

Supporting Information

Table S1. The 19 bioclimatic variables used in the species distribution modelling, available from www.world-clim.org (Hijmans *et al.* 2005).

| BIOCLIM variable | Description |
|------------------|--|
| BIO1 | Annual mean temperature |
| BIO2 | Mean diurnal range of temperatures (Mean of monthly (max temp - min temp)) |
| BIO3 | Isothermality ((BIO2/BIO7)*100) |
| BIO4 | Temperature seasonality (standard deviation*100) |
| BIO5 | Maximum temperature of warmest month |
| BIO6 | Minimum temperature of coldest month |
| BIO7 | Temperature annual range (BIO5 - BIO6) |
| BIO8 | Mean temperature of wettest quarter |
| BIO9 | Mean temperature of driest quarter |
| BIO10 | Mean temperature of warmest quarter |
| BIO11 | Mean temperature of coldest quarter |
| BIO12 | Annual precipitation |
| BIO13 | Precipitation of wettest month |
| BIO14 | Precipitation of driest month |
| BIO15 | Precipitation seasonality (coefficient of variation) |
| BIO16 | Precipitation of wettest quarter |
| BIO17 | Precipitation of driest quarter |
| BIO18 | Precipitation of warmest quarter |

BIO19

Precipitation of coldest quarter

Table S2. Results of Kruskal-Wallis tests between the three groups (bats, rodents, shrews) in three aspects (taxonomic, functional, phylogenetic) and three components (β_{sor} , β_{sim} , β_{nes}) of beta diversity. All pair-wise comparisons between groups were significant at $p < 0.001$ (Nemenyi test).

| | β_{sor} | β_{sim} | β_{nes} |
|---------------------|---------------|---------------|---------------|
| Taxonomic | 2894.9* | 2992.0* | 3435.7* |
| Functional | 246.5* | 1928.2* | 1178.0* |
| Phylogenetic | 5178.6* | 4340.8* | 168.0* |

* $p < 0.001$

Table S3. Traits used to calculate functional beta diversity of bats, rodents, and shrews in sub-Saharan Africa.

| Traits | Trait type | Values | Bats | Rodents | Shrews |
|--|------------|-------------------|------|---------|--------|
| Mass | Morphology | Mean (g) | Yes | Yes | Yes |
| Forearm length | Morphology | Mean (mm) | Yes | | |
| Head-body length | Morphology | Mean (mm) | Yes | Yes | Yes |
| Tail length | Morphology | Mean (mm) | Yes | Yes | Yes |
| Hindfoot length | Morphology | Mean (mm) | Yes | Yes | Yes |
| Ear length | Morphology | Mean (mm) | Yes | Yes | Yes |
| Greatest skull length | Morphology | Mean (mm) | Yes | Yes | Yes |
| Zygomatic breadth | Morphology | Mean (mm) | Yes | Yes | Yes |
| Canine-3 rd molar length | Morphology | Mean (mm) | Yes | | |
| 1 st molar-3 rd molar length | Morphology | Mean (mm) | | Yes | |
| Incisor-3 rd molar length | Morphology | Mean (mm) | | | Yes |
| Open-air | Locomotory | Categorical: 0, 1 | Yes | | |
| Clutter | Locomotory | Categorical: 0, 1 | Yes | | |
| Edge | Locomotory | Categorical: 0, 1 | Yes | | |
| Fruit bat | Locomotory | Categorical: 0, 1 | Yes | | |
| Terrestrial | Locomotory | Categorical: 0, 1 | | Yes | Yes |
| Arboreal | Locomotory | Categorical: 0, 1 | | Yes | Yes |
| Semi-aquatic | Locomotory | Categorical: 0, 1 | | Yes | Yes |
| Rupicolous | Locomotory | Categorical: 0, 1 | | Yes | Yes |

Figure S1. Boxplots of pairwise taxonomic beta diversity showing total (β_{sor}), turnover (β_{sim}), and nestedness (β_{nes}) for communities of bats, rodents, and shrews within each of six bioregions of sub-Saharan Africa.

