10.1071/BT18163_AC © CSIRO 2019

Supplementary Material: *Australian Journal of Botany*, 2019, 67, 67, 116–127.

Good times, bad times: Inter-annual reproductive output in a montane endemic succulent (*Aloe peglerae*; Asphodelaceae) driven by contrasting visitor responses of small mammals and birds

Stephanie L. Payne^{A,B}, Ed T. F. Witkowski^A and Craig T. Symes^A

^ASchool of Animal, Plant and Environmental Sciences, University of the Witwatersrand, Private Bag

3, Wits 2050, Johannesburg, South Africa.

^BCorresponding author. Email: stephanie@thepaynetribe.co.za

Supplementary tables

Table S1. Percentage (%) of visits to *Aloe peglerae* by each species in each exclusion treatments in two different flowering seasons (winter 2013, 14% of plants flowering; winter 2014, 7% flowering); NOCT_{TRT}, DIUR_{TRT} and ALL_{TRT} = Nocturnal Visitors, Diurnal Visitors, and All Visitors treatments respectively.

Bold values indicate visitors on the correct treatment (i.e. appropriate visitors); values in parentheses are visitation rates (number of visits 1000 plants⁻¹ hour⁻¹; mean \pm SE). Visitation rates were converted to 1000 plants hour⁻¹ to account for rates within the entire *A. peglerae* population. Visitation rates highlighted in grey are significantly different between years (Mann-Whitney U Test, *P* < 0.05). An animal was recorded as a visitor if it touched the plant (e.g. perched on leaves, etc.) or inflorescence in any way. No visitors were recorded inside the exclusion cages of the No Visitors treatment. Taxonomy for birds follows Hockey *et al.* (2005) and Chittenden *et al.* (2014). The 2013 columns of the table have been previously presented in Payne *et al.* (2016) and adjusted to suit this article. A Visitors that touched the plant and/or inflorescence and probed flowers; Visitors that touched the plant and/or inflorescence only; Visitors that also fed on flowers; Visitors not previously recorded by Arena *et al.* (2013).

	NOCT _{TRT}		DIU	R _{TRT}	ALLTRT		
	2013	2014	2013	2014	2013	2014	
	(2274 hrs; 11 plants)	(1168 hrs; 8 plants)	(1599 hrs; 12 plants)	(827 hrs; 7 plants)	(3318 hrs; 9 plants)	(1440 hrs; 6 plants)	
BIRDS:							
Cisticolidae							
Wailing Cisticola	0.8	0	0	0	0	0	
Cisticola lais ^{B,D}	(0.52 ± 0.52)	0	0	0	0	0	
Dicruridae							
Fork-tailed Drongo	1.5	0	0.4	0	0.7	0	
Dicrurus adsimilis ^{A,D}	(1.12 ± 1.12)	0	(0.56 ± 0.56)	0	(0.56 ± 0.56)	0	
Fringillidae							
Streaky-headed Seed-eater	3.8	2.7	7.9	0	4.1	3.2	
Crithagra gularis ^{A,C}	(1.79 ± 0.96)	(1.67 ± 1.67)	(12.59 ± 2.95)	0	(4.29 ± 1.29)	(3.96 ± 1.53)	
Lybiidae							
Crested Barbet	0	0	0.4	1.4	1.7	0	
Trachyphonus vaillantii ^{A,D}	0	0	(0.56 ± 0.56)	(0.93 ± 0.93)	(1.76 ± 1.18)	0	

	NOC	T _{TRT}	DIU	R _{TRT}	ALLTRT		
	2013	2014	2013	2014	2013	2014	
	(2274 hrs; 11 plants)	(1168 hrs; 8 plants)	(1599 hrs; 12 plants)	(827 hrs; 7 plants)	(3318 hrs; 9 plants)	(1440 hrs; 6 plants)	
Motacillidae							
Long-billed Pipit	0	0	0.4	0	0	0	
Anthus similis ^B	0	0	(0.54 ± 0.54)	0	0	0	
Muscicapidae							
Cape Rock-Thrush	16.0	42.7	80.5	80.0	68.2	52.4	
Monticola rupestris ^A	(9.30 ± 3.32)	(24.12 ± 9.12)	(134.02 ± 22.40)	(59.34 ± 15.77)	(60.15 ± 7.58)	(65.53 ± 12.68)	
Familiar Chat	0	1.3	1.1	1.4	1	3	
Cercomela familiaris ^B	0	(0.61 ± 0.61)	(1.87 ± 1.29)	(1.36 ± 1.36)	(0.66 ± 0.66)	(1.75 ± 1.11)	
Mountain Wheatear	0	0	0.4	0	0	0	
Oenanthe monticola ^{B,D}	0	0	(0.69 ± 0.69)	0	0	0	
Nectariniidae							
White-bellied Sunbird	0	0	0	1.4	0	0	
Cinnyris talatala ^{A,D}	0	0	0	(1.36 ± 1.36)	0	0	
Pycnonotidae							
Dark-capped Bulbul	4.6	20.0	7.1	15.7	13.7	20.0	
Pycnonotus tricolor ^A	(2.43 ± 1.06)	(11.25 ± 5.13)	(12.40 ± 4.20)	(12.19 ± 5.30)	(12.91 ± 5.12)	(21.81 ± 7.27)	
Sturnidae							
Red-winged Starling	0.8	0	0	0	0	0	
Onychognathus morio ^{A,D}	(0.52 ± 0.52)	0	0	0	0	0	
Zosteropidae							
Cape White-eye	1.5	0	0	0	0	0	
Zosterops virens ^A	(0.67 ± 0.67)	0	0	0	0	0	
MAMMALS:							
Cercopithecidae							
Chacma Baboon	0.7	0	0	0	1.0	1.1	

