: 533 m), although the difference is not significant.
Key Words.– dispersal, interaction, survival, *Xenopus laevis*, *Xenopus gilli*

Is dietary niche breadth linked to morphology and performance in sandveld lizards *Nucras* (Sauria: Lacertidae)?

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Abstract.– The functional characteristics of prey items (such as hardness and evasiveness) have been linked with cranial morphology and performance in vertebrates. In lizards particularly, species with more robust crania generally feed on harder prey items and possess a greater bite force, whereas those that prey on evasive prey typically have longer snouts. However, the link between dietary niche breadth, morphology, and performance has not been explicitly investigated in lizards. The southern African lacertid genus *Nucras* was used to investigate this link because the species exhibit differing niche breadth values and dietary compositions. A phylogeny for the genus was established using mitochondrial and nuclear markers, and morphological clusters were identified. Dietary data

of five *Nucras* species, as reported previously, were used in correlation analyses between cranial shape (quantified using geometric morphometrics) and dietary niche breadth, and the proportion of hard prey taken and bite force capacity. Dietary niche breadth and the proportion of hard prey eaten were significantly related to cranial shape, although not once phylogeny was accounted for using a phylogenetic generalized least squares regression. The proportion of evasive prey eaten was a significant predictor of forelimb length when phylogeny was taken into account. We conclude that, in *Nucras*, the percentage of evasive prey taken co-evolves with forelimb morphology, and dietary niche breadth co-evolves with cranial shape. However, although head width is correlated with the proportion of hard prey eaten, this appears to be the result of shared ancestry rather than adaptive evolution.
Key Words.– bite force, co-evolution, geometric morphometrics, phylogenetic generalized least squares regression, phylogeny, southern Africa, sprint speed

Home on the range: Spatial interaction of two sympatric tortoises (*Psammobates oculifer* and *Stigmochelys pardalis*) in the thorn-bush savanna of central Namibia

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Abstract.– The opportunity to study the ecology of sympatric tortoise species is rare, nonetheless one place it is possible is southern Africa, home to more than one third of the world's 45 tortoise species. Due to its Africa-wide geographic distribution and large size, the Leopard Tortoise (*Stigmochelys pardalis*) has been relatively well-studied. However, its interaction and potential for competition with sympatric species is less understood. In the thorn-bush savanna near Windhoek, this species occurs sympatrically with the smaller Kalahari Tent Tortoise (*Psammobates oculifer*). We are studying the habitat (micro-climate and ecology), thermal ecology and movement patterns of transmitted tortoises (seven *P. oculifer* and six *S. pardalis* discussed here). In this talk we present our preliminary findings on home range and core activity area within and between species. We use minimum convex polygon to delineate the extent of the home range and kernel density estimation to delineate the core activity area within the home range. We characterize differences in the spatial distribution of the core activity areas within and between species, and overlap as a possible indicator of competitive interaction. GPS loggers (30 min logging interval) have recently been attached to three *P. oculifer* and two *S. pardalis*. We will discuss in brief these new findings.
Key Words.– *Psammobates oculifer*, *Stigmochelys pardalis*, home range, GPS logger

It's about time for sentinels: the tortoise in the coal mine

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Abstract.– Understanding patterns of conservation status within and among taxa, ecological guilds, life history strategies and trophic levels can inform important avenues for conservation, and the use of indicator or sentinel species. Although nearly half of all chelonian species are threatened with extinction, is it imprudent to consider chelonians as sentinels analogous to 'the canary in the coal mine'. Chelonian biology, from behaviour and reproductive physiology (e.g., rates of vitellogenesis) to life histories and evolutionary rates, is starkly slow compared to that of the 'canary' or 'hare' (e.g., snowshoe hare and jackrabbit) sentinels. We can quickly detect the significant decline of canary sentinels to short-term, acute changes in the environment (e.g, an annual drought). However, chelonian physiology enables them to endure and survive such impacts. By the time we detect impacts on chelonians, the environment may be severely compromised (e.g., by plant invasions and altered fire regimes) and extremely expensive or impossible to recover. While the reproductive potential of canary sentinels enables their populations to recover quickly (e.g., for snowshoe hares, 250% to 3000% increases per year), the slow chelonian physiology and reproductive potential (ca. 2% to 10% per year) allows only extremely slow rates of population recovery. Consequently, enhancing chelonian reproduction is still a slow means to recover chelonian populations affected 20% to 98% by extended droughts and anthropogenic effects (e.g., fire, disease, plant invasions or introduced predators). Models indicate that enhancing adult survivorship, which naturally often exceeds 90% annually, may be effective towards population recovery. Also, we may be able to cost-effectively conserve individual diversity and affect population recovery by enhancing juvenile survivorship (typical annual rates ca. 50% to 80%) which has a large room for improvement, and can affect a large portion of populations. Canary and chelonian sentinels indicate considerably different conditions of the environment.

Key Words.– chelonian, rates, conservation, sentinel

Adaptive simplification and the evolution of gecko locomotion

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Abstract.– Geckos are known for their remarkable ability to adhere to smooth and/or inclined surfaces using adhesive toe pads. As well as the multiple instances of the acquisition of adhesive capabilities, the secondary loss of the morphological modifications associated with adhesion has been reported for

several lineages. The *Pachydactylus* clade exhibits two unequivocal losses of the adhesive apparatus (*Chondrodactylus angulifer* and *Pachydactylus rangei*), and several cases of simplification (e.g., *Rhoptropus afer* and *Colopus wahlbergii*). This clade occupies both sandy and rocky habitats in southern Africa, and the secondary loss (or simplification) of adhesion appears linked to shifts in habitat use, from climbing to ground dwelling. Although the gain and loss of adhesion has been documented, little is known of the resulting functional consequences. Utilizing 14 species from the *Pachydactylus* clade and one outgroup (*Tarentola annularis*), we examined the morphometric changes associated with the reduction and loss of adhesion. We also explored the three-dimensional hindlimb kinematics of pad-bearing and secondarily padless/simplified taxa, using high speed videography, to determine the functional consequences of the simplification and loss of the adhesive apparatus. To examine morphology and kinematics in a phylogenetic framework, we developed trees based on existing sequences from four genes. We then used both Brownian motion and Ornstein–Uhlenbeck models of character evolution to compare changes in the evolutionarily rates and lability of locomotory traits in clades where adhesion is retained versus in clades where adhesion is reduced or lost. The rates of both morphological and kinematic evolution were elevated in the group with simplified/lost adhesive systems, suggesting that constraints placed on locomotion by the adhesive system were released. Supported by NSF IOS-1147043.

