

SUPPLEMENTARY MATERIAL

Unravelling the taxonomy and distribution of two problematic small mammal genera in the Karoo biome

Main et al.

Table S1: Location details for specimens sampled during this study.

<i>M. namaquensis</i>	Latitude: degrees South	Longitude: degrees East	Locations on map	Marker
RR1	-30.50666	21.34012	11	cytochrome b
RR2	-30.50666	21.34012	11	cytochrome b
RR3	-30.50666	21.34012	11	cytochrome b
RR4	-30.50666	21.34012	11	cytochrome b
RR5	-30.48179	21.35898	12	cytochrome b
RR6	-30.48179	21.35898	12	cytochrome b
RR7	-30.48179	21.35898	12	cytochrome b
RR9	-30.48179	21.35898	12	cytochrome b
RR10	-30.46297	21.15141	6	cytochrome b
RR12	-30.46297	21.15141	6	cytochrome b
RR13	-30.46297	21.15141	6	cytochrome b
RR14	-30.46297	21.15141	6	cytochrome b
RR15	-30.46297	21.15141	6	cytochrome b
RR16	-30.46297	21.15141	6	cytochrome b
RR19	-30.47703	21.18333	9	cytochrome b
RR20	-30.47703	21.18333	9	cytochrome b
RR21	-30.47703	21.18333	9	cytochrome b
RR26	-30.32742	21.20321	5	cytochrome b
RR27	-30.32742	21.20321	5	cytochrome b
RR29	-30.10167	20.29313	1	cytochrome b
RR30	-30.10167	20.29313	1	cytochrome b
RR31	-30.10167	20.29313	1	cytochrome b
RR32	-30.28095	21.18828	2	cytochrome b
RR33	-30.28095	21.18828	2	cytochrome b
Mi3	-32.2143105	21.8751458	21	cytochrome b
Mi4	-32.2143105	21.8751458	21	cytochrome b
Mi5	-32.2143105	21.8751458	21	cytochrome b
Mi24	-31.3530993	22.2892843	18	cytochrome b
Mi25	-32.2143105	21.8751458	21	cytochrome b
Mi27	-32.2143105	21.8751458	21	cytochrome b
Mi29	-31.3530993	22.2892843	18	cytochrome b
Mi34	-32.9665985	22.3610477	26	cytochrome b
Mi37	-32.9665985	22.3610477	26	cytochrome b
Mi41	-32.9665985	22.3610477	26	cytochrome b
<i>M. granti</i>	S	E	Locations on map	Marker
RR35	-31.13462	21.07941	17	cytochrome b
RR37	-30.52841	21.56686	14	cytochrome b
RR38	-30.52841	21.56686	14	cytochrome b
RR40	-30.52841	21.56686	14	cytochrome b

Mi1	-32.515462	20.8858823	22	cytochrome b
Mi2	-32.515462	20.8858823	22	cytochrome b
Mi6	-31.9724257	21.4324336	20	cytochrome b
Mi7	-31.9724257	21.4324336	20	cytochrome b
Mi8	-31.9724257	21.4324336	20	cytochrome b
Mi9	-32.9665985	22.3610477	26	cytochrome b
Mi10	-31.9724257	21.4324336	20	cytochrome b
Mi12	-31.9724257	21.4324336	20	cytochrome b
Mi13	-32.9665985	22.3610477	26	cytochrome b
Mi14	-31.9724257	21.4324336	20	cytochrome b
Mi15	-32.9665985	22.3610477	26	cytochrome b
Mi16	-32.9665985	22.3610477	26	cytochrome b
Mi17	-31.9724257	21.4324336	20	cytochrome b
Mi18	-31.9724257	21.4324336	20	cytochrome b
Mi20	-31.9724257	21.4324336	20	cytochrome b
Mi21	-31.9724257	21.4324336	20	cytochrome b
Mi22	-31.9724257	21.4324336	20	cytochrome b
Mi23	-32.966598	22.3610477	26	cytochrome b
Mi28	-32.515462	20.8858823	22	cytochrome b
Mi31	-32.9665985	22.3610477	26	cytochrome b
Mi32	-32.9665985	22.3610477	26	cytochrome b
Mi33	-32.9665985	22.3610477	26	cytochrome b
Mi38	-31.9724257	21.4324336	20	cytochrome b
Mi40	-31.9724257	21.4324336	20	cytochrome b
Mi42	-31.9724257	21.4324336	20	cytochrome b
GH01	-31.9250000	20.0922222	E	Literature (Russo 2003)
<i>M. proboscideus</i>	S	E	Locations on map	Marker
E01	-31.54212	23.953075	19	Control Region and cytochrome b
E02	-32.55735	25.19892	28	Control Region
E03	-31.542128	23.953075	19	Control Region and cytochrome b
E04	-31.542128	23.953075	19	Control Region and cytochrome b
E05	-32.30179	23.119131	25	Control Region and cytochrome b
E06	-32.30179	23.119131	25	Control Region and cytochrome b
E07	-32.30179	23.119131	25	Control Region and cytochrome b
E08	-31.542128	23.953075	19	Control Region and cytochrome b
E10	-32.55735	25.19892	28	Control Region
E11	-32.55735	25.19892	28	Control Region
E12	-32.55735	25.19892	28	Control Region
E18	-31.9724257	21.4324336	20	Control Region and cytochrome b
E21	-32.9665985	22.3610477	26	Control Region and cytochrome b
E23	-32.9665985	22.3610477	26	Control Region and cytochrome b

