

A revised systematic checklist of the extant mammals of the southern African subregion

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Summary

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Durban Museum Novitates 28: 56-106. The current paper presents a revised, annotated, systematic checklist of 351 extant mammal species, in 190 genera, currently known to occur in southern Africa (south of the Zambezi and Cunene Rivers) and its coastal waters. The checklist includes each species' scientific and English common name, details concerning original description, occurrence or possible occurrence in each of the seven countries falling within the Subregion, and, where relevant, the IUCN global Category of Threat. Taxonomic notes, together with the relevant literature, are provided to justify the proposed classification adopted at each hierarchical level. The new classification we present is founded on the philosophy of phylogenetic systematics, and represents not only a summary of new information, but also tremendous advances in the methods and philosophy of mammalian systematics during the past two decades.

KEYWORDS: *distributions, southern African mammals, systematic checklist*

Introduction

It is more than 15 years since the last comprehensive taxonomic review of the mammals of the southern African Subregion (Meester *et al.* 1986), a region that includes Namibia, Botswana, Zimbabwe, Mozambique (south of the Zambezi River), South Africa, Swaziland and Lesotho. Since then, there have been radical changes to southern African mammal taxonomy from the level of subspecies to superorder. This revolution reflects the increasing application of modern molecular and systematic/clustering methodologies in elucidating mammalian phylogenetic relationships, but these changes have been disseminated largely through specialist systematics journals. Consequently, many non-taxonomists still follow the taxonomic treatment of Skinner & Smithers (1990), which largely echoes that of Meester *et al.* (1986). Furthermore, in recent years there have been calls for taxonomists to come to the fore, with an emphasis on biodiversity conservation. Taxonomy is at the core of biodiversity studies, without which there would be little

comprehension for the diversity of life. The importance of having a sound taxonomic framework on which to base conservation decisions (particularly threat assessments), and to facilitate information storage and retrieval about species, cannot be overemphasised. This is evident from recent taxonomic initiatives to document the diversity of life on earth (for example, the Catalogue of Life www.sp2000.org and the ALL Species Foundation www.all-species.org). A review of the systematic status of southern African mammals is, therefore, long overdue. The aim of this checklist is to provide an updated taxonomic framework that is user-friendly and yet also sufficiently detailed to satisfy non-taxonomists and systematists alike.

In approach, this paper mimics an earlier synthesis by Swanepoel *et al.* (1980) entitled *A Checklist and Numbering System of the Extant Mammals of the Southern African Subregion*. These authors intended to periodically update their list, but this, unfortunately, has not been possible. Swanepoel *et al.* (1980) developed their checklist largely on previous comprehensive taxonomies, in particular, the landmark

publications of Allen (1939), Roberts (1951), Ellerman *et al.* (1953) and Meester & Setzer (1971-1977). In addition, a number of taxon- and region-specific works were consulted, particularly: Shortridge (1934) for Namibia; Smithers (1971) for Botswana; Lynch (1975) for the Free State; Smithers & Lobao-Tello (1976) for Mozambique; Rautenbach (1978; published in 1982) for the then Transvaal; and Smithers & Wilson (1979) for Zimbabwe.

Subsequent to the publication of Swanepoel *et al.*'s (1980) list, Smithers (1983) published his classic first edition of *The Mammals of the Southern African Subregion*, and a few years later, Meester *et al.* (1986) completed their *Classification of Southern African Mammals*. Since then, there have been a number of other key taxonomic reviews of mammals. Corbet & Hill (1991) published their third edition of *A World List of Mammalian Species*, while McKenna & Bell's (1997) *Classification of Mammals Above the Species Level* presented a revision of George Gaylord Simpson's (1945) seminal work using cladistic principles, and is particularly commendable for listing both extant and fossil taxa. However, its supraspecific emphasis and the explosion of unfamiliar ranks and names arising from the cladists' credo of assigning equal or equivalent taxonomic ranks to sister taxa makes it of somewhat limited use for species-level classification.

Currently, the most widely accepted and trusted source of taxonomic information for mammals is the second edition of *Mammal Species of the World*, edited by Wilson & Reeder (1993). A third edition of this comprehensive reference work is in the final stages of preparation. There also have been works of a semi-taxonomic nature, including two editions of *Walkers' Mammals of the World* (Nowak 1991, 1999) and, with particular relevance to Africa, *The Kingdon Field Guide to African Mammals* (Kingdon 1997).

From a southern African perspective, recent works of regional scope focusing on mammals include: Lynch (1989) for the north-eastern Cape; Rowe-Rowe (1992, 1994) and Taylor (1998) for KwaZulu-Natal; Lynch (1994) for Lesotho; and Monadjem (1997, 1998) for Swaziland. The latter two works, in particular, have been instrumental in advancing our knowledge and awareness of the mammals occurring in the subregion. In addition, there has been a plethora of influential systematic studies, together with taxon-specific revisions, published over the last 20 years.

Methods

Procedure

In the present synthesis, an initial draft was compiled by one of us (MH), which was then split into sections for comprehensive review by the various authors, as follows: GB (Afrosoricida, Macroscelidea, Tubulidentata, Proboscidea, Sirenia, Eulipotyphla, Chiroptera, Perissodactyla, Suiformes, Hippopotamidae and Ruminantia); PT (Otomyini, Primates, Pholidota and Carnivora); CC (Hyracoidea and Rodentia, except Otomyini); PB (Whippomorpha, excluding Hippopotamidae); CM (Lagomorpha, Cetartiodactyla, excluding Whippomorpha); and TR (higher classification overview, Lagomorpha). The individual sections were then recombined, and the entire manuscript critically reviewed by all authors. A number of colleagues and experts (see Acknowledgements) were consulted during the review process, and kindly provided valuable input. However, we did not necessarily always heed their advice, and all information contained in this manuscript reflects the current view of the authors.

Ethos

Philosophically, we did not conform to any particular taxonomic school of thought, but our approach is best described as phylogenetic systematics in that we follow (as far as possible) the convention that taxa recognised should be monophyletic groups according to available evidence. Our treatment is unavoidably inconsistent in that numerous species concepts are implicit in the results of studies that we review. This may result in a bias towards the traditional Biological Species Concept, which has been more extensively applied than the newer Evolutionary (ESC) and Phylogenetic (PSC) species concepts. Any such prejudice is unintentional as we deliberately refrained from partisanship concerning the merits and demerits of competing species concepts, and (where possible) fairly discuss taxonomic implications that may arise from the application of competing species concepts to the same taxon. Rejection of taxonomic findings based on any of these species concepts was restricted to instances where evidence is premature, equivocal or conflicting, or where criterion of monophyly is violated. While this may err in favour of a flawed *status quo*, we believe that a conservative approach is needed in the interest of nomenclatural stability.

The validity and desirability of the subspecies rank, and Linnaean trinomial, remain thorny philosophical issues. We concur that many of the described subspecies of (especially small) southern African mammals are probably epistemological constructs based on anecdotal evidence or very limited analyses of geographic variation, and hence that they have little practical or conservation relevance. Accordingly, we restrict the taxonomic scope of this work to the species rank, and mention subspecific taxa only when their elevation to species rank has been mooted.

The tendency to recognize any diagnosable or allopatric population as a distinct species, by liberally applying the ESC or PSC (e.g. Cotterill in press a), is unacceptable to us unless supported by detailed analyses of geographic variation; in such cases we again favour a conservative approach and retain these as intraspecific entities. Cavalier application of this principle without detailed geographic analyses of varied data suites will result in the recognition of a considerably greater number of species of dubious ontological or conservation relevance, and further burden an already creaking nomenclatural framework.

The rigorous application of cladistic and statistical methodologies has become predominant among mammalian systematists, as reflected by the recent panoply of (especially molecular) phylogenies assessing higher-level relationships among eutherian mammals (Table 1). Consequently, the traditional taxonomic landscape is rapidly being supplanted by a plethora of new names and ranks for clades. These are largely unfamiliar to the majority of biologists, who nonetheless rely heavily on taxonomy for teaching and research. This in itself is not a problem, for there is an emerging consensus that increasingly exact and phylogenetically based taxonomy underpins the scientific study of life's diversity. However, suprafamilial names largely fall beyond the scope of the International Code of Zoological Nomenclature (1999), and the "PhyloCode" (see www.ohiou.edu/phylocode/), a new but unestablished system of rules for naming clades at all taxonomic levels (Pleijel & Rouse 2000), remains highly controversial (Forey 2002). In this absence of nomenclatural regulations governing the use of names above the superfamily rank, there has been an alarming tendency in the (primarily molecular systematics) literature to avoid cumbersome and repetitive clade designations by proposing new names for *possible* groupings that still lack a solid taxonomic foundation

Table 1. Table showing supra-ordinal monophyletic groupings for placental mammals, and suggested names for these taxa, from molecular and or morphological phylogenies for placental mammals. Groups with unequivocal or strong bootstrap support are shown in bold. ? denotes names proposed for possible monophyletic groups with only moderate or weak bootstrap support, but that cannot be formally recognised because divergences within clades remain equivocal. Names in parentheses are synonyms following Simpson's (1945) nomenclatural guidelines for higher level taxa.

SUPERCOHORT	COHORT	SUPERORDER	ORDER	
Afrotheria ^{1-7,9,10}	Afroinsectiphylia? ¹²	Afroinsectivora? ¹²	Afrosoricida ^{1,15,16}	
	-----	-----	Macroscelidea	
	-----	-----	Tubulidentata	
	Paenungulata ^{1,3-5,7,14-16}		Tethytheria ^{1,15}	Hyracoidea
				Proboscidea
				Sirenia
Xenarthra ^{1,2,6-8,11}			Cingulata	
			Pilosa	
Euarchontaglires ^{1,2,6,9,12} (Supraprimates ¹²)	Glires ^{1,12,14,15}		Lagomorpha	
			Rodentia	
	Euarchonta ^{1,12}	Primatomorpha ¹²	Primates	
			Scandentia	
Laurasiatheria ^{1,2,6,7,20}	Insectiphylia? ^{12,20}		Eulipotyphla ^{1,17,20}	
			Chiroptera	
	Ferungulata ^{1,12,17}	Ferae ^{1,12,15}		Pholidota
				Carnivora
		Paraxonia ¹³	Cetartiodactyla ^{2,14,17}	Perissodactyla
		-----		Tylopoda ¹⁹
		-----		Suiformes ^{18,19}
		-----		Whippomorpha ¹⁷
		-----		Ruminantia ¹⁷

¹Murphy *et al.* (2001a, b), ²Madsen *et al.* (2001), ³Springer *et al.* (1997), ⁴Springer *et al.* (1999), ⁵Stanhope *et al.* (1998a), ⁶Eizirik *et al.* (2001), ⁷Scally *et al.* (2001), ⁸Delsuc *et al.* (2001), ⁹Van Dijk *et al.* (2001), ¹⁰Malia *et al.* (2002), ¹¹Van Dijk *et al.* (1999), ¹²Waddell *et al.* (2001), ¹³Simpson (1945), ¹⁴Liu & Miyamoto (1999), ¹⁵Liu *et al.* (2001), ¹⁶Stanhope *et al.* (1998b), ¹⁷Waddell *et al.* (1999), ¹⁸Gatesy *et al.* (1999), ¹⁹Mathee *et al.* (2001), ²⁰Nikaido *et al.* (2001).

Note: In assigning ranks to the array of new names that have been proposed, we tried to reconcile Simpson's (1945) guidelines with the cladistics injunction requiring that sister-groups be afforded equal status, yet also using a minimum number of recognisable supra-ordinal ranks. Compromise and pragmatism are implicit in this approach, and our solution reflects no more than an initial opinion aimed at restoring some degree of order in the face of increasing nomenclatural entropy.

(e.g. Waddell *et al.* 2001). Moreover, the ranks of these new names are seldom specified, and the same name is often used to designate clades that differ subtly in composition. We believe that this trend undermines nomenclatural stability. Conventions to ensure nomenclatural stability at the suprafamilial level and above are clearly needed. Although not widely recognised, Simpson (1945) published a set of guidelines that have been informally adopted by traditional taxonomists, but apparently are neither generally appreciated nor applied by the wider systematics fraternity. The judicious application of these principles is imperative for ensuring a sustainable and stable nomenclatural framework for higher-level classification. Our treatment of higher mammal taxa (Table 1) is, therefore, conservative in that we recognise some traditional groupings of abstruse taxonomy rather than prematurely accepting emerging trends and opinions (however interesting) that are not based on substantial data suites with

strong probabilistic support.

Structure

Taxonomic arrangement in the discussion and checklist largely follows Wilson & Reeder (1993), which, together with Meester *et al.* (1986), forms the foundation of this list. Conclusions deviating from these are discussed in the text. Authorities and dates are provided up to the level of family, and are correct as far as we were able to determine from available sources. Common names are based largely on Skinner & Smithers (1990) and Wilson & Cole (2000). Following Swanepoel *et al.* (1980), extinct and introduced mammal species (such as the European rabbit *Oryctolagus cuniculus*, grey squirrel *Sciurus carolinensis*, house mouse *Mus musculus*, ship rat *Rattus rattus*, brown rat *R. norvegicus*, feral pig *Sus scrofa*, fallow deer *Dama dama* and others) are not included in this list.

The revised list differs in a number of key respects from the original. First, Swanepoel *et al.* (1980) presented both English and Afrikaans common names, whereas we opted to list only English common names since Afrikaans is an official language of only one of the seven countries in the subregion. Second, the original list included a numbering system for mammals. This numbering system grew from a request by the then Department of Nature and Environmental Conservation of the Cape Province of South Africa to produce a system whereby each species would have a unique number, readily identifiable in a computer system. Despite the efforts of the authors to produce a system similar to that in use for birds in southern Africa (Robert's bird numbers), this numbering system has not been widely implemented and has proved of little practical use for mammals. One constraint is that any numbering system is very susceptible to taxonomic change, all too common in the modern era of systematics. For this, and other, reasons, we feel that perpetuating this numbering system is of little heuristic value.

The third major departure from the original list is the incorporation of a tabulated listing of species for each country within the southern African subregion. The list makes provision for indigenous species that have been introduced to countries within the subregion, but outside their natural range (indicated by an asterisk), and for species that may possibly occur in the countries covered but for which there is no recent information (indicated by a question mark). Reintroductions of species to countries in which they formerly occurred, but were extirpated, have been included as far as possible, but attention is not specially drawn to them (for example, Black Rhino *Diceros bicornis* in Botswana). The list also highlights species that are known to have gone extinct within a particular country (RE, or regionally extinct), or that are possibly extinct within a particular country (indicated as RE?). Country occurrences are based primarily on the literature mentioned under the Introduction, as well as on other sources, such as East (1999), Taylor (2000) and others not necessarily mentioned in this list. Such a country-by-country breakdown hopefully will encourage and expedite studies on biodiversity and Red List threat assessments. With regard to the latter, the other major difference between this list and the original concerns the provision of the global IUCN Red List threat status as per the 2002 IUCN Red List of Threatened Species (IUCN 2002). However, we have only indicated this for those species classed as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT; formerly LR/nt) and Data Deficient (DD).

Higher Classification

The monophyly of most of the 18 orders of mammals that have been traditionally recognised, based on anatomical features (Simpson 1945), generally is supported by newer studies involving both morphological and molecular data. Departures from convention include the two new orders (the Afrosoricida and Eulipotyphla), and the superorder Cetartiodactyla, which have subsumed some of the more conventional groupings (Waddell *et al.* 2001). However, it is at the higher taxonomic levels where conflict between molecular and morphological phylogenies are most pronounced (Novacek 2001). For example, Shoshani & McKenna (1998) supported the recognition of eight superordinal clades that are strongly supported on morphological grounds (see Scally *et al.* 2001): Epitheria (all living placentals except Xenarthra), Preptotheria (all living placentals except the Xenarthra and Lipotyphla),

Glires (Rodentia + Lagomorpha), Archonta (Scandentia + Primates + Chiroptera + Dermoptera), Volitantia (Chiroptera + Dermoptera), Cetungulata (Artiodactyla + Cetacea + Perissodactyla + Hyracoidea + Proboscidea + Sirenia), Paenungulata (Hyracoidea + Proboscidea + Sirenia), and Tethytheria (Proboscidea + Sirenia). This contrasts sharply with molecular findings that suggest little support for most of these proposed superordinal groups, in turn yielding new evolutionary relationships among mammalian orders and hence significant changes to the Eutherian evolutionary tree (Table 1).

Most molecular-based tree topologies support the division of eutherians into four groups (Eizirik *et al.* 2001; Madsen *et al.* 2001; Murphy *et al.* 2001a; Jow *et al.* 2002): the two southern hemisphere clades, the Afrotheria and Xenarthra, and the monophyletic northern hemisphere Boreoeutheria, comprising the Laurasiatheria and Euarchontoglires clades. This suggests that plate tectonics may have played a central role in the early evolutionary history of eutherian mammals (Eizirik *et al.* 2001; Hedges 2001), and that a single dispersal event may have been fundamental to the early evolutionary history of crown group placentals (Scally *et al.* 2001). Given the basal placement of the Afrotheria and Xenarthra in the eutherian tree, a Gondwanan origin for crown-group eutherians has been suggested (Murphy *et al.* 2001b), which is at odds with the long-held view that the common ancestry for mammals lies in the northern hemisphere (Wallace 1962; Rainger 1991).

Supercohort Afrotheria

This clade includes several mammalian taxa whose radiation is rooted in Africa, namely the Proboscidea (elephants), Tubulidentata (aardvark), Macroscelidea (elephant shrews or sengis), Hyracoidea (hyraxes), Sirenia (dugongs and manatees) and the newly erected order Afrosoricida (golden moles and tenrecs). It is strongly supported by DNA sequence data (Springer *et al.* 1997, 1999; Stanhope *et al.* 1998a; Eastal 1999; Madsen *et al.* 2001; Murphy *et al.* 2001a, b; Scally *et al.* 2001; Van Dijk *et al.* 2001;), but not by their disparate anatomical features, nor, at this stage, by cross-species chromosome painting (Yang *et al.* 2003).

Within the Afrotheria the grouping of the Proboscidea and Sirenia (the superorder Tethytheria), with the Hyracoidea as a sister-taxon, supports the morphologically derived cohort Paenungulata (Simpson 1945). However, the inclusion of the golden moles and tenrecs (order Afrosoricida; Stanhope *et al.* 1998b) within the Afrotheria, as distinct from the true moles, the solenodon, shrews and hedgehogs (Eulipotyphla), challenges the monophyly of the traditional Insectivora/Lipotyphla (Springer *et al.* 1997, 1999; Stanhope *et al.* 1998a, b; Emerson *et al.* 1999; Mouchaty *et al.* 2000a, b; Madsen *et al.* 2001; Murphy *et al.* 2001a; Van Dijk *et al.* 2001; Malia *et al.* 2002; see Asher 1999 for a contrasting view). Other departures from convention include the Macroscelidea (elephant shrews), generally placed with lagomorphs and rodents (Benton 1997), and the enigmatic Tubulidentata (aardvark). These two orders, together with the Afrosoricida, form the Afroinsectiphylia (Waddell *et al.* 2001), a clade that still lacks strong probabilistic support. The aardvark traditionally has been grouped within the "anteaters" in the Order Edentata, which is now sundered into the orders Xenarthra (sloths, armadillos and anteaters) and Pholidota (pangolins), the latter being more closely affined to the Carnivora.

Supercohort Laurasiatheria

This clade includes the Chiroptera, Cetartiodactyla (Cetacea + Artiodactyla), Perissodactyla, Carnivora plus the Pholidota (Superorder Ferae), and “core” insectivores (Eulipotyphla). Most recent studies reject artiodactyl monophyly by placing hippos and cetaceans as sister taxa (Irwin & Arnason 1994; Gatesy 1997; Gatesy *et al.* 1996, 1999, 2002; Matthee *et al.* 2001; Murphy *et al.* 2001a). It comprises the cohort Ferungulata, defined by the orders Pholidota, Carnivora, Cetartiodactyla, and Perissodactyla (Waddell *et al.* 1999), and the Insectiphylia, an only weakly-supported clade comprising the Eulipotyphla and Chiroptera. Although there is strong molecular support for the basal position of the Eulipotyphla within the Laurasiatheria, and for a carnivore plus pangolin clade named Ferae (Murphy *et al.* 2001b), the sister group association suggested between the Perissodactyla and Carnivora/Pholidota is questionable. Waddell *et al.* (2001) are of the view that the Perissodactyla and Cetartiodactyla are more likely sister taxa, which could be explained by a single Laurasian origin, and would result in no major loss of ungulate-like features within the Laurasiatheria.

Supercohort Euarchontoglires (the Supraprimates of Waddell *et al.* 2001)

This is a clade comprising most traditional archontan taxa (primates, tree shrews, flying lemurs/colugos, but excluding bats), and the Glires (rodents and lagomorphs). Although there are several studies that contradict the monophyly of the Rodentia, Glires, and Glires + Euarchonta (Graur *et al.* 1991; Li *et al.* 1992a, b; D'Erchia *et al.* 1996; Reyes *et al.* 1998, 2000), Scally *et al.* (2001) suggest that the most convincing support for the Euarchontoglires is that of Murphy *et al.* (2001a). With adequate taxon sampling (16 rodent species, seven primates, two lagomorphs, one flying lemur and one tree shrew species), these authors and Eizerik *et al.* (2001) provide strong support for the recognition of the Euarchontoglires.

Supercohort Xenarthra

The monophyly of this extralimital supercohort is strongly supported by numerous morphological (Engelmann 1985; Patterson *et al.* 1989, 1992; Rose & Emry 1993; Gaudin 1999) and molecular synapomorphies (De Jong *et al.* 1985; Van Dijk *et al.* 1999; Delsuc *et al.* 2001). However, its position with respect to the Afrotheria, at the root of the eutherian tree is controversial. Several studies place the Afrotheria basally (Madsen *et al.* 2001; Murphy *et al.* 2001a, b; Eizerik *et al.* 2001, Waddell *et al.* 2001), while others afford the Xenarthra this position (Madsen *et al.* 2001; Scally *et al.* 2001; Jow *et al.* 2002). Limited taxon representation within the Xenarthra is considered to be largely responsible for this conflict.

SUPERCOHORT AFROTHERIA

Order Afrosoricida

Stanhope *et al.* (1998a, b) grouped golden moles and tenrecs in the new order Afrosoricida. This designation is somewhat inappropriate since it contains no soricids and engenders confusion with the shrew subgenus *Afrosorex* Hutterer, 1986. Simpson's (1945) guidelines, particularly his principle of reasonable emendation, furthermore identify the name *Tenrecomorpha* Butler, 1972 (page 113) as a prior and more explicit name for this clade. Malia *et al.* (2002) recently argued that the appropriate name for this taxon is *Tenrecoidea* Simpson, 1931. Simpson (1945:32), however, clearly stated that names ending in *oidea* should be avoided, and that only names first published for a group of higher rank than a family

but not considered a superfamily are acceptable. *Tenrecoidea*, first proposed as a superfamily, is thus an inappropriate name for this order. In the interest of nomenclatural stability, we reluctantly adopt the name *Afrosoricida* that has become entrenched in recent literature.