Key Words.– gecko, Namibia, *Pachydactylus*, locomotion, biomechanics

Tortoise (Testudines: Testudinidae) radiation in southern Africa from the Oligocene to present

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Abstract.– Ten of the 16 extant tortoise genera are endemic to the African Region. Southern Africa has exceptionally high testudinid diversity with five genera and 14 species, but the diversity at the generic and species level may be even greater than is reflected by the current taxonomy. The aim of this study was to clarify evolutionary relationships among, and the diversity of, testudinids in southern Africa. We used three mitochondrial (16S, 12S and ND4) and two nuclear (prolactin and R35X) DNA loci in conjunction with fossil data to produce a dated phylogeny, and examined cladogenic events in context of palaeoclimatic shifts and landscape heterogeneity. Using Kinixys and the Malagasy genera, *Pyxis* and *Astrochelys*, as outgroups, the southern African tortoises form a well-supported clade and our phylogeny comprises of two major lineages. The earliest divergence contains two species, *Homopus femoralis*

and ***Homopus areolatus***, whereas the second lineage is more diverse and consists of two clades. Clade one comprises ***Chersina angulata*** and the remaining Homopus species; ***H. boulengeri***, ***H. signatus*** and ***H. solus***. Clade two includes ***Stigmochelys pardalis*** and all ***Psammobates*** species and subspecies. As ***Homopus*** is shown to be paraphyletic, we propose to resurrect ***Chersobius***, which increases to six the number of testudinid genera in the subcontinent. Substantial genetic differentiation within terminal branches points towards radiation events from the Late Miocene onwards, as well as the presence of several cryptic lineages. For example, ***Psammobates tentorius*** consists of four terminal branches, indicating greater diversity than represented by the currently recognized three subspecies. We propose that the development of east-west and north-south aridity gradients, the onset of rainfall seasonality and changes in landscape heterogeneity were important drivers in the diversification of southern African testudinids throughout the Miocene and Pliocene.

Key Words.– *Chersina*, *Chersobius*, dated phylogeny, *Homopus*, Miocene, Palaeoclimate, *Psammobates*, *Stigmochelys*

Geographic variation in body size and diet among elapid snakes

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Abstract.– Snakes represent one of the most remarkable radiations of any vertebrate group. Because they have evolved a number of unique morphological, physiological and behavioural adaptations for prey capture, diet is thought to have played a significant role in this radiation. We assessed the variation in the diets of the elapid snakes, one of the most speciose and widespread snake lineages. We collected information about the consumption of ten prey classes for 303 species (approximately 86% of all species). Hierarchical cluster analysis revealed five major dietary groups characterised respectively by: (A) terrestrial vertebrates especially endotherms; (B) terrestrial vertebrates especially ectotherms; (C) fish or invertebrates; (D) broad representation of most prey classes; and (E) squamates especially snakes. Body size varied significantly among species of the different dietary groups: species representing diet A were much larger, and species representing diet B were much smaller, than those representing diets C, D, and E. Similarly, variation in body size, as measured by coefficient of variation emphasised the remarkable Australasian radiation, with Afrotropical species also exhibiting high diversity in body sizes. Dietary groups were not equally distributed among zoogeographic regions. Afrotropical elapids had the largest mean body size and were significantly larger than the Australasian and Neotropical radiations. Our work demonstrates the extent of variation in morphology and ecology of elapids globally, and provides the natural historical context for understanding diversification and biogeography of this medically important group. Our future analyses will make use of this extensive database to test the impact of dietary trait shifts in a phylogenetic context.

Key Words.– radiation, diet, Elapidae, biogeography

Does climate change drive extinction risk in Namibian lizards (Lacertidae)?

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Abstract.– Reptiles are supposed to be relatively invulnerable to the ongoing rapid anthropogenic climate change as they are able to actively regulate their body temperature (Tb) through behaviour, tolerate high Tb and resist water loss. However, recent studies have shown that lizards and snakes seem to be more at risk than previously expected. In Mexico, increased local extinction probability in lizards correlated with the magnitude of warming during the reproductive period, questioning the assumption of climate invulnerability. We tested the hypothesis that different lizard species of the family Lacertidae are vulnerable to rises in maximum temperatures in Namibia, especially in the Namib and the Kalahari. We predicted that inhabiting different habitats with different microhabitat temperatures and different preferred Tb within different distribution ranges would result in differences in local extinction probability. As opposed to other studies our model integrates past and present distributions verified by museum collections and ground-truthed, a quantifiable physiological parameter (preferred body temperature Tpref) and available operative temperatures in correlation to air temperatures. Data was collected for 17 species (*Meroles anchietae*, *M. cuneirostris*, *M. suborbitalis*, *M. ctenodactylus*, *M. reticulatus*, *M. micropholidotus*, *M. knoxii*, *Pedioplanis namaquensis*, *P. laticeps*, *P. lineoocellata*, *P. breviceps*, *P. rubens*, *P. undata*, *P. inornata*, *P. gaerdesi*, *P. husabensis* and *Heliobolus lugubris*). Our first results seem to indicate that populations of at least one of the tested species were extirpated (both predicted by the model and verified) in the hottest area of its distribution range due to increased maximum temperatures during the reproductive season since the mid-1970s. Furthermore, different extents in future extinction risk are predicted under consideration of the currently accepted climate change scenarios. It seems that Namibian Lacertidae under current conditions already live at their thermal maximum.

Key Words.– climate change, preferred body temperature, lacertidae, Southern Africa, extinction risk

Treatment of snakebite in domestic animals

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Abstract.– I have practised as a veterinarian with farm and companion animals since the 1970s, gaining experience mainly in the Hartbeespoortdam area of North West Province, South Africa, Namibia (North and South), Natal (Coastal and Midlands) and the Highveld region of Gauteng. My interest in reptiles and amphibians involves mainly those indigenous to southern Africa. In all incidents of snakebite, an

attempt is made to identify the species of snake responsible. Over time our practice has developed a protocol to deal with cases involving dogs – we deliver practical, effective treatment at as low a cost as possible. Patients are admitted to hospital as soon as possible and assessed. Serious cases are given full-scale treatment. For moderate cases, treatment is adapted to needs and progress of the case. Mild cases receive palliative treatment and observation of progress. Companion dogs form the majority of snakebite cases. Domestic cats are rarely bitten by venomous snakes. I have not yet come across a proven snakebite involving any type of farm animal. Polyvalent antivenom (SA Vaccine Producers) is the essential mainstay of treatment for serious and moderately severe envenomation. Intravenous fluid therapy, respiratory support, painkillers and anti-inflammatories are ancillary treatment. The primary species of snake involved in my personal experience are, in order of importance, Puff Adder (Bitis arietans), Bushveld Cobra (Naja annulifera), Mocambique Spitting Cobra (Naja mossambica; venom in eyes a very common problem), Night Adder (Causus rhombeatus)and Rinkhals (Hemachatus haemachatus).

Key Words.– veterinarian, dogs, cats, polyvalent antivenom, envenomation

Phylogenetic relationships in the *Pachydactylus capensis* species complex (Sauria: Gekkonidae) of southern Africa

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Abstract.– The *Pachydactylus capensis* species complex (*P. capensis*, *P. affinis*, *P. vansoni*, *P. tigrinis*, *P. oshaughnessyi*) has an extensive distribution in southern Africa. We aim to test species/population boundaries within the *P. capensis* species complex using large samples. Preliminary analysis based on sequence data from 16S rRNA indicated three major clades corresponding with *P. capensis*, *P. vansoni* and *P. affinis*. Within *P. capensis*, there were two major groups, whereas in *P. affinis* there were two major groups with as many as four species. Although *P. capensis* is considered a terrestrial species, some specimens have been collected in rocky, mountainous habitat. Other molecular markers will also be employed to construct the phylogeny, and to determine genetic boundaries across the range of the species complex taking habitat and ecology into consideration. Findings will be used to update the taxonomy of the group in an evolutionary context as the existence of cryptic lineages is suspected.

