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Supplementary material

Appendix 1.

Table A1. Three top-weighted models explaining interspecific variation in pant_{50} (T_{air} at which half the birds of a given species are expected to be engaged in panting behaviour) for generalized least squares (GLS) analyses. Global models included region, *prop_act* (logit transformed proportion of observations where a species was mobile between 35 – 40 °C), Log_{10} body mass ($\text{Log}_{10}M_b$), diet, foraging guild, and water source. Only variables identified as important during model selection are shown, and the influence of each is shown \pm standard error. Significance is shown: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

	Model		
	1	2	3
GLS			
<i>logit_prop_act</i>		-0.30 \pm 0.4	
diet (omn)	-0.66 \pm 0.98		-0.73 \pm 0.99
diet (plant)	2.42 \pm 1.50		2.37 \pm 1.51
water source (P)	3.4 \pm 1.31*	2.01 \pm 0.82*	3.33 \pm 1.32*
(Intercept)	36.67 \pm 1.38***	37.98 \pm 0.72***	36.69 \pm 1.38***
observations	59	59	59
AICc	287.5	288.8	289.4

Table A2. Three top-weighted models explaining interspecific variation in rest₅₀ (T_{air} at which half the birds of a given species are expected to be resting) for generalized least squares (GLS) analyses. Global models included region, Log₁₀ body mass (Log₁₀M_b), diet, foraging guild, and water source. Only variables identified as important during model selection are shown, and the influence of each is shown ± standard error. Significance is shown: *p < 0.05; **p < 0.01; ***p < 0.001.

	Model		
	1	2	3
	GLS		
region (SA)	-10.90 ± 3.33**	-10.31 ± 3.37**	-10.74 ± 3.36**
region (US)	-3.99 ± 3.76	-3.75 ± 3.76	-3.67 ± 3.80
Log ₁₀ M _b		-2.65 ± 2.51	
guild (on-ground)			2.52 ± 3.04
(Intercept)	37.71 ± 2.41 ***	41.77 ± 4.55 ***	35.94 ± 3.23 ***
observations	28	28	28
AICc	199.8	201.5	202.0

Table A3. Three top-weighted models explaining interspecific variation in *prop_act* (logit transformed proportion of observations where a species was mobile between 35 – 40 °C) for both generalized least squares (GLS), and phylogenetic generalized least squares (PGLS) analyses. Global models included region, Log₁₀ body mass (Log₁₀M_b), diet, foraging guild, and water source. Only variables identified as important during model selection are shown, and the influence of each is shown ± standard error. Significance is shown: *p < 0.05; **p < 0.01; ***p < 0.001.

	Model		
	1	2	3
GLS			
region (SA)	-0.27 ± 0.02	-0.27 ± 0.20	-0.27 ± 0.21
region (US)	-0.85 ± 0.28**	-0.83 ± 0.28**	-0.81 ± 0.29**
Log ₁₀ M _b	-0.84 ± 0.16***	-0.83 ± 0.16***	-0.83 ± 0.16***
guild (on-ground)	0.4 ± 0.17*	0.34 ± 0.18	0.29 ± 0.18
water source (P)		-0.28 ± 0.2	
diet (omn)			0.14 ± 0.24
diet (plant)			0.43 ± 0.23
(Intercept)	1.07 ± 0.29***	1.29 ± 0.33***	0.99 ± 0.3**
observations	109	109	109
AICc	289.84	289.76	290.22
PGLS			
Log ₁₀ M _b	-0.73 ± 0.29*	-0.62 ± 0.28*	-0.71 ± 0.29*
guild (on-ground)	0.37 ± 0.25		0.38 ± 0.25
water source (P)	-0.45 ± 0.27	-0.46 ± 0.27	
(Intercept)	0.91 ± 0.89	0.93 ± 0.9	0.62 ± 0.9
observations	109	109	109
AICc	294.3	294.4	294.9

Table A4. Three top-weighted models explaining interspecific variation in shade₅₀ (T_{air} at which half the birds of a given species are expected to be in the shade) for generalized least squares (GLS) analyses. Global models included region, logit transformed *prop_act* (logit transformed proportion of observations where a species was mobile between 35 – 40 °C), Log₁₀ body mass (Log₁₀M_b), diet, foraging guild, and water source. Only variables identified as important during model selection are shown, and the influence of each is shown ± standard error. Significance is shown: *p < 0.05; **p < 0.01; ***p < 0.001.