	NOC	CT _{TRT}	DIU	R _{TRT}	AL	L _{TRT}	
	2013	2014	2013	2014	2013	2014	
	(2274 hrs; 11 plants)	(1168 hrs; 8 plants)	(1599 hrs; 12 plants)	(827 hrs; 7 plants)	(3318 hrs; 9 plants)	(1440 hrs; 6 plants)	
Papio hamadryas ursinus ^{B,C,D}	(0.38 ± 0.38)	0	0	0	(1.18 ± 0.65)	(2.13 ± 1.38)	
Leporidae							
Smith's Red Rock Rabbit	0	1.3	0	0	0	0	
Pronolagus rupestris ^{B,D}	0	(1.06 ± 1.06)	0	0	0	0	
Macroscelididae							
Sengi	3.8	5.3	0	0	0	3.2	
Elephantulus Sp. ^{A,D}	(2.28 ± 2.28)	(3.66 ± 2.44)	0	0	0	(5.68 ± 4.36)	
Muridae							
Namaqua Rock Mouse	66.4	26.7	0	0	9.6	20.6	
Micaelamys namaquensis ^{A,C,D}	(40.17 ± 18.75)	(21.20 ± 13.22)	0	0	(7.83 ± 2.45)	(30.73 ± 1.95)	
REPTILES:							
Agamidae							
Ground Agama	0	0	1.9	0	0	0	
Agama aculeata ^{B,D}	0	0	(3.95 ± 2.21)	0	0	0	
Total Number of Species	10	7	9	5	8	7	
Total Number of Visitors	92, 39	25, 50	266, 0	70, 0	292, 0	189 , 0	
Mean Visitation Rate	59.17 ± 20.33	63.56 ± 21.11	167.18 ± 23.75	75.18 ± 19.19	89.33 ± 13.27	131.58 ± 22.70	

Note: In 2013, a total of 7191 camera hours (~225 hours plant⁻¹) yielded a total of 689 legitimate visits (visits where animals contacted the plant in any way, e.g. touching flowers, sitting/standing on leaves, etc.) across the ALL_{TRT}, DIUR_{TRT} and NOCT_{TRT}, while a total of 3395 camera trap hours (~161 hours plant⁻¹) yielded a total of 334 legitimate visits across the same three treatments in 2014. The number of camera hours/plant was less in 2014 because, i) the flowering/sampling period was shorter in 2014 (~33 days in 2013, ~29 days in 2014), because inflorescences were smaller with fewer flowers, and, ii) three full days of observations were lost due to the fire and logistical difficulties accessing the site, requiring the removal of cameras, resulting in only 26 days of sampling.

Table S2. Percentage (%) of visits to *Aloe peglerae* by the most common visitors in the bird and small mammal guilds, in each exclusion treatment in two different flowering seasons (winter 2013, 14% of plants flowering; winter 2014, 7% flowering; NOCT_{TRT}, DIUR_{TRT} and ALLVIS_{TRT} = Nocturnal Visitors, Diurnal Visitors and All Visitors treatments respectively.

Values in parentheses are visitation rates (number of visits 1000 plants⁻¹ hour⁻¹; mean \pm SE). Visitation rates were converted to 1000 plants hour⁻¹ to account for rates within the entire *A. peglerae* population. Bold values are significantly different between years (Mann-Whitney U-Test, P < 0.05). An animal was recorded as a visitor if it touched the plant (e.g. perched on leaves, etc.) or inflorescence in any way. No visitors were recorded inside the exclusion cages of the No Visitors treatment. Taxonomy for birds follows Hockey *et al.* (2005) and Chittenden *et al.* (2014). The 2013 columns of the table have been previously presented in Payne *et al.* (2016) and adjusted to suit this article.

