

Supplementary data

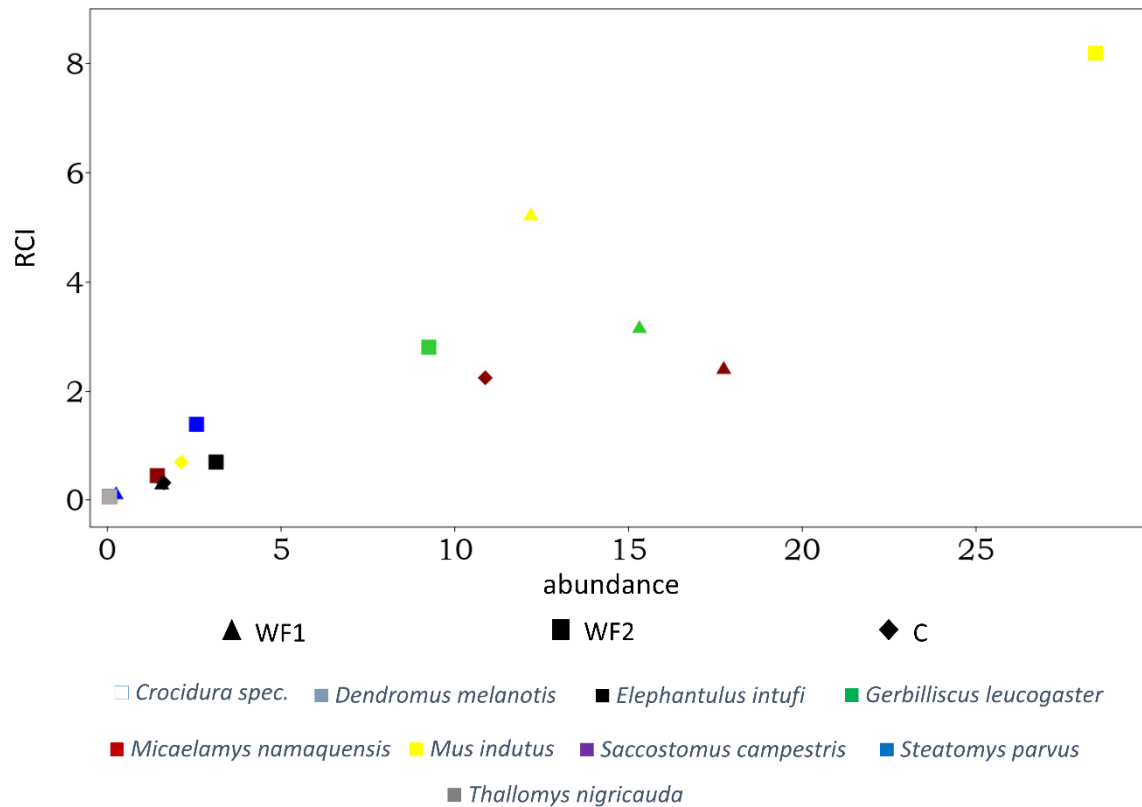


Figure S1. Spearman correlation of relative abundance (number of individuals captured per 100 trap nights) and relative capture index (RCI, captures per 100 trap nights) on the three study sites in the Etosha area. Symbols represent species captured on near natural wildlife rangeland (WF1, triangles), wildlife rangeland close to artificial waterhole (WF2, squares) and on the cattle farm (C, diamonds). There was a strong positive correlation between relative abundance and RCI, which was statistically significant ($r_s=0.97$, $df=16$ $p<0.001$, $z=0.472_{0.05}$), validating that the RCI can be used as a proxy for relative abundance.

Table S1. Small mammals captured by species on private farmland at the southern Etosha boundary from July–November 2006; RA–relative abundance based on captured individuals per species per 100 trap nights; Hs–Shannon Diversity Index; E–evenness; WF1/WF2–near-natural wildlife rangeland/wildlife rangeland close to artificial waterhole, C–cattle farm.