Key Words.– reptiles, Thick-toed Gecko, phylogenetics, genetic diversity, morphology

A summary of snakebite in Zululand

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Abstract.– With its favourable climate, much of Zululand has an abundance of snakes. Snakebites are regularly reported with the majority occurring in the warm, wet months from December to April. Over 1200 victims are hospitalised annually in the Zululand, Uthungulu and Umkhanyakhude districts with approximately two thirds of victims showing signs of envenomation. While most snakebite victims got to the hospital within six hours, some were admitted more than 16 hours after the bite. 10% of the victims were treated with antivenom. Over 95% of victims experienced classic cytotoxic envenomation with excessive pain, swelling and in many cases, subsequent tissue damage. The average stay in hospital was three days. The early administration of polyvalent antivenom was highly effective in reducing the area of necrosis and fatalities were rare. Over 40% of victims experienced some level of allergy to the antivenom with 20-40% of those victims going into anaphylactic shock. A bivalent antivenom for ***Naja mossambica*** and ***Bitis arietans***, and one that does not cause such a high percentage of allergic reaction is needed.

Key Words.– Snakes, snakebite, Zululand, cytotoxic envenomation, *Bitis arietans*, *Naja mossambica*, antivenom, anaphylaxis

Dietary diversity of African vipers (Squamata: Viperidae): recent adaptation or historical contingency?

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Abstract.– Morphology and behaviour related to trophic interactions inform investigations of ecological diversification because those traits structure communities, thereby playing key roles in the origin and maintenance of biodiversity. While novel trophic adaptations (particularly macrophagy and evolution of venoms) have been inferred as driving snake diversification, few studies have explicitly examined trophically-related traits in a detailed phylogenetic context to assess their role in the diversification of advanced snakes. We examine diet type for 160 species of vipers to reconstruct dietary characteristics of ancestral vipers at phylogenetically and biogeographically informative nodes, with a special emphasis on African lineages. We test whether dietary traits of modern vipers show evidence of recent adaptation or whether such traits are better explained by ancient historical contingencies. Ancestral state reconstruction unambiguously showed that the ancestor of all vipers, of viperines, and of crotalines consumed both ectothermic and endothermic prey, probably with an ontogenetic shift between them, respectively. African

vipers show little variation in this trait, with only Causus showing a conserved shift towards consuming ectothermic prey exclusively, and apparently no species shifting to a strictly endothermic diet. Body size varied significantly between species that consume different dietary groups: species that consume only ectotherms were significantly smaller, and species that consume only endotherms were significantly larger than species that consume both groups of prey items. Diet type showed little phylogenetic signal suggesting local adaptation. We were unable to assign invertebrate-consumption unambiguously to any key ancestral nodes, but the trait is highly conserved within clades in which it has evolved. Our results extend earlier work by showing that the biology of modern vipers often reflects combinations of both recent local adaptation and ancient adaptive shifts.

Key Words.– ancestral state reconstruction, phylogeny, diet, body size

Geographic distribution of amphibians and reptiles of Angola

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Abstract.– Angola is one of the larger countries in Africa and, due to its great geographical and climatic variety, presents a diversity of biomes and habitats, representing an important puzzle piece for understanding biogeographic patterns across sub-Saharan Africa. Angola is one of few biodiverse countries in Africa that remains seriously lacking in surveys of vertebrate diversity. This lack of knowledge has several historical causes, but the 27-year civil war greatly hindered research and contributed to this delay. Data regarding the occurrence and geographical distribution of amphibians and reptiles in Angola are currently scattered across natural history institutions in Africa, Europe and North America, and in a diversity of books and scientific papers. Currently, there is no available distribution database or atlas. These data are not easily accessible or properly formatted to use in distributional, niche-modeling, or biodiversity survey studies, thus limiting hindering future studies and conservation actions. Considering the threats faced by amphibians and reptiles worldwide and consequently the need for an update overview of the diversity and distribution of amphibians and reptiles in Angola, we compiled a database with all the available published bibliographical data on amphibian and reptile occurrences in Angola, updated the taxonomy and nomenclature for every citation and mapped the species occurrences in the country. A total of 110 amphibian and 307 reptile taxa were confirmed for Angola, while the presence of some other taxa is considered doubtful. Our results also show that the knowledge on the distribution of amphibians and reptiles in the country is not homogeneous, and for several areas such as Cuando-Cubango Province in the southeast Angola,

there is an almost complete absence of data. This work, together with current projects on digitizing museum collections and new fieldwork, constitutes an initial contribution for a future Atlas and Red List on the Angolan herpetofauna and contributes to the general knowledge of the biogeography of south-western Africa.

Key Words.– Angola, distribution, biodiversity informatics, historical records

Evolutionary and palaeoenvironmental implications of fossil frog assemblages from the South African west and south coasts

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Abstract.– Frog bones have been recovered from a number of South African west and south coast archaeological and palaeontological sites dating to the early Pliocene, Pleistocene and Holocene. The oldest site presented in this study is the early Pliocene (5.1 Mya) west coast fossil site of Langebaanweg (32° 57' 23.8" S; 18° 06' 58.2" E) which contains a rich and diverse anuran fauna recovered from the two main fossil-bearing members, the Muishondfontein Pelletal Phosphate Member (MPPM) and the Langeberg Quarzose Sand Member (LQSM). The former represents river channel deposits, and the latter, more terrestrial, purportedly floodplain, deposits. Differences in the frog communities from these members reflect the different depositional environments, and provide new palaeoenvironmental information for 5.1 Mya, when the west coast supported a rich and diverse anuran community. The majority of frog families identified at Langebaanweg contain high numbers of endemic species today and contributes to our understanding of the evolution and origin of the high degree of endemism of south-western Cape frogs. The morphology of fossil *Breviceps* and *Xenopus* taxa from Langebaanweg, as well as other Pleistocene and Holocene sites, are compared with each other, and to modern taxa, in order to assess morphological change over time.

Key Words.– Langebaanweg, palaeoenvironment, *Breviceps*, *Xenopus*

Assessing the threats against the Cape Platanna

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Abstract.– More publications exist on the conservation of the Cape Platanna, *Xenopus gilli*, than any other African amphibian, yet its status continues to decline. Threats against this species are said to include habitat alteration, genetic introgression, as well as predation and competition from the native congener *X. laevis*. Despite severe habitat alteration on the Cape flats, a reserve network has the potential to harbour populations. A study of the genetics of this species in the 1990s concluded that genetic introgression was minimal. Is it a legitimate claim that an endemic and sympatric congener is a conservation threat? Is there any evidence for competition or predation? In this study, we review what has been published on the threats to *X. gilli* and present some preliminary results from our ongoing studies. We suggest that careful management of populations can have a tangible effect on the conservation of this IUCN Endangered species, and that its future is in fact reliant on this.