The status of the *Afrosoricida* clade, and its affinities with other Afrotherian taxa, is strongly supported by phylogenies based on nuclear and mitochondrial DNA sequences (Madsen *et al.* 2001; Murphy *et al.* 2001a, b), protein sequence signatures (Van Dijk *et al.* 2001) and extensive (>8000 positions) amino acid sequences from both the mitochondrial and nuclear genomes (Waddell *et al.* 2001). Phylogenies based on morphological and palaeontological data are largely incongruent with those derived from molecular data, and are equivocal with regard to the sister-group status of tenrecs and golden moles, and their putative afrotherian affinity. While the *Tenrecidae* and *Chrysochloridae* have traditionally been hypothesised to be closely related, based on their joint possession of zalambodont cheekteeth and some specialised skull characters (e.g. Butler 1956, 1988), some authors have argued that these are convergent or plesiomorphic characteristics (Broom 1916; MacPhee & Novacek 1993). Many morphological studies have concluded that chrysochlorids and tenrecs are highly specialised and only distantly related taxa, each worthy of superfamilial (*Chrysochloroidea* and *Tenrecoidea*; Simpson, 1945; Asher 1998) or subordinal rank (*Chrysochloroidea* Butler, 1972; *Chrysochloromorpha* MacPhee & Novacek, 1993; *Tenrecomorpha* Butler, 1972) within the *Lipotyphla* (= *Insectivora sensu stricto*).

Syntheses of molecular and morphological phylogenies support a close phylogenetic link between tenrecs and golden moles, but their affinities with other placentals remain controversial. Liu & Miyamoto (1999) reported only weak support for an Afrotherian ancestry, but in a combined morphological and molecular supertree the *Afrosoricida* was placed as the sister-group to the *Eulipotyphla* (Liu *et al.* 2001). Springer & De Jong (2001), however, demonstrated numerous weaknesses in this analytical approach, most notably a reliance on equivocal morphological phylogenies (also see Gatesy *et al.* 2002).

This conundrum is not resolved by fossil evidence since the earliest known forms (from the Lower Miocene and mid-Eocene) of tenrecs and chrysochlorids were already highly differentiated and displayed many of the anatomical specialisations evident in extant taxa (Butler 1956). Current palaeontological data thus neither fully support nor conclusively exclude the Afrotherian scenario (Tabuce *et al.* 2001).

Given the robustness of molecular data supporting an endemic African clade including the *Afrosoricida*, and the ambiguity of morphological data in this regard, we accept an Afrotherian affinity for the golden moles and tenrecs. The many apomorphies that distinguish these families, and their long period of evolutionary divergence (estimated at 50-57 million years; Stanhope *et al.* (1998a, b)), warrant their allocation to distinct suborders. Based on extensive amino acid sequences, Waddell *et al.* (2001) proposed the name “*Afroinsectivora*” for a clade comprising the *Afrosoricida* and *Macroscelidea*, and “*Afroinsectiphylia*” for a more inclusive grouping with the *Tubulidentata*. However, there is only weak to moderate probabilistic support for these clades and we thus do not recognise them formally here.

Suborder Chrysochloridea

MacPhee & Novacek (1993) erected the new suborder Chrysochloromorpha for the "spectacularly apomorphic" golden moles. Following Simpson's (1945) nomenclatural guidelines, however, Chrysochloridea Broom, 1916 is the prior valid name for this taxon.

Family Chrysochloridae

Based on phylogenetic analyses of morphometric and cytogenetic data in three genera, Bronner (1995a, b) proposed a new classification that differs in several important respects from those of previous authors, most notably in recognising two subfamilies, the Chrysochlorinae (including Eremitalpinae) and Amblysominae (Appendix 1). Following Simonetta (1968), he resurrected *Carpitalpa* (described by Lundholm (1955) as a subgenus of *Chlorotalpa*) as a full genus for the species *arendsi* from eastern Zimbabwe and adjacent parts of Mozambique. *Chlorotalpa* thus includes only two species (*scateri* and *duthieae*) endemic to South Africa. He transferred *leucorhina* to *Calcochloris*, unlike Simonetta (1968) and Petter (1981a), who included this species in *Amblysomus*, and Meester (1974) who regarded it as a *Chlorotalpa*. Following Meester (1974) and Meester *et al.* (1986), he included *Kilimatalpa* (described by Simonetta (1968) as a subgenus of *Carpitalpa* for the species *stuhmanni* from east Africa) in *Chrysochloris*, owing to its possession of a temporal bulla housing the hypertrophied malleus.

Noting the existence of two distinct clades among species traditionally assigned to *Amblysomus*, Bronner (1995b) resurrected *Neamblysomus* Roberts, 1924 to accommodate *gunningi* and *julianaae*. Based on craniometric and karyotypic divergence, he elevated *marleyi* (previously considered only a subspecies of *hottentotus*) to full specific rank (Bronner 1996), and described the new species *robustus* from Mpumalanga (Bronner 2000). He furthermore showed that *septentrionalis* (previously regarded as a subspecies of *A. iris*) represents a distinct species closely related to *hottentotus* and *robustus*, and that nominotypical *iris* should be afforded only subspecific rank within *hottentotus*. *Amblysomus i. corriae* from the western Cape should therefore be considered a distinct species, and includes populations from this region that were previously assigned to *A. h. devilliersi* (Bronner 1996).

Order Macroscelidea

Tabuce *et al.* (2001) recently described a new herodontine macroscelidid from the Eocene of Algeria, and provided morphological evidence supporting a close relationship between elephant shrews and tethytherians (Proboscidea + Sirenia). While this seemingly supports the Afrotheria hypothesis based on molecular data, they cautioned that these taxa must be regarded as paraphyletic if palaeobiogeographical evidence is also taken into account. This assertion was, however, based on the traditional premise that placental mammals originated exclusively in the Northern Hemisphere, a view that is being increasingly challenged by molecular phylogenies that instead suggest a Gondwanaland origin (Madsen *et al.* 2001; Murphy *et al.* 2001b).

Family Macroscelididae

Recent chromosomal, allozyme and isozyme evidence supports the retention of *Elephantulus brachrhynchus* in *Elephantulus* rather than its allocation to the monotypic genus *Nasilio* (Tolliver *et al.* 1989; Raman & Perrin 1997). Further studies are needed to confirm generic limits and inter-relationships since the Wagner tree they presented renders

Elephantulus paraphyletic. Matson & Blood (1997) demonstrated the absence of significant geographic variation in two species (*E. intufi* and *E. rupestris*), and argued that the common practice of basing field identifications on habitat data is unreliable.

Cohort Paenungulata

Order Hyracoidea

Although some authors have regarded *Heterohyrax* as a subgenus of *Dendrohyrax* (e.g. Ellerman *et al.* 1953; Roche 1972), the consensus is that the family Procaviidae contains three distinct genera, namely *Procavia*, *Heterohyrax* and *Dendrohyrax* (Hoeck 1978; Meester *et al.* 1986; Schlitter 1993; McKenna & Bell 1997), a view supported also by molecular data. At the species level, the very limited molecular data available (Prinsloo & Robinson 1992) suggest that the monospecific *P. capensis* advocated by Olds & Shoshani (1982) may actually be polytypic (in southern Africa, the subspecies *welwitschii* was treated as a distinct species by Bothma (1971) and Swanepoel *et al.* (1980)). Similarly, *Heterohyrax brucei* may yet be shown to be a complex of species, but pending a revision of the taxonomic status of these species, we follow the consensus taxonomic treatment of Schlitter (1993).

SUPERCOHORT EUARCHONTAGLIRES

Cohort Glires

Order Lagomorpha

Family Leporidae

A molecular study based on mtDNA (Matthee 1993; Matthee & Robinson 1996) delineated two major genetic lineages in *Pronolagus rupestris*, one in south-eastern South Africa and the other in the north-west. Each of the two clades contains three of the subspecies recognised by Meester *et al.* (1986), except for *P. r. curryi*, which is genetically distinct and deserves subspecific status. These clades show distinct altitudinal distribution ranges, thus reinforcing the possible existence of two distinct species. Whiteford's (1995) cranial morphometric study of *P. rupestris* also confirmed the presence of a distinct north-western group, but indicated the existence of two groups within the south-eastern clade. She, therefore, proposed recognising three species: *P. saundersiae* from the Western and Eastern Cape Provinces; *P. barretti* from the eastern Escarpment of southern Africa; and *P. rupestris* from the Northern Cape eastwards to the Free State. Based on mtDNA and morphological data, both *P. rupestris* and *P. saundersiae* are good species, with *P. barretti* herein considered synonymous with *saundersiae* (the latter has priority). The genetic distinctiveness of these two red rock rabbit species is also supported by nuclear DNA sequence data where approximately equidistant sequence divergence values were found among the four *Pronolagus* species recognised here (Matthee *et al.* unpubl.)

Order Rodentia

Species- and supraspecific-level classification of the Order Rodentia remains controversial. The earliest classification, proposed by Brandt (1855), divided the rodents into three tribes, the Sciuromorpha, Myomorpha and Hystricomorpha, whereas Tullberg (1899) recognised two Suborders, the Sciurognathi and the Hystricognathi. Miller & Gidley (1918) instead allocated rodents to five superfamilies (Sciuroidae, Muroidae, Dipodoidae, Bathyergoidae and Hystricoidae), while Ellerman (1940) recognised only Hystricomorpha and Sciurognathi. Simpson (1945) split the Order into three

Suborders (Sciuromorpha, Myomorpha and Hystricomorpha), while Roberts (1951) arranged it into five Suborders (Hystricomorpha, Sciuromorpha, Dipodomorpha, Bathyergomorpha and Myomorpha). Anderson (1967), Rosevear (1969), De Graaff (1981) and Meester *et al.* (1986) followed Simpson (1945) in recognising the three Suborders (Sciuromorpha, Myomorpha, and Hystricomorpha). However, Carleton & Musser (1984) followed Tullberg (1899) in recognising the Sciurognathi (including most taxa previously assigned to the Sciuromorpha and Myomorpha) and Hystricognathi (including most members of the Hystricomorpha). Despite Graur *et al.* (1991) rendering this bipartite division invalid due to the lack of evidence of a phylogenetic relationship between the Hystricomorpha and the Myomorpha, Musser & Carleton (1993) retained the use of these two Suborders. Graur (1994) also expressed reservations on the validity of dividing the Sciurognathi into Myomorpha and Sciuromorpha, while Matthee & Robinson (1997), in determining the phylogenetic position of the Pedetidae (springhare) relative to the Sciurognathi, expressed reservations about the subordinal classification used by Carleton & Musser (1984). More recently, McKenna & Bell (1997) listed five suborders: Sciuromorpha, Myomorpha, Anomaluroomorpha, Sciuravidae (a new taxon including a host of extinct families, and also the Ctenodactylidae) and Hystricognatha.

Overall, the distinction between the above-mentioned taxonomic groupings has been based largely on the size and shape of the infraorbital foramen, attachments and development of the masseter muscles or the position of the angular process relative to the plane of the incisor. Of the two suborders, only the Hystricognathi (including 18 families) has been widely recognised, and the monophyly of the suborder has received support from palaeontological, morphological and molecular data. In contrast, the monophyly of the Sciurognathi is not strongly supported, and doubts still remain about its phylogenetic validity.

Based on mitochondrial DNA data, rodent monophyly also has been questioned (D'Erchia *et al.* 1996; Reyes *et al.* 2000) and this contradicts the numerous morphological synapomorphies that have been used to define the Order Rodentia (Luckett & Hartenberger 1993). However, recent studies based on a large number of nuclear markers and a broader taxonomic sampling provided robust support for rodent monophyly (Murphy *et al.* 2001a; Madsen *et al.* 2001; Huchon *et al.* 2002). Unfortunately, these large datasets failed to resolve all the relationships among the 29 extant rodent families, and the associations among the 11 sciurognath taxa (Ctenodactylidae, Pedetidae, Anomaluridae, Geomyidae, Heteromyidae, Sciuridae, Aplodontidae, Castoridae, Gliridae, Dipodidae and Muridae) seem particularly problematic. It is, therefore, not surprising that several recent studies have focussed on the evolution of the sciurognath lineages (Huchon *et al.* 1999, 2000; Adkins *et al.* 2001; De Bry & Sagel 2001). Although some clades have been recovered, these studies used different markers and did not sample representatives for all sciurognath families. Montgelard *et al.* (2002) included all families in a mitochondrial DNA study but failed to resolve the basal topology of the group.

Based on these reports, three rodent clades can be identified: Ctenohystrica (Ctenodactylidae, sister taxa of the suborder Hystricognathi); a clade comprising Gliridae + Sciuridae + Aplodontidae; and a clade including the remaining sciurognath families Myodonta (Muridae + Dipodidae), Castoridae, Geomyoidea (Geomyidae + Heteromyidae), and

Anomaluroidea (Anomaluridae + Pedetidae). It is clear from the nuclear DNA investigations by Murphy *et al.* (2001) and Huchon *et al.* (2002) that supermatrix analyses based on comprehensive taxon sampling is needed to fully understand the phylogeny of the Sciurognathi. Until the relationships within the Sciurognathi are clearly understood, we retain Tullberg's (1899) subordinal division of the Rodentia.

Suborder Hystricognathi **Family Bathyergidae**

The Bathyergidae traditionally has been subdivided into two Subfamilies: those with grooved upper incisors, the Bathyerginae (*Bathyergus*); and those without grooved upper incisors, the Georychinae (*Cryptomys*, *Georchus*, *Heliophobius*, *Heterocephalus*) (Roberts 1951; De Graaff 1981; Smithers 1983; Meester *et al.* 1986). Although Ellerman *et al.* (1953) supported such a classification, they suggested the necessity of a third subfamily for the aberrant *Heterocephalus* from East Africa. Recent phylogenetic studies (Honeycutt *et al.* 1991; Janecek *et al.* 1992) suggest the recognition of two different subfamilies: the Heterocephalinae, represented by the extralimital *Heterocephalus*, and the Bathyerginae, containing *Bathyergus*, *Georchus*, *Cryptomys* and the extralimital *Heliophobius*. Woods (1993) retained the original subfamilies, but based on the more recent data, the subfamily Georychinae is here considered obsolete. This echoes the treatment of McKenna & Bell (1997).

Although Ellerman *et al.* (1953) listed 19 subspecies within *Cryptomys hottentotus*, De Graaff (1981) recognised only seven, with five occurring in the subregion. Meester *et al.* (1986) reiterated the five subspecies within *C. hottentotus* from southern Africa, namely: *C. h. hottentotus*, *C. h. darlingi*, *C. h. natalensis*, *C. h. damarensis* and *C. h. bocagei*. Unlike *C. h. hottentotus* and *C. h. natalensis* that have a diploid number of $2n = 54$, Nevo *et al.* (1986) showed that *C. h. damarensis* has two distinct cytotypes ($2n = 74$ and $2n = 78$). Subsequent studies based on allozyme and mitochondrial DNA data (Nevo *et al.* 1987; Honeycutt *et al.* 1987, 1991; Allard & Honeycutt 1992; Janecek *et al.* 1992; Faulkes *et al.* 1997; Bennett & Faulkes 2000) strongly support the taxonomic elevation of *C. h. damarensis* to a full species.

Based on a diploid number of $2n = 54$, Aguilar (1993) suggested that *C. h. darlingi* should be considered a distinct species. Similarly, Faulkes *et al.* (1997) considered *C. h. darlingi* sufficiently divergent from *C. hottentotus* to be elevated to species rank.

Corbet & Hill (1991) listed *natalensis* as a distinct species without comment, but sequence divergence in the 12s rRNA gene between *C. h. hottentotus* and *C. h. natalensis* is only about half ($\pm 6\%$) of that between either of these species and *C. damarensis*. There is, however, subtle karyotypic divergence between *hottentotus* and *natalensis* that is mirrored also by differences in overall size and ecology (N. Bennett pers. comm.). However, until morphometric and genetic analyses of a broader geographic spectrum of populations conclusively demonstrate the constancy of these differences, we refrain from allocating them to distinct species. Following Faulkes *et al.* (1997) and Bennett & Faulkes (2000), we thus recognise three species of *Cryptomys* in the subregion, namely: *C. damarensis*, *C. hottentotus* and *C. darlingi*.

Suborder Sciurognathi **Family Sciuridae**

Kingdon (1997) raised the subgenus *Giosciurus* (in *Xerus*) to generic level, with both *inauris* and *princeps* as species. Most

authors, however, retain *Giosciurus* as a subgenus only (Ellerman *et al.* 1953; Meester *et al.* 1986; Hoffmann *et al.* 1993), a treatment followed here.

Hoffmann *et al.* (1993) listed *Heliosciurus gambianus* and *H. rufobrachium* from the southern African subregion (the former in Zimbabwe, the latter in eastern Zimbabwe), without comment. Their reasons for doing so are unclear, as they also recognised *H. mutabilis*, which has been treated variably as a subspecies of both *gambianus* (e.g. Ellerman 1940) and *rufobrachium* (e.g. Rosevear 1963). In fact, Ansell (1978) clearly showed that *H. gambianus* (an endemic of mesic miombo woodlands west of the Muchinga Escarpment) does not occur south of the Gwembe Trough and middle Zambezi Valley. Consequently, we do not list these species for southern Africa, pending concrete evidence to the contrary.

Family Myoxidae

Reuven (1890) and Trouessart (1897, 1904) first used the family name Myoxidae for the dormice. Subsequently, many authors (Allen 1939; Ellerman 1940; Ellerman & Morrison-Scott 1951; Roberts 1951; Ellerman *et al.* 1953; Ansell 1978) used the family name Muscardinidae for this group of rodents. However, Simpson (1945) and others (Rosevear 1969; Misonne 1974; Genest-Villard 1978; Swanepoel *et al.* 1980; De Graaff 1981; Honacki *et al.* 1982; Smithers 1983; Meester *et al.* 1986; Corbet & Hill 1991) opted to use the family name Gliridae. More recently, Holden (1993, 1996) reverted to the original usage of Myoxidae as the family name. Interestingly, McKenna & Bell (1997) noted that "The currently fashionable return to Myoxidae and other family-group names based upon it, in preference to Gliridae and its coordinate names, may be a violation of the International Code of Zoological Nomenclature, Article 40, ...". Until this problem is resolved, we opt to retain the original family name Myoxidae.

Subfamily Graphiurinae

Holden (1993) separated *Graphiurus kelleni* from *G. parvus*, with reference to the study by Schlitter *et al.* (1985), and gave its range as Angola, Zambia, Malawi and Zimbabwe. *Graphiurus parvus* is thus extralimital, occurring in West Africa to Ethiopia and Tanzania.

Graphiurus murinus is in need of revision (Holden 1993). Chromosomal studies have identified three diploid chromosome types, suggesting that it may be a complex of species (Dippenaar *et al.* 1983; Holden 1993).

Family Muridae

As summarised by Meester *et al.* (1986) and Musser & Carleton (1993), the classification of the family Muridae is controversial. This uncertainty largely emanates from confusion about relationships below the family level, and discussion of the various treatments presented over the last few decades is beyond the scope of this list. For convenience we follow the classification of Musser & Carleton (1993) in recognising the following five Subfamilies within the family Muridae: Murinae, Gerbillinae, Mystromyinae, Dendromurinae, Cricetomyinae, and Petromyscinae. However, we deviate from Musser & Carleton's (1993) treatment in subsuming the subfamily Otomyinae as a tribe (Otomyini) of the subfamily Murinae, for reasons outlined below. In addition, evidence suggests that *Acomys* does not belong to the subfamily Murinae (e.g. Sarich 1985; Chevret & Hanni 1994, Graur 1994), and the genus has been allocated to the subfamily Acomyinae (Chevret *et al.* 2001). However, because molecular studies include *Acomys-Deomys-*

Uranomys-Lophuromys in the same clade, and because the subfamily Deomyinae has been named earlier, it has been suggested that Acomyinae may not be appropriate but rather the subfamily name Deomyinae (C. Denys pers comm.).

Subfamily Murinae

Since its original description, *Rhabdomys pumilio* has been considered a single species. However, Wroughton (1905) distinguished four distinct groups, but was unsure about their taxonomic status, and referred to them as subspecies for simplicity, a view that has gained wide acceptance (Musser & Carleton 1993). In southern Africa, individuals from the south-west have been reported to be bigger than those from the northern parts (Yom-Tov 1993), while those from the moister eastern parts have been reported to be darker in pelage colour than those from the drier western parts (Lancaster 2002). Other studies have shown the existence of two karyotypic forms ($2n = 46$ and $2n = 44$) in South Africa (Ducroz *et al.* 1999), but allozyme data (Mahida *et al.* 1999) provide no evidence for the presence of a species complex. Breeding and behavioural studies (Pillay 2000a, b) demonstrated the existence of inter-demic pre-mating reproductive isolation, but no evidence of post-mating breakdown for pairs from widely separated populations that bred, while those from close proximity (100 km apart) showed reduced gene flow between chromosomal forms (Lancaster 2002). In addition, an ongoing morphometric study (E. van der Straeten pers. comm.) suggests the existence of three or four species of *Rhabdomys* in southern Africa. Until the nature and extent of variation within the genus is clearly understood, we retain the conventional taxonomic treatment of *Rhabdomys* as a monotypic genus.

Mus neavei was originally described as a full species, but Ellerman *et al.* (1953) relegated it to a subspecies of *M. minutoides*, while Verheyen (1965) and Ansell (1978) treated it as a subspecies of *M. sorella*. Pocock (1974) recorded *M. sorella* and *M. minutoides* from owl pellet remains from the Limpopo Province and Zimbabwe. Swanepoel *et al.* (1980), however, expressed reservations about the occurrence of *M. sorella* in South Africa, owing to the difficulty of accurately identifying species from owl pellet remains, Pocock's (1974) lack of comparison of his material with *M. indutus*, and also because this new record would have represented a substantial southerly range extension for *sorella*. Petter & Matthey (1975) considered *neavei* a valid species, a view endorsed by Corbet & Hill (1980), who listed *M. neavei* from Zimbabwe and *M. sorella* from Uganda and Kenya, and Petter (1981b). Conversely, Honacki *et al.* (1982) listed *neavei* as a subspecies of *M. sorella* occurring extraliminally from Zambia northwards to Kenya. Based on other records from Zambia (Ansell 1978) and south-eastern Zimbabwe (Petter 1981b), Meester *et al.* (1986) also listed *M. sorella* in the subregion and recognised two subspecies: *M. s. sorella* and *M. s. neavei*. Subsequently, Corbet & Hill (1991) also included *neavei* in *M. sorella*. However, an examination of a series of *M. s. neavei* by Musser & Carleton (1993), corroborates the view that *M. neavei* is a distinct species distinguished by its richer tawny fur, smaller size, more delicate cranium and shorter molar rows. More recently, Newbery & Bronner (2002) confirmed the occurrence of *M. neavei* in the subregion based on two specimens collected recently in Limpopo Province.

Meester *et al.* (1986) included the Angolan *sybilla* in *Mus indutus*. After examining the holotype of *sybilla*, Musser & Carleton (1993) identified it as a specimen of the extralimital *M. musculoides*.