Land use intensity trap nights species	Wildlife rangeland				Livestock rangeland	
	WF1		WF2		C	
	low		medium		high	
	1600		1600		1600	
	individuals	RA	individuals	RA	individuals	RA
<i>Crocidura spec.</i>			1	0.06		
<i>Dendromus melanotis</i>			1	0.06		
<i>Elephantulus intufi</i>	5	0.31	11	0.69	5	0.31
<i>Gerbilliscus leucogaster</i>	51	3.19	45	2.81	1	0.06
<i>Micaelamys namaquensis</i>	39	2.44	7	0.44	36	2.25
<i>Mus indutus</i>	84	5.25	131	8.19	11	0.69
<i>Saccostomus campestris</i>			1	0.06		
<i>Steatomys parvus</i>	2	0.13	22	1.38		
<i>Thallomys nigricauda</i>			1	0.06		
Total	181	13.75	220	11.31	53	3.31
Hs	1.1		0.96		0.81	
E	0.77		0.56		0.78	

Table S2. Effects of time (variability between trapping sessions) on RCI (mean±SEM) and S (mean±SEM) in the Etosha area. *Significant differences between group means ($p < 0.05$) were obtained using One-Way ANOVA or Friedman-Test. WF1 – low land use intensity, WF2 – medium land use intensity, C – high land use intensity.

session	WF1		WF2		C	
	RCI	S	RCI	S	RCI	S
1	38±6.54	3.25±0.47	17±1.58	3.75±0.25	17.25±0.64	3.0
2	49.25±1.94	4.0	50.25±2.72	4.75±0.25	20.5±0.64	2.5±0.28
3	56±2.43	4.5±0.28	60.5±1.19	5.0	10.75±0.85	2.0
4	44.74±2.78	4.0	52.5±3.88	5.5±0.28	17.5±6.83	2.75±0.25
	F(1.33, 3.98) =4.803, p=0.09	F _R (4,4)=8.0, p=0.05	F(1.45, 4.34)= 52.44, p=0.001	F _R (4,4) =10.64, p=0.003	F _R (4,4) =6.9, p=0.07	F _R (4,4)=7, p=0.09
	n.s.	n.s.	*	*	n.s.	n.s.

Table S3. Effects of time (variability between trapping sessions) and local landscape (variability between sites) on RCI (mean±SEM) and S (mean±SEM) in the Tsumeb area.

*Significant differences between group means ($p < 0.05$) were obtained using two-sample t-Test or two-sample Kolmogorov-Smirnov (K-S) test. EBL- encroached bushland (low land use intensity), CBL – cleared bushland (medium land use intensity), MF – maize (high land use intensity), LF - lucerne (high land use intensity)

	EBL			CBL			MF			LF		
site	session	RCI	S	session	RCI	S	session	RCI	S	session	RCI	S
1	Feb 2018	47.78±6.74	4.75±0.25	Apr 2018	17.78±4.01	3.67±0.33	Feb 2018	54.72±3.46	2.5±0.5	March 2017	51.11±14.59	2.5±0.29
	Dec 2018	14.07±2.06	2.66±0.33	Dec 2018	20.74±2.43	4.0				Dec 2017	36.11±15.81	2.5±0.29
		t=4.78, df=3.54, p=0.012	D=1, p=0.06		t=0.63, df=3.29 p=0.57	D=0.33, p>0.9999					t=0.69, df=5.96, p=0.52	D=0.13, p>0.999
	time	*	n.s.		n.s.	n.s.					n.s.	n.s.
2	Nov 2017	55±2.24	2.25±0.25	May 2018	17.78±1.01	3.5±0.29	May 2018	50.37± 9.98	2.67± 0.33	May 2018	44.81±13.61	2.0 ±0.58
		-	D=0.61, p=0.17		t=0.612, df=6.84 p=0.56	D=0.33, p=0.5		t=0.412, df=2.49, p=0.71	D=0.42, p=0.49		t=0.071, df=4.55, p=0.95	D=0.33, p=0.39
	landscape		n.s.		n.s.	n.s.		n.s.	n.s.		n.s.	n.s.

Table S4. Comparison of selected biological and ecological traits of small mammal species captured in the study areas. body size=total length in mm; p.a.- per annum (year)

