AFROTHERIAN CONSERVATION

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Afrotherian Conservation is published by the IUCN Species Survival Commission Afrotheria Specialist Group at least once a year to promote the exchange of news and information on the conservation of, and applied research into, golden moles, sengis, hyraxes, tenrecs and the Aardvark.

Editor: PJ Stephenson

Message from the Chair

Galen Rathbun
Chair, IUCN/SSC Afrotheria Specialist Group

In the Afrotheria Specialist Group, we work with small African mammals that often take second stage to the charismatic African megafauna. In addition, the general public and resource agencies often are hardly aware that the smaller afortheres even exist. One of the consequences of this obscurity is that there are relatively few of us involved with gathering and interpreting data on this unique group of mammals and even fewer of us that are actively developing and applying conservation strategies for the Afrotheria. However, since the last newsletter our specialist group has been busy addressing the conservation concerns by updating the IUCN Red List for the Afrotheria. With the assistance from several group members, I successfully completed re-assessments of three sengis - changing their status from "vulnerable" to "least concern." Andrew Taylor completed an assessment for the aardvark, which resulted in a "least concern" listing for this species. The 2003 Red List will be available this November at http://www.redlist.org. PJ Stephenson is co-ordinating a review of tenrec assessments that were produced by a Conservation Assessment and Management Plan workshop in Madagascar for the 2004 list. Similarly, assessments of South African golden moles (led by Gary Bronner) and tree hyraxes (Paulette Bloomer) will be completed for the 2004 Red List update. These updates come at a particularly important time because it gives us a jump on a new programme that IUCN is launching to assess the world's mammal species (see information on page 7 of this newsletter as well as at http://www.iucn.org/themes/ssc/news/glomap.html).

When we formed our Afrotheria Specialist Group, we intentionally kept our membership relatively small in order to create a "lean and mean" organization. Most of our members are either world authorities on specific taxa, or they are particularly familiar with habitats used by afrotheres in specific regions of Africa. For large areas of Africa, however, we have no representation on our group. To help round out our geographical coverage I have invited Professor Dr. Akaibe Dudu of the Laboratoire d'Ecologie et de Gestion des Ressources Animals in the Democratic Republic of Congo to join us (but I have lost contact with him – does anyone have a current email for Dr. Dudu?). Because of the increasing conservation issues with golden moles in South Africa, Gary Bronner (Co-ordinator for Golden Moles) recommended including Dr. Sarita Maree of the University of Pretoria in our group and she has accepted my invitation. Dr. Robert Asher of the Institut für Systematische Zoologie in Berlin has also agreed to join our group to assist with tenrec and taxonomic issues. The group looks forward to working with these new members to advance the conservation of the Afrotheria. ❖

Inside This Issue

Aardvark, *Orycteropus afer*
Photo: A. Taylor

Article:

Aspects of the biology of the Cape Sengi, *Elephantulus edwardii*, from the Western Escarpment, South Africa

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Introduction

The Cape Sengi *(Elephantulus edwardii)* is endemic to South Africa. It is associated with rocky terrain in both low and relatively high rainfall areas from extreme north-western South Africa in a belt that curves south to northern Western Cape, extreme southern Northern Cape and into western Eastern Cape. Through this fairly restricted range it is fairly common, yet there is little field data published on this sengi. Considerable information, however, exists based on laboratory studies, including thermal biology (Downs & Perrin 1995), parasites (Fourie *et al.* 1995), systematics (amongst others Raman *et al.* 1995; Raman & Perrin 1997), food consumption, assimilation and food passage (Woodall & Currie 1989) and activity patterns (Woodall *et al.* 1989). Skinner and Smithers (1990) summarise what little is known from wild caught specimens.

During the course of an extensive study of the rodent populations of South Africa's western escarpment during 29 months from January 1992 to January 1995, we also captured Cape Sengis. Because this species is poorly known, we present information on this species in this report.

Study Area

Our study was conducted on Sewefontein Farm (31° 35'45"S; 19° 07'48"E), situated near the village of Nieuwoudtville on the Bokkeveld Plateau of Western Cape Province, South Africa, about 400 km north of Cape Town.

The area consists of undulating to rugged hill country with steep-sided ridges separating a scattering of dryland cultivation (rooibos tea, lupins and oats) and natural vegetation in sand-bottomed valleys. Livestock, principally sheep, run freely over most of the area. The rock structures are dominated by Table Mountain sandstones and Malmesbury shales, which have many horizontal and to a lesser extent vertical crevices and narrow cracks between strata. The site is about 720 m above sea level. We recorded rainfall for six years that included the study period, and the annual average ranged from 200 mm to 500 mm. Much of the precipitation falls during the winter months, June to September. Because the study area is at the edge of the escarpment, it received slightly higher annual precipitation than areas to the east and west.

Three principal vegetation types merge in the area: arid karroid scrub from the east, succulent Karoo from the west, and Cape Heathland (Fynbos) from the south. The study area was dominated by low bushes and shrubs that were about 20-200 cm high and were particularly abundant on the valley bottoms and in gullies cutting through the ridges. Dominant plants included *Galenia procumbens, Osteospermum spinescens,* various *Protea* species, *Rhus burchellii* and several of the reed-like *Restio* species. Rock ledges used by the sengis were largely bare of vegetation.