Meester *et al.* (1986) listed *orangiae* from the Free State

and Lesotho as a subspecies of *M. minutoides*. After examining eight specimens of *orangiae* from the type locality (Kruisfontein, Viljoens Drift), Vermeiren & Verheyen (1983) concurred with Roberts (1926) in considering *M. orangiae* a full species, and it was considered as such by Musser & Carleton (1993). Externally, there is little resemblance between *orangiae* and *setzeri*, except for overall dimensions, as *orangiae* lacks large ears or the colour pattern of *setzeri*. However, there are cranial (strongly developed masseteric knob, the shape of the zygomatic plate, and the appearance of the anterior and posterior palatal foramina) and dental (the shape of the first upper molar, the position of its cusps, and the presence of a t_2 in the second upper molar) similarities between the two, and Vermeiren & Verheyen (1983) suggested the two might be allied. For now, we choose to accept Musser & Carleton's (1993) treatment of *orangiae* as a full species.

The recognition of subgenera and the taxonomic allocation and delineation of species and numerous subspecies in southern African *Aethomys* has been the source of systematic uncertainty (Meester *et al.* 1986; Skinner & Smithers 1990; Musser & Carleton 1993). The genus has undergone a number of nomenclatural changes (Rosevear 1969). Some species currently assigned to *Aethomys* were originally ascribed to *Gerbillus*, *Praomys*, *Mus* and *Epimys* (De Graaff 1981). For simplicity, Thomas (1915a) proposed *Aethomys* as a subgenus and later accorded it full generic rank (Thomas 1915b), a view subsequently accepted by Ellerman (1941) who, in his review of the genus, opted to allocate the currently recognised species *A. namaquensis* to the genus *Thallomys*. Ellerman *et al.* (1953) relegated *Aethomys* to a subgenus of *Rattus*. Based on dental (Lundholm 1955; Meester *et al.* 1964; Davis 1965, 1975) and cytogenetic (Matthey 1954, 1958, 1964) characteristics, it was subsequently reinstated as a genus. Davis (1975) subdivided the genus into two subgenera, *Micaelamys* and the nominate subgenus *Aethomys*. This subgeneric separation seems to be supported by a marked contrast in modes of karyotypic change, gross sperm and bacular morphology and their staining properties (Matthey 1954, 1958, 1964; Visser & Robinson 1986, 1987), and a cladistic analysis of qualitative cranial and dental characters (Chimimba 1997). Additional immunological and molecular data, as well as cladistic analyses of qualitative cranial data, provide additional support for the subgeneric separation of *Aethomys* and *Micaelamys* (Watts & Baverstock 1995; Chimimba 1997; I. Russo pers. comm.).

Gordon & Rautenbach (1980) found two distinct cytotypes ($2n = 44$ and 50) in *A. chrysophilus* that are morphologically indistinguishable. The absence of hybrids in areas of sympatry suggests reproductive isolation between the two cytotypes and, therefore, the possibility of two species. This was reinforced by other studies using cytogenetics (Gordon & Watson 1986; Visser & Robinson 1986; Baker *et al.* 1988), protein electrophoresis (Gordon & Watson 1986), gross sperm and bacular morphology and their staining properties (Gordon & Watson 1986; Visser & Robinson 1987; Breed *et al.* 1988), and cranial morphology (Chimimba 1997, 1998; Chimimba *et al.* 1999). A morphometric analysis involving cytogenetically known populations of *A. chrysophilus* (*sensu lato*) (Chimimba 1997, 1998; Chimimba *et al.* 1999) delineated two morphologically similar species: *A. chrysophilus* and *A. ineptus*. *Aethomys ineptus* forms one of the ten previously recognised subspecies within *A. chrysophilus* (*sensu lato*) from southern Africa.

Subregional infraspecific cranial morphometric analyses

suggest that *A. ineptus* and *A. granti* are monotypic with the former showing a south-west/north-east and the latter a longitudinal pattern of clinal variation (Chimimba 2001a; Chimimba *et al.* 1998). In contrast, *A. chrysophilus* was shown to comprise two subspecies, *A. c. chrysophilus* and *A. c. imago* whose morphological discontinuities coincide with an altitudinal limit of either below or above 500 m a.s.l. in the eastern part of southern Africa. However, the infraspecific data analysed for *A. ineptus* and *A. chrysophilus* need to be revisited as the results of the original diagnostic morphometrical analyses of these cryptic species may have included a combination of individuals representing both species. An infraspecific analysis of *A. namaquensis* suggests the recognition of four subspecies, *A. n. namaquensis*, *A. n. lehocla*, *A. n. alborarius*, and *A. n. monticularis*, reducing the number of previously recognised subspecies or referred taxa from 16 to four (Chimimba 2001b). The geographical limits of the proposed subspecies broadly coincide with major phytogeographical zones of southern Africa (Chimimba 2001b). These findings need to be independently tested as they may reveal the existence of species complexes (I. Russo pers. comm.). Similarly, geographic distributions, particularly of cryptic species need to be determined as has recently been attempted for *A. ineptus* and *A. chrysophilus* (Linzey *et al.* 2003).

The presence of *A. nyikae* in the subregion (Davis 1975; Swanepoel *et al.* 1980; De Graaff 1981; Honacki *et al.* 1982; Smithers 1983; Meester *et al.* 1986; Corbet & Hill 1991) is based on a single, now missing, "broad-toothed" juvenile specimen collected in 1965 from East Ngorima Forest Reserve in eastern Zimbabwe (one of the localities where *A. silindensis* has been recorded). Although a subsequent revision of the genus in southern Africa (Chimimba 1997, 1998; Chimimba *et al.* 1999) confirmed the presence of *A. nyikae* in central Africa (Democratic Republic of Congo, Angola, Zambia, Malawi), there was no evidence of its occurrence in the subregion. Since broadened teeth and a strong sagittal crest are characteristic of both *A. nyikae* and *A. silindensis*, it was speculated that the single previous record from Zimbabwe was probably based on a misidentification of a juvenile *A. silindensis* (Chimimba 1997, 1998; Chimimba *et al.* 1999).

Musser & Carleton (1993) listed five species within the genus *Dasymys*, including two from the subregion: *D. incomtus* and *D. nudipes*. Being considerably larger than *incomtus*, and having five rather than six plantar pads, Hill & Carter (1941) also considered *D. nudipes* a separate species. In contrast, Ellerman (1941) regarded *nudipes* as a subspecies of *incomtus*. Roberts (1951) recognised *nudipes* as a distinct species, but later relegated it to a subspecies of *incomtus* after examining smaller-sized specimens from within the distributional range of *nudipes*. Subsequently, most taxonomic reviews (Ellerman *et al.* 1953; Smithers 1971; Misonne 1974; Swanepoel *et al.* 1980; Honacki *et al.* 1982; Smithers 1983; Meester *et al.* 1986) considered *nudipes* a subspecies of *incomtus*. Crawford-Cabral (1983, 1986) maintained the specific distinction between *nudipes* and *incomtus* because of their different ranges in Angola where specimens identifiable to both were found in a zone of overlap. A subsequent craniometric study by Crawford-Cabral & Pacheco (1989), examining four distinct forms (*incomtus*, *nudipes*, *bentleyae* and *fuscus* from Mt Selinda in Zimbabwe), supported this view. However, these authors only formally recognised *nudipes* and *incomtus*, distinguished by the length of both the upper and lower molar tooth rows (length of upper molar tooth row: *incomtus* < 7.95 mm < *nudipes*; length of lower molar

tooth row: *incomtus* 6.7-7.7 mm, *nudipes* 8.4-8.9 mm). Although Crawford-Cabral & Pacheco (1989) only considered material from Angola (and not from Namibia, Botswana and South Africa), Musser & Carleton (1993) listed both *nudipes* and *incomtus* (see also Crawford-Cabral 1998).

The matter is further complicated by extensive chromosomal variation in the genus, where six distinct chromosomal forms have been identified (Matthey 1958; Maddalena *et al.* 1989; Gordon 1991; Granjon *et al.* 1992; Volobouev *et al.* 2000), two of which were not included in Musser & Carleton's (1993) assessment. We follow the taxonomic treatment of a recent pan-African systematic revision of the genus (Mullin 2003) in (Mullin *et al.* 2002) provisionally recognising five morphologically defined species, namely: the largely extralimital *D. rufulus* ($2n = 36$, FN = 44) which is tentatively considered to occur marginally in southern Mozambique; *D. incomtus* ($2n = 38$, FN = 44; restricted to eastern South Africa and south-western Zimbabwe); *D. capensis* (Western Cape Province, South Africa); and two, new, undescribed species listed here as *Dasymys sp. A* (from the Okavango Delta, Botswana, and the Caprivi, Namibia); and *Dasymys sp. B* ($2n = 46$, FN = 44; northern South Africa and eastern Zimbabwe). *D. capensis* represents an elevation of a previously recognised subspecies of *D. incomtus*. Mullin (2003) showed that the contested species *D. nudipes* is restricted in its distribution to the south-western Angolan plateau, and hence is not listed in this checklist.

The number of species attributable to the genus *Grammomys* is uncertain. Roberts (1951) listed five species of *Thamnomys* (*Grammomys*) from South Africa: *dolichurus*, *ruddi*, *cometes*, *silindensis* and *vumbaensis*. Ellerman *et al.* (1953) synonymised *silindensis* and *vumbaensis*, and referred all material from the subregion to *Grammomys dolichurus*, recognising the following subspecies: *G. d. dolichurus* (from the Eastern Cape); *G. d. cometes* (south-eastern Mozambique and northern KwaZulu-Natal); *G. d. baliolus* (Limpopo Province and north-eastern Mpumalanga); *G. d. tongensis* (northern KwaZulu-Natal); and *G. d. silindensis* (eastern Zimbabwe) which was later re-allocated as a subspecies of *T. (G.) cometes* (Misonne, 1974); *G. ruddi* was listed as occurring extraliminally. Meester *et al.* (1986) recognised two species, *G. cometes* and *G. dolichurus*, from southern Africa, as did Musser & Carleton (1993). The latter authors, however, included an additional species, *G. macmillani* from eastern Zimbabwe, based on the original description and the examination of a specimen from the original series. This, together with the suggestion that Roberts' (1938) *vumbaensis* (from Vumba and Mt Selinda in Zimbabwe) is clearly synonymous with *G. macmillani* and not with *dolichurus* as suggested by Ellerman *et al.* (1953) and Meester *et al.* (1986), motivate us to follow Musser & Carleton's (1993) treatment in accepting the occurrence of *G. macmillani* in the subregion.

Due to a high degree of morphological and chromosomal diversity, several authors (Hutterer & Dieterlen 1984; Meester *et al.* 1986; Musser & Carleton 1993) have drawn attention to the critical need for a revision of *G. dolichurus*. Dippenaar *et al.* (1983), for example, found the diploid number for the species to vary from $2n = 44$ at Woodbush (Limpopo Province) to $2n = 52$ at Ngoye Forest (KwaZulu-Natal), while in the north-eastern parts of Africa diploid numbers of $2n = 54$ and $2n = 61$ have been reported (Roche *et al.* 1984). Subsequently, Taylor *et al.* (1994) reported diploid numbers of $2n = 50$ and $2n = 52$ for *G. dolichurus* and *G. cometes*, respectively, in KwaZulu-Natal. In a pan-African context, Musser & Carleton (1993) have commented that specimens of true *dolichurus*

from South Africa are characterised by duller pelage and more inflated auditory bullae than those from East and West Africa, further suggesting a critical need for a systematic revision of this group of rodents.

The validity of the type species *Mus colonus* is central to the ongoing debate over use of the generic names *Myomys* versus *Myomyscus*. The type locality of this species is given as Algoa Bay, Eastern Cape, South Africa, which lies outside the distributional range of the genus. Roberts (1944) considers it the same species as the subsequently described *Mus verroxii*, although Ellerman *et al.* (1953) argued that *M. colonus* is unidentifiable. *Myomys* was subsequently abandoned and *Myomyscus* (proposed by Shortridge (1942)) was used, mostly as a subgenus of the genus *Praomys* (Davis 1965; Misonne 1974; De Graaff 1981; Honacki *et al.* 1982; Smithers 1983); both Rosevear (1969) and Van der Straeten & Verheyen (1978) continued to use *Myomys*. Van der Straeten (1979) regarded *Myomyscus* as generically separable from *Praomys*, and subsequent authors, therefore, used this name for the genus (Meester *et al.* 1986; but see Qumsiyeh *et al.* 1990). Musser & Carleton (1993) used *Myomys* and considered *Myomyscus* a synonym (see McKenna & Bell 1997), but stated that should *Myomys* really prove to have no nomenclatural status, then *Myomyscus* would be the valid name. Van der Straeten & Robbins (1997) have shown that *Mus colonus* is a *Mastomys*, a conclusion supported by an ongoing investigation of a large series of *Myomyscus* (E. van der Straeten pers. comm.). *Myomyscus* is thus the valid name for the genus.

The correct spelling of the species name is a case that comes under Article 33.1.1. of the ICZN (1999). The Correct Original Spelling seems to be *Mus verroxii*, while *Mus verreauxi* is an Incorrect Subsequent Spelling. But "when an incorrect subsequent spelling is in prevailing usage and is attributed to the publication of the original spelling, the subsequent spelling and attribution are to be preserved and the spelling is deemed to be a correct original spelling." Consequently, because the spelling "*verreauxi*" tended to be used, it becomes the "Correct Original Spelling" (P. Grubb pers. comm.)

Gordon (1987) presented chromosomal evidence for supporting the recognition of two species of tree rats, *Thallomys paedulus* and *T. nigricauda*. He concluded that the two species were parapatric, with *T. paedulus* occurring in the Savannah and *T. nigricauda* in the Nama-Karoo and Succulent Karoo biomes. In a diagnostic morphometric study, Taylor *et al.* (1995) supported the existence of two distinct species, but, in contrast to Gordon (1987), showed the geographical ranges of the two species to be broadly sympatric. They suggested a complete revision of the genus as Gordon (1987) found considerable morphological and chromosomal variation in both *T. paedulus* ($2n = 43-46$) and *T. nigricauda* ($2n = 47-50$) from KwaZulu-Natal. In addition, Musser & Carleton (1993) listed *T. shortridgei* from the south bank of the Orange River, from about Upington west to Goodhouse in the Northern Cape, based on the original description by Thomas & Hinton (1923) that distinguishes the species on chromatic and cranial traits (e.g. well-marked supraorbital ridges, long palatal foramina, and small bullae). Ellerman (1941) and Roberts (1951) also recognise *shortridgei* as a species, but such a treatment was not widely accepted by subsequent authors. The morphometric study by Taylor *et al.* (1995) did not recognise *shortridgei*, and the latter may merely represent a synonym of *paedulus*. However, this urgently requires examination, and pending a complete revision, we do not recognise *shortridgei* here.

Tribe Otomyini

Based on the close murine affinities of the fossil genus *Euryotomys*, recent palaeontological studies (Sénégal & Avery 1998, Sénégal 2001) suggested that the laminate-toothed rats should be recognised taxonomically at the level of a tribe rather than a subfamily, a view accepted by Ducroz *et al.* (2001) and Taylor *et al.* (in press).

Between one (Bohmann 1952) and five (Roberts 1951) genera have been included in this tribe, although most commonly only two (*Otomys* and *Parotomys*) are recognised (Misonne 1974; Meester *et al.* 1986; Musser & Carleton 1993). The current generic taxonomy of the tribe, and in particular the monophyly of *Parotomys* and *Otomys*, has been questioned by analyses of morphological (Pocock 1976), allozyme (Taylor *et al.* 1989) and immunoblot data (Contrafatto *et al.* 1997), as well as by chromosomal banding and fluorescence *in-situ* hybridisation (FISH) studies (Rambau *et al.* 1997, 1999) and mtDNA sequencing (Maree 2002) data. These reports suggest that either or both *Otomys unisulcatus* and/or *O. sloggetti* are phylogenetically closer to *Parotomys* than to *Otomys*. While molecular data provided robust probabilistic support for terminal relationships within the Otomyini, basal relationships were not well supported (Maree 2002). Bernard *et al.* (1991), using sperm morphology, found no evidence to support the inclusion of *O. unisulcatus* in *Parotomys*. A recent cladistic analysis of a large set of morphological and allozyme characters suggested a basal position for *O. unisulcatus* relative to other members of *Otomys* (*sensu lato*), but the precise relationship between *O. unisulcatus* and the two *Parotomys* species (*brantsii* and *littledalei*) was equivocal (Taylor *et al.* in press). Until a comprehensive multidisciplinary analysis can be undertaken, we retain the current generic taxonomy, in recognising both *Otomys* and *Parotomys*.

Taylor *et al.* (1993) showed that Western Cape populations of *O. saundersiae* (= *O. karoensis* Roberts 1931) are clearly morphometrically distinguishable from sympatric populations of *O. irroratus*, while conversely, Eastern Cape (topotypical) populations of *O. saundersiae* (= *O. saundersiae* Roberts 1929) are morphometrically indistinguishable from *irroratus*. This suggests that *saundersiae* Roberts 1929 may be a synonym of *irroratus* Brants 1827, and that the available name *O. karoensis* Roberts 1931 should be applied instead to the smaller-sized, pallid-coloured species from montane habitats in the Western Cape. However, a recent traditional and geometric morphometric study (Taylor *et al.* in press) showed that the type and cotype of *saundersiae* cluster with the type of *karoensis* in multivariate space, but are distinct from *irroratus*, at least in skull size. For these reasons, notwithstanding subtle but significant differences between *saundersiae* and *karoensis* in ecology, skull shape and size, and pelage colour, and pending further chromosomal and genetic studies of *O. s. saundersiae*, these two taxa (*O. s. saundersiae* and *O. s. karoensis*) are retained here as subspecies of *O. saundersiae* (following Meester *et al.* 1986). The diploid chromosome number of *O. s. karoensis* is $2n = 28$, similar but distinct in karyotype from *O. irroratus*.

Otomys maximus Roberts 1924 may be a distinct species (Swanepoel *et al.* 1980, Musser & Carleton 1993, Crawford-Cabral 1998), but a morphometric overlap suggests retaining it as a subspecies of *O. angoniensis* Wroughton, 1906 (Misonne 1974; Meester *et al.* 1986; Bronner *et al.* 1988) a view supported by mtDNA sequence data (Maree 2002).

Subfamily Mystromyinae

Except for Corbet & Hill (1980, 1991), who included *Mystromys albicaudatus* in the subfamily Nesomyinae, the species has generally been assigned to the subfamily Cricetinae (Roberts 1951; Ellerman *et al.* 1953; Misonne 1974; Swanepoel *et al.* 1980; De Graaff 1981; Smithers 1983; Meester *et al.* 1986), together with the hamsters. However, many authors have questioned its affinity to the hamsters. Ellerman (1941) for example, commented: "I am entirely at a loss to suggest the relationships of this genus, which seems not only isolated from the Palaearctic and Neotropical genera, but to have no generic characters...". Subsequently, Vorontsov (1966) established that *M. albicaudatus* was certainly not closely related to Palaearctic hamsters, and allocated the species to the tribe Mystromyini. Consequently, and together with opinions expressed by Lavocat (1973) and Carleton & Musser (1984), Musser & Carleton (1993) referred *M. albicaudatus* to the distinct subfamily Mystromyinae. *Mystromys* does share certain characteristics with the Cricetomyinae, including a pair of ridges running in a slightly raised band lengthways along the lower incisors; a very long, coronoid process of the mandible; inflated sac-like preorbital foramina; and the possession of gastric papillae. Pocock (1985, 1987) went so far as to suggest that *Mystromys* should actually be placed in the Cricetomyinae, but we follow the treatment of Musser & Carleton (1993) and McKenna & Bell (1997).

Subfamily Cricetomyinae

Saccostomus campestris shows an unusually high degree of chromosomal variation over its entire distributional range. Up to 16 karyotypic variants, ranging from $2n = 28-50$, have been reported in southern Africa (Gordon & Watson 1986), but the taxonomic significance of this variation remains unclear (Gordon 1986; Gordon & Watson 1986). Ferreira (1990) suggested that these karyotypic variants may be the result of centric fusions, heterochromatic additions and the presence of a single pericentric inversion in the X-chromosome, and Ellison (1992), found geographic differences in body mass and physiological characteristics that allude to the localised differentiation of demes. There is also intraspecific variability in some aspects of reproductive biology and feeding behaviour (Westlin & Ferreira 2000; Tinney *et al.* 2001). Until the nature and extent of variation within the genus is clearly understood, we herein retain the conventional taxonomic treatment of *Saccostomus* as a monotypic genus.

Subfamily Petromyscinae

Most authors have only recognised two species within *Petromyscus*, namely *Petromyscus monticularis* and *P. collinus*, the latter with three subspecies (the nominate form, *barbouri* and *shortridgei*). Schlitter (in Meester *et al.* 1986) argued that *barbouri* and *shortridgei* may represent distinct species, leading Skinner & Smithers (1990) to raise both forms to the species level. Musser & Carleton (1993) studied museum specimens and original descriptions and confirmed the existence of four distinct species. It is worth noting here that these authors recorded a specimen of *P. monticularis* from South Africa (on the south bank of the Orange River at the Augrabies Falls).

Cohort Euarchonta

Superorder Primatomorpha

Order Primates

Classification of primates above the family level has, for many years, followed Simpson (1945), who split the Order into two

Suborders, the Prosimii and Anthropoidea (see Ellerman *et al.* 1953; Dandelot 1974; Hill & Meester 1974). More recently, the Order has been split into the Suborders Strepsirhini and Haplorhini (Szalay & Delson 1979; Petter & Petter-Rousseau 1979; Meester *et al.* 1986; Groves 1989; but see also Martin 1990). Although the latter arrangement is not without its faults, it is currently the most widely accepted, and also that used by Groves (2001), whose classification is followed here.

Meester *et al.* (1986) included the bushbabies (in southern Africa represented by the genera *Galago*, *Galagoides* and *Otolemur*) in the subfamily Galaginae in the family Lorisidae. Most modern authors have recognised two families in the Loriformes, namely Lorisidae (for the pottos and angwantibos) and Galagidae (for the bushbabies). However, Jenkins (1987) showed that the latter family should be referred to as the Galagonidae, in accordance with Article 29(b)(ii) of the ICZN code, which states that the stem of a non-classical name is determined by the author who first established the family-group name for it. Likewise, Jenkins (1987) showed that Lorisidae has to be called Loridae, and these names were applied by Groves (1993, 2001). However, the ICZN recently has ruled in favour of retaining Galagidae as the valid family name.

The generic taxonomy of the galagos is in a state of flux due to contradictory phylogenetic reconstructions (J. Masters pers. comm.). Thus, the genus *Otolemur* is still commonly recognised (e.g. Meester *et al.* 1986; Groves 1993, 2001), mostly on the basis of its larger size, and despite its apparent paraphyly. The commonly recognised genus *Galagoides* is considered a “wastebasket taxon”, since it contains the unrelated “dwarf” and “Zanzibar” galagos (DelPero *et al.* 2000). Groves (2001), in his recent revision of the taxonomy of all primates, states that he feels “... it is unsafe for the present to recognise any genera beyond *Otolemur*, *Euoticus* and *Galago*.” Until consensus is reached, three southern African genera are retained here: *Otolemur*, *Galagoides* and *Galago*.