	NOCTTRT				DIURTRT		ALLTRT		
	2013 (2274 hrs; 11 plants)	2014 (1168 hrs; 8 plants)	Test Statistics	2013 (1599 hrs; 12 plants)	2014 (827 hrs; 7 plants)	Test Statistics	2013 (3318 hrs; 9 plants)	2014 (1440 hrs; 6 plants)	Test Statistics
BIRDS:									
Fringillidae									
Streaky-headed Seed-eater	3.8	2.7	$U_{17} = 49.0$	7.9	0	$U_{17} = 73.5$	4.1	3.2	$U_{13} = 28.0$
Crithagra gularis	(1.79 ± 0.96)	(1.67 ± 1.67)	P = 0.60	(12.59 ± 2.95)	0	P = 0.005	(4.29 ± 1.29)	(3.96 ± 1.53)	P = 0.95
Muscicapidae									
Cape Rock-Thrush	16.0	42.7	$U_{17} = 29.0$	80.5	80.0	$U_{17} = 39.0$	68.2	52.4	$U_{13} = 20.0$
Monticola rupestris	(9.30 ± 3.32)	(24.12 ± 9.12)	P = 0.23	(134.02 ± 22.40)	(59.34 ± 15.77)	P = 0.38	(60.15 ± 7.58)	(65.53 ± 12.68)	P = 0.66
Pycnonotidae									
Dark-capped Bulbul	4.6	20.0	U_{17} = 30.0	7.1	15.7	$U_{17} = 43.0$	13.7	20.0	$U_{13} = 17.0$
Pycnonotus tricolor	(2.43 ± 1.06)	(11.25 ± 5.13)	P = 0.21	(12.40 ± 4.20)	(12.19 ± 5.30)	P = 0.97	(12.91 ± 5.12)	(21.81 ± 7.27)	P = 0.26
MAMMALS:									
Macroscelididae									
Sengi	3.8	5.3	$U_{17} = 38.0$	0	0	-	0	3.2	U_{13} = 18.0
Elephantulus Sp.	(2.28 ± 2.28)	(3.66 ± 2.44)	P = 0.48	0	0	-	0	(5.68 ± 4.36)	P = 0.09
Muridae									
Namaqua Rock Mouse	66.4	26.7	$U_{17} = 58.0$	0	0	-	9.6	20.6	$U_{I3} = 13.5$

Micaelamys namaquensis	(40.17 ± 18.75)	(21.20 ± 13.22)	P = 0.25	0	0	-	(7.83 ± 2.45)	(30.73 ± 1.95)	P = 0.13
Total Number of Visitors to Treatment	131	75		266	70		292	189	_
Mean Overall Treatment Visitation Rate	59.17 ± 20.33	63.56 ± 21.11		167.18 ± 23.75	75.18 ± 19.19		89.33 ± 13.27	131.58 ± 22.70	

		NOCTTRT			DIURTRT			ALLTRT	
	2013	2014	Test	2013	2014	Test	2013	2014	Test
	(2274 hrs;	(1168 hrs;	Statistics	(1599 hrs;	(827 hrs;	Statistics	(3318 hrs;	(1440 hrs;	Statistics
	11 plants)	8 plants)		12 plants)	7 plants)		9 plants)	6 plants)	
BIRDS:									
Fringillidae									
Streaky-headed Seed-eater	3.8	2.7	$U_{17} = 49.0$	7.9	0	$U_{17} = 73.5$	4.1	3.2	$U_{13} = 28.0$
Crithagra gularis	(1.79 ± 0.96)	(1.67 ± 1.67)	P = 0.60	(12.59 ± 2.95)	0	P = 0.005	(4.29 ± 1.29)	(3.96 ± 1.53)	P = 0.95
Muscicapidae									
Cape Rock-Thrush	16	42.7	$U_{17} = 29.0$	80.5	80	$U_{17} = 39.0$	68.2	52.4	$U_{13} = 20.0$
Monticola rupestris	(9.30 ± 3.32)	(24.12 ± 9.12)	P = 0.23	(134.02 ± 22.40)	(59.34 ± 15.77)	P = 0.38	(60.15 ± 7.58)	(65.53 ± 12.68)	P = 0.66
Pycnonotidae									
Dark-capped Bulbul	4.6	20	U_{17} = 30.0	7.1	15.7	$U_{17} = 43.0$	13.7	20	$U_{13} = 17.0$
Pycnonotus tricolor	(2.43 ± 1.06)	(11.25 ± 5.13)	P = 0.21	(12.40 ± 4.20)	(12.19 ± 5.30)	P = 0.97	(12.91 ± 5.12)	(21.81 ± 7.27)	P = 0.26
MAMMALS:									
Macroscelididae									
Sengi	3.8	5.3	$U_{17} = 38.0$	0	0	-	0	3.2	U_{13} = 18.0
Elephantulus Sp.	(2.28 ± 2.28)	(3.66 ± 2.44)	P = 0.48	0	0	-	0	(5.68 ± 4.36)	P = 0.09
Muridae									
Namaqua Rock Mouse	66.4	26.7	$U_{17} = 58.0$	0	0	=	9.6	20.6	$U_{13} = 13.5$
Micaelamys namaquensis	(40.17 ± 18.75)	(21.20 ± 13.22)	P = 0.25	0	0	-	(7.83 ± 2.45)	(30.73 ± 1.95)	P = 0.13
Total Number of Visitors to Treatment	92, 39	25, 50		266, 0	70, 0		292, 0	189 , 0	
Mean Overall Treatment	59.17 ±	63.56 ±		167.18 ±	75.18 ±		89.33 ±	131.58 ±	
Visitation Rate	20.33	21.11		23.75	19.19		13.27	22.70	