Key Words.– African clawed frogs, conservation, hybridisation, predation, threats, wetlands

Chemical crypsis in the ambushing *Bitis arietans* (Squamata: Viperidae)

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Abstract.– Ambush foragers use a hunting strategy which places them at risk of predation by both visual and olfactory-oriented predators. Resulting selective pressures have driven the evolution of impressive visual crypsis in many ambushing species, and may have lead to the development of chemical crypsis. However, unlike visual crypsis, chemical crypsis is difficult to demonstrate or quantify. Field observations of Puff Adders (*Bitis arietans*) going undetected by mongooses and dogs, both of which are scent-orientated predators, lead us to investigate chemical crypsis in this ambushing species. We trained four scent-matching dogs of different breeds to test whether a canid predator could detect *B. arietans* using olfaction. We also tested for chemical crypsis in *B. arietans*' sloughed skin and in five species of active-foraging snakes. Due to differences in the modality of foraging, active foragers are predicted to have easily detectable scents due to reduced selective pressures acting on a "moving target". Dogs unambiguously indicated all active-foraging species and the sloughed skin of *B. arietans*, but

failed to correctly indicate Puff Adder scent, confirming that *B. arietans* employs chemical crypsis. The dogs' ability to detect *B. arietans* sloughed skin fits with field observations, where Puff Adders relocate to a new lie-up immediately after shedding. This is the first demonstration of chemical crypsis anti-predatory behaviour, though the phenomenon may be widespread among ambushers, especially those that are at high risk of predation. Our study provides additional evidence for the existence of an ongoing chemically-mediated arms race between predator and prey species.

Key Words.– olfactory camouflage, selective evolution, Puff Adder

Assessing the effects of changing climate on distributions of the endemic amphibian fauna of the Cape Floristic Region

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Abstract.– Climatic changes have had profound impacts on the distribution of species throughout time. In response to these climatic shifts, species have shifted ranges, adapted genetically or became extinct. Using Species Distribution Models (SDMs) on current distribution data, we assess the impacts of climatic changes on the distribution of a community of 37 amphibian species endemic to the Cape Floristic Region (CFR); a region that is proposed to have experienced relatively stable climates throughout the Quaternary, thus leading to current exceptional levels of endemism across taxa. We used paleo-climate models for 21 Kya (Last Glacial Maximum: LGM) and 6 Kya (Holocene Glacial Minimum: HGM) to reconstruct hypothetical historical distributions and future climate models to construct hypothetical future distributions for the year 2080. We found that CFR amphibian community has lost suitable climate space since the LGM and this trend is expected to continue under future climate scenarios. In addition, the rate at which the CFR amphibian community is expected to shift in keeping with predicted climatic changes, as well as the rate of climate space loss far exceeds historical background rates.

Key Words.– climate change, Cape Floristic Region, amphibian community, species distribution models, rate of change

The Gerrhosauridae-Cordylidae divergence: Effects of going on a diet

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Abstract.– The squamate suborder Scinciformata is comprised of four families: skinks (Scincidae), night lizards (Xantusiidae), plated lizards (Gerrhosauridae), and girdled lizards (Cordylidae). The Scincidae occupies the basal position in the scinciform phylogenetic tree, with the Xantusiidae being sister to the two most recently diverged families, the Gerrhosauridae and Cordylidae. In this paper, we use a simple parsimony approach to reconstruct ancestral states for the Scinciformata. Our preferred hypothesis is that the Gerrhosauridae/Cordylidae divergence was accompanied by transitions from a terrestrial lifestyle to a rock-dwelling one, from a widely foraging mode to a sit-and-wait one, from heavy armour to light armour, as well as the loss of lingual prehension and the evolution of exposed generation glands. We demonstrate that the inclusion of a clumped food source such as black flies in the diet of the most recent common ancestor of extant cordylids would have forced the ancestor to become an agile, rock-dwelling sit-and-wait forager that used jaw prehension to secure prey and that heavily relied on high levels of visual and chemical communication in the dense aggregations that would have formed at food hotspots. In extant platysaurinids, aerial predation pressure apparently continuously reinforces light armour and agility, which in turn reinforce dorso-ventral flattening of the body to compensate for the lack of armour. It was only after the evolution of viviparity, that the system was compromised. The prolonged gestation period and increased clutch size of the viviparous cordylinids, would have seriously compromised agility and dorso-ventral flattening in females, forcing individuals to stay closer to their rock shelters during activity and to shelter in wider crevices. This would have resulted in increased terrestrial predation pressure and an increased need for armour.

Key Words.– ancestral state reconstruction, black flies, Platysaurinae, viviparity, Cordylinae

Semi-comparative phylogeographic analysis of two widely distributed squamate sister-species (*Agama atra* and *A. anchietae*) reveals unrecognized cryptic species and incongruent genetic and biogeographic patterns

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Abstract.– African lizards in the genus Agama are speciose and have a pan-continental distribution, making them an ideal model for investigating bio- and phylogeographic patterns. Many species have large geographic distributions that span numerous biogeographic barriers. Species with such distributions, when analyzed at finer scales, may reveal that some are, in fact, complexes of cryptic species, particularly those with strict ecological requirements. Two rupicolous lizard species, the Southern Rock Agama (*Agama atra*) and Anchieta's Agama (*A. anchietae*), are widely distributed (mostly allopatrically) across much of southern Africa. Using expanded geographic sampling, as well as both nuclear and organellar (i.e., mtDNA) genetic data, we asked: 1) is there evidence of unrecognized cryptic diversity within these taxa; 2) are the distributions of the recovered clades shaped by proposed bio-/ phylogeographic barriers (e.g., Knersvlatke plain, Orange & Kunene rivers, Great Escarpment etc.); and 3) are the recovered mtDNA clades congruent to those recovered by the nuclear data? We found substantial mtDNA sub-structure within both species, suggesting that each is a complex of cryptic species. Proposed phylogeographic barriers demarcate some clades, however the results vary. Furthermore, the nuclear data are incongruent with respect to the recovered mtDNA clades in *A. atra*, instead suggesting one large panmictic population. We discuss possibilities for this incongruence, as well as why the results differ for *A. anchietae*, and how these species-specific patterns can provide insight into the processes governing speciation in southern Africa.

Key Words.– nuclear DNA, mitochondrial DNA, evolution, speciation, Africa

Identifying priority conservation areas for the Sungazer (*Smaug giganteus*) using ecological niche models

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Abstract.– The Sungazer (*Smaug giganteus*) is a Threatened South African cordylid species, with an Area of Occupancy just over 1000 km2. The species faces increasingly severe threats to its habitat from burgeoning human populations that require more space for agriculture, residential areas, dams and mines. As a result, 44% of the Extent of Occurrence has been irreversibly transformed, with a rate of habitat decline of 1.5% per year. In the light of these risks, conservation measures to protect habitat across the distribution of the species must be considered. However, the species occurs patchily across its distribution and an unguided approach to conserving habitat is likely to be unsuccessful for the long-term conservation of the species. We constructed ecological niche models to detect areas of optimal Sungazer habitat and associated high population density, based on 536 locality records, and 24 environmental GIS layers. The model resolved five zones of optimal habitat. These zones have a total area of 812 km2 and are spread across the distribution, with sites situated in the west (Welkom), north centre (Vrede, Edenville), south east (Harrismith) and north east (Volksrust). We estimated that these areas would support between 7 000 and 11 000 individuals. This is four to five times the mean minimum viable population (MVP) for vertebrate species. Ideally, a network of protected areas that cover the priority areas and link them through corridors would serve as the best approach to conserving the species. This would ensure that relatively large populations could persist within a network of linked optimal habitat patches.