species	life style	habitat	primary diet	body size	life span	burrows	seasonality	specifics	litter size	potential trigger
<i>Mastomys natalensis</i>	nocturnal / terrestrial ¹	open grassland, settlements ²	omnivorous ¹	161-299 ¹	339 days ²	nests underground ²	seasonal (rainfall) ³ aseasonal (food) ¹	altricial, short gestation, 4 generations ²	10 (40 p.a.) ²	germinating grass ⁴ , phytohormones ⁵
<i>Micaelamys namaquensis</i>	nocturnal, terrestrial and arboreal ¹	rocky outcrops, and grasslands ¹	omnivorous ⁶	80-147 ¹	700 days ¹	rocky crevices, hollow trees logs, shrubs ¹	seasonal ¹	altricial, polygynous ¹	1-5 ¹	rainfall, food abundance ⁷
<i>Gerbilliscus leucogaster</i>	nocturnal, colonial ^{8, 1}	woodland, bushland, thornveld ¹	granivorous ^{8, 1}	210-330 ¹	Max. 360 days ⁸	extensive burrow systems underground ^{8, 1}	seasonal ^{8, 1}	altricial, 2-3 litters ⁸	4.38 (12-28 p.a.) ⁸	photoperiod ⁹ , no evidence for an effect of phytohormones ¹⁰
<i>Mus indutus</i>	nocturnal, terrestrial ¹	extensive tolerance, avoids open habitats ¹¹	omnivorous ¹	76-118 ¹		crevices, logs, bark and stones ¹	year-round ¹¹	altricial, grass nests ¹	2-8 ¹	-
<i>Aethomys crysophilus</i>	nocturnal ^{1,12}	savanna /woodland, dense vegetation or rocky cover ¹²	omnivorous ^{1,12}	120-169 ¹		burrows, rock niches, termite mounds ¹²	year-round ¹²	altricial, short gestation ¹²	3.1 ¹²	photoperiod, rain, temperature ¹²
<i>Elephantulus intufi</i>	crepuscular, social and mating pairs but forage solitary ¹	dry savanna woodlands with low-lying brush, loose, sandy soils ¹	insectivorous ¹	211-272 ¹	4-6 years ¹	does not build or use nests, use shelter of bushes ¹	in Namibia year-round ¹	precocial; polygynous; monogamy; gestation: 50 days ¹	1 ¹	-
<i>Steatomys parvus</i>	nocturnal/terrestrial, solitary or pairs ¹	wide tolerance, grassland/ dry savanna species ^{13,14}	herbivorous ¹³	110-157 ¹	2-3 years ¹		seasonal ^{1,14}			-
<i>Steatomys pratensis</i>	nocturnal, terrestrial, solitary or in pairs ^{1,15}	sandy substrate, open grasslands & agricultural areas ^{1,15-17}	granivorous ^{1,17}	110-162 ¹		deep burrows in loose, sandy soils ¹⁵⁻¹⁷	seasonal, 2 peaks ^{16,17}		3 ¹	-
<i>Dendromus melanotis</i>	nocturnal ^{1,18}	pristine and degraded areas ¹⁸	insectivorous ¹	145-156 ¹	3 years ^{18,19}	uses burrows ¹	seasonal ¹	constructs nests ¹	2-4(7) ¹⁹	-
<i>Saccostomus campestris</i>	nocturnal, terrestrial, solitary ¹	catholic, open bushland ^{1,20}	omnivorous ¹	1-163 ¹		uses burrows ^{1,20}	seasonal ¹	20-21day gestation ²⁰	7.1 ²¹	spontaneous ovulators ¹

<i>Thallomys nigricauda</i>	nocturnal/ arboreal ¹	acacia woodland ¹	herbivorous ¹	127–330 ¹		needs (hollow) trees/bark to build nests ¹	seasonal ¹		3.6 ¹	-
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References