Table S3. Additional mammal species recorded by camera traps, on one or more occasions, during two consecutive flowering seasons (2013 and 2014) of *Aloe peglerae*.

Presence of the species in each flowering season is indicated with an "X". These species were recorded in the vicinity of the aloes, but did not interact with the aloes in any way, with the exception of one Smith's Red Rock Rabbit (*Pronolagus rupestris*), which sniffed one A. peglerae raceme in 2014, but no other contact was recorded.

	2013	2014
Bovidae		
Mountain Reedbuck Redunca fulvorufula	-	Х
Canidae		
Black-backed Jackal <i>Canis mesomelas</i> ^A	Χ	-
Felidae		
Caracal Caracal caracal ^A	-	Х
Herpestidae		
Slender Mongoose Galerella sanguinea A,B	Χ	-
Hystricidae		
Cape Porcupine Hystrix africaeaustralis	Χ	-
Leporidae		
Smith's Red Rock Rabbit <i>Pronolagus rupestris</i>	Х	Х
Viverridae		
Genet <i>Genetta</i> Sp. ^{A,C}	X	Х

^A Species that may be predators of small mammals such as mice and shrews/sengis.

^B Cape grey Mongoose (*Galerella pulverulenta*) has been recorded feeding on *Protea canaculilata* and *Protea recondita* nectar (Steenhuisen *et al.* 2015).

^C Large-spotted Genet (*Genetta tigrina*) has been recorded feeding on *Protea pendula* and *Protea scabra* nectar (Steenhuisen *et al.* 2015; Zoeller *et al.* 2016).

Table S4. Seed germination and viability (tetrazolium trial) data for *Aloe peglerae* plants in each selective exclusion experiment, for two consecutive years of different flowering proportions, where 2013 represents a "good" and 2014 a "poor" flowering year.

 $NOCT_{TRT}$ = Nocturnal Visitors treatment, $DIUR_{TRT}$ = Diurnal Visitors treatment and ALL_{TRT} = All Visitors treatment. No fruit (and therefore seed) was produced by plants in the No Visitors treatment. Germination trials took place during 19 October-30 November 2013, and 06 October-17 November 2014. All values are presented as mean \pm standard error, where possible

	NOC	Г _{ТRТ}	DIUR	TRT	ALI	-TRT
	2013	2014	2013	2014	2013	2014
No. of plants in trial	8	1	11	0	10	2
No. of seeds dish ⁻¹ in germination trial	46.8 ± 2.3	50	48.6 ± 0.8	0	50.0 ± 0.3	47.5 ± 2.5
No. of days until first seed germinated	1	5	3	0	3	5
No. of days until last seed germinated	18	14	18	0	23	17
Mean Germination Time (MGT; days)	7.3 ± 0.5	8.7	6.4 ± 0.2	0	6.5 ± 0.3	8.5
Cumulative germinated seeds (%)	89.5 ± 4.4	98	92.4 ± 2.1	0	97.2 ± 1.4	94
No. of dead seeds	1.9 ± 1.7	1	2.7 ± 1.1	0	0.3 ± 0.2	1
No. of seeds in tetrazolium trials	2.5 ± 1.0	0	0.9 ± 0.3	0	1.1 ± 0.5	2
No. of viable seeds after tetrazolium	0.3 ± 0.2	0	0.2 ± 0.1	0	0.3 ± 0.2	1
Viable seeds after germination & tetrazolium (%)	90.0 ± 4.1	98	93.0 ± 2.1	0	98.0 ± 1.3	96