Key Words.– nuclear DNA, mitochondrial DNA, evolution, speciation, Africa

Cryptic frog diversity may indicate overlooked biodiversity hotspots in West Africa

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Abstract.– West African's biological diversity is under severe pressure. With dramatic speed, natural ecosystems, forests and savannas are exploited (e.g., logging, mining) and converted into agricultural systems (e.g., cotton fields, rubber and oil palm plantations). The troubling state of the region's biological richness may be in future additionally challenged by changing climatic conditions. In contrast we are

still far from comprehensively knowing the region's species richness. Despite intensive research activities during the last 20 years, this knowledge gap still exists for the anuran fauna of the Upper Guinean forests. During the last years we detected unexpected rates of cryptic diversity in various non-related frog genera. In this talk we present the geographic pattern of this cryptic diversity, interpret this pattern based on presumed previous forest fluctuations and discuss how our results might be used to detect overlooked areas of exceptional biological richness in other taxa.

Key Words.– biodiversity hotspot, habitat conversion, forest refugia, Upper Guinea forests

Are South Africa's amphibians slipping through the conservation cracks?

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Abstract.– Amphibians have one of the highest rates of extinction globally. While the threat-levels of species, as defined by the IUCN, are based on many criteria, sometimes little attention is given to how the distributions of species relate to protected areas or areas of land transformation. Data collected during the South African Frog Atlas Project (Minter *et al*. 2004) allowed us to analyse the distribution data for South African amphibians in terms of land-cover characteristics, with a focus on formally designated conservation areas. Using a ranking system based on Extent of Occurrence, Area of Occupancy and the portion of the distribution within conservation areas, we identified 15 species of amphibians in South Africa that are of conservation concern in this respect. The four species of highest concern were ***Heleophryne orientalis***, ***H. regis***, ***Breviceps fuscus*** and ***Amietophrynus pardalis*** as only small portions of their distributions lie within the formally designated conservation network of South Africa. These species face habitat loss over a large proportion of their distribution, and yet they are currently classified as Least Concern. This suggests that species of conservation concern may be overlooked by the IUCN conservation assessment process. These flagged species should thus undergo further studies to reassess their conservation status. Our results indicate that there is a need to look more closely at the conservation network within South Africa and assess whether it can be altered to sufficiently conserve all of South Africa's amphibians.

Key Words.– IUCN conservation assessment, conservation network, South African Frog Atlas

Microornamentation on snake scales

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Abstract.– The microscopic structures (microornamentation) on the surface of snake scales may have a variety of functions. For example, Spinner *et al*. (2013) showed that the microornamentation on the black scales of the West African Gaboon Adder created a velvet appearance, aided in dirt-repellence,

and potentially functioned in improving the snake's thermoregulation and camouflage. We surveyed 10 species of snakes for the presence of microornamentation using light microscopy. We detected microornamentation in three species, ***Bitis schneideri*** (Namaqua Dwarf Adder), ***B. arietans*** (Puff Adder) and ***Hemachatus haemachatus*** (Rinkhals). We then used scanning electron microscopy (SEM) to quantify the morphometrics of microornamentation for the latter two species. We found etched parallel grooves at three levels of organisation (approximately 30 µm, 5 µm, and 0.4 µm) on ***H. haemachatus***. For ***B. arietans***, we detected significant differences in the height of microornamentation between black (40 µm) and pale (17 µm) scale regions, but no differences in the density on each region. These results suggest that the colour of ***B. arietans*** scales is primarily a product of the pigment in the micro-ornaments. We suggest that microornamentation creates optical effects on the scales of both ***H. haemachatus*** and ***B. arietans***, and improves thermoregulation in ***H. haemachatus*** and camouflage in ***B. arietans***.

Key Words.– structural colour, pigment, light microscopy, scanning electron microscopy

Phylogenetics and biogeography of the northern *Cordylus*

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Abstract.– The genus Cordylus is made up of 21 species of small, mostly-rupicolous lizards, divided into two geographically distinct lineages. One lineage is restricted to the southern and western areas of South Africa and Lesotho, and the other extends from eastern South Africa northwards to Angola and Ethiopia. While the southern clade is well-studied and has been the focus of several recent phylogenetic analyses, the evolutionary relationships of the eastern clade are less well known. This study uses a well-sampled, multi-locus phylogeny of eastern Cordylus as a foundation for a range of biogeographic and systematic analyses, identifying hidden diversity within the Tanzanian and Angolan Cordylus, and uncovering a number of clear biogeographic patterns, including strong evidence of a single exodus from southern Africa during the late Miocene.

Key Words.– girdled lizards, species delimitation, historical biogeography, systematics

Progress in protecting Pickersgill's Reed Frog *Hyperolius pickersgilli* (Anura: Hyperoliidae) in KwaZulu-Natal

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Abstract.– Pickersgill's Reed Frog, ***Hyperolius pickersgilli*** (Anura: Hyperoliidae) was uplisted from Endangered to Critically Endangered in the previous Red List assessment for South African frogs (2010). The species is known only from a limited number of sites along the KwaZulu-Natal coastline. Recommendations regarding conservation research and action for the species were outlined in the conservation research strategy developed as a result of the assessment. The species received the highest conservation priority ranking in terms of requiring more knowledge on threats and basic biology, identification of management units, implementation of monitoring, obtaining population estimates and initiating stakeholder agreements to protect habitat. Through the joint efforts of the Endangered Wildlife Trust, Ezemvelo KZN Wildlife and North-West University, we have succeeded in initiating and implementing the following conservation actions for ***H. pickersgilli***: 1) ongoing surveys have revealed new localities and helped to understand threats; 2) a Biodiversity Management Plan for Species (BMP-S) has been developed and finalised for approval by the Minister of the Department of Environmental Affairs (DEA), with the input of 14 stakeholders; 3) a monitoring protocol has been developed and tested; 4) using this monitoring method population abundance estimates have been obtained for selected sites; 5) sites have been prioritised and rehabilitation work on these has commenced through funding from the DEA; 6) ¬collaborations with ***ex situ*** organisations, that have resulted in a better understanding of the breeding biology, and; 7) improved capacity, education and public awareness, resulting in various research and citizen science projects as well as local employment.