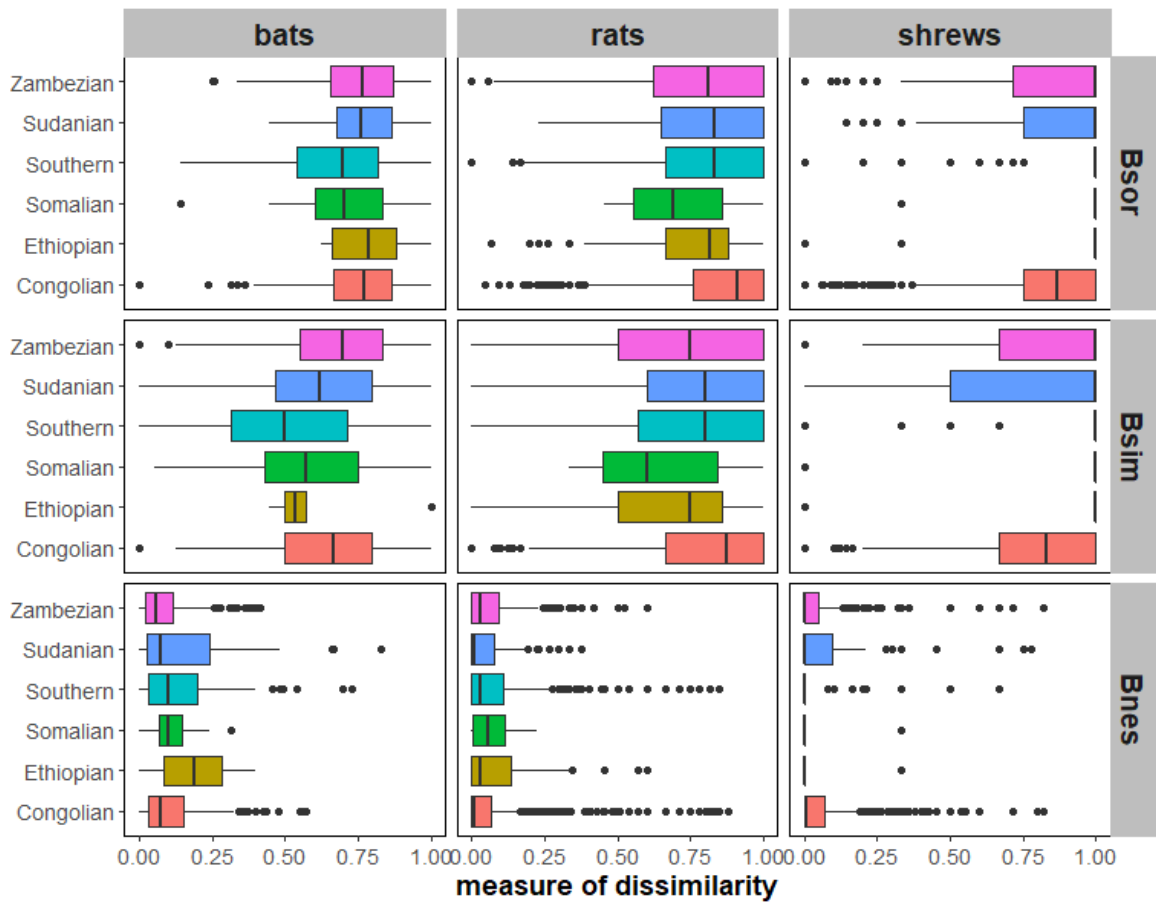


Figure S2. Boxplots of pairwise functional beta diversity showing total (β_{sor}), turnover (β_{sim}), and nestedness (β_{nes}) for communities of bats, rodents, and shrews within each of six bioregions of sub-Saharan Africa. Note that sites had to have at least three species of shrews to be able to generate an output in the package 'betapart' since two morphological traits (two PCA axes) were being used (see Methods for more details). Hence only a single site in the Ethiopian region and none in the Somalian region met this requirement, and hence are not included here.