	Model		
	1	2	3
GLS			
<i>logit_prop_act</i>	-1.50 ± 0.68*	-1.70 ± 0.69*	-1.30 ± 0.78
Log ₁₀ M _b			0.77 ± 1.43
water source (P)		-1.92 ± 1.42	
(Intercept)	30.07 ± 0.66 ***	31.40 ± 1.19 ***	28.94 ± 2.18 ***
observations	52	52	52
AICc	307.7	308.2	309.8

Table A5. List of all species included in data analyses. Heat dissipation behaviour (HDB) indices (if they could be calculated) and organismal variables for each species are shown. HDB indices *pant*₅₀, *wing*₅₀, *rest*₅₀, and the *shade*₅₀ are the T_{air} at which half the observed birds of a particular species are expected to be panting, wing drooping, resting / inactive, and in shaded microsites, respectively (Smit et al. 2016). *Prop_act* is the logit-transformed proportion of observations where species were active between 35 – 40 °C for all species within each region. Organismal variables are the log-transformed body mass (LogM_b), foraging guild (On- or Off-ground), diet (animal or plant), and water source (rely on drinking = D, not reliant upon drinking = P). The number of observations made on each species (n) as well as sample size summaries for each index and variable are included for each region.

Region	Name	n	HDB Indices					Organismal variables				
			wing ₅₀ (°C)	pant ₅₀ (°C)	rest ₅₀ (°C)	shade ₅₀ (°C)	<i>prop_act</i>	logit_prop_act	LogM _b	foraging guild	diet	water source
US	Ash-throated flycatcher (<i>Myiarchus cinerascens</i>)	126	35.3	41.4	23.7	31.5	0	-1.7	1.5	Off	animal	P
US	Black-tailed gnatcatcher (<i>Polioptila melanura</i>)	609	37.4	42.6	49.6	27.9	0.6	0.2	0.7	Off	animal	P
US	Black-throated sparrow (<i>Amphispiza bilineata</i>)	81	38.4	43		30.9	0.1	-0.9	1.1	On	omn	P
US	Brown-crested flycatcher (<i>Myiarchus tyrannulus</i>)	40	35			29.2	0.1	-0.9	1.6	Off	animal	P
US	Cactus wren (<i>Campylorhynchus brunneicapillus</i>)	213	38.1	41.3		26.8	0.3	-0.3	1.6	On	animal	P
US	Crissal thrasher (<i>Toxostoma crissale</i>)	29	35.7	38.5	36.9		0.3	-0.4	1.8	On	animal	P

US	Curve-billed thrasher (<i>Toxostoma curvirostre</i>)	103	36.4	36.7	26.6	29	0.2	-0.6	1.9	On	animal	P
US	Gambel's quail (<i>Callipepla gambelii</i>)	127	51.4	43.7	32.6	29.7	0.3	-0.5	2.2	On	plant	D
US	Gila woodpecker (<i>Melanerpes uropygialis</i>)	98	37.2	33.3		29.6	0.2	-0.7	1.8	Off	omn	P
US	Gilded flicker (<i>Colaptes chrysoides</i>)	38	34.2	36.3		33.9	0	-2	2	On	animal	P
US	Greater roadrunner (<i>Geococcyx californianus</i>)	11	38		33.2		0	-2	2.5	On	omn	P
US	House finch (<i>Carpodacus mexicanus</i>)	11					0.2	-0.7	1.3	On	omn-	D
US	Ladder-backed woodpecker (<i>Picoides scalaris</i>)	10	32.7				0	-2	1.5	Off	animal	D
US	Loggerhead shrike (<i>Lanius ludovicianus</i>)	53	37	44.9		33.1	0.1	-1	1.7	Off	animal	P
US	Mourning dove (<i>Zenaida macroura</i>)	28	38.8				0	-2	2.1	On	plant	D
US	Verdin (<i>Auriparus flaviceps</i>)	596	38.3	38.5	33.4	29.5	0.4	-0.1	0.8	Off	animal	P
US	White-winged dove (<i>Zenaida asiatica</i>)	108	42.7	49.1		38	0	-2	2.2	Off	plant	D
US	American kestrel (<i>Falco sparverius</i>)	14				35.6	0	-2	2.1	Off	omn	P