Materials and Methods

We trapped Cape Sengis with breakback traps (18 cm x 10 cm) and Sherman-type live traps baited with a mix of peanut butter, oats, and a fat and meat extract. Traps were set haphazardly along rock ledges, rock crevices, and along the bottoms of steep gullies - especially where we found signs of rodent activity. We checked traps at dawn, midday, and dusk and rebaited when required. We recorded in the field head and body, tail, hind foot (SU), and ear lengths and body mass. We measured testes length and then preserved them in 10% formaldehyde, and we recorded the presence, location and size of foetuses before they were preserved. All testes and ovaries were deposited in the collections in the Department of Zoology and Entomology, Rhodes University, South Africa. We collected and preserved ectoparasites in 70% alcohol for later identification. A captive female Cape Sengi gave birth to twins, which we measured and weighed at intervals of one to three days.

Results

Morphology and Reproduction

Body measurements of captured sengis are presented in Table 1. Females were slightly larger than males (T-test P=0.022, Table 1). Maximum testes lengths were in August and September (Table 2), which is after the peak rainfall months. No measurements are available for November.

Table 1. Cape Sengi body measurements: a) male; b) female. Sample sizes are not the same for all measurements due to some specimens being damaged.

a). Males

Body measurement	Mean	N	Range
Head and body (mm)	107.8	56	93.8-120.0
Tail (mm)	134.4	56	117.0-148.0
Hind foot-su (mm)	32.9	56	31.1-34.7
Ear (mm)	29.7	57	24.7-34.0
Mass (g)	48.2	26	36.8-57.0

b). Females

Body measurement	Mean	N	Range
Head and body (mm)	110.9	40	96.7-124.5
Tail (mm)	139.3	40	123.0-160.0
Hind foot-su (mm)	33.5	43	31.3-35.5
Ear (mm)	30.1	43	27.5-35.7
Mass (g)	56.7	24	41.3-83.0

Table 2. Reproduction data: average testes length and number of pregnant females.

Month	Males (n=123)			Females (n=43)	
	Testes Length (mm)			No. pregnant	No. caught
	Mean	Range	N		
March	6.8	5.9-7.4	4	0	1
April	6.8	4.0-8.5	6	0	0
May	7.7	6.1-9.6	36	0	3
June	7.4	5.8-9.0	22	0	7
July	7.9	1.3-9.1	20	0	8
August	8.8	7.3-10.7	21	0	7
September	8.5	8.0-9.4	8	5	7
October	6.9	6.5-7.2	2	5	6
November	-	-	-	-	-
December	6.8	6.2-7.4	4	3	4

We found pregnant females from September to December. Of the 13 pregnant Cape Sengis we examined (Table 3), 12 were carrying two foetuses each. We first trapped immature sengis, which were less than about 90 mm head and body length, in November and continued to trap young through January.

Table 3. Foetal crown/rump lengths (mm) for each pregnant female captured (all were carrying twins except the one captured on 27 Sep 1994).

Date	Foetal length (mm)	
	left	right
09 Sep 1992	12.0	13.8
09 Sep 1993	3.6	3.5
09 Sep 1994	9.8	9.2
24 Sep 1994	42.2	35.1
27 Sep 1994	-	10.0
06 Oct 1994	30.8	33.0
10 Oct 1992	28.3	30.7
10 Oct 1992	7.7	7.7
12 Oct 1994	46.0	44.0
26 Oct 1994	25.1	26.7
12 Dec 1992	11.6	13.7
12 Dec 1992	38.5	33.9
20 Dec 1994	17.3	18.9

The captive female Cape Sengi gave birth between 0800 hr and 1100 hr on 11 December to two females (Table 4). The neonates were fully haired, eyes open, external pinnae erect, and toes separated. They were able to walk steadily by 1200 hr. Development rates of the two neonates are outlined in Figure 1 and compared with other data in Table 5. The widening discrepancy between the weights of the two young over time were due to competition that occurred between them at about day 18 at the single food dish. The smaller one died on day 43.

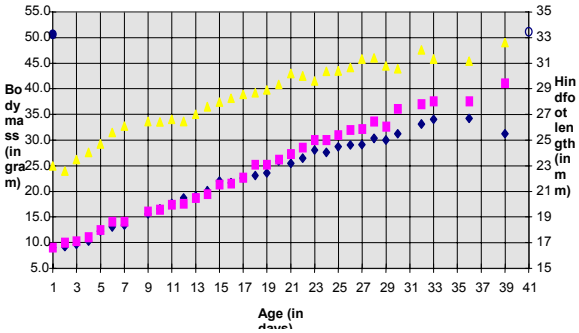
Table 4. Measurements of neonate twins born in captivity.

Measurement (unit)	Neonate 1	Neonate 2
Head and body (mm)	54.7	52.4
Tail (mm)	58.7	56.7
Hind foot (su)	22.9	23.1
Ear (mm)	11.9	13.7
Weight (g)	9	9

Table 5. Post-natal development of *Elephantulus edwardii*

Measurements	This study	Dempster *et al.* (1992)
Birth weight (g)	9	11.9
Birth hind foot (mm)	23	25.7
Birth weight in % adult weight	17.8%	23.6%
Litter weight in % adult weight	35.5%	42.5%
Hind foot as % adult hind foot	66.7%	74.3%
Weight growth rate (g/day)	0.89	0.59
Hind foot growth rate (mm/day)	0.28	0.3
Weight at 1 month as % adult weight	73%	65%
Hind foot at 1 month as % adult hind foot	95.8%	95%

Figure 1. Growth rates of two neonates. Squares represent mass for neonate 1 and diamonds for neonate 2. Triangles represent the average hind foot length for both neonates.