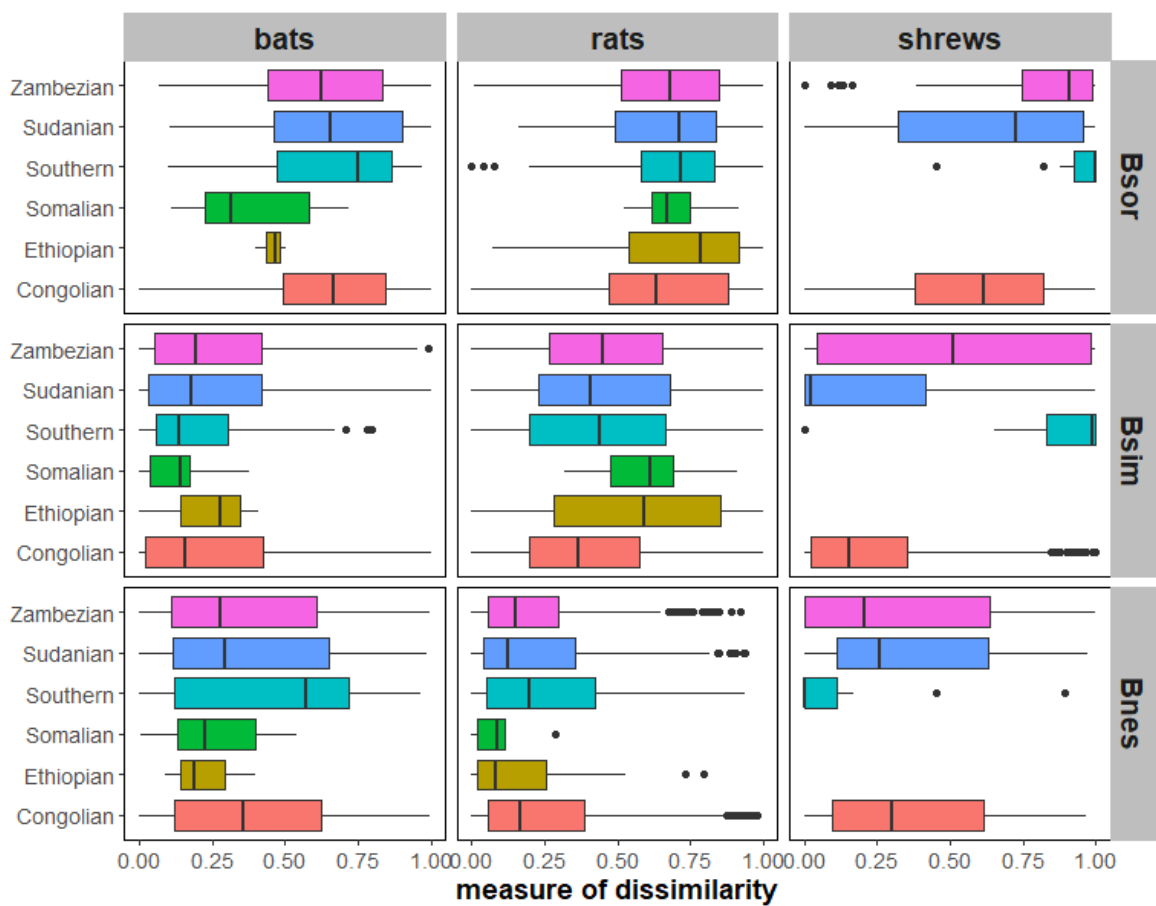


Figure S3. Boxplots of pairwise phylogenetic beta diversity showing: (A) total (β_{sor}); (B) turnover (β_{sim}); and (C) nestedness (β_{nes}) for communities of bats, rodents, and shrews within each of six bioregions of sub-Saharan Africa.