Galagoides granti was included as a subspecies of *Galagoides zanzibaricus* by Meester *et al.* (1986) and Groves (1993). Earlier authors considered it a subspecies of *G. senegalensis* (e.g. Allen 1939; Roberts 1951; Ellerman *et al.* 1953) although later authors, while following suit, pointed out differences in various morphological and ecological traits (e.g. Smithers 1983). Groves (1974) suggested that *granti* was a southern representative of *zanzibaricus*, which he considered distinct from *senegalensis*, and, subsequently (in Honacki *et al.* 1982), even treated them as distinct species. The study by Honess (1996) confirmed that *granti* should be raised to species level as *Galagoides granti*, since it differs from *zanzibaricus* in call structure, penile anatomy, facial characters and body and skull dimensions (Honess 1996; Kingdon 1997; Masters & Bragg 2000; note that Groves (2001) recognised *granti* as a species, but in the genus *Galago*).

Groves (1989, 1993, 2001) recognised *Chlorocebus* as distinct from *Cercopithecus* and includes the superspecies *aethiops*, although he retained *albogularis* and *mitis* as distinct species in *Cercopithecus*. However, the relationship of the *aethiops* superspecies to other guenons remains speculative, with different datasets producing conflicting results. Placing *aethiops* in *Chlorocebus* implies a very early divergence for the species, which may or may not be true (J. Masters pers. comm.). Until consensus can be reached, both *aethiops* and *albogularis* are here retained as respective superspecies in the genus *Cercopithecus*. *Cercopithecus aethiops* is a superspecies comprising *C. (a.) aethiops*; *C. (a.) tantalus*; *C. (a.) sabaeus*; *C. (a.) djamdjamentis*; and *C. (a.) pygerythrus*,

the latter being the vervet monkey occurring into southern Africa. *Cercopithecus mitis* is also a superspecies comprising several species, including, in southern Africa, Sykes' (samango) monkey *C. (m.) albogularis*. Thus, we follow the classification of Groves (2001) in recognising *pygerythrus* and *albogularis* as the southern African specific names for the *aethiops* and *mitis* superspecies, respectively.

The taxonomy of the baboons is currently unresolved. Depending on the taxonomic approach and species concept adopted, at least three names have been proposed for the southern African Chacma baboon. One approach recognises one Pan-African species, *Papio hamadryas* Linnaeus 1758, with five parapatric subspecies, of which only one, the Chacma baboon (*P. hamadryas ursinus* Kerr 1792) occurs in southern Africa. Strong support for this hypothesis comes from allozyme data indicating that baboon taxa are no more genetically divergent from each other than are races of humans (Williams-Blangero *et al.* 1990). Furthermore, widespread interbreeding occurs between subspecies (C. Jolly pers. comm.). A second viewpoint considers *P. hamadryas* distinct from the other so-called “savannah” baboons. In this case, the name *P. cynocephalus* Linnaeus 1766 is available for the savannah baboons, including the southern African Chacma subspecies *P. cynocephalus ursinus*. A third viewpoint (Kingdon 1997; Groves 2001) elevates the five African subspecies to species status: *hamadryas*, *cynocephalus*, *ursinus*, *papio* Desmarest 1820, and *anubis* J. B. Fischer 1829. Subspecies are recognised within the southern African species, *P. ursinus*.

The first approach is most consistent with the biological species concept. The second approach, although widely used, appears untenable since the taxon *cynocephalus* is paraphyletic, and, on morphological and genetic grounds, the most divergent taxon is *ursinus*, not *hamadryas* (C. Jolly pers. comm.). The third approach, most recently advocated by Groves (2001), represents a “modified phylogenetic species concept”, since it generally recognises diagnosable taxa to be species, but it also allows subspecies, a concept not accepted under the phylogenetic species concept. A strict adoption of the phylogenetic species concept would recognise four diagnosable southern African species (C. Jolly pers. comm.): 1) *ursinus* (very large, dark, short-tailed; black hands and feet; southern distribution); 2) *transvaalensis* Zukowsky 1927 (lighter colored; possibly longer-tailed; more northerly); 3) *griseipes* Pocock 1911 (lighter still, light patches on face; gray not black hands and feet; long tail; features approaching yellow baboon, *P. cynocephalus*; Botswana, Zimbabwe, Zambezi Valley; and 4) *ruacana* Shortridge 1942 (small, dark, Kalahari form). However, such a radical approach appears impractical and remains to be tested by a thorough analysis of geographic variation. At the present, the first approach mentioned above seems best supported by the available evidence, and the Chacma baboon is taken to represent a subspecies of the widespread *P. hamadryas*, namely *P. h. ursinus*, including as synonymys the names *transvaalensis*, *griseipes* and *ruacana*.

SUPERCOHORT LAURASIATHERIA

Order Eulipotyphla

The Insectivora (Lipotyphla), once a taxonomic wastebasket for “primitive” insectivorous forms thought to be the central stock from which other eutherians radiated, is clearly a polyphyletic taxon (Emerson *et al.* 1999; Mouchaty *et al.* 2000a, b). This poorly defined order was rendered obsolete by systematic fission, first by the removal of the macroscelidids and tupaiids, and more recently by the deployment of

chrysochlorids and tenrecs to the Afrotheria (Stanhope *et al.* 1998). The remaining core insectivores (solenodons, shrews, moles and hedgehogs) form a monophyletic group (Eulipotyphla) in both morphological (MacPhee & Novacek 1993; Asher 1999) and molecular phylogenies (Madsen *et al.* 2001; Murphy *et al.* 2001a, b; Douady *et al.* 2002). Within the Eulipotyphla, two distinct clades are evident (Butler 1988): Erinaceomorpha (hedgehogs) and Soricomorpha (remaining forms). While some authors have argued for ordinal recognition of these taxa, the genetic and morphological differences between them are of no greater magnitude than those distinguishing microchiropteran and megachiropteran bats, and we consequently afford each only subordinal status.

Suborder Soricomorpha

Family Soricidae

It has long been recognised that *Myosorex*, together with the extra-limital *Surdisorex* and *Congosorex*, are in several respects morphologically more similar to the white-toothed shrews (Soricinae) than those with pigmented teeth (Crociodurinae), and that this primitive lineage can be considered central to soricid evolution (Heim de Balsac & Lamotte 1956, 1957; Repenning 1967; Gureev 1971; Butler & Greenwood 1979). Based on limited allozyme data, Maddalena & Bronner (1992) suggested that *Myosorex* be classified in the distinct subfamily Crocidosoricinae (which Reumer (1987) erected for several extinct taxa), a conclusion upheld by characters of the reproductive system (Bedford *et al.* 1998). Phylogenetic analyses of mitochondrial rRNA sequences also strongly support the allocation of *Myosorex* and *Congosorex* to a distinct subfamily, for which the name Myosoricinae is available (Quérrouil *et al.* 2001). This name has formal priority over Crocidosoricinae, which should be restricted to extinct taxa (Wolsan & Hutterer 1998).

Myosorex sclateri has often been considered a subspecies of *M. cafer* (Ellerman *et al.* 1953; Heim de Balsac & Meester 1977; Meester *et al.* 1986) although Roberts (1951) and Hutterer (1993) recognised it as distinct. Recent biochemical (Maddalena & Bronner 1992) and morphological (Kearney 1993) evidence support its elevation to species status.

Hutterer (1993) recognised *M. tenuis* as distinct from *M. cafer*, based on information alluding to the sympatric co-existence of forms having different karyotypes in Mpumalanga (Dippenaar *et al.* 1983; Wolhuter, in Smithers 1983). Although this might justify recognising these as distinct species, no concrete evidence in this regard has ever been published, and the phylogenetic significance of such putative karyotypic variation remains equivocal. Therefore, we follow Meester *et al.* (1986) in including *tenuis* as a synonym of *cafer*, pending further revision.

Crocidura, *Sylvisorex* and *Suncus*, together with the extralimital *Paracrocidura*, *Ruwenzisorex* and *Scutisorex*, form a distinct clade in phylogenetic analyses of mitochondrial rRNA, justifying the allocation of these genera to a restricted subfamily Crocidurinae (Quérrouil *et al.* 2001). While some authors (Butler *et al.* 1989) have concluded that *Crocidura* is not a natural taxonomic unit, Quérrouil *et al.* (2001) confirmed that this genus is monophyletic.

A number of authors have regarded *C. occidentalis* as synonymous with *C. flavescens* (Roberts 1951; Ellerman *et al.* 1953; Heim de Balsac & Meester 1977; Swanepoel *et al.* 1980). Maddalena *et al.* (1987) have shown that *C. flavescens* is karyotypically distinct from other large African shrews, which were previously referred to as *C. occidentalis* - a name that is preoccupied by *C. olivieri* (Meester *et al.* 1986; Corbet

& Hill 1991; Hutterer 1993).

Order Chiroptera

The chiropteran monophyly/diphlyly debate that raged over the last decade or so has been quelled by recent molecular studies (Allard *et al.* 1999; Liu *et al.* 2001; Miyamoto *et al.* 2000; Murphy *et al.* 2001a, b) that have unequivocally demonstrated bat monophyly, and thereby dispelled the "flying primate" hypothesis (e.g. Pettigrew 1986). Molecular analyses reject any close relationship among bats, flying lemurs and tree shrews (once grouped in the cohort Archonta), and instead support a sister-taxon relationship between Chiroptera and Eulipotyphla (Murphy *et al.* 2001a, b), which together are the sister-group of the Ferungulata clade (Nikaido *et al.* 2001). Recent analysis of amino-acid sequences suggests that bats are the sister-group to the Ferungulata, in a broad clade named the Scrotifera, but statistical support for this grouping was not strong (Waddell *et al.* 2001).

The monophyly of the Microchiroptera is supported by morphological characters associated with laryngeal echolocation, but has recently been challenged by several molecular analyses. Baker *et al.* (1997) showed that cosmid markers of some rhinolophoids do not hybridise with those of other microbats, whereas Hutcheon *et al.* (1998) reported that the three rhinolophoid species they analysed consistently grouped with megabats, rather than other microchiropterans, in single-copy DNA hybridisation experiments. More recent analyses of nuclear and mtDNA gene sequences (Teeling *et al.* 2000, 2002; Springer *et al.* 2001) strongly support an alliance of megachiropterans and rhinolophoids (excluding Nycteridae) in the suborder Yinpterochiroptera. The other suborder Yangochiroptera includes all other microbats and nycteriids, and is a robust monophyletic group (Teeling *et al.* 2002). This, however, implies that the complex suite of morphological innovations for nasal emission of laryngeal echolocation pulses found in rhinolophoid bats evolved independently at least twice, and subsequently lost in the Pteropodidae. Furthermore, other molecular studies have upheld microbat monophyly (Liu *et al.* 2001; Murphy *et al.* 2001). Until consensus is reached on this matter, we retain the traditional suborders Megachiroptera and Microchiroptera.

Suborder Megachiroptera

Family Pteropodidae

Epomophorus crypturus was previously afforded full species status (Corbet & Hill 1980; Swanepoel *et al.* 1980; Honacki *et al.* 1982; Meester *et al.* 1986; Claessen & De Vree 1990, 1991). However, following Bergmans (1988, 1997), Boulay & Robbins (1989) and Koopman (1993), we treat it as a subspecies of *E. gambianus*.

Corbet & Hill (1992) corrected Geoffroy Saint-Hilaire's spelling of *Rousettus aegyptiacus* to *R. egyptiacus*, a change endorsed by Koopman (1993) and Bergmans (1994). Kock (2001b), however, has presented a detailed and convincing case for regarding *egyptiacus* as an incorrect original spelling and treating *aegyptiacus* as the valid name.

Rousettus angolensis has long been assigned to the subgenus *Lissonycteris* (Andersen 1912; Ellerman *et al.* 1953; Hayman & Hill 1971; Honacki *et al.* 1982; Meester *et al.* 1986; Corbet & Hill 1991). Lawrence & Novick (1963) separated *Lissonycteris* from *Rousettus* because of ethological differences concerning the use of the limbs, and the absence of echolocation in *Lissonycteris*. Juste *et al.* (1997) presented allozyme evidence corroborating earlier chromosome studies (Haiduk *et al.* 1980, 1981), DNA-hybridisation results (Kirsch

et al. 1995) and cladistic analyses (Springer *et al.* 1995) that support the recognition of *Lissonycteris* as a distinct genus. Bergmans (1997) showed that craniological characters also distinguish *Lissonycteris* from *Rousettus*, and assigned the specimens from Zimbabwe to a new subspecies (*L. a. goliath*). Liberally applying the evolutionary species concept, which holds that any diagnosable or allopatric population is a valid species, Cotterill (2001a) elevated *goliath* to full species rank. Similar application of the evolutionary and phylogenetic species concepts would necessitate that many other allopatric subspecies of southern African small mammals would also have to be afforded species rank, and would be premature in the absence of detailed analyses of geographical variation. We thus retain *L. a. goliath* as a subspecies pending careful revision of this genus, and some consensus on the heuristic value of this approach.

Myonycteris relicta was described by Bergmans (1980) based on the re-identification of a specimen from the Nguru Mountains, and two specimens from the Usambara Mountains, in Tanzania. Peterson *et al.* (1995) regarded *M. relicta* as a species of *Rousettus*, in contrast to Koopman (1982), Corbet & Hill (1991), Koopman (1993) and Bergmans (1997) who retained this taxon in *Myonycteris*. Recently, a female specimen captured in Haroni Forest (Zimbabwe) in 1973 and originally identified incorrectly as *Rousettus* (= *Lissonycteris*) *angolensis*, was re-identified as *Myonycteris relicta* (Cotterill 1995; Bergmans 1997), thereby providing the first record of this species in the southern African subregion.

Suborder Microchiroptera

Family Molossidae

The status of *Sauromys*, described as a monotypic subgenus of the extralimital *Platymops* for the South African flat-headed free-tailed bat, remains unclear. Petersen (1965) raised it to generic rank, a treatment endorsed by many subsequent authors, and corroborated by a limited multivariate analysis of wing bone and cranial characteristics (Petersen 1985). However, morphometric studies by Freeman (1981) and Legendre (1984) concluded that it is a subgenus of *Mormopterus*, a position followed by Koopman (1993, 1994). N. Simmons (in litt.) retains *Sauromys* as a valid genus in the new *Mammal Species of the World* (3rd Edition), a treatment we favour because of the unique ecology and morphology of *S. petrophilus*.

The genera *Mops* and *Chaerephon* have often been included as subgenera of *Tadarida* (Ellerman *et al.* 1953; Hayman & Hill 1971; Swanepoel *et al.* 1980; Meester *et al.* 1986; Corbet & Hill 1991). Roberts (1951) elevated these taxa to generic rank, an approach followed by Freeman (1981), Honacki *et al.* (1982), Koopman (1993) and N. Simmons (in litt.). In southern Africa, *Mops* is therefore represented by two species (*M. midas* and *M. condylurus*); *Chaerephon* by five (*C. bivittata*, *C. ansorgei*, *C. nigeriae*, *C. chapini* and *C. pumila*); and *Tadarida* by four (*T. aegyptiaca*, *T. lobata*, *T. ventralis* and *T. fulminans*).

Family Vespertilionidae

The classification of the subfamily Vespertilioninae was historically based on facial shortening and dental reduction characters (Miller 1907), and augmented by bacula morphology (Hill & Harrison 1987). Inter-relationships among *Eptesicus* and *Pipistrellus* species have long been contentious and have for the most part remained unresolved. The principal character used to diagnose these genera was the presence (*Pipistrellus*) or absence (*Eptesicus*) of the anterior

upper premolar. However, this character is variable in both genera (Wallin 1969; Koopman 1975; Heller & Volleth 1984). Baculum morphology (Heller & Volleth 1984; Hill & Harrison 1987) and karyological properties (Heller & Volleth 1984; Zima & Horáček 1985) also vary markedly among species assigned to *Pipistrellus* using dental characters. Heller & Volleth (1984) concluded that the genus *Eptesicus* is characterised by a distinct karyotype of $2n = 50$, and removed those taxa with $2n = >44$ (*E. capensis* and some Australian species) from *Eptesicus* to *Pipistrellus*, a treatment they considered consistent with patterns of variation in baculum morphology.

After extensively reviewing variation in baculum morphology, Hill & Harrison (1987) divided *Pipistrellus* into seven subgenera. They transferred *anchietae* (see Kock [2001b] for justification of spelling) to the subgenus *Hypsugo* and four African species of *Eptesicus* (*capensis*, *melckorum*, *zuluensis* and *rendalli*) to the subgenus *Neoromicia* within *Pipistrellus*. *Hypsugo* was subsequently raised to generic rank on the basis of detailed morphological and biochemical analyses (Horáček & Hanak 1986; Ruedi & Arlettaz 1991), a treatment supported also by cytogenetic evidence showing radical re-organization of the genome and karyotypic evolution in *H. anchietae* (Kearney *et al.* 2002). Most of the other (extralimital) subgenera were subsequently also afforded full genus status, with the exception of *Pipistrellus* and *Neoromicia*. McBee *et al.* (1987) and Morales *et al.* (1991) provided further cytogenetic and electrophoretic evidence supporting the findings of Heller & Volleth (1984), but argued that further studies were needed to justify the inclusion of these species in *Pipistrellus*. Koopman (1993), therefore, recognised *Neoromicia*, but retained it as a subgenus of *Eptesicus*.

Volleth & Heller (1994) subsequently published more karyotypic evidence supporting the inclusion of *Neoromicia* within *Pipistrellus*, a treatment formalised by Koopman (1994). Most recently, Volleth *et al.* (2001) showed that the four African species included in *Neoromicia* (*capensis*, *nanus*, *rendalli* and *zuluensis*) display karyotypic synapomorphies typical of the Vespertilionini, in contrast to the other African *Pipistrellus* that show cytogenetic traits characteristic of the Pipistrellini. *Neoromicia* should thus be elevated to full generic rank to avoid recognising a paraphyletic *Pipistrellus*. Cladistic analyses of chromosomal data (showing that the four *Neoromicia* species also share three Roberstonian fusions), and of baculum characters in southern African species, provide additional support for recognising *Neoromicia* as a distinct genus (Kearney *et al.* 2002). Consequently, the genus *Eptesicus* in southern Africa is represented by only one species, namely *E. hottentotus*.

Volleth *et al.* (2001) and Kearney *et al.* (2002) provided karyotypic evidence for the inclusion of the banana bat (*P. nanus*) in *Neoromicia*. Ansell & Dowsett (1988) and Koopman (1966) pointed out that *africanus* Rüppell, 1842 antedates *nanus* (Peters, 1852) as the valid name for this species. However, we continue to use the better-known name *nanus*, as topotypical *africanus* is restricted to Ethiopia (and is thus unlikely to be conspecific with *nanus*) and Happold (2002) has applied to the International Commission on Zoological Nomenclature for conservation of this specific epithet on the grounds of nomenclatural stability. Koopman (1993) listed the subspecies in southern Africa as *nanus*, and took this to include the larger-sized form from Transkei that Roberts (1913) named *australis*, since the latter name is a junior homonym of *P. hespersus australis*. However, Kock (2001a) redescribed *australis* as *Neoromicia africanus meesteri*. There are thus two

subspecies in the subregion: *N. n. meesteri* in Eastern Cape; and *N. n. nanus*, from KwaZulu-Natal northwards.

Most previous authors recognised *Eptesicus* (= *Neoromicia*) *melckorum* as distinct from *N. capensis* (Roberts 1951; Ellerman *et al.* 1953; Hayman & Hill 1971; Corbet & Hill 1980; Meester *et al.* 1986). Koopman (1982), however, questioned the status of *N. melckorum*, since it cannot be clearly distinguished from *N. capensis*. Specimens from the type locality (Kersefontein Farm in the Western Cape Province) are morphologically and karyotypically indistinguishable from *N. capensis*, but specimens from the Kruger National Park with a unique karyotype ($2n = 40$, aNF = 50) agree with the original description of *melckorum* (Rautenbach *et al.* 1993; Kearney *et al.* 2002 for Kersefontein chromosomal data). The Kruger National Park specimens are also well differentiated from *N. capensis* by allozymes (Morales *et al.* 1991). *Neoromicia melckorum* should thus be synonymised under *N. capensis*, whereas specimens from the Kruger National Park probably represent a distinct species that remains unnamed (Koopman 1994), and which we refer to as *Neoromicia sp.* It seems likely that the Zimbabwe specimens reported by Cotterill (1996) represent this unnamed species.

Although Ellerman *et al.* (1953) and Hayman & Hill (1971) recognised *Eptesicus* (= *Neoromicia*) *zuluensis* as a distinct species, Koopman (1975, 1993), Honacki *et al.* (1982), Meester *et al.* (1986) and Corbet & Hill (1991) treated it as a subspecies of *Eptesicus* (= *Pipistrellus*) *somalicus*. Rautenbach *et al.* (1993) confirmed its distinctness from the latter on the grounds of inter-specific chromosomal differences.

Kearney & Taylor (1997) recently reported the occurrence of Rendall's serotine bat (*Neoromicia rendalli*) and the light-winged lesser house bat (*Scotoecus albofuscus*) in South Africa. This represents a significant extension in the known ranges of both species and testifies to the need for more intensive field surveys targeting poorly known taxa. Cotterill (2001b) also recorded *Scotoecus albigula* and *S. hindei* from Zinave, Mozambique, based on the re-identification of two museum specimens originally assigned to *Scotophilus viridis*. Compared with the light-winged *albofuscus*, species identification of the dark-winged taxa of *Scotoecus* (*albigula*, *hindei*, *hirundo*, *falabae*) is more complicated. Indeed, Koopman (1993) included all these taxa in *S. hirundo*. A study of cranial variation involving a small sample of Malawian specimens (Taylor & van der Merwe 1998) revealed that *hindei*, *hirundo* and *albigula* are distinguishable on morphometric grounds, with *albigula* and *hindei* apparently having larger canines and cheekteeth (as well as larger skulls) than *hirundo*, while *albigula* and *hindei* differ from each other in skull proportions. However, we provisionally retain these within *S. hirundo*, pending a broader study of the dark-winged forms including a larger sample of specimens from across the range. It is worth noting, however, that one of the two specimens of *S. albofuscus* collected at Zinave by J. P. Labao-Tello in 1973 is clearly a specimen of *Mimetillus moloneyi* (Cotterill 2001c). These new records significantly extend the known ranges of these two species, and testify to the need for a detailed revision of this genus.

The genus *Myotis* has been considered to include several subgenera, but the number thereof, and placement of species, varied considerably. Meester *et al.* (1986) listed three subgenera from the subregion, namely *Cistugo* Thomas, 1912 (for *seabrai* and *leseuri*), *Chrysopteron* Jentink, 1910 (for *welwitschii*) and *Selysius* Bonaparte, 1841 (for *tricolor* and *bocagei*). Menu (1987) proposed synonymising *Selysius* under the subgenus *Leuconoe* Boie, 1830 on the basis of dental

characters. This was endorsed by Koopman (1993, 1994) who transferred *M. bocagei* to *Leuconoe* but included other *Selysius* and *Chrysopteron* in the subgenus *Myotis*, and also by Godawa-Stormark's (1998) phenetic analyses of dental variation in the genus. Phylogenetic analyses of mitochondrial DNA sequences, however, do not support the monophyly of the three subgenera (*Selysius*, *Leuconoe* and *Myotis*) analysed (Ruedi & Mayer 2001), but *Cistugo* warrants generic separation (N. Simmons in litt.) owing to the distinct wing glands and unique karyotypes (see Rautenbach *et al.* 1993) found in *seabrai* and *leseuri* from southern Africa. There also are differences in pelage colour and skull morphology between *Cistugo* and other *Myotis* that corroborate this view (T. Kearney in litt.).