Ecology

We regularly saw sengis during daylight hours while servicing our traps, but during the hottest hours in the summer months they remained in the shade of crevices. At these times they frequently made rapid dashes into the open to snatch insect prey, or to move to adjacent crevices. The sengis were also active during the night and dawn based on observations while checking traps at these times.

Three species of rodents occupied the same rock crevices as the Cape Sengis, with the Rock hyrax *Procavia capensis* using and sharing the larger retreats. The Namaqua rock rat (*Aethomys namaquensis*) was particularly abundant throughout the study period, although populations of this rodent declined noticeably during the winter months. The Cape spiny mouse (*Acomys subspinosus*) was less common and frequently occupied narrower crevices than those used by the sengis. Present at very low densities was the Spectacled dormouse (*Graphiurus ocularis*). The dormouse is principally insectivorous, and the spiny mouse includes some invertebrates in its diet, therefore possibly resulting in nocturnal feeding competition with the sengis. However, cursory examination of stomach contents indicated that sengis were feeding mainly on ants whereas the two rodents rarely had the remains of these insects in their stomachs. Based on our observations, Cape Sengis seem to be

principally wait-dash-snatch hunters, operating from the edge of shaded crevices. The one exception observed was of sengis foraging on the communal dung middens of Rock hyraxes, where they flicked over dung pellets with their front feet, and to a lesser extent their snout, to expose ants, termites, flies, and beetles. Only three ectoparasites were identified from Cape Sengis, namely the louse *Polyplax biseriata*, and two ticks, *Ixodes* sp. and *Rhipicephalus cf. simus.*

Cape Sengi, *Elephantulus edwardii*
Photo: Chris & Tilde Stuart

Discussion

Our observations of diurnal as well as nocturnal activity of Cape Sengis contrast with Smithers & Skinner (1990), who suggest they are predominantly nocturnal. Smithers & Skinner (1990) also record that young Cape Sengis are born in the summer months from November to January. We found pregnant females in September, October and December, with juveniles from November to the end of January. We suspect that spring births predominate in the winter rainfall areas of its range, and somewhat later in areas in the east of its range receiving mainly summer rains. We base this on casual observations of young animals in February and March in the Eastern Cape Province.

The louse (*Polyplax biseriata)* we found on the sengis has not previously been mentioned as occurring on any macroscelid (Fourie, *et al.* 1995). This species is normally associated with the rodent genus *Tatera*, of which one species *T. afra* occurred on the sandy flats of the greater study area. Parasites were collected on a random basis from a limited number of animals.

Smithers & Skinner (1990) state that a single young, sometimes two, is the norm, but our data do not support this. Of the 13 pregnant females we examined, 12 were carrying two foetuses and only one had a single foetus. The captive female gave birth to twins.

Acknowledgements

The Parasite Identification Unit of the Onderstepoort Veterinary Research Institute examined the ectoparasite samples. A special thank you to Galen Rathbun for his valuable input in the draft manuscript.

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Article:

The conservation of golden moles (Afrosoricida; Chrysochloridae) with emphasis on the status of *Neamblysomus julianae* in South Africa

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The conservation status of the Juliana Golden Mole (*Neamblysomus julianae*) and its habitat is of considerable concern to the Afrotheria Specialist Group. During a scientific meeting held in Morogoro, Tanzania in July this year, several of our members participated in a workshop on the Afrotheria. During this meeting we discussed the deteriorating status of golden moles in general, and their habitats in some areas of South Africa.

Golden moles are morphologically very similar and it is possible that undescribed cryptic species are contained within the 21 species currently recognised in nine genera,

Amblysomus, Calcochloris, Carpitalpa, Chlorotalpa, *Chrysochloris, Chrysospalax, Cryptochloris, Eremitalpa* and *Neamblysomus* (Bronner 1995). Bronner's comprehensive taxonomic revision of the group, which is based on morphological and cytogenetic evidence, is the current baseline for conservation planning and will remain so until it is updated with new data and analyses. Based on this taxonomy and the "Conservation Action Management Plan" Workshop coordinated by the Endangered Wildlife Trust, eight of the ten most endangered mammals in South Africa are golden moles. Moreover, 11 golden mole species are considered threatened according to IUCN criteria, of which four are Critically Endangered, one is Endangered, and six are Vulnerable; *Neamblysomus julianae* is one of the Critically Endangered golden moles. Nevertheless, the results of Bronner's study are inconclusive in terms of the delineation of some of the golden mole taxa and there is a pressing need to produce a comprehensive molecular phylogeny of the Chrysochloridae to determine whether the 21 putative species contain cryptic species that would merit further protection as distinct evolutionary lineages, since so many of them are threatened. Such information will facilitate the development of an urgently required conservation action plan for the group as a whole, but more specifically for the focal species of this article, the critically endangered Juliana golden mole (Freitag & van Jaarsveld 1997; IUCN 2002).