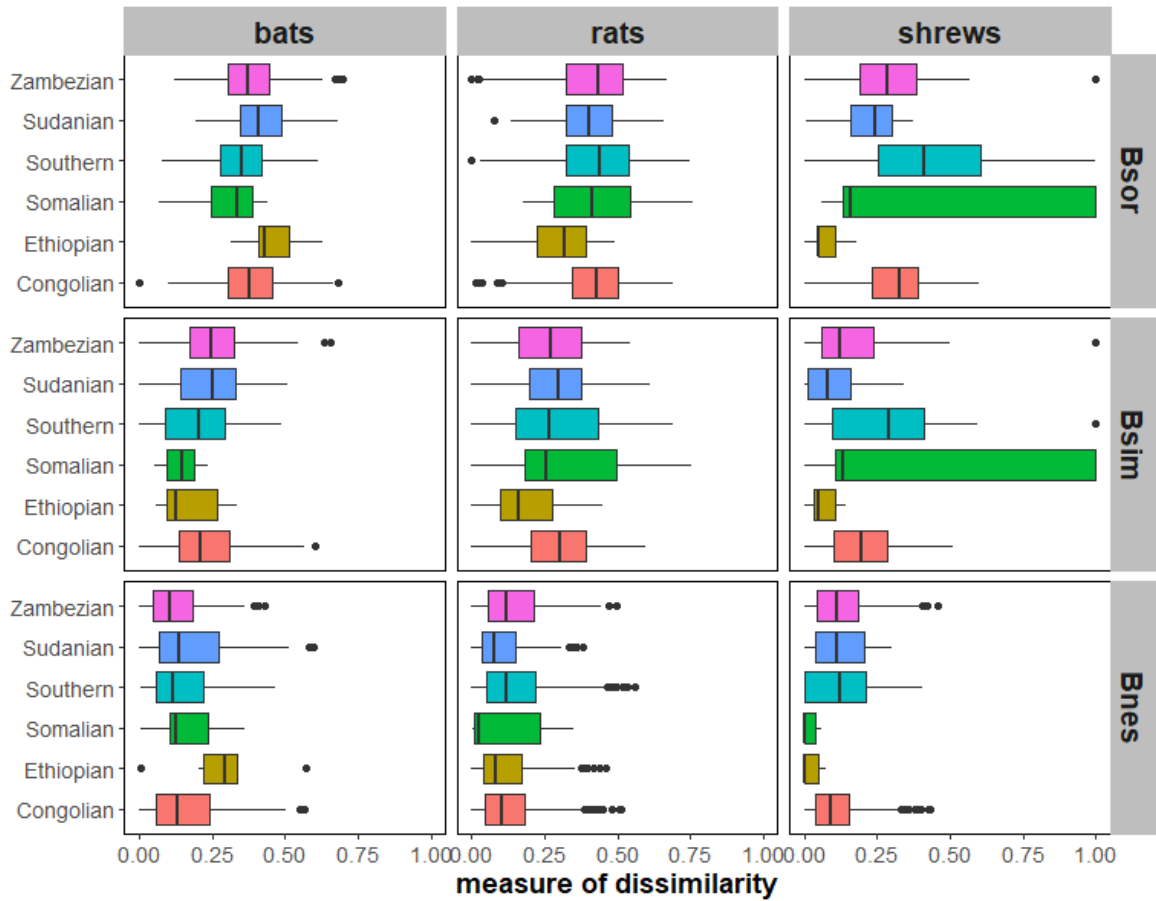


Figure S5. Heatmap of functional beta diversity of bats, rodents, and shrews between the six biogeographical regions. Note that sites had to have at least three species of shrews to be able to generate an output in the package ‘betapart’ since two morphological traits (two PCA axes) were being used (see Methods for more details). None of the sites in the Somalian region met this requirement, and hence this region is not included in the comparisons here.