Although occasionally treated as a subgenus of *Chalinolobus* (Koopman 1971; Swanepoel *et al.* 1980; Honacki *et al.* 1982; Meester *et al.* 1986; Koopman 1993), *Glauconycteris* has often been considered as a distinct genus (Allen 1939; Roberts 1951; Ellerman *et al.* 1953; Hayman & Hill 1971; Corbet & Hill 1980, 1991). Despite some superficial cranial resemblance, the marked differences in baculum morphology (Hill & Harrison 1987) and karyotypic properties (Rautenbach *et al.* 1993; Volleth & Heller 1994) support the recognition of these taxa as discrete genera (N. Simmons in litt.). *Glauconycteris* is thus represented in the subregion by a single species, *G. variegata* (butterfly bat), while *Chalinolobus* is extralimital (Australia).

Skinner & Smithers (1990) withdrew *Laephotis wintoni* from their list of southern African mammals based on a communication suggesting that specimens from the Western Cape actually represent *L. namibensis*. However, we follow Meester *et al.* (1986) and Koopman (1993, 1994), who listed this species from South Africa following a multivariate analysis of cranial characters (Rautenbach & Nel 1978). Specimens from Lesotho and the Free State (Watson 1990a), and KwaZulu-Natal (Kearney & Taylor 1997; Taylor 1998) have also been assigned to *L. wintoni*.

The taxonomy of African *Scotophilus* remains problematic. Three species, differing mainly in body size, probably occur in the subregion but species limits and phylogenetic inter-relationships are unclear (Meester *et al.* 1986). Ellerman *et al.* (1953) referred to the largest species as *gigas*, but Robbins (1978) showed that in describing *gigas*, Dobson (1875) had in fact re-described *nigrita* a name used by Ellerman *et al.* (1953) for the medium-sized species. Koopman (in Honacki *et al.* 1982) accepted *nigrita* as a senior synonym of *gigas*, but argued that *nigrita* is a *nomen dubium* and should therefore not be used a position later recanted (Koopman 1993, 1994). Since *nigrita* was no longer available for the medium-sized species, Robbins (1978) used *dinganii* as the next valid name. Koopman (1975, 1978), however, regarded *leucogaster* as a senior synonym of *dinganii*, but later revised this opinion and recognised these as discrete species (Koopman 1993). Shortly thereafter he reverted to his earlier treatment and again listed *dinganii* under *leucogaster* (Koopman 1994).

Ellerman *et al.* (1953) referred to the smallest of the three species in the subregion as *viridis*, containing two subspecies (*S. v. viridis* and *S. v. damarensis*), which they recognised as distinct from *borbonicus* on Reunion Island. Hill (1980) regarded these taxa as conspecific and, therefore, used *borbonicus* as the prior name for this taxon. Corbet & Hill (1980) followed Koopman (1975) in confining *borbonicus* to Madagascar and Reunion, and thus once again recognised *viridis* as a mainland species, a treatment followed by Swanepoel *et al.* (1980) and Koopman (in Honacki *et al.*

1982). Robbins *et al.* (1985) followed suit but also listed *leucogaster* to accommodate *damarensis*, which they considered distinct from *viridis*, a treatment endorsed by Corbet & Hill (1991). Koopman (1993) considered *damarensis* synonymous with *viridis*, but subsequently recognised both of these as only subspecies of *borbonicus* (Koopman 1994).

While some consensus seems to have emerged concerning the largest species (*S. nigrita*), the scope and nomenclature of the other two species in southern Africa has been obfuscated by conflicting classifications, many of which were mere checklists that failed to provide any details on characters or assessment methods used. We provisionally follow the more objective classification of Robbins *et al.* (1985) and thus recognise four species in southern Africa: *nigrita* (including *gigas*); *dinganii*; *leucogaster* (including *damarensis* from Namibia); and *viridis* (distinct from *borbonicus*).

The genus *Nycticeius* long has been considered to comprise two species: *N. humeralis*, from North America, and *N. schlieffenii* from Africa and Arabia. Koopman (1978) found these species so similar that he retained them in the same genus, a treatment disputed by Kitchener & Caputi (1985). Hill & Harrison (1987) demonstrated consistent differences between these species in baculum morphology and proposed the allocation of *schlieffenii* to the distinct genus *Nycticeinops*. Extensive karyotypic differences between the American *humeralis* ($2n = 46$ and $FN = 48$; Baker & Patton 1967; Bickham 1979) and East African *schlieffenii* ($2n = 34$ and $FN = 52$) provide additional evidence that the two species are not congeneric (Rudeas *et al.* 1990) and mtDNA sequence divergence data strongly support their allocation to distinct genera (Hooper & Van Den Busche 2001). However, Rautenbach *et al.* (1993) reported an intermediate karyotype of $2n = 42$ and $FN = 50$ for *schlieffenii* from South Africa. This not only suggests the existence of two species in Africa, but also casts some doubt on the karyotypic basis for generic distinction between these forms. We nevertheless recognise these as distinct genera owing to clearcut differences in bacular and mtDNA properties.

Family Nycteridae

Originally described from Mozambique (Dalquest 1965), Kock (1969) considered *Nycteris vinsoni* a synonym of *N. macrotis luteola*, based on the size and position of the second lower premolar. Hayman & Hill (1971) suggested that *N. vinsoni* is a variant of *N. aethiopica*, itself considered a member of the *N. macrotis* group (Koopman 1965; Kock 1969). Koopman (1975) argued that the size and position of the second lower premolar is extremely variable, and instead recognised *vinsoni* as a distinct species closely related to *N. thebaica*, based on the presence of a pyriform tragus (and see Honacki *et al.* 1982). He later concluded that the tragus of the holotype is actually semilunate and therefore synonymised *vinsoni* under *N. macrotis oriana* (Koopman 1992, 1993). Swanepoel *et al.* (1980), Meester *et al.* (1986) and Corbet & Hill (1991) retained *vinsoni* as a distinct species, a treatment endorsed by limited morphometric comparisons (Van Cakenberghe & De Vree 1998).

Rhinolophidae and Hipposideridae

Koopman (1993, 1994) treated the leaf-nosed bats as a subfamily (Hipposiderinae) of the Rhinolophidae, an arrangement that followed several earlier classifications (e.g. Ellerman *et al.* 1953), in contrast to some later authors (Swanepoel *et al.* 1980; Meester *et al.* 1986; Corbet & Hill

1991; Koopman 1993) who afforded this taxon family rank. Hipposiderids differ markedly from the rhinolophids in skeletal, dental and noseleaf structure. For example, their noseleaves lack the single upstanding triangular process on the posterior part of the noseleaf that is characteristic of the rhinolophids. Most importantly, the toes of the hipposiderids have two joints, whereas in the rhinolophids only the first toe has two joints, while the rest have three. Furthermore, although species ascribed to the two genera have the same fundamental number of chromosome arms, there are marked karyotypic differences between *Rhinolophus* ($2n = 32-62$) and *Hipposideros* ($2n = 32$; Ando *et al.* 1980; Harada *et al.* 1985; Rautenbach 1986; Qumsiyeh *et al.* 1988; Zima *et al.* 1992; Rautenbach *et al.* 1993; Sreepada *et al.* 1993). These phenotypic differences are mirrored by substantial genetic divergence, collective evidence that provides strong support for the allocation of *Rhinolophus* and *Hipposideros* to distinct (albeit closely related) families (see Maree & Grant 1997).

Cohort Ferungulata

This cohort is robustly defined in molecular phylogenies (see Table 1) and a supertree based on molecular and morphological phylogenies (Liu *et al.* 2001). The superorder Ferae includes Carnivora and Pholidota, the latter showing no affinity to New World xenarthrans with which they were once grouped (in the Edentata).

Superorder Ferae

Order Carnivora

Most modern authors (e.g. Flynn & Galiano 1982; Flynn *et al.* 1988; Wozencraft 1989a, b; Flynn & Nedbal 1998; and see Bininda-Emonds *et al.* 1999) divide the Carnivora into two major suborders, Feliformia (“cat-like”) and Caniformia (“dog-like”), a split believed to have occurred early in the evolution of the group, possibly in the early Palaeocene. Although a few authors have included the aquatic seals, fur seals and walruses in their own order, Pinnipedia, most authors consider them to belong to the caniform carnivorans (e.g. Tedford 1976). Even accepting their inclusion in the Order Carnivora, there is still some controversy concerning the monophyly (Arnason *et al.* 1995; Bininda-Emonds *et al.* 1999) or diphyly (Hunt 1974; Wozencraft 1989b) of the families Phocidae (true seals) and Otariidae (fur seals)

Suborder Feliformia

Family Hyaenidae

Allen (1939), Roberts (1951), Ellerman *et al.* (1953), Coetsee (1977), and Meester *et al.* (1986) considered the aardwolf to belong to the distinct family Protelidae. More recently, Averyanov & Baryshnikov (1996) also recognised the Protelidae, including in it both *Proteles* (subfamily Protelinae) and the extinct *Percrocutas* (subfamily Percrocutinae). Conversely, Swanepoel *et al.* (1980) followed, inter alia, Hendey (1973, 1974a, b, 1978) in placing the aardwolf (*Proteles cristatus*) in the subfamily Protelinae within the family Hyaenidae. A number of modern studies and reviews, some using cladistic analysis, support the latter view (e.g. Wayne *et al.* 1989; Wozencraft 1989a, b, 1993; Werdelin & Solounias 1991; Werdelin & Turner 1996; McKenna & Bell 1997; Jenks & Werdelin 1998). The correct taxonomic rank for this taxon is still a matter of contention, largely due to its poorly known fossil history (Hendey 1974a, b). Based on a supertree approach, the split between *Proteles* and other hyaenids took place 20-17 Mya (Bininda-Emonds *et al.* 1999) a date that may justify either subfamily or family status.

Jenks & Werdelin (1998) summarised the two general hypotheses regarding the phylogenetic relationships between the three members of the subfamily Hyaeninae. The first regards *Hyaena hyaena* and *H. brunnea* as more closely related to each other than either is to *Crocuta crocuta* (Pilgrim 1932; Ewer 1955; Thenius 1966); the second regards *H. brunnea* as more closely related to *C. crocuta* than either is to *H. hyaena* (Schlosser 1890; Galiano & Frailey 1977). The morphological study of Werdelin & Solounias (1991) suggests that *H. hyaena* and *H. brunnea* are not sister species and, therefore, they proposed use of *Parahyaena* Hendey 1974 to accommodate the brown hyaena *Parahyaena brunnea*. This generic distinction was used by Wozencraft (1993), but not by McKenna & Bell (1997) who used the genus *Pachycrocuta*. However, the molecular evidence presented by Jenks & Werdelin (1998) provides unequivocal support to the first hypothesis that *H. hyaena* and *H. brunnea* are sister-taxa, but still raises the interesting question as to whether the two are congeneric or not. Jenks & Werdelin (1998) placed the two species in the same genus *Hyaena*, but in two different subgenera, *Hyaena* (striped) and *Parahyaena* (brown). Nevertheless, the ancient separation between the two species appears to be sufficient evidence for separation at the genus level (L. Werdelin pers. comm.) and we retain the treatment of Wozencraft (1993) pending clarification of the issue. Only two of the three hyaena genera (*Parahyaena* and *Crocuta*) are represented in southern Africa, with *Hyaena* occurring in East and North Africa (although ancestors of the striped hyaena *H. hyaena* are known from southern Africa).

Family Felidae

There is much uncertainty regarding relationships among the Felidae. Traditionally, mammalogists have followed Simpson's (1945) treatment that lumps all felids (with the exception of taxa in the genera *Panthera* and *Acinonyx*) into the genus *Felis*. However, as Wozencraft (1993) pointed out, this treatment "... is not well supported by primary systematic studies and only poorly represents relationships below the family level." The fundamental problem is that *Felis*, as previously defined, is wildly paraphyletic (see Groves 1982), a view most recently supported by the comprehensive cladistic analysis by Mattern & McLennan (2000).

Consequently, some felid taxa have been transferred to different genera as a means of representing different lineages. As such, while many authors (e.g. Ellerman *et al.* 1953; Smithers 1975; Ansell 1978; Swanepoel *et al.* 1980; Meester *et al.* 1986; Skinner & Smithers 1990; Corbet & Hill 1991) have included both the caracal and the serval in the genus *Felis* (see Werdelin 1981 for discussion against inclusion in *Lynx*), they are here allocated to the monotypic genera *Caracal* and *Leptailurus*, respectively, following Weigel (1961), Hemmer (1978), Wozencraft (1989a, b, 1993), O'Brien *et al.* (1996) and others. The genus *Felis* is thus restricted to include only the African wild cat *F. silvestris* (see below), the black-footed (or small-spotted) cat *F. nigripes*, and two species extralimital to southern Africa, the sand cat *F. margarita* and the swamp or jungle cat *F. chaus*.

For many years, the African wildcat and European wildcat were considered separate species. Pocock (1951), an authority on the species, considered them to be taxonomically distinct, while admitting that there appeared to be a close relationship between the two species. Likewise, Ellerman *et al.* (1953) admitted that African members of *F. lybica* have a close affinity to the European wild cat, *F. silvestris*, but retained usage of *F. lybica* for the African wild cat, as did other authors

(Rosevear 1974; Smithers 1975, 1983; Ansell 1978; Swanepoel *et al.* 1980; Meester *et al.* 1986; Skinner & Smithers 1990). However, Haltenorth (1953, 1957) suggested that *F. lybica* was conspecific with the older named *F. silvestris* and numerous authors (Corbet 1966, 1978; Corbet & Hill 1980, 1991; Honacki *et al.* 1982; Wozencraft 1989a, b, 1993; Kingdon 1997) have regarded *F. lybica* as a subspecies of *F. silvestris*. A multivariate analysis of craniometric characters in three races of wildcat by Ragni & Randi (1986) confirmed that *lybica* is conspecific with *silvestris*, and this has been further corroborated by additional molecular studies (Randi & Ragni 1991; Essop *et al.* 1997). On the other hand, Wiseman *et al.* (2000) presented evidence that wild cats in South Africa and the domestic cat are genetically distinct, although the authors do not specifically state that their evidence argues for specific status of the two. A global revision of *Felis silvestris* is pending (C. Driscoll pers. comm.), including a pan-African analysis of specimens, and until the results of this analysis are available, we follow Hemmer (1978) and Nowell & Jackson (1996) in distinguishing four groups of *F. silvestris*: the *silvestris* group of Europe; the *ornata* group of Asia; the *lybica* group of Africa and the Middle East; and the domesticated cat *F. s. catus*. Ellerman & Morrison-Scott (1951) argued that *lybica* Foster 1780, was probably a *lapsus* for *libyca*; however, Meester *et al.* (1986) stated that there is no clear evidence that the name was misspelled. Actually, both names are used in Forster's original book, although *lybica* appears in print first, and thus has priority.

Family Viverridae

As considered here, this family includes only the genera *Genetta* and *Civettictis*, and excludes the mongooses and *Nandinia* (see the discussion under Herpestidae and Nandiniidae, respectively).

The so-called large-spotted, or rusty-spotted, genets long have been regarded to represent an unresolved species complex under *G. tigrina* (von Schreber, 1776) (Coetzee 1977; Pringle 1977; Meester *et al.* 1986; but see Ansell 1978; Schlawe 1981 and Wozencraft 1993). Coetzee (1977) recognised two southern African "sections", *tigrina* and *rubiginosa* Pucheran, 1855. Meester *et al.* (1986) recognised three possible southern African subspecies: *G. t. tigrina*, *G. t. rubiginosa* and *G. t. zambesiana* (Matschie, 1902), although the latter is extralimital to southern Africa, occurring north of the Zambesi River. Based on morphometric evidence, Crawford-Cabral and Pachecho (1992) regarded "*rubiginosa*" (a *nomen nudem* since it belongs to a distinct West African taxon, *G. thierryi*; Gaubert *et al.* 2003a,b) and *tigrina* (endemic to South Africa) to be separate species. These authors excluded critical material from KwaZulu-Natal (housed in the Natal Museum, Pietermaritzburg), which was suggested by Pringle (1977) to represent a broad zone of intergradation between two subspecies, based on coat colour patterns. However, detailed re-examination of study skins and skulls of these KwaZulu-Natal specimens suggested only very limited hybridisation between the two distinct species in KwaZulu-Natal (P. Gaubert & P.J. Taylor unpubl.). Crawford-Cabral & Fernandes (2001) suggest that the "rusty-spotted genets" comprise three valid "southern African" species, *letabae* Thomas & Schwann, 1906, *zambesiana* and *mossambica* Matschie, 1902. However, the two last-mentioned taxa occur north of the Zambesi River and are not, therefore, strictly southern African in their distribution. Wozencraft (1993) lists *G. angolensis* Bocage, 1882 as occurring in Zimbabwe, while all other authors restrict the

range of this species to north of the Zambezi River (e.g. Coetzee 1977; Meester *et al.* 1986; Crawford-Cabral & Fernandes 2001). The species actually occurs in Botswana (Ngamiland; specimens from the BMNH) (P. Gaubert pers. comm.).

Gaubert *et al.* (2003a,b) proposed a nomenclatural solution to the taxonomic problems mentioned above by designating a neotype from Ethiopia to *G. maculata* (Gray 1830) in order to replace the misnamed “*rubiginosa*” group of rusty-spotted genets (occurring from Ethiopia to South Africa), distinct from *tigrina* (large-spotted genet; occurring from the southern Cape to southern KwaZulu-Natal). The species status of *G. pardina*, *G. maculata* and *G. tigrina* has recently been confirmed from the observation of discrete characters (following examination of nearly 4400 specimens of Viverrinae, including type material) although the exact limits of distribution between the three remain equivocal (Gaubert 2003). Consequently, for the purposes of this list we consider two species of large-spotted genets as occurring in southern Africa: *G. tigrina*, confined to the coastal area from the southern Cape to southern KwaZulu-Natal; and *G. maculata*, which is widely distributed in sub-Saharan Africa, sharing its western boundary with *G. pardina* (Volta River, Togo) and southern boundary with *G. tigrina* (southern KwaZulu-Natal). The taxa *zambesiana* and *mossambica* are not recognised pending clarification of the taxonomic validity and distributional limits of these species, based on, *inter alia*, current ongoing studies of mitochondrial DNA sequences (P. Gaubert & C. Fernandes pers. comm.).

Family Nandiniidae

Nandinia binotata usually has been considered a member of the Viverridae, and has alternatively been assigned to the Subfamilies Paradoxurinae (Simpson 1945; Rosevear 1974; Ansell 1978; Honacki *et al.* 1982; Meester *et al.* 1986) or Nandiniinae (Gregory & Hellman 1939; Ellerman *et al.* 1953; Coetzee 1977; Swanepoel *et al.* 1980; Smithers 1983; Wozencraft 1993). Occasionally, it has been treated as a separate family (Hunt 1987; McKenna & Bell 1997). Shallow observations may lead to the conclusion that the external morphology and the structure of the scent gland are very similar between *Nandinia* and the Paradoxurinae. However, several authors regarded characteristics related to the scent gland, the paraoccipital process and the auditory bullae morphology (retention of primitive characters) as sufficient evidence to warrant their designation to a separate family (Pocock 1929; Hunt 1974, 1987, 1989). Wozencraft (1993) acknowledged this view but refrained from such drastic measures and assigned *Nandinia* to the subfamily Nandiniinae. The studies of Veron (1995; morphology), Flynn & Nedbal (1998; DNA and morphology) and Veron & Heard (2000; cytochrome *b*) found *Nandinia* to be a basal taxon within the Feliformia, which make us place *Nandinia* apart from the Viverridae *sensu stricto* (i.e. without Malagasy taxa; see Yoder *et al.* 2003) and recognise the family Nandiniidae as distinct from the Viverridae.

Family Herpestidae

Certain authors separate the Herpestidae from the Viverridae (Gregory & Hellman 1939; Honacki *et al.* 1982; Hunt 1987; Flynn *et al.* 1988; Wozencraft 1989a, b; Corbet & Hill 1991), while others include the mongooses as a subfamily (Herpestinae) of the Viverridae (Roberts 1951; Ellerman *et al.* 1953; Michaelis 1972; Rosevear 1974; Ansell 1978; Swanepoel *et al.* 1980; Smithers 1983; Meester *et al.* 1986). Wozencraft (1993) and McKenna & Bell (1997) also recognise

the Herpestidae as a distinct family (and see the tree in Bininda-Emonds *et al.* [1999]), and this view is followed here. The subfamilies Herpestinae and Galidiniinae remain in use for the mongooses and Malagasy mongooses, respectively.

McKenna & Bell (1997) included the genera *Paracynictis* in *Cynictis* and *Dologale* in *Helogale* without comment; Wozencraft (1989a) suggested that *Dologale* and *Helogale* are congeneric, but did not go so far as formally recognising this. We continue to regard these as distinct genera, following the traditional classification (Coetzee 1977; Honacki *et al.* 1982; Meester *et al.* 1986; Wozencraft 1993; Kingdon 1997; and see the tree in Bininda-Emonds *et al.* 1999).

Among the most contentious of all taxonomic debates is the taxonomic status of the genus *Galerella*. This genus has been differentiated from *Herpestes* using differences in cranial, skeletal and dental characters (e.g. absence of a lower first premolar in adult specimens and inflation of the auditory bullae; Allen 1924; Rosevear 1974). Nevertheless, many authors have followed Simpson (1945) by including *Galerella* in *Herpestes* (Ellerman *et al.* 1953; Michaelis 1972; Wenzel & Haltenorth 1972; Ewer 1973; Taylor 1975; Coetzee 1977; Corbet & Hill 1980; Swanepoel *et al.* 1980; Honacki *et al.* 1982; Wozencraft 1989a, b; Crawford-Cabral 1989; Cavallini 1992; Taylor & Goldman 1993; Kingdon 1997; McKenna & Bell 1997; Nowak 1999; Taylor & Matheson 1999), with many of these authors demoting *Galerella* to subgenus status. Chromosomal studies, incorporating both Asiatic and African *Herpestes*, indicate that recognition of *Galerella* would make *Herpestes* paraphyletic (Fredga 1972). An allozyme study by Taylor *et al.* (1991) presents evidence for recognition of *Galerella*, but their study excludes Asiatic *Herpestes*. According to Wozencraft (1993), comparison of measurements from African forms (Allen 1924; Rosevear 1974; Smithers 1983) with Asiatic forms (Bechthold 1939; Pocock 1941) reveals that when Asiatic species are included, the morphological gaps originally identified by Allen (1924) are meaningless. Nevertheless, based on recent reviews (Rosevear 1974; Ansell 1978; Smithers 1983; Meester *et al.* 1986; Skinner & Smithers 1990) and revisions (Watson & Dippenaar 1987; Watson 1990b), Wozencraft (1993) provisionally separated *Galerella* from *Herpestes*. Considering both African and Asian forms, Taylor & Matheson (1999) provided craniometric grounds for including *Galerella* in *Herpestes*, but the use of a phenetic approach renders their results inconclusive for drawing phylogenetic conclusions. Based on their composite “supertree” for Carnivora, which included six source trees for the Herpestidae, Bininda-Emonds *et al.* (1999) showed *Galerella* and *Herpestes* to comprise distinct clades, and this arrangement is here followed. However, it should be noted that recent data from cytochrome *b* sequences of herpestids show both *Galerella* and *Herpestes* to be polyphyletic (G. Veron in litt.).