E25	-32.515462	20.8858823	22	Control Region and cytochrome b
E27	-32.515462	20.8858823	22	Control Region and cytochrome b
E28	-31.2157377	20.5261348	15	Control Region and cytochrome b
E29	-32.4603312	22.1381362	24	Control Region and cytochrome b
E30	-31.9724257	21.4324336	20	Control Region and cytochrome b
E34	-31.2157377	20.5261348	15	Control Region and cytochrome b
E36	-31.9724257	21.4324336	20	Control Region and cytochrome b
E38	-31.9724257	21.4324336	20	Control Region and cytochrome b
E40	-31.9724257	21.4324336	20	Control Region and cytochrome b
E42	-31.9724257	21.4324336	20	Control Region and cytochrome b
E45	-31.9724257	21.4324336	20	Control Region and cytochrome b
E47	-32.9665985	22.3610477	26	Control Region and cytochrome b
E48	-32.688947	20.3790503	23	Control Region and cytochrome b
E49	-31.2157377	20.5261348	15	Control Region and cytochrome b
ES01	-30.4847	21.31452	10	Control Region and cytochrome b
ES02	-30.4847	21.31452	10	Control Region and cytochrome b
ES06	-30.47922	21.35911	13	Control Region and cytochrome b
ES08	-30.4592	21.16377	7	Control Region and cytochrome b
ES12	-30.32301	21.20123	4	Control Region and cytochrome b
ES13	-30.29199	21.18904	3	Control Region and cytochrome b
<i>E. pilicaudus</i>	S	E	Locations on map	Marker
E16	-31.9724257	21.4324336	20	Control Region and cytochrome b
E19	-31.9724257	21.4324336	20	Control Region and cytochrome b
E20	-31.9724257	21.4324336	20	Control Region and cytochrome b
E22	-32.515462	20.8858823	22	Control Region
E24	-31.9724257	21.4324336	20	Control Region and cytochrome b
E32	-31.9724257	21.4324336	20	Control Region and cytochrome b
E33	-32.515462	20.8858823	22	Control Region
E35	-31.9724257	21.4324336	20	Control Region and cytochrome b

E37	-31.9724257	21.4324336	20	Control Region and cytochrome b
E39	-31.9724257	21.4324336	20	Control Region and cytochrome b
E41	-31.9724257	21.4324336	20	Control Region and cytochrome b
E43	-31.9724257	21.4324336	20	Control Region and cytochrome b
E44	-31.9724257	21.4324336	20	Control Region and cytochrome b
E46	-31.9724257	21.4324336	20	Control Region and cytochrome b
ES14	-31.1436	21.07127	16	Control Region
<i>E. rupestris</i>	S	E	Locations on map	Marker
E15	-32.2143105	21.8751458	21	Control Region and cytochrome b
E17	-32.9665985	22.3610477	26	Control Region and cytochrome b
E26	-32.2143105	21.8751458	21	Control Region and cytochrome b
ES05	-30.47922	21.35911	13	Control Region
ES09	-30.47317	21.18219	8	Control Region
ES11	-30.32301	21.20123	4	Control Region and cytochrome b
<i>E. myurus</i>	S	E	Locations on map	Marker
E09	-31.86402	25.4705	27	Control Region and cytochrome b
E13	-31.86402	25.4705	27	Control Region and cytochrome b