The IUCN category "Critically Endangered" emphasizes the pressing need to protect a species that is being severely impacted by anthropogenic activities. This is the very situation with the Juliana golden mole, where the habitat of the geographically isolated nominotypical population on the Bronberg Ridge in eastern Pretoria has, and continues to be, degraded or destroyed by urban development and mining activities. The Bronberg Ridge is a unique region for the conservation of the Juliana golden mole because it supports one of only three known populations of this species that are restricted to deep sandy soils. The other two known populations are found in the Nylsvley area near Nylstroom (Northern Province, approximately 120 km away), and in the Pretoriuskop area in the south west of Kruger National Park (Mpumalanga, about 400 km away). On the Bronberg, individuals of this species have a clumped dispersion along the ridge, being restricted to patches of deep sands, and they have limited dispersal ability. Up to 35% of the original ridge habitat has been radically transformed during the past two decades, largely due to mining activities and rapid urbanization. Construction of the Hans Strydom Highway and Zwavelpoort Spruit road has also dissected the area into three regions, and these roads serve as significant barriers to dispersal. This has probably resulted in the fragmentation of this endemic golden mole population, and a reduction in gene flow among isolated subpopulations. Reduced gene flow inevitably results in decreased genetic variability and may result in genetic bottlenecking that can severely compromise the viability of the population as a whole.

The ridge to the east of the Hans Strydom Highway, and particularly the north-facing slopes of Shere and Zwavelpoort, has a high abundance of golden moles that is crucial for the future survival of this species. The western side of the highway has already seen vast development and loss of valuable habitat. As a consequence, this "eastern" sub-population is of high importance, yet this region is currently also under threat from a quartzite mining operation, and unregulated urban sprawl. The deeper sands on the north-facing slope are critical corridors for the movement of the golden moles. Our specialist group believes that if these corridors are transgressed, further fragmentation of this "eastern population" will result, thereby potentially further threatening the viability of the population. This degradation and a general decline in the population are ongoing despite the massive dearth in knowledge regarding the intraspecific phylogeny, population genetics, phylogeography and breeding strategies of the species, knowledge that is crucial for making informed management decisions relevant to their conservation.

A Juliana Golden Mole, *Neamblysomus julianae*, in hand
Photo: Craig Jackson

While there is some taxonomic uncertainty about the status of the three known populations of *Neamblysomus julianae*, this in no way diminishes the urgent need for conservation actions by authorities to halt habitat transformation and loss in the Bronberg region near Pretoria. Morphological characters suggest that the populations at Nylsvley Nature Reserve and the Bronberg Ridge may represent at least a separate subspecies, and perhaps even a full species, from those in Kruger National Park. A molecular phylogeny is clearly needed to clarify phylogenetic relationships and the taxonomy of these distinct geographical populations. Dr. Sarita Maree and Professor Nigel C. Bennett at the University of Pretoria and Dr. Gary N. Bronner at the University of Cape Town, who are also members of the specialist group, in association with Dr. Paulette Bloomer from the University of Pretoria, are currently undertaking such a study. Unfortunately, some of the results from this study are not expected before the end of 2004 because an in-depth investigation into genetic differentiation at the population level using appropriate genetic markers (e.g. mitochondrial D-loop sequences, and microsatellites for which a microsatellite library needs to be developed) is required before final conclusions can be reached. The results of this study are, however, unlikely to change the present conservation assessment of the Bronberg population. For example, even if the molecular phylogeny shows all three populations of *Neamblysomus julianae* are in the same species, the species as a whole would still be Endangered according to IUCN categories and criteria, and the Bronberg deme would still remain classified as a Critically Endangered sub-population. Hence, any attempt to question the validity of the current conservation status on the grounds of taxonomic uncertainty and outstanding evidence is largely irrelevant and logically flawed.

The Afrotheria Specialist Group therefore fully supports the recent decision of the Gauteng Department of Agriculture, Conservation, Environment and Land Affairs

(GDACEL) to classify the Bronberg Ridge as a Class 2 Ridge with a "no-go" development policy. Our support for this decision is based on the best scientific evidence available, which clearly identifies the importance of protecting habitat for the Critically Endangered Juliana Golden Mole. Environmental change occurs against a backdrop of other human-created stresses on biodiversity. Foremost among these are the loss and fragmentation of natural ecosystems. Thus, habitat protection is one of the most effective tools in conservation management for endangered species as small isolated populations resulting from habitat fragmentation are highly vulnerable to demographic and environmental stochastic related extinction events. In the presence of physical barriers such as roads, paving, swimming pools, etc, population isolation is enforced and a lack of migration serves to exacerbate the vulnerability to population extinction, leading to an increased risk of species extinction. Species that occupy specialist niches within ecosystems are often the first to be severely affected by anthropogenic-induced alteration of natural habitats. However, large charismatic species such as the African Elephant or Black Rhino readily receive attention when their existence is questioned. Smaller species, such as the Juliana Golden Mole, that are less appealing to the public in general and difficult to study, are frequently overlooked even when the risk of extinction is faced.

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Juliana Golden Mole, *Neamblysomus julianae*
Photo: Gary Bronner

Afrotheria News

Does the Golden-rumped Sengi (*Rhynchocyon chrysopygus*) occur in coastal Tanzania?