Within *Galerella*, at least two species are generally recognised: the Cape grey mongoose, *G. pulverulenta* and the slender mongoose *G. sanguinea*. Watson & Dippenaar (1987) recognised three southern African species: *G. pulverulenta*, *G. sanguinea*, and *G. nigrata*. The latter was first described as a subspecies (*flavescens*) of the slender mongoose from southwestern Angola (Bocage 1889). Subsequently, Thomas (1928) identified specimens from the Kaokoveld (in Namibia) as a separate species, namely *Myonax nigratus*. The latter was then assigned subspecific rank in *pulverulenta* by Ellerman *et al.* (1953) who considered it to be no more than a melanistic variant (and see Coetzee 1977 and Meester *et al.* 1986). Meanwhile, Coetzee (1977) assigned the form *flavescens* to

sanguinea. Subsequently, the studies of Watson & Dippenaar (1987), Watson (1990b) and Taylor & Goldman (1993) confirmed the specific distinction of *nigrata*. Crawford-Cabral (1989, 1996) demonstrated that material from south-western Angola can be assigned to *nigrata* Thomas 1928 (supporting the synonymy of *nigrata* with *flavescens*), but stated that the older available name *flavescens* Bocage 1889, should be used instead. Wozencraft (1993) endorsed the use of *flavescens*.

Watson & Dippenaar (1987) also suggested that a fourth species, *G. swinnyi*, based on two skulls (one broken) without skins, should be treated as *incertae sedis*. Watson's (1990b) study, using skull morphology and pelage colour, supported Watson & Dippenaar's (1987) findings, but also proposed recognition of another species, *G. swalius*, formerly a subspecies of *G. sanguinea* occurring in the southern and central parts of Namibia. Watson (1990b) chose to recognise *G. swalius* largely on grounds of colour and the absence of a post-orbital bar, usually present in *G. sanguinea*. However, both the studies of Watson & Dippenaar (1987) and Watson (1990b) excluded specimens from north-eastern Africa. Taylor & Goldman (1993) included skulls and skins from across Africa and negated the elevation of *G. swalius* to species rank, stating that post-orbital bars develop with age in mongooses and that as Watson's (1990b) study only involved six specimens of *G. swalius*, it was possible that the sample included young adults with unfused post-orbital bars. Furthermore, they noted that colour and morphometric variations could be attributed to the high degree of variability in *G. sanguinea*.

In the light of such uncertainty surrounding the taxonomy of *Galerella*, we follow Wozencraft (1993) in provisionally regarding *Galerella* as separate from *Herpestes*, and Watson & Dippenaar (1987), Taylor & Goldman (1993) and Crawford-Cabral (1989, 1996) in recognising three species of *Galerella* in the subregion: *G. pulverulenta*, *G. sanguinea* and *G. flavescens*. *Galerella swalius* and *G. swinnyi* are not recognised as distinct species pending clarification of their status.

Suborder Caniformia

Family Mustelidae

Some evidence links the genus *Mellivora* with the subfamily Mustelinae, and it has been included as such by Wozencraft (1989a, b). Indeed, the supertree of Bininda-Emonds (1999) places *Mellivora* as the sister-group to mustelines, indicating reasonable support for such an arrangement. However, the taxonomy of the family as a whole is uncertain, with molecular evidence suggesting that the Mustelidae may not be monophyletic (Dragoo & Honeycutt 1997; Flynn *et al.* 2000). We retain *Mellivora* in the subfamily Mellivorinae, but emphasise that this arrangement is provisional.

Family Otariidae

The Antarctic fur seal, *Arctocephalus gazella*, which is known to haul-out on Marion Island, has now been recorded from the South African coastline (J. David pers. comm.). Also, the Subantarctic fur seal, *A. tropicalis*, which has long been known to occur as a vagrant along the South African shores, has recently been recorded from the Namibian coast (S. Kirkman pers. comm.).

Superorder Paraxonia

Simpson (1945) erected this taxon for ungulates having paraxonic arrangement of digits, but recent evidence suggests that this is a plesiomorphic characteristic shared with primitive

cetaceans. Molecular evidence for the phylogenetic affinities of perissodactyls is equivocal, with one analysis placing them as the sister-group to the Ferae (Murphy *et al.* 2001b), and another concluding that they are best treated as the sister-taxon of the Cetartiodactyla (=Cetacea + Artiodactyla; Waddell *et al.* 2001).

Order Perissodactyla

Family Equidae

In the last two decades there has been considerable debate in the scientific literature concerning the status of the extant plains zebra *Equus burchellii* relative to that of the extinct quagga *E. quagga*. The latter is poorly represented in the fossil record, and some of the available material is of doubtful validity because it was collected at a time when the name "quagga" applied to all zebras. One school of thought maintains, on the basis of morphometric measures, that the quagga and the plains zebra are not conspecific (e.g. Bennett 1980, Thackeray 1988, 1997, Klein & Cruz-Urbe 1996, 1999), whereas the other argues that the quagga is merely a subspecies of the highly variable plains zebra, based on similarities in cranial morphology (Eisenmann 1980), striping on the body (Rau 1978, 1986) or molecular evidence (e.g. Higuchi *et al.* 1984, Lowenstein & Ryder 1985, George & Ryder 1986, Harley 1988).

While this debate has raged, most authors have retained *E. burchellii* and *E. quagga* as separate species (Meester *et al.* 1986, Corbet & Hill 1991, Grubb 1981, 1993c), but there has been a recent trend (e.g. Kingdon 1997), based on the growing morphological and genetic evidence available, to consider *E. quagga* and *E. burchellii* as conspecific, with the quagga being the extreme south-western end of a cline of the plains zebra (see Groves & Ryder 2000 for a recent taxonomic treatment of the Equidae). As *E. quagga* Boddaert, 1785 predates *burchellii* (Gray, 1824), the former has priority.

Superorder Cetartiodactyla

The traditional view of cetacean evolution, based largely on Eocene fossils, involves a land-to-water transition by amphibious mesonychia of archaic ungulate stock. Recent molecular phylogenies support an ungulate origin of the Cetacea but identify hippopotamids as the sister-group (Liu & Miyamoto 1999; Murphy *et al.* 2001a, b). Cladistic analyses of two new pakicetid fossils also confirm that cetaceans are more closely related to artiodactyls than mesonychia (Thewissen *et al.* 2001).

While improved sampling of both extant and extinct taxa is needed to unravel the precise details of phylogenetic divergence among these groups (Gatesy & O'Leary (2001), the Artiodactyla (as traditionally recognised) is clearly paraphyletic for the Cetacea, and is thus an unacceptable taxonomic entity (Matthee *et al.* 2001; Murphy *et al.* 2001a). An alternative name for this clade the Cetartiodactyla has become entrenched in the literature as a superorder epithet (Waddell *et al.* 1999; Liu & Miyamoto 1999; Madsen *et al.* 2001). Waddell *et al.* (1999) proposed the name "Whippomorpha" (here treated as an order) for the cetacean-hippo clade, and "Ruminantia" for a broader lineage including the extralimital chevrotains (Infraorder Tragulina) and the pecoran lineage (Matthee *et al.* 2001). The reduced Suiformes and extralimital Tylopoda (camels) have both been proposed as basal to the Whippomorpha (Matthee *et al.* 2001), warranting their recognition as orders, at least until the phylogenetic placement of these basal taxa in the Cetartiodactyla has been unequivocally demonstrated.

Acceptance of "Artiofabula" as the name for a clade comprising Suiformes + Cetuminantia, as proposed by Waddell *et al.* (1999), is also contingent upon such resolution.

Order Suiformes

The Suiformes, traditionally taken to include the Hippopotamidae (e.g. Ansell 1972; Meester *et al.* 1986; Grubb 1993b), is clearly paraphyletic (Matthee *et al.* 2001). Removal of the hippopotamus clade alters the underlying grouping concept slightly, but retention of Suiformes as an ordinal name is admissible following Simpson's (1945) principle of reasonable emendation.

Suborder Suida

Superfamily Suoidea

Family Suidae

Grubb (1993a, b) separated *Phacochoerus* in the subfamily Phacochoerinae and *Potamochoerus* in the subfamily Suinae.

The genus *Potamochoerus* long has been considered monotypic, including only *P. porcus* (Haltenorth 1963; Ansell 1972; Honacki *et al.* 1982; Corbet & Hill 1991). Grubb (1993a, b), however, recognised two allopatric species: the red river hog, *Potamochoerus porcus*, in the forest zone of West Africa; and the bushpig, *P. larvatus*, from southern Africa north to East Africa. Consequently, the species in the subregion should now be referred to as *P. larvatus*, in contrast to all previous works.

Similarly, *Phacochoerus* has traditionally been recognised as monotypic, the sole representative being *P. aethiopicus* (e.g. Ellerman *et al.* 1953; Ansell 1972; Swanepoel *et al.* 1980; Meester *et al.* 1986; Corbet & Hill 1991). However, palaeontologists have argued for recognition of two separate species, as evidenced in southern African fossil deposits: *Phacochoerus aethiopicus*, the extinct Cape warthog; and *P. africanus*, the extant common warthog (Cooke 1949; Ewer 1956, 1957, 1958; Ewer & Cooke 1964; Cooke & Wilkinson 1978). In *P. aethiopicus* functional incisors were lacking and root formation of the third molars was delayed until well after the last columns of these teeth came into use. Conversely, in *P. africanus* there are usually two incisors in the upper jaw and six in the lower jaw, and root formation of the molars occurs well before the hindmost columns come into use. The specific epithet *aethiopicus* represents the earliest name in the genus, and when Lydekker (1913-1916) considered all warthogs to represent one single species, *P. aethiopicus*, the characteristics of the common warthog automatically and erroneously became associated with the name of the Cape warthog (Grubb 1993a).

Grubb (1993a, b) confirmed differences between the living *P. africanus* and the extinct *P. aethiopicus*, and furthermore showed that warthogs from Somalia and northern Kenya (originally assigned by Lönnberg (1909) to *P. delamerei*) share dental and craniometric characters typical of extinct *P. aethiopicus* (and see D'Huart & Grubb 2001). The notion that specimens from the far Northern Cape Province of South Africa may also represent a living isolated population of the extinct Cape warthog is erroneous as these have fully functional incisors and are, therefore, definitely *P. africanus* (Grubb 1993a; Vercammen & Mason 1993). Grubb (1993a, b), therefore, recognised two distinct species within *Phacochoerus*: the common warthog, *Phacochoerus africanus*, and the desert warthog, *Phacochoerus aethiopicus*. Randi *et al.* (2002) have provided genetic evidence confirming the recognition of these two species.

Order Whippomorpha

Suborder Cetacea

Infraorder Mysticeti

Family Balaenidae

The taxonomy of right whales has yet to be resolved satisfactorily. Some authors have placed the right whale separately from the bowhead whale, in *Eubalaena* and *Balaena*, respectively (Ellerman & Morrison-Scott 1951; Ellerman *et al.* 1953; Hershkovitz 1966; Mead & Brownell 1993). Others regard *Eubalaena* and *Balaena* as congeneric (Rice 1977; Swanepoel *et al.* 1980; Hall 1981; Honacki *et al.* 1982; Meester *et al.* 1986; Corbet & Hill 1991), on the grounds that they differ from each other no more than do the species of *Balaenoptera* (Arnason & Gullberg 1994; Rice 1998).

Concerning the number of right whale species, recent genetic analyses suggest that the North Atlantic, North Pacific and Southern Hemisphere populations are three distinct lineages, with North Pacific right whales being closer to southern than North Atlantic right whales (Rosenbaum *et al.* 2000). However, apart from differences in size and some details of the callosity pattern, no reliable morphological criteria exist to accurately differentiate among right whales from these three regions (the cranial character suggested by Muller (1954) to distinguish between northern and southern right whales is now believed to be ontogenetic). Earliest available species names are *glacialis* (Muller, 1776) for the North Atlantic, *japonica* (Lacepede, 1818) for the North Pacific, and *australis* (Desmoulins, 1822) for the Southern Hemisphere, so in the absence of agreement on speciation among these forms, *glacialis* would take priority.

Family Balaenopteridae

Minke *Balaenoptera* whales in the Southern Hemisphere occur in two distinct forms. The larger, more abundant form (known as the "Antarctic minke") has, *inter alia*, baleen plates with a thick black outer edge posteriorly, quite unlike Northern Hemisphere minke whales (Best 1985). Genetic analysis has shown that these whales differ in many respects from North Atlantic and North Pacific minke whales, more so than do sei and Bryde's whales (Wada & Numachi 1991; Arnason *et al.* 1993). Rice (1998) has recognised this distinction by referring the Antarctic minke whale to *B. bonaerensis*. The smaller, less abundant form (known as the "dwarf minke") more closely resembles northern minke whales in external appearance (Arnold *et al.* 1987), and is genetically very different from Antarctic minke whales (Pastene *et al.* 1994), but closer to North Pacific minke whales (Wada *et al.* 1991). Rice (1998) considers this likely to be a race or subspecies of the northern minke whale *B. acutorostrata*, as yet unnamed. Both forms occur in the region, but in the absence of a recognised scientific name for the dwarf minke, we have included it in the checklist as *B. acutorostrata* subsp.

Bryde's whales also occur in the region in two forms, a larger, offshore form on the west coast; and a smaller, coastal form, mainly located over the Agulhas Bank on the south coast of South Africa, but seasonally migratory up (mainly) the west coast of South Africa in winter. A third population south of Madagascar, from which strays may reach the east coast of South Africa, is probably phylogenetically closer to the offshore form (Best 1977, 2001). When Olsen (1913) described *B. brydei* from Saldanha Bay, South Africa, he did so without reference to either of these forms and using external appearance only, and failed to designate a type specimen. The first actual specimen assigned to *B. brydei* was a skeleton from South Africa (Lönnberg 1931). Subsequently, Junge (1950)

synonymised *B. brydei* with a species described earlier from Burma (Myanmar), *B. edeni* Anderson, 1879, but this was a smaller animal even than the coastal form from South Africa. In an allozyme study, Wada *et al.* (1991) found that although most "ordinary" Bryde's whales clustered close to sei whales, some from south of Java and near the Solomon Islands ("small form" Bryde's whales) clustered as a distant sister group to the sei/Bryde's whale group. Later mtDNA studies confirmed that "pygmy Bryde's whales" from Hong Kong and the Philippines also clustered well apart from the sei/Bryde's whale clade (Dizon *et al.* 1998), and both sets of authors considered that the latter group might be a new species, or possibly referable to *B. edeni*. Thus, there appear to be at least three forms of Bryde's whale worldwide: a larger form that is divided into inshore and offshore populations (the latter animals being somewhat larger); and a tropical pygmy form, smaller even than the coastal form. The offshore form can be referred to *B. brydei*, but whether the type specimen of *B. edeni* refers to the coastal form or to the pygmy form is not clear at this stage. If the former, then the South African specimens should be referred to *B. edeni* rather than *brydei*, and a new name will have to be found for the pygmy Bryde's whale. If the latter, then presumably all South African Bryde's whales will revert to being *B. brydei*. For the present, the species is referred to as *B. edeni*.

Two forms of blue whale occur in the subregion, the larger "Antarctic blue whale", and a smaller "pygmy blue whale", which differs not only in being smaller, but also in having a shorter tail region (Ichihara 1966). The latter has been described as a subspecies, *B. musculus brevicauda*, and occurs seasonally round Marion and Prince Edward Islands and off Durban (Gambell 1964).

Infraorder Odontoceti

Family Physeteridae

Physeter macrocephalus was used almost exclusively for the sperm whale until Thomas (1911) stated that *P. catodon* had "line priority" over *P. macrocephalus* and should, therefore, be used instead. Subsequent authors (Allen 1939; Roberts 1951; Ellerman & Morrison-Scott 1951; Ellerman *et al.* 1953; Hershkovitz 1966) follow suit and use *Physeter catodon* for the sperm whale. However, Husson & Holthuis (1974) argued that such "priority" is not recognised by the International Code of Zoological Nomenclature, and that in terms of Article 24(a) of ICZN (1964) *macrocephalus* should be given priority. Subsequently, most authors (Rice 1977; Swanepoel *et al.* 1980; Honacki *et al.* 1982; Smithers 1983; Meester *et al.* 1986; Rice 1989) have used *macrocephalus*. Schevill (1986), however, argued that *P. macrocephalus* could not apply to the sperm whale because a phrase in Linnaeus' original description ("fistula in cervice" - which applies to the location of the blowhole in the neck area) did not fit the sperm whale. Holthuis (1987) rallied that Linnaeus probably copied his description of the location of the blowhole from a description based on a "faulty" representation of a true sperm whale. But Schevill (1987) refuted this, stating that only *catodon* (in which the position of the blowhole is given correctly) could have been a sperm whale. Mead & Brownell (1993) reinstated *P. catodon*, claiming line priority. Rice (1998), however, reasserted that *macrocephalus* takes precedence over *catodon* because of the Principle of the First Reviser.

The species name for the dwarf sperm whale was originally bestowed in combination with a masculine generic name, *Physeter*. The current generic name, *Kogia*, is not a Latin word, but has a Latin feminine ending. According to Rice (1998), in

such a case where the generic name is not Latin, Greek or modern Indo-European, and if no gender was attributed or implied, the name should be treated as masculine, except if the ending is clearly a natural Latin feminine or neuter one in which case the gender is then that appropriate to the ending. Consequently, as the species name must agree in gender, the species name becomes *sima*.

Family Delphinidae

The rough-toothed dolphin *Steno bredanensis* is now included in the list based on specimens from northern Namibia (found in a museum at Möwe Bay) and the Western Cape, South Africa (a live stranding at Hermanus).

The intrageneric relationships within *Sousa* are poorly understood, with as many as five species having been recognised (*chinensis*, *plumbea*, *teuszii*, *borneensis* and *lentiginosa*) (Pilleri & Gühr 1972), as opposed to as few as two species (Mitchell 1975; Rice 1977; Corbet & Hill 1991; Mead & Brownell 1993). *Sousa teuszii* is clearly distinguished from other forms. Zhou Kaiya *et al.* (1980) distinguished between *S. chinensis* (including *borneensis*) and *S. plumbea* based on differences in dorsal fin structure. They recognised three geographical groups, the Atlantic forms (*S. teuszii*), Indian forms (*S. plumbea*) and Pacific forms (*S. chinensis*). Swanepoel *et al.* (1980), Smithers (1983), Meester *et al.* (1986) and Skinner & Smithers (1990) all referred southern African species to *S. plumbea*. In contrast, both Corbet & Hill (1991) and Mead & Brownell (1993) recognised only two species, *chinensis* (including *borneensis*, *lentiginosa* and *plumbea*) and *teuszii*, although Ross *et al.* (1994) followed Zhou Kaiya *et al.* (1980) in recognising three distinct geographical groups.

The taxonomy of bottlenose dolphins remains abstruse. The smaller Indian Ocean coastal form, with a longer rostrum and more teeth, has been referred to as *Tursiops aduncus* (Van Bree 1966; Ross 1977, 1984), although Ross & Cockcroft (1990) noted some intergradation between *aduncus* and *truncatus* in Australian waters. A recent mtDNA study revealed that *aduncus* from South Africa, Timor Sea and the Taiwan Strait comprise a separate clade from *truncatus* (Curry & Smith 1998). A further genetic study, using both mitochondrial and nuclear markers, indicated a clear distinction between inshore and offshore populations of the *truncatus* form in the Northwest Atlantic (Hoelzel *et al.* 1998). While animals from both the inshore (Namibian) and offshore populations of the *truncatus* form from southern Africa grouped with the offshore population in the Northwest Atlantic, the *aduncus* form has haplotypes grouping with both the inshore and offshore populations in the Northwest Atlantic. In a review of phylogenetic relationships among delphinids using cytochrome *b* sequences, Le Duc *et al.* (1999) concluded that the genus *Tursiops* is polyphyletic, with *aduncus* more closely related to some *Stenella* and *Delphinus* spp. than to *truncatus*. However, the authors concluded that a taxonomic revision of the subfamily Delphininae is long overdue, and that until that revision occurs, it is best to take a conservative approach and retain generic names while recognising *T. aduncus* as a species. Therefore, both species are listed here for the time being.

A similar long-standing controversy over the number of species of *Delphinus* has reached some kind of resolution, with morphological (Heyning & Perrin 1994) and genetic (Rosel *et al.* 1994) studies indicating at least two species, a long-beaked coastal form (*D. capensis*) and a short-beaked offshore form (*D. delphis*). An even longer-beaked form (*D. tropicalis*) has

been described from the northern Indian Ocean (Van Bree & Gallagher 1978), although Rice (1998) speculated that some intergradation between *D. capensis* and *D. tropicalis* may occur along the coast of East Africa. Jefferson & Van Waerebeek (2002) suggested that the *tropicalis* form is a long-beaked subspecies of *D. capensis*, with an unknown distribution along the coast of East Africa. In South African waters a long-beaked form occurs inshore over the Agulhas Bank, which Jefferson & Van Waerebeek (2002) assign to *D. capensis capensis*, while recognising that occasionally different animals strand in the Western Cape that might be *D. delphis*. Consequently, although these two forms in South African waters do not conform exactly with Heyning & Perrin's (1994) descriptions, both *D. capensis capensis* and *D. delphis* have been included in the list, pending a thorough analysis of the situation.

Rice (1989) pointed out that, according to Article 31(b) of the Third (1985) edition of the International Code of Zoological Nomenclature, *Globicephala melaena* should be renamed *G. melas*. The Article specifically cites *melas* as an example of a Greek adjective that does not change its ending when transferred to a genus of another gender. His proposal sparked off a debate with William E. Schevill (Schevill 1990a, b; Rice 1990) on the interpretations of the Code and its various applicable Articles, and the bearing it would have on *melas* over *melaena*. Mead & Brownell (1993), in reviewing all the literature, and presumably also the Code, used *melas* as the species name.

Longman's beaked whale *Indopacetus pacificus* has been added to the checklist on the strength of two previously incorrectly identified specimens from Blythesdale Beach and Sodwana Bay, KwaZulu-Natal (Dalebout *et al.* in press).

Order Ruminantia

Suborder Pecora

Superfamily Bovoidea

Family Bovidae

Past taxonomic treatment of bovids contained many inconsistencies reflecting uncertainty over phylogenetic relationships, especially among subfamilies and tribes. This can be attributed largely to extensive morphological convergence among species and an incomplete fossil record for their rapid radiation during the Miocene and early Pliocene (Gentry 1992). Advances in systematics and molecular techniques over the past decade, however, have significantly advanced our understanding of bovid evolution. The monophyly of this family, which is unambiguously diagnosed by only a few morphological characters (Janis & Scott 1987), was not supported by earlier analyses of molecular data (Miyamoto & Goodman 1986; Irwin *et al.* 1991; Gatesy *et al.* 1992). Recent molecular studies of SINE retrotransposition (Nijman *et al.* 2002), mtDNA (Gatesy *et al.* 1997; Hassanin & Douzery 1999a; Matthee & Robinson 1999), and nuclear genes (Matthee & Davis 2001; Matthee *et al.* 2001), unequivocally demonstrate bovid monophyly and point to a sister-taxon relationship with the Cervidae (Matthee *et al.* 2001).