Table S2 GenBank Accession numbers and reference used in this study

Species	Accession number	Reference	Marker
<i>M. proboscideus</i>	DQ901219	Smit et al. 2007	Control region
<i>M. proboscideus</i>	DQ901220	Smit et al. 2007	Control region
<i>M. proboscideus</i>	EF141753	Smit et al. 2010	Control region
<i>M. proboscideus</i>	EF141728	Smit et al. 2010	Control region
<i>M. proboscideus</i>	EF141760	Smit et al. 2010	Control region
<i>M. proboscideus</i>	EF141757	Smit et al. 2010	Control region
<i>M. proboscideus</i>	EF141759	Smit et al. 2010	Control region
<i>E. pilicaudus</i>	DQ901250	Smit et al. 2007	Control region
<i>E. pilicaudus</i>	DQ901251	Smit et al. 2007	Control region
<i>E. pilicaudus</i>	EU076240	Smit et al. 2008	Control region
<i>E. pilicaudus</i>	EU076241	Smit et al. 2008	Control region
<i>E. edwardii</i>	DQ901105	Smit et al. 2007	Control region
<i>E. edwardii</i>	DQ901093	Smit et al. 2007	Control region
<i>E. myurus</i>	DQ901244	Smit et al. 2007	Control region
<i>E. myurus</i>	DQ901245	Smit et al. 2007	Control region
<i>E. rupestris</i>	DQ901230	Smit et al. 2007	Control region
<i>E. rupestris</i>	DQ901231	Smit et al. 2007	Control region
<i>E. karoensis</i>	DQ901238	Smit et al. 2007	Control region
<i>R. udzungwensis</i>	KF202259	Lawson et al. 2013	Control region
<i>M. proboscideus</i>	EF141793	Smit et al. 2010	cytochrome b
<i>M. proboscideus</i>	EF141804	Smit et al. 2010	cytochrome b
<i>M. proboscideus</i>	EF141792	Smit et al. 2010	cytochrome b
<i>M. proboscideus</i>	EF141820	Smit et al. 2010	cytochrome b
<i>M. proboscideus</i>	EF141788	Smit et al. 2010	cytochrome b
<i>M. proboscideus</i>	EF141773	Smit et al. 2010	cytochrome b
<i>E. edwardii</i>	DQ901076	Smit et al. 2007	cytochrome b
<i>E. edwardii</i>	DQ901059	Smit et al. 2007	cytochrome b
<i>E. edwardii</i>	DQ901016	Smit et al. 2007	cytochrome b
<i>E. pilicaudus</i>	DQ901213	Smit et al. 2007	cytochrome b
<i>E. pilicaudus</i>	DQ901215	Smit et al. 2007	cytochrome b
<i>E. pilicaudus</i>	EU076246	Smit et al. 2008	cytochrome b
<i>E. pilicaudus</i>	EU076248	Smit et al. 2008	cytochrome b
<i>E. myurus</i>	DQ901207	Smit et al. 2007	cytochrome b
<i>E. myurus</i>	DQ901210	Smit et al. 2007	cytochrome b
<i>E. rupestris</i>	EF141635	Smit et al. 2010	cytochrome b
<i>E. rupestris</i>	DQ901196	Smit et al. 2007	cytochrome b
<i>R. udzungwensis</i>	KF742619	Lawson et al. 2013	cytochrome b

References

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Table S3: Distribution (bioregion and vegetation type) for historical and recent records of *Micaelamys granti* and *Elephantulus pilicaudus* in the determination of the area of occupancy