- Skinner, J.D.; Chimimba, C.T. *The Mammals of the Southern African Sub-Region*; Cambridge University Press: Cambridge, UK, 2005.
- Makundi, R.H.; Massawe, A.W.; Mulungu, L.S. Reproduction and population dynamics of *Mastomys natalensis* Smith, 1834 in an agricultural landscape in the Western Usambara Mountains, Tanzania. *Integr. Zool.* **2007**, *2*, 233–238, doi:10.1111/j.1749-4877.2007.00063.x.
- Leirs, H.; Verhagen, R.; Verheyen, W.; Mwanjabe, P.; Mbise, T. Forecasting rodent outbreaks in Africa: An ecological basis for *Mastomys* control in Tanzania. *J. Appl. Ecol.* **1996**, *33*, 937–943, doi:10.2307/2404675.
- Firquet, E.; Leirs, H.; Bronner, G. Germinating grasses and reproductive seasonality of *Mastomys* species (Rodentia, Muridae). *Mammalia* **1996**, *60*, 775–779.
- Leirs, H. *Population Ecology of Mastomys Natalensis (Smith, 1834)*; Implications for rodent control in Africa, Agricultural Edition; Belgian Administration for Development Cooperation: Brussels, Netherlands, 1994; Volume 35, pp. 1–268.
- Russo, I.R.; MacFadyen, D.; Taylor, P.; Child, M.F. A conservation assessment of *Micaelamys namaquensis*. In *The Red List of Mammals of South Africa, Swaziland and Lesotho*; Child, M.F., Roxburgh, L., Do Linh San, E., Raimondo, D., Davies-Mostert, H.T., Eds.; South African National Biodiversity Institute and Endangered Wildlife Trust: Cape Town, South Africa, 2016.
- Muteka, S.P.; Chimimba, C.T.; Bennett, N.C. Reproductive seasonality in *Aethomys namaquensis* (Rodentia: Muridae) from southern Africa. *J. Mammal.* **2006**, *87*, 67–74, doi:10.1644/05-MAMM-A-088R2.1.
- Odhambo, R.O.; Makundi, R.H.; Leirs, H.; Verhagen, R. Dietary selection in *Mastomys natalensis* (Rodentia: Muridae) in the maize agro-ecosystems of central and southwestern Tanzania. *Mammalia* **2008**, *72*, 169–177, doi:10.1515/MAMM.2008.007.
- Muteka, S.P.; Chimimba, C.T.; Bastos, A.D.S.; Bennet, N.C. Photoperiodic effects on the male gonads of the Namibian gerbil, *Gerbillus* cf. *leucogaster* from central Namibia. *Mamm. Biol.* **2020**, *100*, 165–171, doi:10.1007/s42991-020-00008-y.
- Neal, B.R.; Alibhai, S.K. Reproductive response of *Tatera leucogaster* (Rodentia) to supplemental food and 6-methoxybenzoxazolinone in Zimbabwe. *J. Zool.* **1991**, *223*, 469–473, doi:10.1111/j.1469-7998.1991.tb04777.x.
- Watson, J.; Britton-Davidian, J.; Monadjem, A.; Relton, C. A conservation assessment of *Mus indutus*. In *The Red List of Mammals of South Africa, Swaziland and Lesotho*; Child, M.F., Roxburgh, L., Do Linh San, E., Raimondo, D., Davies-Mostert, H.T., Eds.; South African National Biodiversity Institute and Endangered Wildlife Trust: Cape Town, South Africa, 2016.
- Linzey, A.; MacFadyen, D.; Russo, I.M.; Taylor, P.; Bryja, J. A conservation assessment of *Aethomys chrysophilus*. In *The Red List of Mammals of South Africa, Swaziland and Lesotho*; Child, M.F., Roxburgh, L., Do Linh San, E., Raimondo, D., Davies-Mostert, H.T., Eds.; South African National Biodiversity Institute and Endangered Wildlife Trust: Cape Town, South Africa, 2016.
- Schlitter, D.; Monadjem, A. *Steatomys parvus*. The IUCN Red List of Threatened Species 2017: e.T20721A22233188. <https://dx.doi.org/10.2305/IUCN.UK.2017-2.RLTS.T20721A22233188.en> Downloaded on 16 June 2020.

14. Jacobsen, N.H.G. *An Annotated Checklist of the Amphibians, Reptiles and Mammals of the Nylsvley Nature Reserve. South*; African National Scientific Programmes Report; Council for Scientific and Industrial Research: Pretoria, South Africa, 1977; pp. 1–65.
15. Perrin, M.R.; Richardson, E.J. Factors affecting the induction of torpor and body mass in the fat mouse *Steatomys pratensis*. *J. Therm. Biol.* **2004**, *29*, 133–139, doi:10.1016/j.jtherbio.2003.12.003.
16. Child, M.F.; Monadjem, A. *Steatomys pratensis* (errata version published in 2017). The IUCN Red List of Threatened Species 2016: e.T20722A115159593. <https://dx.doi.org/10.2305/IUCN.UK.2016-3.RLTS.T20722A22233313.en> Downloaded on 16 June 2020.
17. Schoeman, C.; Relton, C.; Harvey, J.; Monadjem, A. A conservation assessment of *Steatomys pratensis*. In *The Red List of Mammals of South Africa, Swaziland and Lesotho*; Child, M.F., Roxburgh, L., Do Linh San, E., Raimondo, D., Davies-Mostert, H.T., Eds.; South African National Biodiversity Institute and Endangered Wildlife Trust: Cape Town, South Africa, 2016.
18. Child, M.F.; Monadjem, A. *Dendromys melanotis*. The IUCN Red List of Threatened Species 2016: e.T6443A22235350. <https://dx.doi.org/10.2305/IUCN.UK.2016-3.RLTS.T6443A22235350.en> Downloaded on 16 June 2020.
19. Smithers, R.H.N. *A Checklist and Atlas of the Mammals of Botswana*; Trustees of the National Museum of Rhodesia: Salisbury, Rhodesia, 1971.
20. Coetzee, B.J.; van der Meulen, F.; Zwanziger, S.; Gonsalves, P.; Weisser, P.J. A phytosociological classification of the Nylsvley Nature Reserve. *Bothalia* **1976**, *1*, 137–160, doi:10.4102/abc.v12i1.1388.
21. Earl, Z. Postnatal development of *Saccostomus campestris*. *African Small Mammal Newsletter* **1978**, *2*, 10–12.