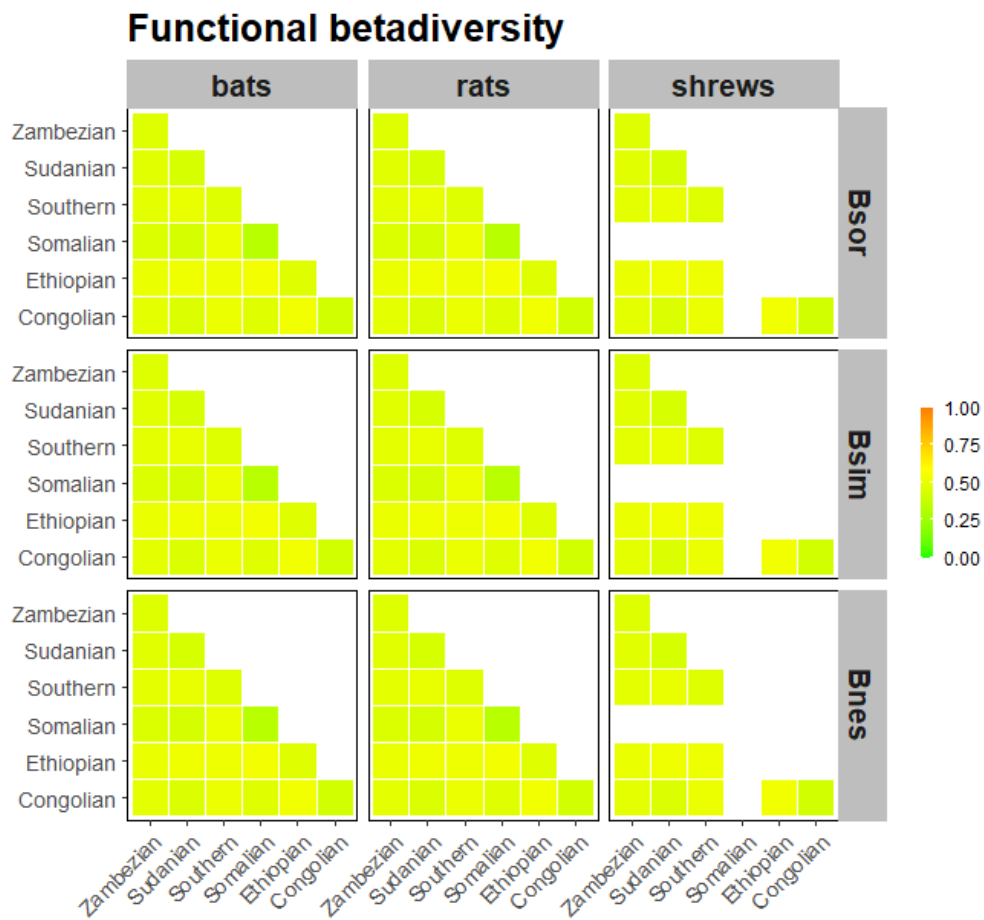
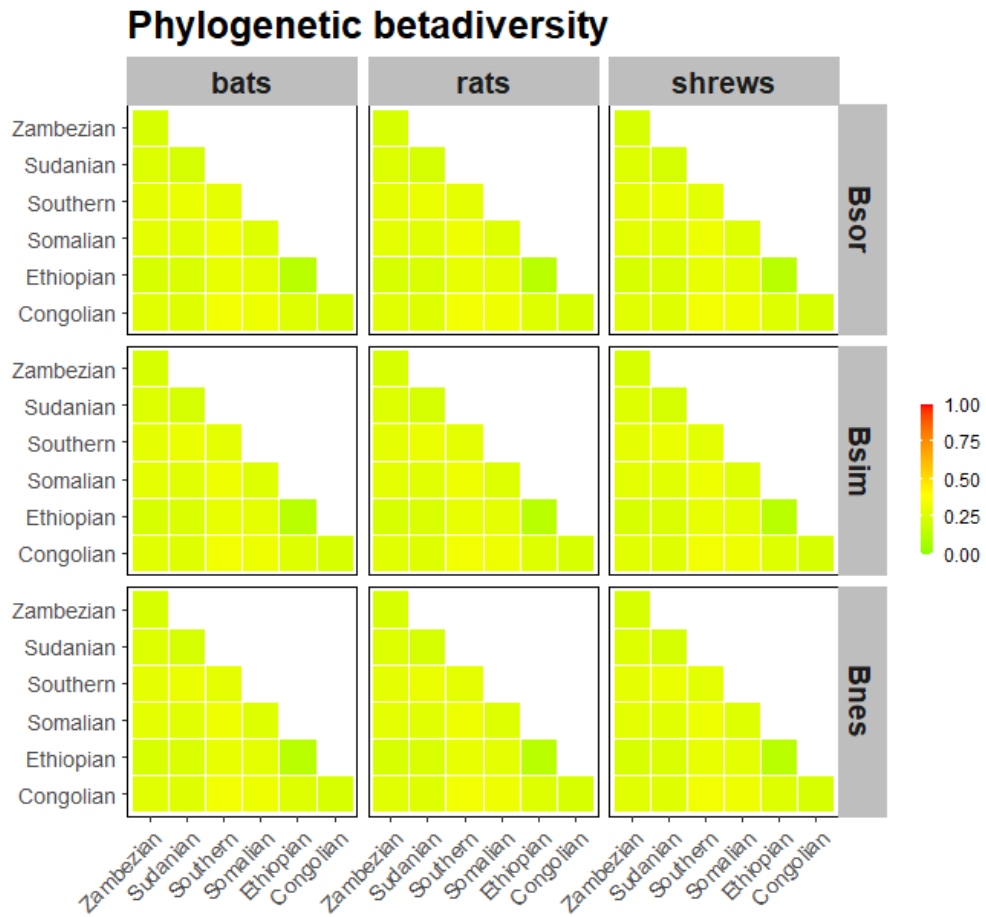


Figure S6. Heatmap of phylogenetic beta diversity of bats, rodents, and shrews between the six biogeographical regions.



Appendix 1. The papers from which records of the presence of small mammals were extracted for this study.