Record type	Coordinates		Biome	Bioregion	Vegetation type	Source
	S	E				
<i>Micaelamys granti</i>						
New	−31.1346	21.0794	Nama Karoo	Bushmanland	Bushmanland Basin Shrubland	This study
New	−30.5284	21.5669	Nama Karoo	Bushmanland	Bushmanland Basin Shrubland	This study
New	−32.9666	22.3610	Nama Karoo	Lower Karoo	Gamka Karoo	This study
New	−31.9724	21.4324	Nama Karoo	Upper Karoo	Western Upper Karoo	This study
New	−32.5155	20.8859	Succulent Karoo	Trans-Escarpment Succulent Karoo	Roggeveld Karoo	This study
Confirmed	−31.6417	22.3761	Nama-Karoo	Upper Karoo	Eastern Upper Karoo	Russo 2003
Confirmed	−31.9250	20.0922	Succulent Karoo	Trans-Escarpment Succulent Karoo	Roggeveld Karoo	Russo 2003
Confirmed	−33.0000	20.0000	Nama-Karoo	Lower Karoo	Gamka Karoo	Chimimba et al. 1998
Confirmed	−31.7167	23.1833	Nama-Karoo	Upper Karoo	Eastern Upper Karoo	Chimimba et al. 1998
Confirmed	−30.9833	23.8000	Nama-Karoo	Upper Karoo	Eastern Upper Karoo	Chimimba et al. 1998
Confirmed	−32.0333	21.6167	Nama-Karoo	Upper Karoo	Western Upper Karoo	Chimimba et al. 1998
Confirmed	−31.5000	20.5000	Nama-Karoo	Upper Karoo	Western Upper Karoo	Chimimba et al. 1998
Confirmed	−33.2500	20.5833	Succulent Karoo	Rainshadow Valley Karoo	Koedoesberge-Moordenaars Karoo	Chimimba et al. 1998
Confirmed	−32.3833	20.6667	Succulent Karoo	Rainshadow Valley Karoo	Prince Albert Succulent Karoo	Chimimba et al. 1998
Confirmed	−32.3833	20.6833	Succulent Karoo	Rainshadow Valley Karoo	Prince Albert Succulent Karoo	Chimimba et al. 1998
Confirmed	−33.6667	21.2500	Succulent Karoo	Rainshadow Valley Karoo	Western Gwarrieveld	Chimimba et al. 1998
Confirmed	−31.4667	19.7833	Succulent Karoo	Trans-Escarpment Succulent Karoo	Hantam Karoo	Chimimba et al. 1998
Confirmed	−31.4667	19.8000	Succulent Karoo	Trans-Escarpment Succulent Karoo	Hantam Karoo	Chimimba et al. 1998