In 2002 Jonathan Walz, an archeologist working south of Tanga in northeastern Tanzania, contacted us about a Golden-rumped Sengi sighting in a patch of forest near the mouth of the Pangani River. This created considerable interest because *R. chrysopygus* is known only from small and fragmented coastal forests north of Mombasa in Kenya. South of Mombasa, the Black and Rufous Sengi (*Rhynchocyon petersi*) occurs in coastal forests and also forests in the northern Eastern Arc Mountains. Golden-rumped Sengis at Pangani, about 200 km south of Mombasa, would therefore be of great interest in terms of biogeography and, because both species are listed as endangered by the IUCN, their conservation.

We undertook a survey for *Rhynchocyon* from 8-11 July 2003 in the Pangani area with the considerable assistance of Andrew Perkin, who works on galagos in Tanzania. With GPS (Global Positioning System) co-ordinates and contacts provided by Jonathan Walz, the three of us interviewed local residents and searched suitable habitats in the Pangani area. The forest patch near the village of Msambeni, where Jonathan had made his sighting, recently had been reduced to less than a hectare by clearing for new maize crops; an area too small to support *Rhynchocyon*. We searched for larger forest patches in the area, but due to clearing for subsistence crops we only found small fragments of forest along the small escarpment dropping down to the Pangani River flood plain. We failed to make any sengi sightings in these forest patches, although there were still Blue Monkeys present in the largest patch on the steep slope of the escarpment near the village of Boza.

During the interviews, we asked local residents to identify from photographs which of the two sengis occur locally. Most people were not familiar with either sengi, but those that were identified were *R. petersi*. We visited the Msumbgwe Forest, about 20 km south of Pangani, and made a good sighting of *R. petersi* there. The colour pattern of the two *Rhynchocyon* species is distinctive, but in a brief sighting of an animal darting across a forest path we believe it is quite possible to confuse the two. We found no evidence of *R. chrysopygus* in the Pangani area.

We were shocked at the lack of coastal forest remaining around Pangani and the high rate of forest clearing that continues there. We believe that any *R. petersi* that remain in the area will soon disappear along with their forest habitat.

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An Update on the Global Mammal Assessment

Over the last several years, the IUCN Species Survival Commission (SSC) has developed two major projects, the Global Amphibian Assessment (GAA) and the Global Mammal Assessment (GMA), both of which are essential for providing new and updated Red List information for amphibians and mammals. Along with red list data from birds through Birdlife International, these projects will serve as major components to be incorporated into the Species Information Service (SIS) being developed by the SSC.

The GMA was initiated in July 2003, as a collaborative effort between the SSC mammal-related Specialist Groups and partner institutions. Project coordination is being carried out by a team comprising Dr. Wes Sechrest, at the CI/CABS - IUCN/SSC Biodiversity Assessment Initiative in Washington DC, Dr. Jonathan Baillie at the Zoological Society of London, and Dr. Mariano Gimenez Dixon at IUCN headquarters in Gland, Switzerland. The IUCN/SSC is currently fund-raising for the SIS and GMA and has submitted proposals to potential donors.

Specialist Groups are being engaged to provide information on most of the major groups of taxa. Yet information for small mammals (especially most rodents, insectivores, bats, etc.) will require an approach using regional workshops. It is expected that the next six months will be invested in data compilation. The data will be collected in a Data Entry Module developed for all the global biodiversity assessments and will be integrated into the Species Information Service, where it will be maintained and updated. There are various advantages to using the data entry module:

a). It will allow the collection of information on species in an electronic format making it easily available for future use.

b). Data will be entered using a standard format and standardized authority files. This standardization facilitates data entry and will allow comparisons between different taxa.

c). Copies of the module can be sent to different Specialist Group members to enter information. This method will allow the workload to be distributed to various people and allow experts to enter information on the species of their expertise, while maintaining consistency in the overall process. The information coming from different colleagues will then be merged "centrally".

It is expected that the GMA will take two years to complete, but by April 2004, there will be sufficient information to allow a comparative analysis of the conservation status of mammals, birds, and amphibians.

One important aspect of the Global Mammal Assessment is that it will concentrate on species level taxonomy. If we attempt to develop a full assessment of all subspecies we would require significantly more time and resources than we have available. This does not diminish the importance of subspecies or populations, it simply puts limits to the data collection effort within the GMA. If a Specialist Group collects information below the species level, it will be eventually incorporated into the SIS as a service to future studies, but it will not be used for this particular Assessment.

Also, by April 2004 the SSC plans to collect sufficient information to evaluate (or re-evaluate) all known mammals, birds and amphibians according to the latest IUCN Red List Categories, and allow a comparative anaylsis of conservation status.

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Just Published - Guidelines for Application of IUCN Red List Criteria at Regional Levels

The Guidelines for Application of IUCN Red List Criteria at Regional Levels have been published as a booklet in three languages: English, French and Spanish. They are now available on the SSC website in PDF format, also in three languages, at:
www.iucn.org/themes/ssc/redlists/regionalguidelines.htm

From IUCN/SSC E-bulletin, October 2003

Coming Soon - IUCN 2003 Red List

The Species Survival Commission (SSC) will be releasing the 2003 update to the IUCN Red List of Threatened Species on Tuesday 18 November. There will be an information package posted on the SSC website (www.iucn.org/themes/ssc) linked from the IUCN home page www.iucn.org. The news release will be available in English, French and Spanish.