The csv files that contain the location data for the three small mammal groups can be located on the following github site: https://github.com/kanead/beta_diversity and are named “Bats_sites1.csv”, “Rats_sites1.csv”, and “Shrews_sites1.csv”, respectively. For each site, we provide a citation to the paper(s) from which the data were extracted. These citations are fully referenced here.

Bats

The papers that we used for the bat presence data as specified in the datafile “Bats_sites1.csv” are presented here in chronological order: Meester 1962; Rautenbach 1971; Fenton 1975, 1980; Poche 1975; Stuart 1975; Archer 1977; O’Shea & Vaughan 1980; Schlitter *et al.* 1982; Aldridge & Rautenbach 1987; Happold *et al.* 1987; Varty 1990; Hutterer *et al.* 1992; Rautenbach *et al.* 1996; Fenton *et al.* 1998; Cockle *et al.* 1998; Leirs *et al.* 1999; Van Cakenberghe *et al.* 1999; Angelici *et al.* 2000; Meinig 2000; Lunde *et al.* 2001; Rainho & Franco 2001; Ziegler *et al.* 2002; Fahr & Ebigbo 2003; Lavrenchenko *et al.* 2004, 2010; Webala *et al.* 2004, 2019; Stanley *et al.* 2005a, b, 2007; Fahr *et al.* 2006; Kruskop & Lavrenchenko 2006, 2008; Rainho *et al.* 2007; Rovero & De Luca 2007; Monadjem & Reside 2008; Schoeman & Jacobs 2008; Stanley & Foley 2008; Fils 2009; Kerbis Peterhans *et al.* 2010; Monadjem *et al.* 2010, 2018, 2021; Decher *et al.* 2010, 2015; Fahr & Kalko 2011; Schoeman & Waddington 2011; Stanley & Goodman 2011a; Curran *et al.* 2012; Denys *et al.* 2013; Bakwo Fils *et al.* 2014; Bayliss *et al.* 2014; Kruskop *et al.* 2016; Rainho & Palmeirim 2017; Wechuli *et al.* 2017; Malekani *et al.* 2018; Atagana *et al.* 2018; Taylor *et al.* 2018; Mongombe *et al.* 2019; Musila *et al.* 2019; Tanshi *et al.* 2019; Weber *et al.* 2019; Mamba *et al.* 2021.

Rodents

The papers that we used for the rodent presence as specified in the datafile "Rats_sites1.csv" are presented here in chronological order: Nel & Rautenbach 1975; Happold 1977; Hutterer 1977; Withers 1979; Bond *et al.* 1980; Christian 1980; Traore *et al.* 1980; Kern 1981; Jooste & Palmer 1982; Neal 1984; Gliwicz 1985; Martin 1985; Dieterlen 1986; Gliwicz 1987; Duplantier 1989; Gubista 1989; Happold & Happold 1989b, a, 1990; Kerley *et al.* 1990; Varty 1990; Happold & Happold 1991; Hutterer *et al.* 1992; Kerley & Erasmus 1992; Korn 1992; Wirminghaus & Perrin 1993; Hughes *et al.* 1994; Ferreira & Van Aarde 1996; Decher 1997; Lavrenchenko *et al.* 1997; Linzey & Kesner 1997; Kerbis Peterhans *et al.* 1998; Ray 1998; Van Cakenberghe *et al.* 1999; Decher & Bahian 1999; Leirs *et al.* 1999; Avenant 2000; O'Brien *et al.* 2000; Clausnitzer & Kityo 2001; Decher *et al.* 2001; Avenant & Kuyler 2002; Caro 2002; Granjon *et al.* 2002; Johnson *et al.* 2002; Ziegler *et al.* 2002; Kasangaki *et al.* 2003; Mahlaba & Perrin 2003; Monadjem & Perrin 2003; Nicolas *et al.* 2003; Nicolas & Colyn 2003; Granjon *et al.* 2004; Angelici & Luiselli 2005; Granjon *et al.* 2005; Hoffmann & Zeller 2005; Katuala *et al.* 2005; Mukinzi *et al.* 2005; Stanley *et al.* 2005b; Webala *et al.* 2006; Datiko *et al.* 2007; Fitzherbert *et al.* 2007; Rovero & De Luca 2007; Stanley & Hutterer 2007; Stanley *et al.* 2007; Yarnell *et al.* 2007; Habtamu & Bekele 2008; Mulungu *et al.* 2008; Stanley & Foley 2008; Denys *et al.* 2009; Makundi *et al.* 2009; Kerbis Peterhans *et al.* 2010; Nicolas *et al.* 2010; Webala *et al.* 2010; Denys *et al.* 2011; Granjon & Duplantier 2011; Stanley & Goodman 2011b; Girma *et al.* 2012; Kok *et al.* 2012; MacFadyen *et al.* 2012; Ba *et al.* 2013; Datiko 2013; Habtamu & Bekele 2013; Hurst *et al.* 2013; Symes *et al.* 2013; Tuyisingize 2013; Bosing *et al.* 2014; Jacquet *et al.* 2014; Rautenbach *et al.* 2014; Stanley *et al.* 2014; Taylor *et al.* 2014; Adam *et al.* 2015; Benjamin *et al.* 2015; Fekdu, A., Bekele, A., Datiko 2015; Plavsic 2015; Terefe & Samuel 2015; Codron *et al.* 2016; Namukonde *et al.* 2017; Simelane *et al.* 2017; Akpatou *et al.* 2018; Gumbi *et al.* 2018; Harris *et al.* 2018; Taylor *et al.* 2018; Kostin *et al.* 2019; Mayamba *et al.* 2019; Weber *et al.* 2019; Craig *et al.* 2020; Mamba *et al.* 2021.