Confirmed	-31.9000	23.5833	Nama-Karoo	Upper Karoo	Eastern Upper Karoo	Chimimba et al. 1998
Confirmed	-31.3667	23.1500	Nama-Karoo	Upper Karoo	Eastern Upper Karoo	Chimimba et al. 1998
Confirmed	-31.5000	25.0000	Nama-Karoo	Upper Karoo	Western Upper Karoo	Chimimba et al. 1998
Confirmed	-31.5000	20.5333	Nama-Karoo	Upper Karoo	Western Upper Karoo	Chimimba et al. 1998
Unverified	-32.2758	25.0761	Grassland	Dry Highveld Grassland	Karoo Escarpment Grassland	Kok et al. 2012
Unverified	-32.3000	25.0811	Grassland	Dry Highveld Grassland	Karoo Escarpment Grassland	Kok et al. 2012
Unverified	-32.2825	25.0767	Grassland	Dry Highveld Grassland	Karoo Escarpment Grassland	Kok et al. 2012
Unverified	-32.2953	25.0792	Grassland	Dry Highveld Grassland	Karoo Escarpment Grassland	Kok et al. 2012
Unverified	-32.2814	25.0764	Grassland	Dry Highveld Grassland	Karoo Escarpment Grassland	Kok et al. 2012
Unverified	-32.3000	25.0811	Grassland	Dry Highveld Grassland	Karoo Escarpment Grassland	Kok et al. 2012
Unverified	-32.2750	25.0761	Grassland	Dry Highveld Grassland	Karoo Escarpment Grassland	Kok et al. 2012
Unverified	-32.2972	25.0794	Grassland	Dry Highveld Grassland	Karoo Escarpment Grassland	Kok et al. 2012
Unverified	-32.2750	25.0761	Grassland	Dry Highveld Grassland	Karoo Escarpment Grassland	Kok et al. 2012
Unverified	-31.7728	24.6647	Nama-Karoo	Upper Karoo	Eastern Upper Karoo	Kok et al. 2012
Unverified	-33.1200	23.4500	Nama-Karoo	Lower Karoo	Gamka Karoo	Monadjem et al. 2015
Unverified	-31.4700	19.9000	Nama-Karoo	Bushmanland	Bushmanland Basin Shrubland	Monadjem et al. 2015
Unverified	-30.7300	24.4700	Nama-Karoo	Upper Karoo	Northern Upper Karoo	Monadjem et al. 2015
Unverified	-33.4200	20.7500	Succulent Karoo	Rainshadow Valley Karoo	Western Little Karoo	Monadjem et al. 2015
Unverified	-32.5700	20.6800	Succulent Karoo	Trans-Escarpment Succulent Karoo	Roggeveld Karoo	Monadjem et al. 2015
Unverified	-31.3700	20.7200	Nama-Karoo	Upper Karoo	Western Upper Karoo	Monadjem et al. 2015
Unverified	-33.7000	18.9500	Fynbos	Granite and Dolerite Renosterveld	Swartland Granite Renosterveld	Monadjem et al. 2015

Unverified	-32.4330	19.0830	Fynbos	Sandstone Fynbos	Cederberg Sandstone Fynbos	Monadjem et al. 2015
Unverified	-32.1830	22.6000	Nama-Karoo	Upper Karoo	Upper Karoo Hardeveld	Monadjem et al. 2015
Unverified	-32.1330	22.5500	Nama-Karoo	Upper Karoo	Eastern Upper Karoo	Monadjem et al. 2015
Unverified	-33.5670	19.1500	Fynbos	Sandstone Fynbos	Hawequas Sandstone Fynbos	Monadjem et al. 2015
Unverified	-30.0500	26.0167	Grassland	Dry Highveld Grassland	Xhariep Karroid Grassland	Chimimba et al. 1998
<i>Elephantulus pilicaudus</i>						
New	-32.5155	20.8859	Succulent Karoo	Trans-Escarpment Succulent Karoo Bioregion	Roggeveld Karoo	This study
New	-31.9724	21.4324	Nama Karoo	Upper Karoo	Western Upper Karoo	This study
New	-31.1436	21.0713	Nama Karoo	Bushmanland	Bushmanland Basin Shrubland	This study
Confirmed	-32.2000	22.3200	Nama-Karoo	Upper Karoo	Western Upper Karoo	Smit et al. 2008
Confirmed	-31.1700	21.5800	Nama-Karoo	Upper Karoo	Western Upper Karoo	Smit et al. 2008
Confirmed	-30.5000	22.1000	Nama-Karoo	Bushmanland	Bushmanland Arid Grassland	Smit et al. 2008
Confirmed	-31.8000	19.8200	Succulent Karoo	Trans-Escarpment Succulent Karoo	Roggeveld Karoo	Smit et al. 2008
Confirmed	-31.6000	22.6000	Nama-Karoo	Upper Karoo	Eastern Upper Karoo	Smit et al. 2008