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Lesser hedgehog tenrec, *Echinops telfairi*
Illustration by Stephanie Mansourian

Abstracts

Gary Bronner and Galen Rathbun organized a session on the Afrotheria at the 9th International African Small Mammals Symposium, Sokoine University of Agriculture, Morogoro, Tanzania, 14-18 July 2003. Here we publish the abstracts of the papers presented during the Afrotheria session, which included six 20-minute spoken papers and one poster (Barry *et al.*) that remained up during the entire symposium.

Evolutionary relationships of Golden Moles (Chrysochloridae) from the southern African subregion

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The family Chrysochloridae (the golden moles) is one of two major families of burrowing mammals endemic to sub-Saharan Africa. Chrysochlorids tend to be restricted-range taxa, which make them vulnerable to habitat degradation and local extinction, and most species are only known from scattered, isolated populations. Eleven of the presently recognised species appear in the 2002 IUCN Red Data List of threatened species (four critical, one endangered and six vulnerable). The latest taxonomic review of the Chryso-chloridae recognises two subfamilies (Chrysochlorinae and Amblysominae) and 21 species in nine genera (*Amblysomus*, *Calcochloris*, *Carpitalpa*, *Chlorotalpa*, *Chrysochloris*, *Chrysospalax*, *Cryptochloris*, *Eremitalpa*, *Neamblysomus*) based on morphological and cytogenetic criteria. Eighteen of these species occur within the boundaries of the southern African Subregion, and the remaining three species are extralimital. The results of the chromosome banding studies in Bronner's revision are inconclusive in terms of the delineation of some of the taxa. Here we represent new preliminary phylogenetic results based on taxonomic sampling covering all but one (*Carpitalpa*) of the nine genera and 17 of 21 species with emphasis on intergeneric and interspecific relationships. Sequence data derived from near complete sequences of the mitochondrial, protein-coding cytochrome *b* gene (1400 base pairs) were analyzed using neighbour-joining, parsimony, maximum likelihood and Bayesian phylogenetic reconstruction methods. We also present preliminary findings pertaining to the evolutionary relationships of the three geographically isolated populations of the critically endangered Juliana's Golden Mole, *Neamblysomus julianae* known at present (the Bronberg, Pretoria, Gauteng, the Nylsvley Provincial Nature Reserve, Northern Province, and the Pretoriuskop area, Kruger National Park, Mpumalanga). It is presently uncertain whether they represent distinct taxonomic entities, information that is of critical importance for the conservation of these rare golden moles.

Ten years of population data on two species of hyrax in the Matobo National Park, Zimbabwe

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Abundance, species ratios, and age distributions of the syntopic Rock Hyrax (*Procavia capensis*) and Yellow-spotted Hyrax (*Heterohyrax brucei*) were monitored from 1992-2001 in the 424 km² Matobo National Park (MNP), Zimbabwe, following suspected decreases in numbers through the 1980s. Hyraxes were identified to species and age class (adult, subadult and juvenile) and counted at 20 permanent observation posts in April-May each year following the birth event in March. We used the ratio method for aerial surveys to estimate hyrax abundance. The estimate of total abundance of hyraxes was lowest in 1995 at 52,900 (95% confidence interval of 36,600 to 69,300). Populations recovered to 140,600 by 1998 (110,800 to 170,400). *P. capensis* ranged from a low of 31,100 (22,600 to 39,600) in 1995 to a high of 59,200 (44,300 to 74,100) in 1998 before a 3-year decline. *H. brucei* ranged from 21,800 (11,900 to 31,700) in 1995 to 81,400 (65,000 to 97,900) in 1998, followed by a 2-year decline. The species ratio varied significantly ($P<0.001$) across years, *H. brucei* increasing disproportionately through the study period. Juveniles and subadults comprised 26% (1994) to 39% (2001) for *P. capensis* and 26% (1994) to 46% (1998) of *H. brucei* populations. Fluctuations of hyrax populations and temporal variation in the species ratio appear to be responses to annual rainfall, population dynamics of the black eagle, *Aquila verreauxii* (the principal predator), and an outbreak of mange in 1998.

A Yellow-spotted (or Bush) Hyrax, *Heterohyrax brucei*
Photo: PJ Stephenson

Afrotheria: Cinderella of mammalian systematics

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The Afrotheria concept challenges the traditional, morphology-based paradigm concerning the origin and early evolution of eutherian mammals. First proposed in 1997, this superordinal clade is supported by a muti-kilobase molecular

data suite and unites six anatomically and ecologically divergent orders that apparently evolved in isolation on the African continent: elephants (Proboscidea), sea cows (Sirenia), hyraxes (Hyracoidea), the Aardvark (Tubulidentata), elephant-shrews (Macroscelidea), and the newly-erected Afrosoricida (golden moles and tenrecs). The early genesis of this clade was paralleled by the independent evolution of Xenartha in South America, and later the northern hemisphere Boreoeutheria, comprising 2 lineages (Euarchontaglires and Laurasiatheria) giving rise to the other 12 placental orders. Divergence times based on molecular clocks defy the dogma of rapid adaptive radiation of mammals after the mass-extinction of dinosaurs at the K-T boundary, and instead suggest that placental mammals were already diversifying into clades that led to extant orders deep in the Cretaceous (ca. 100 MYA).