Key Words.– Biodiversity Management Plan, conservation research, monitoring, abundance estimates, habitat management

Little frogs and big surprises: phylogenetics of the widespread species *Arthroleptis wahlbergii*

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Abstract.– The amphibian ***Arthroleptis wahlbergii***, as currently defined, is broadly distributed along the eastern margin of South Africa, primarily associated with forest fragments within the savanna and grassland biomes. It is the southernmost species in this genus and, along with three ***Leptopelis*** species represents the southern extent for the African family Arthroleptidae. Many animal taxa that inhabit forests in this region have been shown to exhibit strong phylogenetic structure, often at the species level. For example, dwarf chameleons (***Bradypodion***) and velvet worms (***Peripatopsis***), from the naturally fragmented forests of KwaZulu-Natal and the Eastern Cape regions where ***A. wahlbergii*** occurs, are thought to have diversified and fragmented in connection with fragmentation of forests since the early to mid-Miocene, and multiple cryptic species have been uncovered. Given that forest dynamics may be a strong force for allopatric speciation in the region and that ***A. wahlbergii*** contains populations that differ phenotypically, we investigated ***A. wahlbergii*** in a phylogenetic context using one mitochondrial and one nuclear marker (16S, RAG-1). Thirty-seven individuals from 11 forest patches were included in a maximum likelihood analysis. Eight strongly supported clades were recovered, at least three of which show levels of divergence similar to that found between other amphibian species. These clades reflect the major forest types in the area (Afromontane, Scarp, Coastal forest) to a limited extent, but geographical proximity of subpopulations is a stronger predictor of relatedness than current forest type classification, with additional population level structure within each forest type associated with individual forest fragments. These results largely mirror that found for ***Bradypodion*** by suggesting that fragmentation of forest habitat, as well as forest type, has profoundly affected forest specialists, and is a major driver of divergence between species and populations.

Key Words.– amphibians, *Arthroleptis wahlbergii*, Afrotemperate forest, biogeography, phylogenetics

Arthroleptella: What we know now and what we still need to investigate (Anura: Pyxicephalidae)

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Abstract.– A review is provided on the current state of knowledge on endemic South African genus *Arthroleptella* (moss frogs). Existing gaps in our knowledge are identified for future research to resolve. Included in the review is a brief overview of the systematic placement of the genus and its likely origin as inferred from DNA-based phylogenies; the mode of speciation and possible causes including identification of barriers to gene flow, the current number of species in the genus, the variation of advertisement calls across genetic clades and space, and the threats to the continued existence of the various *Arthroleptella* species.

Key Words.– phylogeny, speciation, vicariance, advertisement calls

Environmental citizenship in citizen science: A case study of a volunteer conservation group, from Noordhoek, South Africa

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Abstract.– The Endangered Western Leopard Toad (*Amietophrynus pantherinus*) is endemic to the winter-rainfall parts of the Western Cape, areas which are also favoured for human settlement. Residents in the Noordhoek area witnessed many toads being killed on roads during their annual migration to breeding ponds. Concerned citizens mobilised a volunteer group to mitigate this threat to the species. My research interest lies in the analysis of the learning dynamics presented in citizen science groups, the enabling and constraining factors shaping citizen science practices and how participation in citizen science nurtures environmental citizenship. I have chosen a case study approach to explore the practices of the Toad NUTS (Noordhoek Unpaid Toad Savers) group. The evidence showed that the Toad NUTS group is a community of practice where learning occurs by legitimate peripheral participation and is deepened through an apprenticeship style of learning interaction with more experienced volunteers. Four interconnected components of learning were identified: practice, meaning, identity and community. There are various shaping arrangements of cultural-discursive, material-economic and social-political configurations which not only influence Toad NUTS practices, but require that volunteers learn to navigate these arrangements and develop relational expertise in order to implement conservation strategies successfully. Volunteers with a pre-existing sense of environmental citizenship are more likely to join a citizen science group.

However these virtues are also strengthened and others are gained with ongoing participation in citizen science practices. This study showed that citizen science presents opportunities to develop the core science and applied mathematics knowledge and skills of volunteers. If facilitated sensitively, citizen science can make a meaningful contribution to the field in which they operate, in this instance, in conservation, while also nurturing the governmentality of the volunteers with regard to the species and the environment.

Key Words.– Western Leopard Toad, citizen science, volunteers, learning, environmental citizenship, practices, conservation strategies, governmentality

Exploring the invasion of *Amietophrynus gutturalis* (Anura: Bufonidae): a multidisciplinary approach

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Abstract.– The Guttural Toad, *Amietophrynus gutturalis* (Power, 1927), is a generalist and synanthropic species naturally distributed in central and southern Africa. Due to its adaptable habits, it has become invasive in Cape Town, where it was introduced from KwaZulu-Natal at the end of 1990s, probably as eggs or tadpoles with a consignment of aquatic plants. Despite an ongoing, sustained eradication campaign which started in 2010, the invaded range is currently expanding. Moreover, in the last twenty years the same species shows a range expansion along the western stretch of the Orange River, probably because of anthropogenic landscape transformation. We aim to predict the potential spread of *A. gutturalis* in the Cape Town area and estimate the efficacy of the current eradication program utilizing individual based model. Moreover, we aim to investigate the extent of change of the phenotype since introduction in the novel environment context of Cape Town, in order to identify possible adaptive responses during invasion. To achieve this, we will compare the invasive population with the native one in KwaZulu-Natal, by considering energetic reserves, life-history traits and physiology. We will use this comparison to quantify the extent to which species-specific physiological constraints could limit the future spread of an invasive species. Finally we intend studying the Guttural Toad's invasive spread along the Orange River and assess the extent, due to spatial disequilibrium dynamics, the phenotype of the individuals at the invasion front diverges from that of long-established populations.

Key Words.– Guttural Toad, invasive spread, local adaptation, phenotypic plasticity, spatial disequilibrium dynamics

Herpetological Association of Africa

12th Conference

GOBABEB, NAMIBIA

Posters

Thermal ecology of two sympatric tortoise species (*Psammobates oculifer* and *Stigmochleys pardalis*) in the Thorn-Bush Savanna of central Namibia.

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Abstract.– This study investigated the thermal behaviour of two sympatric tortoise species, *Stigmochleys pardalis* (previously known as *Geochelone pardalis*) and *Psammobates oculifer*. In addition, the study is part of larger international study that aims to predict the possible impact of rapid global warming on tortoise adaptation and survival. The study is currently being conducted in the semi-arid savanna of Windhoek at the Hohewarte farm, in Namibia. To assess the thermal behavior of these two species, transmitters and temperature loggers were attached to tortoises for continuous long-term monitoring of individuals. Data were collected from December 2013 (and is currently ongoing) to measure the seasonal and daily difference in the activity patterns and thermal ecology of these tortoises. Preliminary results suggest that tortoises are most active during morning and afternoon hours, and although more active during the wet season, there is a surprising amount of dry-season activity. During the winter months, *P. oculifer* is more active than *S. pardalis*. The use of burrows over pallets appears to increase during the summer months, likely for protection from higher temperatures. Nonetheless, temperature data-loggers recorded external carapace temperatures as high as 50 $^{\circ}$C, although not for extended periods of time. Conversely, winter temperatures regularly dipped below freezing (as recorded by our adjacent weather station) for up to several hours at night, and tortoise temperature data loggers closely tracked these ambient conditions, dropping below freezing for short periods. We have found one small *P. oculifer* on more than one occasion completely buried by as much as 4 cm of dirt below the surface.