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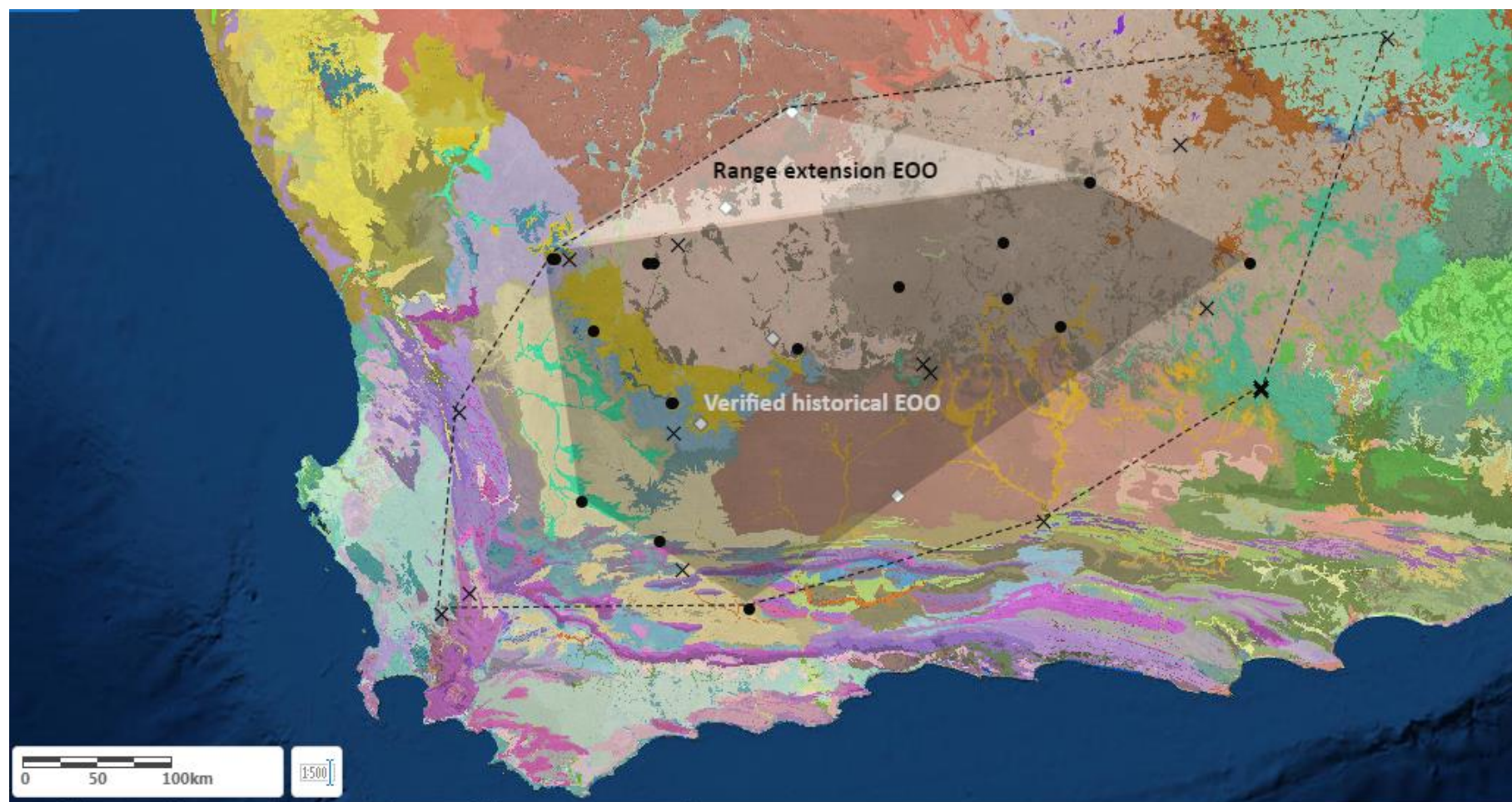


Figure S1: Map showing the distribution records of *Micaelamys granti*, based on historical records (black circles) verified by multivariate morphometrics and/or genotyping; published but unverifiable records (x); and new records (white triangles) documented by this study, in relation to bioregions and vegetation types of the SANBI 2012 Vegetation Map of South Africa. Shading indicates verified minimum convex polygon extent of occurrence (EOO) ranges based on historical verified records; range-extension records provided by this study; and the possible EOO if unverifiable records are included. See Supplementary Table 1 for a list of records and associated vegetation units and data sources.