Evidence for the existence of this clade is compelling. Over 16 kbp of 22 genes from more than 50 species have been sequenced and analysed by three independent research groupings, with remarkably concordant results. Studies of amino acid sequences, protein signatures and retroposons (SINES) provide additional support, and calculated divergent times coincide with the split of Africa from Gondwanaland (ca. 103 MYA). The evidence points to a long overlooked taxonomic unit - but morphological evidence is discordant, and attempts to integrate morphological and molecular data suites have yielded equivocal results. Consequently, many mammalogists regard the Afrotheria concept as a mere hypothesis at best, or at worst a taxonomic fairy tale as delicate as that proverbial glass slipper.

In this paper, I critically review evidence for and against the Afrotheria theory, and highlight future research priorities to resolve this issue. I conclude by examining recent suggestions that conservation action plans, such as those being formulated by the IUCN/SSC Afrotheria Specialist Group, are ineffective in promoting the preservation of biodiversity.

Density and cover preferences of Black-and-rufous Elephant-shrews, *Rhynchoycon petersi*, in Chome Forest Reserve, Tanzania

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The objective of this study was to determine the density and habitat preferences of the Black-and-rufous Elephant-shrew (*Rhynchocyon petersi*) in some of its most important habitat in Chome Forest Reserve, Tanzania. This forest covers 143 km^2 in the South Pare mountains. Along 13 transects (300 x 5 m) cut through the centre of the forest in an east-west direction the number of elephant-shrew nests were recorded. The number of nests was converted to a density estimate based on the conversion factor determined for Golden-rumped Elephant-shrews, *Rhynchocyon chrysopygus* (FitzGibbon and Rathbun 1994). Nest-site cover preferences were examined by estimating the amount of cover at low (< 5 m), medium (5-15 m), and high (> 15 m) layers and comparing to cover estimates recorded every 20 m along transects. The average number of elephant-shrew nests per 100 m of transect was 0.39 (1 SE = 0.47), resulting in a density estimate of 19.04 km^2 (1 SE = 22.9). Nest sites tended to be found in areas with greater than expected cover at the low (< 5 m) levels. These results indicate the population of Black-and-rufous Elephant-shrews is lower in the Chome Forest Reserve than in most populations in the eastern Arc Mountains. The reasons for fewer Black-and-rufous Elephant-shrews in the Chome Forest and the conservation implications will be discussed.

Heterothermy in free-ranging Rock Elephant-shrews, *Elephantulus myurus*

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In the laboratory, Rock Elephant-shrews (*Elephantulus myurus*, mean body mass 56.6 g) displayed the lowest torpor minimum body temperature (Tb) yet recorded (ca. 5^{o}C) in a placental daily heterotherm. It was unknown whether this low Tb was characteristic of daily heterothermy in free-ranging animals. It was also unclear how cost effective the low Tb was since considerable energy is required to arouse from low Tb on a daily basis. We continuously measured body temperature once every hour in free-ranging *E. myurus* from May 2001 - May 2002 in Weenen Game Reserve, KwaZulu-Natal, South Africa. Free-ranging *E. myurus* had a high propensity for torpor, with females displaying higher torpor frequency than males. Also, torpor was used more during winter compared with other seasons. The lowest Tb recorded was 7.5^o C at an ambient temperature (Ta) of 3.7^o C and the minimum torpor Tb was strongly correlated with ambient temperature. Torpor arousal was tightly coupled with ambient temperature cycles. Low minimum torpor Tb at low Ta was therefore cost-effective because the animals offset the high cost of arousal through exogenous passive heating. Laboratory studies under constant ambient temperatures may therefore underestimate the energetic benefits of torpor in free-ranging small mammals that inhabit regions where seasonality is moderate.

Social structure and behaviour of the Bushveld Sengi (*Elephantulus intufi*) in Namibia

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The elephant-shrews or sengis (order Macroscelidea) represent a monophylectic radiation of African endemics with 15 extant species in four genera. Representatives of all four genera have been studied and they all appear to be socially

monogamous. Female and resource dispersion, indirect paternal investment, and mate guarding have been proposed as responsible for sengi monogamy. We hoped to better understand sengi social organization by studying the bush-veld sengi in southern Africa, where more temperate and seasonal habitats occur than in the tropics where other studies have been done. We used radio tags and direct observation to gather spatial and behavioural data during five months in 2000-2003.

Our animals were distributed as pairs on relatively stable and exclusive territories and exhibited few pair-bond behaviours. Maternal care was characterised by an "absentee" or "hider" strategy and there was no evidence of direct or indirect paternal care. This obligate and uniparental monogamy is also found in other sengis and several small cursorial herbivores, especially the smallest African antelopes.

Several studies indicate that monogamy in the Dik-dik antelope (*Madoqua kirki*) evolved as a mate-guarding strategy by males. Our results, along with previous studies of other sengis, especially *Rhynchocyon chrysopygus*, suggest that mate guarding is probably the main factor in the evolution of monogamy in sengis.