These studies also confirmed the existence of two main lineages within the family: a bovine clade, comprising cattle, buffalos, nilgai and spiral-horned antelopes; and a diverse clade containing the sheep, goats and non-bovine antelopes (Table 2). This basal dichotomy between bovine and non-bovine taxa is supported also by marked chromosomal differences (Buckland & Evans 1978; Gallagher & Womack 1992; Robinson *et al.* 1998), immunodiffusion distances

(Lowenstein 1986), SINE retrotransposition (Nijman *et al.* 2002) and morphological discontinuities (Kingdon 1982). We follow Hassanin & Douzery (1999a) in affording these lineages subfamilial rank (as the Bovinae and Antilopinae, respectively) and we rather use tribal divisions to accommodate phylogenetic divergence below the subfamily rank.

Grubb (2001) reviewed family-group names of living bovids, and noted that Adenotinae (and Eleotraginae), Connochaetini, Nesotragini, Strepsicerotini, Sylvicaprinae and Tetracerini are senior synonyms of Reduncinae, Alcelaphini, Neotragini, Tragelaphini, Cephalophinae, and Boselaphini, respectively. Neotragini and Reduncinae are protected names, and use of the other junior synonyms for tribal names is permissible until their validity is confirmed.

Subfamily Bovinae

Based on mtDNA analyses a sister taxon relationship of the Tragelaphini and extralimital Boselaphini has been suggested in the past (Allard *et al.* 1992; Gatesy *et al.* 1997). In contrast, supermatrix analyses of nuclear DNA genes point to a sister taxon relationship between Tragelaphini and Bovini with Boselaphini basal in the phylogeny (Matthee *et al.* 2001). The support for these associations is weak and combined analysis of mtDNA and nuclear DNA data indicated that the three Bovinae tribes (Bovini, Tragelaphini and Boselaphini) radiated from each other more or less concurrently (Hassanin & Douzery 1999b; Matthee & Davis 2001). The monophyly of the Bovini, Tragelaphini and Boselaphini is well supported (Schreiber *et al.* 1990; Hassanin & Douzery 1999a, b; Matthee & Davis 2001). Within the Bovini, a distinction (at the sub-tribe level) between cattle (*Bos* and *Bison*) and buffalo (*Bubalus* and *Syncerus*) may be warranted based on recent molecular and morphological studies (Groves 1981; Pitra *et al.* 1997; Hassanin & Douzery 1999b).

Inclusion of *Taurotragus* within the genus *Tragelaphus* has been motivated by some authors (Haltenorth 1963; Ansell 1978; Vrba 1987; Corbet & Hill 1991), but others have retained these as separate genera (Roberts 1951; Ellerman *et al.* 1953; Ansell 1972; Swanepoel *et al.* 1980; Meester *et al.* 1986; Grubb 1993b; Nowak 1999). Analyses of allozyme (Georgiadis *et al.* 1990) and mtDNA data (Essop *et al.* 1997a; Gatesy *et al.* 1997; Matthee & Robinson 1999) have unequivocally demonstrated that *Tragelaphus* is paraphyletic for *Taurotragus*, and reports of hybridisation between species in this clade (Boulineau 1933; Jorge *et al.* 1976; Van Gelder 1977a, b) further support its recognition as a single genus.

P. Grubb (pers. comm.) notes that, following Article 50.1.1 of the ICZN (1999), *Tragelaphus angasii* is attributable to Angas, 1949 who described this taxon, rather than Gray, 1949 who merely suggested the name.

Subfamily Antilopinae

Evolutionary relationships among the tribes belonging to the Antilopinae are partly resolved. The following tribes are clearly monophyletic: Alcelaphini, Hippotragini, Caprini (extralimital), Reduncini, and Cephalophini (Gatesy *et al.* 1997; Hassanin & Douzery 1999a; Matthee & Robinson 1999; Matthee & Davis 2001). Aepycerotini and the Oreotragini are represented by single representatives and appear to be survivors of the early Antilopinae radiation (Matthee & Robinson 1999; Matthee & Davis 2001). The Alcelaphini and Hippotragini are sister-taxa, and together with the Caprini (including Ovibovini and Rupicaprini: Hassanin & Douzery 1999a) form a strongly supported clade (Gatesy *et al.* 1997;

Table 2. A classification of the superorder Cetartiodactyla, based on phylogenies computed from molecular and/or morphological data.

ORDER	SUBORDER	INFRAORDER	SUPERFAMILY	FAMILY	SUBFAMILY	TRIBE			
Tylopoda				Camelidae		[Extralimital]			
Suiformes	Suina		Suoidea	Suidae	Suinae				
					Phacochoerinae				
				Tayassuidae	Tayassuinae	[Extralimital]			
Whippomorpha ¹	Ancodonta		Anthracotheroidea	Hippopotamidae					
	Cetacea	Mysticeti		Balaenidae					
				Balaenopteridae					
				Neobalaenidae					
				Eschrichtiidae		[Extralimital]			
		Odontoceti			Physeteridae				
					Kogiidae				
					Ziphiidae	Ziphiinae			
						Hyperoodontinae			
					Delphinidae				
					Monodontidae		[Extralimital]		
					Phocoenidae		[Extralimital]		
					Platanistidae		[Extralimital]		
					Ruminantia	Tragulina		Traguloidea	Tragulidae
Pecora						Antilocaproidea	Antilocapridae		[Extralimital]
		Giraffoidea	Giraffidae						
		Cervoidea	Cervidae			[Extralimital]			
			Moschidae			[Extralimital]			
		Bovoidea				Bovidae	Bovinae ²	Bovini	
								Tragelaphini	
								Boselaphini	
								[Extralimital]	
							Antilopinae ²	Alcelaphini ³	
								Hippotragini ³	
Caprini ³	[Extralimital]								
Cephalophini									
Reduncini ⁴									
Antilopini ⁵									
Neotragini ⁶									
Oreotragini ⁶									
Aepycerotini ⁶									

¹ Waddell *et al.* (1999:2). Artiodactyla is no longer permissible since this paraphyletic grouping concept excluded Cetacea. Their “Artiofabula” (Suiformes + Cetuminantia) cannot be accepted until the phylogenetic placement of Suiformes and Tylopoda as the most basal lineages has been clarified (see Matthee *et al.* 2001a). ² Hassanin & Douzery (1999a), Matthee & Robinson (1999) and Matthee & Davis (2001) have unequivocally demonstrated a basal split between bovine and non-bovine taxa; Antilopinae is the prior name for the non-bovine subfamily, despite the inclusion of some species colloquially known as “antelopes”. ³ These taxa form a well-defined clade that may be worthy of recognition at the supertribe or subfamily level (see Gatesy *et al.* 1997; Hassanin & Douzery 1999a; Matthee & Davis 2001; Matthee *et al.* 2001). ⁴ Includes Peleini. ⁵ Includes Raphicerotini and Madoquini. ⁶ Of uncertain status and affiliations (see Gatesy *et al.* 1997; Hassanin & Douzery 1999a; Rebholz & Harley 1999).

Hassanin & Douzery 1999b; Matthee & Davis 2001; Matthee *et al.* 2001) that may be worthy of supertribe or subfamily status.

Within the Alcelaphini, the hartebeest complex (*Alcelaphus buselaphus*) currently is represented by a number

of different forms mostly regard as separate subspecies. One of these, Lichtenstein's hartebeest, generally has been considered as a distinct species within the genus *Alcelaphus* (*A. lichtensteini*; see, for example, Gentry 1990) or even in a distinct genus *Sigmoceros* (e.g. Vrba 1979; Grubb 1993b).

While *lichtensteinii* is clearly morphologically distinct from the red hartebeest (*A. b. caama*) of southern Africa in many respects, molecular evidence (Arctander *et al.* 1999; Matthee & Robinson 1999) shows that it is closely allied to *caama* and should not be given separate generic status. Additional recent evidence (Flagstad *et al.* 2001) suggests that there are three main hartebeest clades arising from three geographic refugia on the African continent: a southern clade (comprising *caama* and *lichtensteinii*), and two clades extralimital to southern Africa, one western (*major*; *buselaphus*) and one eastern (*lelwel*, *cokei*, *swaynei*, *tora*). Hence, it would appear that *caama* is most closely related to *lichtensteinii* and not more closely allied to the East African forms as in current classifications. However, for the purposes of this checklist, we prefer to consider Lichtenstein's hartebeest as a separate species within the genus *Alcelaphus*.

Rookmaaker (1991) showed that the valid name for the blesbok/bontebok is *Damaliscus pygargus* rather than *D. dorcas*, and Bigalke (1948) restricted the type locality to the Swart River (Grubb 1993b). A full discussion of the matter is provided by Grubb (1999).

Haltenorth (1963) proposed that the puku *Kobus vardonii* could represent a southern form of the kob *Kobus kob*, while Ansell (1972) considered them as a superspecies, having earlier (1960) noted differences between the inguinal glands of kob and puku. Most authors have retained the puku as a distinct species (Meester *et al.* 1986; Grubb 1993b; Kingdon 1997). A recent study analysing the entire cytochrome *b* gene (Birungi 1999; Birungi & Arctander 2000) supports the idea that the puku might be a subspecies of the kob. However, we take a conservative view and provisionally retain the puku as a separate species.

The intratribal taxonomy of the monophyletic Cephalophini remains largely unresolved. Grubb (1993b) included *Philantomba* within *Cephalophus*, but we retain recognition of *Philantomba*, which can be distinguished from the other genera based on morphological (Pocock 1910), chromosomal (Hard 1969; Robinson *et al.* 1996) and mtDNA and fluorescence in situ hybridisation data (Jansen van Vuuren & Robinson 2001). *Sylvicapra* retains its autonomy (Swanepoel *et al.* 1980; Smithers 1983; Meester *et al.* 1986), supported by recent mtDNA data (Jansen van Vuuren & Robinson 2001).

Pocock (1910) regarded *Pelea capreolus* as belonging to the Reduncini. Since then, the status of the taxon has been a source of contention and the species has been placed with the Antilopini (Oboussier 1970), Caprini (Gentry 1978), Neotragini (Gentry 1992) or in its own tribe Peleani (Vrba 1976). Recent analyses of morphological (Vrba *et al.* 1994; and see Vrba & Schaller 2000), mtDNA (Gatesy *et al.* 1997; Matthee & Robinson 1999) and nuclear DNA data (Matthee & Davis 2001) all suggest that *Pelea* should be included as a primitive taxon within the Reduncini, as originally proposed by Pocock (1910).

Numerous studies have demonstrated that the two tribes (Antilopini and Neotragini) traditionally grouped in the subfamily Antilopinae are not monophyletic (Roberts 1951; Haltenorth 1963; Ansell 1972; Vrba 1985; Gentry 1992; Gatesy *et al.* 1997; Hassanin & Douzery 1999a; Matthee & Robinson 1999; Rebholz & Harley 1999; Matthee & Davis 2001). Most of the controversies were limited to the placement of *Neotragus* and *Oreotragus* (Gentry 1992; Matthee & Robinson 1999). Given the problematic phylogenetic placement at the base of the Antilopinae radiation, we allocate these two taxa to separate tribes, the Neotragini and

Oreotragini, respectively. There is fairly strong morphological (Simpson 1945; Gentry 1992) and molecular evidence (Matthee & Davis 2001) that the remainder of the taxa belonging to the traditional Antilopinae are monophyletic. We thus include the regional *Antidorcas*, *Madoqua*, *Ourebia* (which Vrba *et al.* 1994 included in the Reduncini on the basis of cranial characters and the morphology of scent glands, though see Vrba & Schaller 2000) and *Raphicerus* in the Antilopini (Hassanin & Douzery 1999a; Matthee & Robinson 1999; Matthee & Davis 2001).

Aepyceros has an uncertain phylogenetic placement and does not seem to fit in with any of the currently recognised tribes (Ansell 1972; Vrba 1979; Gentry 1992; Gatesy *et al.* 1997; see also Vrba & Schaller 2000). The taxon most likely originated in Africa early during the evolution of the Antilopinae and we thus follow previous reports and recognise *Aepyceros* as a distinct taxon in the tribe Aepycerotini. The latter is supported by both mtDNA and nuclear DNA data (Hassanin & Douzery 1999a; Matthee & Robinson 1999; Matthee & Davis 2001).

In concluding this section on southern African Bovidae, it is necessary to make reference to Cotterill (in press a, b), and in so doing highlight some of the implications of the liberal application of an evolutionary species concept. Among the various proposals put forward by Cotterill is the notion that *Damaliscus lunatus* and *Kobus leche* are not polytypic species. Based on a review of the biogeography and taxonomy of tsessebes, which like the hartebeest complex includes a number of forms, Cotterill proposes the recognition of two clades: *Damaliscus lunatus*, present in the subregion; and an unresolved *Damaliscus korrigum* complex present in East, north-east and West Africa, and including the topi, tiang and korrigum. In the case of *K. leche*, he recognizes four evolutionary species: *K. leche*, the species occurring in the subregion; *K. kafuensis*, from the Kafue flats in Zambia; *K. smithemani*, from the Bangweulu Basin; and the extinct *K. robertsi*. Fortunately, neither of these two assertions has any direct bearing on this checklist, because the names allocated to southern African taxa remain the same (although other assertions made do have relevance to southern African bovids). Nevertheless, we repeat our earlier caution that liberal application of the ESC or PSC without detailed geographic analyses of varied data suites is taxonomically unwise.

Cotterill's (in press a) proposal that the south-west African representative of *Madoqua kirkii* (*M. k. damarensis*) may represent a separate species does, however, seem justified, and has been posited by others. This taxon is isolated from *M. kirkii* in north-east Africa, from which it differs in lacking pedal glands and having padded hooves. Furthermore, karyotyping of the Damara dik-dik has revealed it to have a distinct cytotype within the *M. kirkii* complex ($2n=48$; Kumamoto *et al.* 1994). Indeed, based on this and other genetic studies (Ryder *et al.* 1989; Zhang & Ryder 1995), *M. kirkii* as traditionally defined would appear to embrace four genetically distinct species corresponding to four of the seven subspecies listed by Ansell (1972), of which one *M. damarensis* is found in the subregion.

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Order SIRENIA**Family DUGONGIDAE Gray, 1821**

Dugong dugon (P.L.S. Müller, 1776)	Dugong	-	-	-	X	X	-	-	VU
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SUPERCOHORT EUARCHONTAGLIRES**COHORT GLIRES****Order LAGOMORPHA****Family LEPORIDAE G. Fischer, 1817**

Lepus capensis Linnaeus, 1758	Cape hare	X	X	X	X	X	?	X	
Lepus saxatilis F. Cuvier, 1823	Scrub hare	X	X	X	X	X	X	X	
Pronolagus rupestris (A. Smith, 1834)	Smith's red rock rabbit					X		X	
Pronolagus saundersiae (Hewitt, 1927)	Hewitt's red rock rabbit					X			
Pronolagus crassicaudatus (I. Geoffroy, 1823)	Natal red rock rabbit				X	X	X		
Pronolagus randensis Jameson, 1907	Jameson's red rock rabbit	X	X	X	X	X			
Bunolagus monticularis (Thomas, 1903)	Riverine rabbit					X			EN

Order RODENTIA**Suborder HYSTRICOGNATHI****Family BATHYERGIDAE Waterhouse, 1841**

Bathyergus suillus (Schreber, 1782)	Cape dune mole-rat							X	
Bathyergus janetta Thomas & Schwann, 1904	Namaqua dune mole-rat	X						X	LR/nt
Cryptomys hottentotus (Lesson, 1826)	African mole-rat		X	X	X	X	X	X	
Cryptomys damarensis (Ogilby, 1838)	Damaraland mole-rat	X	X	X	X	X			
Cryptomys darlingi (Thomas, 1895)	Mashona mole-rat			X	X				
Georchus capensis (Pallas, 1778)	Cape mole-rat							X	

Family HYSTRICIDAE G. Fischer, 1817

Hystrix africaeaustralis Peters, 1852	Cape porcupine	X	X	X	X	X	X	X	
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Family THRYONOMYIDAE Pocock, 1922

Thryonomus swinderianus (Temminck, 1827)	Greater canerat	X	X	X	X	X	X		
Thryonomys gregorianus (Thomas, 1894)	Lesser canerat			X	X				

Family PETROMURIDAE Tullberg, 1899

Petromus typicus A. Smith, 1831	Dassie rat	X						X	
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Suborder SCIUROGNATHI**Family PEDETIDAE Gray, 1825**

Pedetes capensis (Forster, 1778)	Springhare	X	X	X	X	X			? VU
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Family SCIURIDAE Hemprich, 1820

Xerus inauris (Zimmermann, 1780)	South African ground squirrel	X	X			X			?
Xerus princeps (Thomas, 1929)	Damara ground squirrel	X				?			
Heliosciurus mutabilis (Peters, 1852)	Mutable sun squirrel			X	X				
Funisciurus congicus (Kuhl, 1820)	Striped tree squirrel	X							
Paraxerus palliatus (Peters, 1852)	Red bush squirrel			X	X	X			VU
Paraxerus cepapi (A. Smith, 1836)	Tree squirrel	X	X	X	X	X			

Family MYOXIDAE Gray 1821

Subfamily Graphiurinae Winge 1887									
Graphiurus ocularis (A. Smith, 1829)	Spectacled dormouse					X			VU
Graphiurus platyops Thomas, 1897	Rock dormouse	X	X	X	X	X	X		
Graphiurus murinus (Desmarest, 1822)	Woodland dormouse	X	X	X	X	X	X	X	
Graphiurus kelleni (Reuvenis, 1890)	Lesser savannah dormouse			X					

Family MURIDAE Illiger, 1815

Subfamily Deomyinae Lydekker, 1889

Acomys spinosissimus (Peters, 1852)	Spiny mouse		X	X	X	X		
Acomys subspinosus (Waterhouse, 1838)	Cape spiny mouse						X	

Subfamily Murinae Illiger, 1815

Pelomys fallax (Peters, 1852)	Creek grooved-toothed rat			X	X	X		
Lemniscomys rosalia (Thomas, 1904)	Single-striped grass mouse	X	X	X	X	X	X	
Rhabdomys pumilio (Sparrmann, 1784)	Four-striped grass mouse	X	X	X	X	X	X	DD
Zelotomys woosnami (Schwann, 1906)	Woosnam's desert mouse	X	X			X		
Dasymys incomtus (Sundevall, 1847)	African marsh rat			X		X	X	DD
Dasymys capensis Roberts, 1936	Cape marsh rat					X		
Dasymys sp. A	Shortridge's marsh rat	X	X					
Dasymys sp. B	Roberts' marsh rat			X		X		
Dasymys rufulus Miller, 1900	West African marsh rat					X		
Grammomys cometes (Thomas & Wroughton, 1908)	Moçambique thicket rat			X	X	X		
Grammomys dolichurus (Smuts, 1832)	Woodland thicket rat			X	X	X	X	
Grammomys macmillani (Wroughton, 1907)	Macmillan's thicket rat			X	?			
Mus setzeri Petter, 1978	Setzer's pygmy mouse	X	X					
Mus triton (Thomas, 1909)	Grey-bellied pygmy mouse					X		
Mus neavei (Thomas, 1910)	Neave's pygmy mouse			X	X	X		
Mus indutus (Thomas, 1910)	Desert pygmy mouse	X	X	X		X		
Mus minutoides A. Smith, 1834	Pygmy mouse			X	X	X	X	X
Mus orangiae (Roberts, 1926)	Free State pygmy mouse					X		
Uranomys ruddi Dollman, 1909	Rudd's mouse			X	X			
Mastomys natalensis (A. Smith, 1834)	Natal multimammate mouse	X		X		X	X	
Mastomys coucha (A. Smith, 1836)	Southern multimammate mouse	X		X		X	X	X
Mastomys shortridgei (St. Leger, 1933)	Shortridge's mouse	X	X					
Myomyscus verreauxi (A. Smith, 1834)	Verreaux's mouse					X		
Thallomys paedulcus (Sundevall, 1846)	Acacia rat	X	X	X	X	X	X	
Thallomys nigricauda (Thomas, 1882)	Black-tailed tree rat	X	X	?	?	X	?	
Aethomys namaquensis (A. Smith, 1834)	Namaqua rock mouse	X	X	X	X	X	X	X
Aethomys granti (Wroughton, 1908)	Grant's rock mouse					X		
Aethomys silindensis Roberts, 1938	Selinda rock rat			X	?			
Aethomys chrysophilus (De Winton, 1897)	Red veld rat	X	X	X	X	X	X	
Aethomys ineptus (Thomas & Wroughton, 1908)	Tete veld rat	X	X	X	X	X	X	X

Tribe Otomyini Thomas, 1897

Parotomys brantsii (A. Smith, 1834)	Brants' whistling rat	X	X			X		
Parotomys littledalei Thomas, 1918	Littledale's whistling rat	X				X		
Otomys laminatus Thomas & Schwann, 1905	Laminate vlei rat					X		
Otomys angoniensis Wroughton, 1906	Angoni vlei rat	X	X	X	X	X	X	
Otomys saundersiae Roberts, 1929	Saunders' vlei rat					X		LR/nt
Otomys irroratus (Brants, 1827)	Vlei rat			X	X	X	X	X
Otomys sloggetti Thomas, 1902	Sloggett's vlei rat					X		X LR/nt
Otomys unisulcatus F. Cuvier, 1829	Bush vlei rat					X		

Subfamily Gerbillinae Gray, 1825

Desmodillus auricularis (A. Smith, 1834)	Cape short-tailed gerbil	X	X			X		
Gerbillurus paebea (A. Smith, 1836)	Hairy-footed gerbil	X	X	X	X	X		
Gerbillurus tytonis (Bauer & Niethammer, 1960)	Dune hairy-footed gerbil	X						
Gerbillurus vallinus (Thomas, 1918)	Brush-tailed hairy-footed gerbil	X				X		
Gerbillurus setzeri (Schlitter, 1973)	Setzer's hairy-footed gerbil	X						
Tatera leucogaster (Peters, 1852)	Bushveld gerbil	X	X	X	X	X	X	
Tatera afra (Gray, 1830)	Cape gerbil					X		
Tatera brantsii (A. Smith, 1836)	Highveld gerbil	X	X	X		X		X
Tatera inclusa Thomas & Wroughton, 1908	Gorongosa gerbil			X	X			

Subfamily Mystromyinae Vorontsov, 1966

Mystromys albicaudatus (A. Smith, 1834)	White-tailed mouse							X			X	VU
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Subfamily Cricetomyinae Roberts, 1951

Cricetomys gambianus Waterhouse, 1840	Gambian giant rat							X	X	X		
Saccostomus campestris Peters, 1846	Pouched mouse	X	X	X	X	X	X	X	X	X	X	

Subfamily Dendromurinae Alston, 1876

Malacothrix typica (A. Smith, 1834)	Gerbil mouse	X	X					X				
Dendromus nyikae Wroughton, 1909	Nyika climbing mouse					X		X				
Dendromus melanotis A. Smith, 1834	Grey climbing mouse	X	X	X	X	X	X	X	X	X	X	
Dendromus mesomelas (Brants, 1827)	Brants' climbing mouse	X	X			X	X	X	X			
Dendromus mystacalis Heuglin, 1863	Chestnut climbing mouse			X	X	X	X	X	X			
Steatomys pratensis Peters, 1846	Fat mouse	X	X	X	X	X	X	X	X			
Steatomys parvus Rhoads, 1896	Tiny fat mouse	X	X	X	X							
Steatomys krebsii Peters, 1852	Krebs's fat mouse	X	X					X			X	