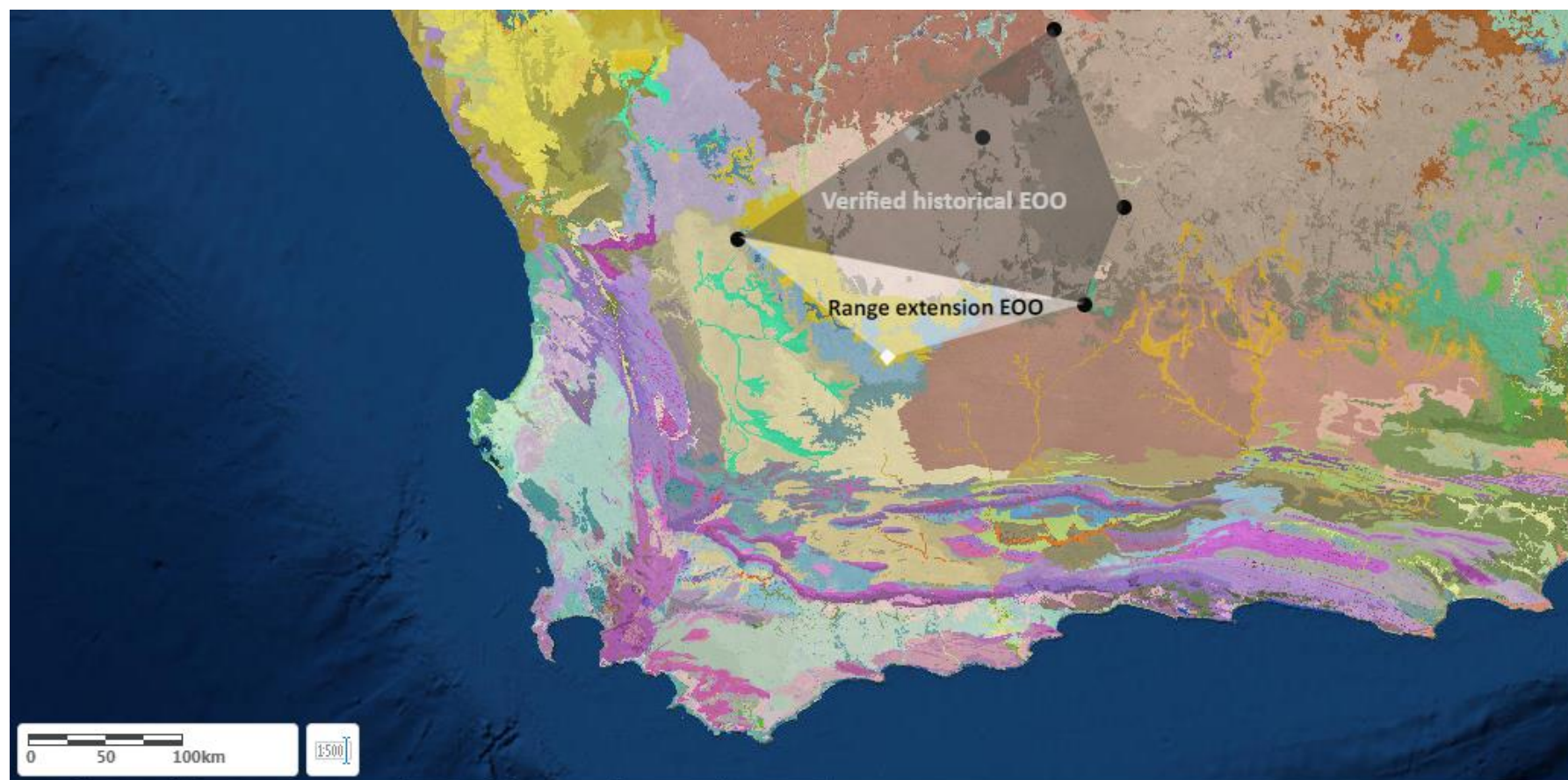


Figure S2: Map showing the distribution records of *Elephantulus pilicaudus*, based on historical records (black circles) verified by multivariate morphometrics and/or genotyping (Smit et al. 2008) and new records (white triangles) documented by this study, in relation to bioregions of the SANBI 2012 Vegetation Map of South Africa. Shading indicates verified minimum convex polygon extent of occurrence (EOO) ranges based on historical verified records; and range-extension records provided by this study. See Supplementary Table 2 for a list of records and associated vegetation units and data sources