Social organization of the Eastern Rock Elephant-shrew (*Elephantulus myurus*): the evidence for mate guarding

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Understanding the costs and benefits of defending solitary females, or mate guarding, may be the key to understanding the evolution of monogamy in most mammals. Elephant-shrews, or sengis, are a unique clade of small mammals that are particularly attractive for studies of mate guarding. We studied the spatial organization of Eastern Rock Elephant-shrews (*Elephantulus myurus*) in KwaZulu-Natal, South Africa, from August-December 2000. Our objectives were to describe the home ranges of males and females using radiotelemetry, noting the sizes and overlap of adjacent ranges and how the spatial organization changes through time. Males and females were spatially associated in monogamous pairs despite the fact that males contributed no direct care to offspring. These monogamous associations persisted despite the fact that some males had home ranges large enough to encompass multiple females. Males also had more variable ranges, perhaps because they spent more time at the periphery of their ranges exploring for the presence of additional females. There was likely competition for females, as range shifts were observed when male territory holders died or disappeared. It seems likely that this species is a model study organism to investigate the costs and benefits of mate guarding.

Afrotheria Noticeboard

Newsletter Printing

The Afrotherian Specialist Group has received support from the National Association of Private Animal Keepers in the UK for the production of hard copies of this edition of *Afrotherian Conservation*. We are very grateful to NAPAK for their help which allows us to send copies of the newsletter to biologists and conservationists in Africa who are not so easily able to access the document on line.

Greetings Cards

Last year the Afrotheria Specialist Group sold greetings cards to raise awareness of the group and raise money for its activities. A total of 220 cards were sold, including 35 to IUCN headquarters who mailed them to its offices for Christmas. After production costs, the profit from the card sales came to 52.50 Swiss francs. This is obviously not going to fund many Afrotherian conservation projects, but it will allow the group to be able to mail copies of the newsletter to colleagues in Africa. Every little bit counts for a volunteer organisation that depends on donations for even basic administration costs!

Following the interest generated last year, the group will also be selling cards again this year.

A feeding Rock Sengi - one of the Stephanie Mansourian designs used on the Specialist Group's greetings cards.

As described in the IUCN/SSC E-Bulletin "if you want Christmas cards with a difference" this is the place to come! Each card features a sketch by Egyptian artist Stephanie Mansourian on the front (new designs will be included this year!). Inside are the words "Season's Greetings - Meilleurs voeux". The group's mission statement and website are on the back. The cards are sold in packs of five, with a different member of the Afrotheria depicted on each card - an aard-vark, a sengi, a hyrax, a tenrec and a golden mole. Cards cost 10 Swiss francs or 7 US dollars for a pack of five with envelopes - postage and package will be extra and will depend on the size of the order.

For card orders and further details, please contact Dr PJ Stephenson, c/o WWF International, Avenue du Mont Blanc, CH-1196 Gland, Switzerland. E-mail: PJStephenson@wwfint.org.

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Prof. Terry Robinson	Department of Zoology, Stellenbosch University, Private Bag X1, Matieland 7602, South Africa	tjr@land.sun.ac.za Voice: +27 21 808-3955 Fax: +27 21 808-2405	Afrotheria South Africa	Cytogenetics, molecular genetics, systematics, evolution
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Prof. Hezy Shoshani	Department of Biology, University of Asmara, PO Box 1220, Asmara, Eritrea	hezy@eol.com.er Voice: +291-1-16-19-26	Hyracoidea Tubulidentata Horn of Africa	Taxonomy, conservation biology, ecology, population biology, ecosystem biology
Ms. Voahangy Soarimalala	c/o WWF Ecology Training Programme, WWF, BP 738, Antananarivo 101, Madagascar	etp@wwf.mg	Tenrecidae	Conservation biology, taxonomy
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Prof. Peter Vogel	Institut d'Ecologie - Zoologie et Ecologie Animale, Bâtiment de Biologie, Université de Lausanne, CH 1015 Lausanne, Switzerland	peter.vogel@ie-zea.unil.ch Voice: +41 21 692 41 61 Fax: +41 21 692 41 65	Tenrecidae *Micropotamogale lamottei* Ivory Coast	Ecology, population biology, taxonomy

If you notice any errors in this table, or you change your contact details, please inform Galen Rathbun and PJ Stephenson.

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Have you checked out our website yet? If not, go to http://www.calacademy.org/research/bmammals/afrotheria/ASG.html.

The home page appears as below with a map of Africa and Madagascar. By clicking on a photograph of a member of each of the five taxa covered by the group, the map displays the taxa's range. Pages available on the website are:

- What is Afrotheria? – explaining more about the Specialist Group
- Group Mission and Goals – what we are aiming to do
- Group Members – all the names and addresses
- Afrotherian Systematics - all you need to know about the taxonomic details of the group's target mammals
- Newsletter – the web-posted version of *Afrotherian Conservation*
- Photo Gallery - this page is under development but will have photos of species from all five taxa
- IUCN Specialist Groups – a link to the IUCN website and details of other specialist groups dealing with mammals

Guidelines for Authors

Articles, species profiles, news items and announcements are invited on topics relevant to the newsletter's focus. Manuscripts should be sent either by post or email to the Editor, Dr Peter J. Stephenson (c/o WWF International, Africa & Madagascar Programme, Avenue du Mont Blanc, CH-1196, Switzerland. PJStephenson@wwfint.org). Articles should be under 3,000 words and follow the format of this edition. References should be cited in the text and listed in alphabetical order at the end of the article. Journal titles should be given in full. The Editor reserves the right to edit all contributions for style and content.

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