Shrews:

The papers that we used for the insectivore presence as specified in the datafile "Shrews_sites1.csv" are presented here in chronological order: Happold 1977; Withers 1979; Bond *et al.* 1980; Kern 1981; Jooste & Palmer 1982; Neal 1984; Brosset 1988; Happold & Happold 1989a, b, 1990, 1991; Kerley *et al.* 1990; Varty 1990; Hutterer *et al.* 1992; Kerley & Erasmus 1992; Korn 1992; Wirminghaus & Perrin 1993; Ferreira & Van Aarde 1996; Hutterer & Schlitter 1996; Decher 1997; Lavrenchenko *et al.* 1997; Linzey & Kesner 1997; Kerbis Peterhans *et al.* 1998, 2010; Ray 1998; Decher & Bahian 1999; Leirs *et al.* 1999; Van Cakenberghe *et al.* 1999; Avenant 2000; O'Brien *et al.* 2000; Decher *et al.* 2001; Goodman *et al.* 2001; Caro 2002; Avenant & Kuyler 2002; Johnson *et al.* 2002; Ziegler *et al.* 2002; Kasangaki *et al.* 2003; Mahlaba & Perrin 2003; Monadjem & Perrin 2003; Nicolas & Colyn 2003; Nicolas *et al.* 2003, 2010; Churchfield *et al.* 2004; Goodman & Hutterer 2004; Granjon *et al.* 2004, 2005; Oguge *et al.* 2004; Angelici & Luiselli 2005; Hoffmann & Zeller 2005; Mukinzi *et al.* 2005; Barrière *et al.* 2005; Stanley *et al.* 2005b, 2011, 2014; Webala *et al.* 2006, 2010; Fitzherbert *et al.* 2007; Rovero & De Luca 2007; Stanley & Hutterer 2007; Yarnell *et al.* 2007; Gambalemoke *et al.* 2008b, a; Habtamu & Bekele 2008, 2013; Mulungu *et al.* 2008; Stanley & Foley 2008; Denys *et al.* 2009, 2011, 2014, 2021; Girma *et al.* 2012; Kok *et al.* 2012; Datiko 2013; Hurst *et al.* 2013; Ba *et al.* 2013; Symes *et al.* 2013; Tuyisingize 2013; Rautenbach *et al.* 2014; Taylor *et al.* 2014, 2018; Bosing *et al.* 2014; Adam *et al.* 2015; Fekdu, A., Bekele, A., Datiko 2015; Terefe & Samuel 2015; Namukonde *et al.* 2017; Simelane *et al.* 2017; Akpatou *et al.* 2018; Gumbi *et al.* 2018; Weber *et al.* 2019; Craig *et al.* 2020; Mamba *et al.* 2021.

Appendix 2: Species accumulation curves for the three African small mammal groups (bats, rodents, and shrews) based on the datasets used in this study

The csv files that contain the location data for the three small mammal groups can be located on the following github site: https://github.com/kanead/beta_diversity and are named “Bats_sites1.csv”, “Rats_sites1.csv”, and “Shrews_sites1.csv”, respectively. An important question relates to how well this dataset reflects the true species richness of these sites. In an attempt to answer this question, we have plotted species accumulation curves [using the function `specaccum()` in the R package ‘vegan’] for each of the three taxa referred to in this study (Figure S7). None of the three curves has reached the asymptote, however, all of them have started to taper off. This suggests that, while some species may have been overlooked, in general, we can consider these data to be representative of species richness on the continent of Africa.