Subfamily Petromyscinae Roberts, 1951

Petromyscus monticularis (Thomas & Hinton, 1925)	Brukkaros pygmy rock mouse	X						X				LR/nt
Petromyscus collinus (Thomas & Hinton, 1925)	Pygmy rock mouse	X						X				
Petromyscus barbouri Shortridge & Carter, 1938	Barbour's rock mouse							X				EN
Petromyscus shortridgei Thomas, 1926	Shortridge's rock mouse	X										

COHORT EUARCHONTA**Superorder PRIMATOMORPHA****Order PRIMATES****Suborder STREPSIRHINI****Infraorder LORIFORMES****Family GALAGIDAE Gray, 1825**

Otolemur crassicaudatus (E. Geoffroy, 1812)	Greater galago			X	X	X	X	X	X			
Galago moholi A. Smith, 1836	South African galago	X	X	X	X	X	X					
Galagoides granti Thomas & Wroughton, 1907	Grant's galago				X	X						DD

Suborder HAPLORHINI**Infraorder SIMIIFORMES****Superfamily CERCOPITHECOIDEA****Family CERCOPITHECIDAE Gray, 1821****Subfamily Cercopithecinae Gray, 1821**

Papio hamadryas (Linnaeus, 1758)	Chacma baboon	X	X	X	X	X	X	X	X	X	X	
Cercopithecus pygerythrus (F. Cuvier, 1821)	Vervet monkey	X	X	X	X	X	X	X	X			
Cercopithecus albogularis (Sykes, 1831)	Sykes' monkey				X	X	X	X				

SUPERCOHORT LAURASIATHERIA**Order EULIPOTYPHILA****Suborder SORICOMORPHA****Family SORICIDAE G. Fischer, 1817****Subfamily Myosoricinae Kretzoi, 1965**

Myosorex longicaudatus Meester & Dippenaar, 1978	Long-tailed forest shrew							X				VU
Myosorex cafer (Sundevall, 1846)	Dark-footed forest shrew			X	X	X	X	X	X			
Myosorex sclateri Thomas & Schwann, 1905	Sclater's forest shrew							X	?			VU
Myosorex varius (Smuts, 1832)	Forest shrew							X	X	X		

Family VESPERTILIONIDAE Gray, 1821**Subfamily Miniopterinae Dobson, 1875**

Miniopterus inflatus Thomas, 1903	Greater long-fingered bat			X	X					
Miniopterus fraterculus Thomas & Schwann, 1906	Lesser long-fingered bat			X	X	X	X			LR/nt
Miniopterus schreibersii (Kuhl, 1817)	Schreibers' long-fingered bat	X	X	X	X	X	X	X	X	LR/nt

Subfamily Vespertilioninae Gray, 1821

Hypsugo anchietae (Seabra, 1900)	Anchieta's pipistrelle			X	?	X				VU
Pipistrellus kuhlii (Kuhl, 1817)	Kuhl's pipistrelle			X	X	X	X	X		
Pipistrellus rusticus (Tomes, 1861)	Rusty pipistrelle	X	X	X		X				
Pipistrellus rueppelli (Fischer, 1829)	Rüppell's pipistrelle			X	X	?	X			
Neoromicia capensis (A. Smith, 1829)	Cape serotine bat	X	X	X	X	X	X	X	X	
Neoromicia sp.	Kruger serotine bat				?	X				
Neoromicia nanus (Peters, 1852)	Banana bat	X	X	X	X	X	X	X		
Neoromicia rendalli (Thomas, 1889)	Rendall's serotine bat			X	X	X	X			
Neoromicia zuluensis Roberts, 1924	Aloe serotine bat	X	X	X		X				LR/nt
Cistugo seabrai Thomas, 1912	Angolan hairy bat	X					X			VU
Cistugo lesueuri (Roberts, 1919)	Lesueur's hairy bat						X		X	VU
Myotis welwitschii (Gray, 1866)	Welwitsch's hairy bat			X	X	X				
Myotis tricolor (Temminck, 1832)	Temminck's hairy bat			X	X	X			X	
Myotis bocagei (Peters, 1870)	Rufous mouse-eared bat			X	X	X				
Chalinolobus variegata Tomes, 1861	Butterfly bat	X	X	X	X	X				
Laephotis namibensis Setzer, 1971	Namib long-eared bat	X								EN
Laephotis botswanae Setzer, 1971	Botswana long-eared bat	X	X	X		X				LR/nt
Laephotis wintoni Setzer, 1971	De Winton's long-eared bat						X		X	
Eptesicus hottentotus (A. Smith, 1833)	Long-tailed serotine bat	X		X	X	X			X	
Scotophilus nigrita (Schreber, 1774)	Schreber's yellow bat			X	X	X				LR/nt
Scotophilus dinganii (A. Smith, 1833)	African yellow bat	X	X	X	X	X	X	X		
Scotophilus viridis (Peters, 1852)	Greenish yellow bat	X	X	X	X	X				
Scotophilus leucogaster (Cretzschmar, 1826)	White-bellied yellow bat	X								
Nycticeinops schlieffenii (Peters, 1859)	Schlieffen's bat	X	X	X	X	X	X	X		
Scotoecus albobfuscus (Thomas, 1890)	Light-winged lesser house bat					X	X			LR/nt

Subfamily Kerivoulinae Miller, 1907

Kerivoula argentata Tomes, 1861	Damara woolly bat	X		X	X	X				
Kerivoula lanosa (A. Smith, 1847)	Lesser woolly bat		X	X	X	X				

Family NYCTERIDAE Van der Hoeven, 1855

Nycteris hispida (Schreber, 1774)	Hairy slit-faced bat	?		X	X	X				
Nycteris grandis Peters, 1865	Large slit-faced bat			X	X					
Nycteris woodi K. Andersen, 1914	Wood's slit-faced bat			X		X				LR/nt
Nycteris macrotis Dobson, 1876	Large-eared slit-faced bat		X	X	X					
Nycteris thebaica E. Geoffroy, 1813	Egyptian slit-faced bat	X	X	X	X	X	X	X		
Nycteris vinsoni Dalquest, 1965	Vinson's slit-faced bat					X				

Family RHINOLOPHIDAE Gray, 1825

Rhinolophus hildebrandtii Peters, 1878	Hildebrandt's horseshoe bat			X	X	X	X			
Rhinolophus fumigatus Rüppell, 1842	Rüppell's horseshoe bat	X		X	X	X				
Rhinolophus clivosus Cretzschmar, 1828	Geoffroy's horseshoe bat	X		X	X	X	X	X	X	
Rhinolophus darlingi K. Anderson, 1905	Darling's horseshoe bat	X	X	X	X	X	X	X		
Rhinolophus landeri Martin, 1838	Lander's horseshoe bat			X	X	X				
Rhinolophus blasii Peters, 1867	Blasius's horseshoe bat			X	X	X				LR/nt
Rhinolophus capensis Lichtenstein, 1823	Cape horseshoe bat					X				VU
Rhinolophus simulator K. Anderson, 1904	Bushveld horseshoe bat		X	X	X	X	X	X		
Rhinolophus denti Thomas, 1904	Dent's horseshoe bat	X	X			X				
Rhinolophus swinnyi Gough, 1908	Swinny's horseshoe bat			X	X	X				

Family Hipposideridae Lydekker, 1891

Hipposideros commersoni (E. Geoffroy, 1813)	Commerson's roundleaf bat	X	X	X	X	X		
Hipposideros caffer (Sundevall, 1846)	Sundevall's roundleaf bat	X	X	X	X	X	X	
Cloeotis percivali Thomas, 1901	Short-eared trident bat		X	X		X	X	LR/nt
Triaenops persicus Dobson, 1871	Persian trident bat			X	X			

COHORT FERUNGULATA**Superorder FERA****Order PHOLIDOTA****Family MANIDAE Gray, 1821**

Manis temminckii Smuts, 1832	Ground pangolin	X	X	X	X	X	X	LR/nt
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Order CARNIVORA**Suborder FELIFORMIA****Family HYAENIDAE Gray, 1821****Subfamily Protelinae I. Geoffroy St-Hilaire, 1851**

Proteles cristatus (Sparman, 1783)	Aardwolf	X	X	X	X	X	X	?
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Subfamily Hyaeninae Gray, 1821

Parahyaena brunnea (Thunberg, 1820)	Brown hyaena	X	X	X	X	X	?	?	LR/nt
Crocuta crocuta (Erxleben, 1777)	Spotted hyaena	X	X	X	X	X	X		LR/cd

Family FELIDAE G. Fischer, 1817**Subfamily Felinae G. Fischer, 1817**

Acinonyx jubatus (Schreber, 1775)	Cheetah	X	X	X	X	X	X		VU
Panthera pardus (Linnaeus, 1758)	Leopard	X	X	X	X	X	X	X	
Panthera leo (Linnaeus, 1758)	Lion	X	X	X	X	X	X		VU
Caracal caracal (Schreber, 1776)	Caracal	X	X	X	X	X	X	X	
Felis silvestris Forster, 1780	African wild cat	X	X	X	X	X	X	X	
Felis nigripes Burchell, 1824	Black-footed cat	X	X			X		?	VU
Leptailurus serval (Schreber, 1776)	Serval	X	X	X	X	X	X	?	

Family VIVERRIDAE Gray, 1821**Subfamily Viverrinae Gray, 1821**

Civettictis civetta (Schreber, 1776)	African civet	X	X	X	X	X	X		
Genetta genetta Linnaeus, 1758	Small-spotted genet	X	X	X	X	X		X	
Genetta tigrina (Schreber, 1776)	South African large-spotted genet					X			
Genetta maculata (Gray, 1830)	Common large-spotted genet	X	X	X	X	X	X	X	

Family NANDINIIDAE Pocock, 1929

Nandinia binotata (Gray, 1830)	African palm civet			X	X				
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Family HERPESTIDAE Bonaparte, 1845**Subfamily Herpestinae Bonaparte, 1845**

Suricata suricatta (Schreber, 1776)	Meerkat (also Suricate)	X	X			X			?
Paracynictis selousi (De Winton, 1896)	Selous' mongoose	X	X	X	X	X			
Bdeogale crassicauda Peters, 1852	Bushy-tailed mongoose			X	X				
Cynictis penicillata (G. Cuvier, 1829)	Yellow mongoose	X	X			X		X	
Herpestes ichneumon (Linnaeus, 1758)	Large grey mongoose	X	X	X	X	X	X		?
Galerella sanguinea (Rüppell, 1836)	Slender mongoose	X	X	X	X	X	X		
Galerella flavescens (Bocage, 1889)	Kaokoland slender mongoose	X							
Galerella pulverulenta (Wagner, 1839)	Cape grey mongoose	X				X		X	
Rhynchogale melleri (Gray, 1865)	Meller's mongoose			X	X	X	X		
Ichneumia albicauda (G. Cuvier, 1829)	White-tailed mongoose	X	X	X	X	X	X		?
Atilax paludinosus (G. Cuvier, 1829)	Marsh mongoose	X	X	X	X	X	X	X	
Mungos mungo (Gmelin, 1788)	Banded mongoose	X	X	X	X	X	X		
Helogale parvula (Sundevall, 1847)	Dwarf mongoose	X	X	X	X	X	X		

Suborder CANIFORMIA**Family CANIDAE G. Fischer, 1817**

Otocyon megalotis (Desmarest, 1822)	Bat-eared fox	X	X	X	X	X		
Lycaon pictus (Temminck, 1820)	African wild dog		X	X	X	X	X	EN
Vulpes chama (A. Smith, 1833)	Cape fox	X	X			X	X	?
Canis adustus Sundevall, 1847	Side-striped jackal	X	X	X	X	X	X	
Canis mesomelas Schreber, 1775	Black-backed jackal	X	X	X	X	X	X	X

Family MUSTELIDAE G. Fischer, 1817**Subfamily Lutrinae Bonaparte, 1817**

Aonyx capensis (Schinz, 1821)	African clawless otter	X	X	X	X	X	X	X
Lutra maculicollis Lichtenstein, 1835	Spotted-necked otter	X	X		X	X		VU

Subfamily Mellivorinae Gray, 1865

Mellivora capensis (Schreber, 1776)	Honey badger (also Ratel)	X	X	X	X	X	X	
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Subfamily Mustelinae G. Fischer, 1817

Poecilogale albinucha (Gray, 1864)	African striped weasel	X	X	X	X	X	X	X
Ictonyx striatus (Perry, 1810)	Striped polecat	X	X	X	X	X	X	X

Family OTARIIDAE Gray, 1825

Arctocephalus pusillus (Schreber, 1775)	South African fur seal	X				X		
Arctocephalus gazella (Peters, 1875)	Antarctic fur seal						1	
Arctocephalus tropicalis (Gray, 1872)	Subantarctic fur seal						1,2	

Family PHOCIDAE Gray 1821

Mirounga leonina (Linnaeus, 1758)	Southern elephant seal	X				X,1		
Lobodon carcinophagus (Hombron & Jacquinot, 1842)	Crabeater seal					X		
Hydrurga leptonyx (Blainville, 1820)	Leopard seal						1,2	
Leptonychotes weddellii (Lesson, 1826)	Weddell seal						1	

Superorder PARAXONIA**Order PERISSODACTYLA****Family RHINOCEROTIDAE Gray, 1821**

Ceratotherium simum (Burchell, 1817)	White rhinoceros	X	X	X	?	X	X	LR/cd
Diceros bicornis (Linnaeus, 1758)	Black rhinoceros	X	X	X	X	X	X	CR

Family EQUIDAE Gray, 1821

Equus zebra (Linnaeus, 1758)	Mountain zebra	X				X		EN
Equus quagga (Gray, 1824)	Plains zebra	X	X	X	X	X	X	

Superorder CETARTIODACTYLA**Order SUIFORMES****Suborder SUINA****Superfamily SUIODEA****Family SUIDAE Gray, 1821****Subfamily Suinae Gray, 1821**

Potamochoerus larvatus (F. Cuvier, 1822)	Bushpig			X	X	X	X	X
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Subfamily Phacochoerinae Gray, 1868

Phacochoerus africanus (Gmelin, 1788)	Common warthog	X	X	X	X	X	X	
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Order WHIPPOMORPHA**Suborder ANCODONTA****Superfamily ANTHRACOTHEROIDEA****Family HIPPOPOTAMIDAE Gray, 1821**

Hippopotamus amphibius Linnaeus, 1758	Hippopotamus	X	X	X	X	X	X	
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Suborder CETACEA**Infraorder ODONTOCETI****Family PHYSETERIDAE Gray, 1821**

Physeter catodon Linnaeus, 1758	Sperm whale	X	X	X	VU
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Family KOGIIDAE Gill, 1871

Kogia breviceps (Blainville, 1838)	Pygmy sperm whale	X		X	
Kogia sima (Owen, 1866)	Dwarf sperm whale			X	

Family ZIPHIIDAE Gray, 1865**Subfamily Ziphiinae Gray, 1850**

Berardius arnuxii Duvernoy, 1851	Arnoux's beaked whale			X	LR/cd
Ziphius cavirostris G. Cuvier, 1823	Cuvier's beaked whale	X		X	DD

Subfamily Hyperoodontinae Gray, 1846

Indopacetus pacificus (Longman, 1926)	Longman's beaked whale			X	DD
Hyperoodon planifrons Flower, 1882	Southern bottlenose whale	X		X	LR/cd
Mesoplodon hectori (Gray, 1871)	Hector's beaked whale			X	DD
Mesoplodon mirus True, 1913	True's beaked whale			X	DD
Mesoplodon grayi Von Haast, 1876	Gray's beaked whale	X		X	DD
Mesoplodon layardii (Gray, 1865)	Strap-toothed beaked whale	X		X	DD
Mesoplodon densirostris (Blainville, 1817)	Blainville's beaked whale			X	DD

Family DELPHINIDAE Gray, 1821

Grampus griseus (G. Cuvier, 1812)	Risso's dolphin	X		X	DD
Globicephala macrorhynchus Gray, 1846	Short-finned pilot whale			X	LR/cd
Globicephala melas (Traill, 1809)	Long-finned pilot whale	X		X	
Orcinus orca (Linnaeus, 1758)	Killer whale	X		X	LR/cd
Feresa attenuata Gray, 1875	Pygmy killer whale	X		X	DD
Pseudorca crassidens (Owen, 1846)	False killer whale	X	X	X	
Steno bredanensis (Lesson, 1828)	Rough-toothed dolphin	X		X	DD
Delphinus capensis Gray, 1828	Long-beaked common dolphin			X	
Delphinus delphis Linnaeus, 1758	Short-beaked common dolphin			X	
Stenella longirostris (Gray, 1828)	Spinner dolphin		X	X	LR/cd
Stenella coeruleoalba (Meyen, 1833)	Striped dolphin		X	X	LR/cd
Stenella attenuata (Gray, 1846)	Pantropical spotted dolphin		X	X	LR/cd
Sousa chinensis (Osbeck, 1765)	Humpback dolphin		X	X	DD
Tursiops truncatus (Montagu, 1821)	Bottlenosed dolphin	X		X	DD
Tursiops aduncus (Ehrenberg, 1833)	Indian Ocean bottlenose dolphin		X	X	
Lissodelphis peronii (Lacépède, 1804)	Southern right whale dolphin	X			DD
Lagenodelphis hosei Fraser, 1956	Fraser's dolphin			X	DD
Peponocephala electra (Gray, 1846)	Melon-headed whale			X	
Lagenorhynchus obscurus (Gray, 1828)	Dusky dolphin	X		X	DD
Cephalorhynchus heavisidii (Gray, 1828)	Heaviside's dolphin	X		X	DD

Infraorder MYSTICETI**Family BALAENIDAE Gray, 1821**

Eubalaena australis (Desmoulins, 1822)	Southern right whale	X	X	X	LR/cd
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Family NEOBALAENIDAE Gray, 1873

Caperea marginata (Gray, 1846)	Pygmy right whale	X		X	
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Family BALAENOPTERIDAE Gray, 1864

Megaptera novaeangliae (Borowski, 1781)	Humpback whale	X			X	X			VU
Balaenoptera bonaerensis Burmeister, 1867	Antarctic minke whale	X			X	X			
Balaenoptera acutorostrata ssp.	Dwarf minke whale				X	X			LR/nt
Balaenoptera borealis Lesson, 1828	Sei whale	X			X	X			EN
Balaenoptera edeni Anderson, 1878	Bryde's whale	X			X	X			DD
Balaenoptera musculus (Linnaeus, 1758)	Blue whale	X			X	X			EN
Balaenoptera physalus (Linnaeus, 1758)	Fin whale	X			X	X			EN

Order RUMINANTIA

Suborder PECORA

Superfamily GIRAFFOIDEA

Family GIRAFFIDAE Gray, 1821

Giraffa camelopardalis (Linnaeus, 1758)	Giraffe	X	X	X	X	X	X		LR/cd
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Superfamily BOVOIDEA

Family BOVIDAE Gray, 1821

Subfamily Bovinae Gray, 1821

Tribe Bovini Gray, 1821

Syncerus caffer (Sparrman, 1779)	African buffalo	X	X	X	X	X	X		LR/cd
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Tribe Tragelaphini Blyth, 1863

Tragelaphus strepsiceros (Pallas, 1766)	Greater kudu	X	X	X	X	X	X		LR/cd
Tragelaphus angasii Gray, 1849	Nyala	*	*	X	X	X	X		LR/cd
Tragelaphus scriptus (Pallas, 1766)	Bushbuck	X	X	X	X	X	X		E?
Tragelaphus spekii Speke, 1863	Sitatunga	X	X	X	X				LR/nt
Tragelaphus oryx (Pallas, 1766)	Eland	X	X	X	X	X	X	X	LR/cd

Subfamily Antilopinae Gray, 1821

Tribe Alcelaphini Brooke in Wallace, 1876

Connochaetes gnou (Zimmerman, 1780)	Black wildebeest	X				X	*	X	LR/cd
Connochaetes taurinus (Burchell, 1823)	Blue wildebeest	X	X	X	X	X	X		LR/cd
Alcelaphus lichtensteinii (Peters, 1849)	Lichtenstein's hartebeest			X	X	X	E		LR/cd
Alcelaphus buselaphus (Pallas, 1766)	Red hartebeest	X	X	X	*	X	*	E	LR/cd
Damaliscus pygargus (Pallas, 1767)	Bontebok/blesbok	*	*	*		X	X		LR/cd
Damaliscus lunatus (Burchell, 1823)	Tsessebe	X	X	X	?E	X	X	X	LR/cd

Tribe Hippotragini Sundevall in Retzius & Loven, 1845

Hippotragus equinus (Desmarest, 1804)	Roan	X	X	X	X	X	X		LR/cd
Hippotragus niger (Harris, 1838)	Sable		X	X	X	X	*		LR/cd
Oryx gazella (Linnaeus, 1758)	Gemsbok	X	X	X		X			LR/cd

Tribe Cephalophini Blyth, 1863

Philantomba monticola (Thunberg, 1789)	Blue duiker			X	X	X			
Cephalophus natalensis A. Smith, 1834	Red duiker				X	X	X		LR/cd
Sylvicapra grimmia (Linnaeus, 1758)	Common duiker	X	X	X	X	X	X	X	

Tribe Reduncini Knottnerus-Meyer, 1907

Redunca arundinum (Boddaert, 1785)	Southern reedbuck	X	X	X	X	X	X	X	LR/cd
Redunca fulvorufula (Afzelius, 1815)	Mountain reedbuck		X		X	X	X	X	LR/cd
Kobus ellipsiprymnus (Ogilby, 1833)	Waterbuck	X	X	X	X	X	X		LR/cd
Kobus leche Gray, 1850	Lechwe	X	X						LR/cd
Kobus vardonii (Livingstone, 1857)	Puku	X	X	X					LR/cd
Pelea capreolus (Forster, 1790)	Grey rhebok		E			X	X	X	LR/cd

Tribe Antilopini Gray, 1821

Antidorcas marsupialis (Zimmermann, 1780)	Springbok	X	X			X				LR/cd
Madoqua kirkii (Günther, 1880)	Kirk's dik-dik	X								
Ourebia ourebi (Zimmermann, 1783)	Oribi	?	X	X	X	X	X	X	X	LR/cd
Raphicerus campestris (Thunberg, 1811)	Steenbok	X	X	X	X	X	X			
Raphicerus melanotis (Thunberg, 1811)	Cape Grysbok					X				LR/cd
Raphicerus sharpei Thomas, 1897	Sharpe's grysbok		X	X	X	X	X			LR/cd

Tribe Aepycerotini Gray, 1872

Aepyceros melampus (Lichtenstein, 1812)	Impala	X	X	X	X	X	X			LR/cd
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Tribe Oreotragini Haltenorth 1963

Oreotragus oreotragus (Zimmermann, 1783)	Klipspringer	X	X	X	X	X	X	?		LR/cd
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Tribe Neotragini Sclater & Thomas 1894

Neotragus moschatus (Von Dueben, 1846)	Suni			X	X	X	?			LR/cd
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