Key Words.– sympatric, *Psammobates oculifer*, *Stigmochelys pardalis*, thermal biology

Harnessing the power of social media: hashtags as a tool to synthesise reptile natural history

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Abstract.– Despite growing interest in the behaviour and ecology of reptiles in Africa, our understanding of the natural history of many species remains speculative. However, advancement of digital photography and social media provides a powerful tool to remedy this situation as photographs of interesting and often novel observations of reptile behaviours are regularly posted on major social media platforms such as Facebook and Twitter. We propose the use of a series of standardised hashtag social media metadata tags, linking posts to specific themes, and making those themes searchable and collatable. We propose the use of four hashtags to categorise major classes of observation. Observations of reptiles with prey items should be designated by #WildReptileFeeding; observations of reptiles being killed or preyed upon should be designated by #WildReptilePredation; observations of copulating, courting, male-male combat, birthing, or egg-laying should be designated by #WildReptileMating; while agonistic interactions between individuals of different species should be designated by #AgonisticReptile. Preliminary results suggest significant potential to discover novel species interactions (both trophic and agonistic), as well as broad-scale spatial and temporal activity patterns exhibited by free-ranging reptiles. The value of our proposal is thus dependent on community buy-in and active use and tracking of the proposed hashtags.

Key Words.– natural history, citizen science, predation, reproduction, feeding

Comparative phylogeography of three rock dwelling lizard species (*Agama atra*, *Karusasaurus polyzonus*, & *Chondrodactylus bibronii*) provides insight into the speciation process in southern Africa

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Abstract.– Geology, geography and changing climate have all played a role in shaping the distribution of organisms in southern Africa, particularly for species spanning the arid/semi-arid Karoo Biome.

Using comparative phylogeography, we explored patterns within three sympatric yet distantly related, rock-dwelling lizard species: the Southern Rock Agama, ***Agama atra***; Bibron's Gecko, ***Chondrodactylus bibronii***; and the Karoo Girdled Lizard, ***Karusasaurus polyzonus***. All three taxa are saxicolous, greatly utilizing the geologically complex, ancient, rock formations found throughout the subcontinent; yet differ in period of daily activity, social structure, and microhabitat use (although ***C. bibronii*** has been observed inhabiting the same rock cracks with either ***K. polyzonus*** or ***A. atra***). In many regards ***C. bibronii*** could be considered a 'rock generalist,' often living in rocky habitat unsuitable for either ***A. atra*** or ***K. polyzonus***. This habitat 'leniency' could potentially erase significant, informative genetic signal as it would allow for better individual dispersal throughout its range. In light of this, we hypothesized that there would be a degree of shared evolutionary history across the subcontinent between the three, particularly at recognized barriers to gene flow for other rock-dwelling organisms (e.g., the Knersvlatke plain) due to shared distribution and gross ecological requirements. Employing genetic data we asked: 1) what is the structure of 'populations' within a species, and what are the geographic boundaries of those groupings; 2) are these clusters/populations isolated (or conversely, is gene flow ongoing between them), and for how long; and 3) how have climatic shifts affected species/population distributions? The species-specific patterns provide insight into the processes of speciation governing the arid zones of the southern hemisphere.

Key Words.– squamate, evolution, Cordylidae, Agamidae, Gekkonidae

The movement ecology and habitat use of the Cape Dwarf Chameleon

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Abstract.– This project focussed on the Cape Dwarf Chameleon (***Bradypodion pumilum***), a Western Cape endemic, found primarily in transformed and degraded habitats. Using micro radio-transmitters, we documented habitat-use and the area utilized by this species using data from five individuals radio-tracked in 2014 and six individuals in 2010 at the Noordhoek Wetlands, Cape Town. The area utilized and daily displacement were examined for differences between sexes. Additionally, chameleon perch diameters were compared to diameters of randomly sampled vegetation transects to test whether chameleons select specific branches or use all available sizes. To test whether chameleons prefer to be higher at night (more exposed) and lower (more concealed) during the day, the height above ground and vegetation cover was documented and compared between day and night. Perch height and vegetation cover were also compared between sexes to investigate differences in risk taking. The area utilized and perch cover for radio-tracked chameleons were not significantly different between the sexes. However,

males perched higher in the vegetation than females and may have had a greater daily displacement and perch diameter (the data were inconclusive). Lastly, we found that chameleon vegetation use varied between day and night, but not between early morning, midday and late afternoon (e.g., chameleons perched in higher, less dense vegetation at night than during the day). This study reveals how the Cape Dwarf Chameleon utillises the environment, and provides insight into the potential for dispersal of the species across the transformed, fragmented landscape.

Key Words.– Chamaeleonidae; conservation; habitat fragmentation; dispersal; habitat selection; radio-telemetry

Seed dispersal by tortoises (*Psammobates oculifer*) and the effect of their gut passage on seed germination

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Abstract.– Tortoises play a vital role in the ecosystem. Some frugivorous tortoises play an important role in seed dispersal. They can disperse seeds away from the parent plant to areas favourable for establishments through gut passage. Tortoises subject seeds to less severe digestive processes in their gut. The longer period the seeds stay in the gut, the further they can be dispersed depending on the distance travelled by the tortoise away from the parent plant. The study was carried out to investigate the plant species dispersed by the Serrated Tortoise (*Psammobates oculifer*) in the wild, the effect of gut passage on the germination rate of seeds eaten by the tortoises (tomato seeds) and the retention time of the ingested seeds. The tortoises used in the study were captured in the non-protected areas of Botswana and were kept at the animals' outdoor enclosure at Botswana College of Agriculture (BCA), where experiments were conducted. Faeces defecated during transportation from the bush to BCA were collected and analysed for the presence of seeds which were later identified at the herbarium. At BCA, the tortoises were maintained on indigenous vegetation and supplemented on various fruits and vegetables known to be eaten by tortoises. The gut passed seeds, the seeds extracted directly from fruits as well as the whole fruit were planted at the end of the experiment and number of germinated seeds recorded daily. The food retention time was calculated by subtracting the time in which the colourful beads appeared in the faeces from the time at which the feeds mixed with beads were offered. The serrated tortoises were found to disperse seeds of Grewia species in the wild. Gut passage was found to significantly enhance germination rate of tomatoes while food retention time ranged from three to seven days. This study demonstrates the importance of the tortoises in the ecosystem.

Key Words.– food retention, gut passage, seed dispersal, tortoises

The invasive Guttural Toad, *Amietophrynus gutturalis* (Anura: Bufonidae) of Cape Town, South Africa: Where do they come from?

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Abstract.– Invasive species and the effect they have on the natural biota are cause for great concern. The mega-diverse Fynbos region of the Western Cape, South Africa plays host to three exotic and potentially invasive amphibian species. A recent introduction of Guttural Toad, ***Amietophrynus gutturalis***, egg-clutches, tadpoles or male and female adults were somehow introduced to the Constantia region of Cape Town. As this region plays host to many of the endangered Western Leopard Toad, ***Amietophrynus pantherinus***, breeding sites, the expanding population of ***A. gutturalis*** may be problematic. In order to adequately manage and understand this invasive species it is important to isolate the origin of the population; determine if single or multiple introductions have occurred; provide an estimate on how many individuals were released; and compare the invasive populations' genetic variation to that of populations across their natural range. Twenty four samples from the invasive population and 45 samples from across the species natural range were sequenced. A resulting total of 121 genetic sequences derived from ND2 and 16S genetic markers were aligned in Sequencher 5.2.4 and all sequencing errors were checked against the chromatogram. These genetic data will be used to produce a fine scale phylogeny and haplotype network across the range of the natural population in order to examine population structure. Using haplotype networks and F_{st} as an estimator of genetic distance from both natural and invasive populations we identify the origin of the invasive population and assess the genetic diversity of both populations in order to assess the invasive species genetic potential.