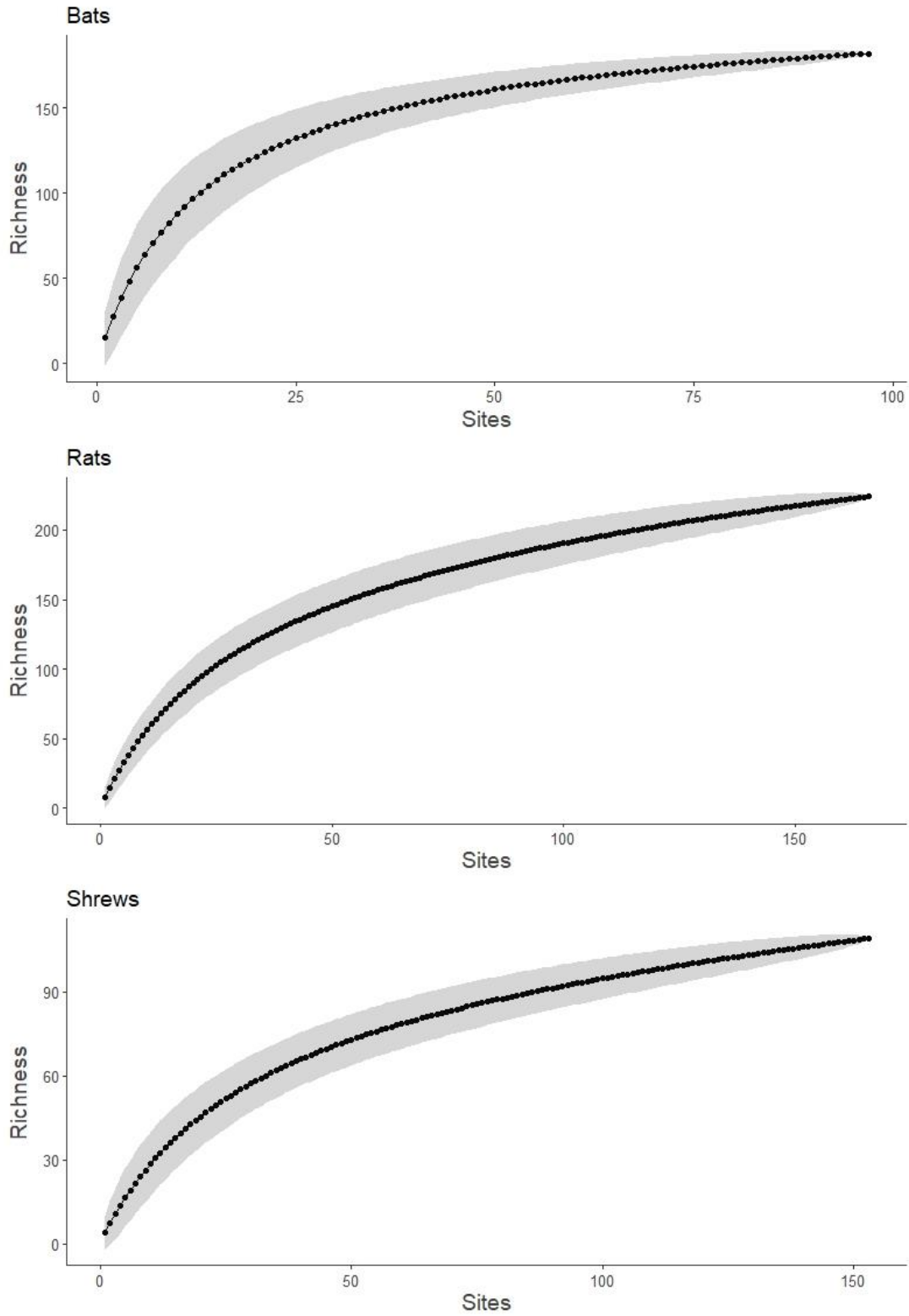


Figure S7. Species accumulation curves for the bats, rodents, and insectivore datasets. Note that all three curves have started to taper off.

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