Key Words.– invasive species, Cape Town, mtDNA, ND2, 16S, Bufonidae

Photo Bil Branch

Gobabeb, Namibia

Photograph by Unknown

Sand storm at Gobabeb

Photo Bill Branch

Ed Stanley and the balance of nature.

Photo Edward Stanley

Ed's close-up of *Meroles anchietae*.

AHN INSTRUCTIONS TO Authors

AFRICAN HERP NEWS

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CONTRIBUTIONS SUBMITTED IN AN INCORRECT STYLE (SEE GUIDELINES BELOW) WILL BE RETURNED TO THE AUTHORS.

All submissions should be set in 10 pt, Calibri, with 1.15 line spacing throughout. Submitted manuscripts should not contain any consecutive space characters, nor should they contain tab characters. Every word in English common names should start with a capital letter (e.g., Namaqua Dwarf Adder).

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African Herp News publishes longer contributions of general interest that would not be presented as either Natural History Notes or Geographical Distributions. A standard format is to be used, as follows: **TITLE** (capitals, bold, centred); **AUTHOR(S)** (bold, centred); Author's address(es) (italicised; use superscript Arabic numerals with author's names and addresses if more than one author); **HEADINGS** (bold, aligned left) and **Subheadings** (bold, aligned left) as required; **REFERENCES** (bold), following the standardised formats described below.

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African Herp News publishes succinctly annotated species lists resulting from local surveys of amphibians and reptiles on the African continent and adjacent regions, including the Arabian Peninsula, Madagascar, and other islands in the Indian Ocean. The area surveyed may be of any size but should be defined geographic unit of special relevance to the herpetological community. For example, surveys should address declared or proposed conservation reserves, poorly explored areas, biogeographically important localities or administrative zones. The relevance of survey results should be judged by the extent that these records fill distributional gaps or synthesise current knowledge. As far as possible survey records should be based on accessible and verifiable evidence (specimens deposited in public collections, photos submitted illustrating diagnostic features, call recordings and sonograms, or DNA sequences accessioned into international databases). Survey results should be presented in the same format as used for Articles (described above), and must additionally include a section titled **SYSTEMATIC ACCOUNT** (bold) comprising Scientific name (including author citation), location and habitat, evidence (including registration numbers and location of vouchers), and comments (where required). **REFERENCES** should follow the standardised formats described below.

Natural History Notes

Brief notes concerning the biology of the herpetofauna of the African continent and adjacent regions, including the Arabian Peninsula, Madagascar, and other islands in the Indian Ocean. A standard format is to be used, as follows: **FAMILY: *Scientific name* (including author citation)**; English common name (using Bill Branch's *Field Guide to Snakes and Other Reptiles of Southern Africa*, third edition, 1998, for reptiles; and Du Preez & Carruthers' *A Complete Guide to the Frogs of Southern Africa*, 2009, for amphibians as far as possible); **KEYWORD** (this should be one or two words best describing the topic of the note, e.g., Reproduction, Avian predation, etc.); the Text (in concise English with only essential references quoted). The body of the note should include information describing the locality (Country; Province; quarter-degree locus; location; latitude and longitude in D° M' S" format; elevation above sea level), providing the date (day, month, year), naming the collector(s), and stating the place of deposition and museum accession number or describing the fate of the animal. **REFERENCES** should follow the standardised formats described below. **SUBMITTED BY**: **NAME**, Address, E-mail.

Geographical Distributions

Brief notes of new geographical distributions of amphibians and reptiles on the African continent and adjacent regions, including the Arabian Peninsula, Madagascar, and other islands in the Indian Ocean. Records submitted should be based on specimens deposited in a recognised collection. A standard format is to be used, as follows: **FAMILY; *Scientific name* (including author citation)**; English common name (using Bill Branch's *Field Guide to Snakes and Other Reptiles of Southern Africa*, third edition, 1998, for reptiles; and Du Preez & Carruthers' *A Complete Guide to the Frogs of Southern Africa*, 2009, for amphibians as far as possible). The body of the note should include information describing the locality (Country; Province; quarter-degree locus; location; latitude and longitude in D° M' S" format; elevation above sea level), providing the date (day, month, year), naming the collector(s), and stating the place of deposition and museum accession number, or fate of the animal. The body should also include information on the size, colour and taxonomic characters (e.g., scalation, webbing) used to identify the specimen, as well as the distance to the nearest published locality. **REFERENCES** should follow the standardised formats described below. **SUBMITTED BY**: **NAME**, Address, E-mail.

Tables, Figures, and Photographs

Tables should be submitted as separate MS Excel files. Tables should be small enough to fit onto an A5 page, and should NOT contain any vertical lines. Photographs and figures should be submitted as separate JPEG files, and not embedded in the text. They should preferably be over 1MB in size, and not more than 5MB. The name of the photographer should be given, if not taken by the author of the submission. Each table, figure, or photograph, needs to be associated with an appropriate caption that should follow the reference list in the submission.

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Reference formatting is similar to African Journal of Herpetology.

References should be listed in the following format:

ALEXANDER, G.J. 2007. Thermal biology of the Southern African Python (*Python natalensis*): does temperature limit its distribution? Pp. 50-75. In HENDERSON, R.W., & POWELL, R. (Eds.). *Biology of the Boas and Pythons*. Eagle Mountain Publishing, Utah.

BRANCH, W.R. 1998. *Field guide to the snakes and other reptiles of southern Africa*. Third edition. Struik Publishers. Cape Town.

COTTONE, A.M. 2007. Ecological investigations of the Psammophiidae (Squamata: Serpentes). Unpubl. MSc thesis. Villanova University, Pennsylvania.

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LAMB, T., BISWAS, S. & BAUER, A. 2010. A phylogenetic reassessment of African fossorial skinks in the subfamily Acontinae (Squamata: Scincidae): evidence for parallelism and polyphyly. *Zootaxa* 2657: 33-46.

Note that author names are set as ALL CAPS, and that Journal Titles are not abbreviated.

Formatting should be achieved using paragraph settings and NOT tabs or spaces.

Citations should occur in chronological order: (Branch 1998, Alexander 2007, Cottone 2007, Frost 2010, Lamb *et al.* 2010). For papers with more than two authors, only the first author should be named in the text (e.g., Masterson *et al.* 2010) – italicising "*et al.*". Cite unpublished data as in press, e.g., (in press), which then appears in the list of references, or as J. J. Marais (pers. comm.), in which case Johan J. Marais's name and institutional affiliation should appear under Acknowledgements. Unpublished reports should be cited as personal communications.

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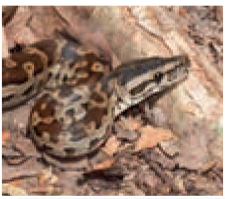

Southern Rock Python
Predation by Carnivores

Photo William R. Branch

Boomslang
Melanistic Coloration

Photo Johan Marais

Montane Egg-eater
Diet and Distribution

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Mapacha Ridged Frog
Distribution