US	Sample size summary		16	12	7	13	18	18	18	Off = 9; On = 9	animal = 10; omn = 5; plant = 3	D = 5; P = 13
AUS	Australian ringneck parrot (<i>Barnardius zonarius</i>)	35	31.8	26.1		29.2	0.2	-0.6	2.2	On	plant	D
AUS	Black-faced woodswallow (<i>Artamus cinereus</i>)	48	34.2	38.8			0.2	-0.5	1.5	Off	animal	P
AUS	Budgerigar (<i>Melopsittacus undulatus</i>)	4	39.2				0.3	-0.3	1.5	On	plant	D
AUS	Chestnut-rumped thornbill (<i>Acanthiza uropygialis</i>)	49	38.9	41.4		21.2	0.9	1.1	0.8	Off	animal	P
AUS	Cockatiel (<i>Nymphicus hollandicus</i>)	3				34.5	1	2	2	On	plant	D
AUS	Crested bellbird (<i>Oreoica gutturalis</i>)	37		37.4			0.3	-0.3	1.8	On	animal	P
AUS	Crested pigeon (<i>Ocyphaps lophotes</i>)	33			28.6	41.4	0.2	-0.6	2.3	On	plant	D
AUS	Diamond dove (<i>Geopelia cuneata</i>)	43			30.5		0.1	-0.8	1.5	On	plant	D
AUS	Galah (<i>Cacatua roseicapilla</i>)	28	29.3	42.8	30.3	34.3	0.1	-1	2.5	On	plant	D
AUS	Grey butcherbird (<i>Cracticus torquatus</i>)	14	36.5		33.4		0.1	-0.8	2	Off	animal	P
AUS	Grey shrike-thrush (<i>Colluricincla harmonica</i>)	18	38.2	39.3	37.5		0.5	-0.1	1.8	On	animal	P

AUS	Grey-crowned babbler (<i>Pomatostomus temporalis</i>)	20	35.1	40.2	39.7		0.8	0.6	1.8	On	animal	P
AUS	Hooded robin (<i>Melanodryas cucullata</i>)	6				39.2	0.2	-0.6	1.3	Off	animal	P
AUS	Masked woodswallow (<i>Artamus personatus</i>)	32	37.5	40.2		35.2	0.2	-0.7	1.6	Off	animal	P
AUS	Nankeen kestrel (<i>Falco cenchroides</i>)	8	32.4				0	-2	2.2	Off	animal	P
AUS	Pied butcherbird (<i>Cracticus nigrogularis</i>)	6		41.7			1	2	2.1	Off	animal	P
AUS	Red-capped robin (<i>Petroica goodenovii</i>)	12	36.8	39.6	32.8		0.1	-0.8	1	On	animal	P
AUS	Redthroat (<i>Pyrrholaemus brunneus</i>)	26		39.3			0.9	1.1	1.1	On	animal	P
AUS	Rufous whistler (<i>Pachycephala rufiventris</i>)	51	36.2				0.3	-0.3	1.4	Off	animal	P
AUS	Singing honeyeater (<i>Lichenostomus virescens</i>)	53	37.8	41.2		25.1	0.8	0.5	1.4	Off	plant	D
AUS	Slaty-backed thornbill (<i>Acanthiza robustirostris</i>)	39	38.7	40.2		26.4	0.9	0.9	0.8	Off	animal	P
AUS	Southern whiteface (<i>Aphelocephala leucopsis</i>)	23	34.3	39.8			0.7	0.4	1	On	animal	P
AUS	Spiny-cheeked honeyeater	26	38.2	38	40.3		0.6	0.2	1.7	Off	plant	D

	<i>(Acanthagenys rufogularis)</i>											
AUS	Splendid fairywren <i>(Malurus splendens)</i>	19	40.3	39.2	42.1		0.9	0.9	1	On	animal	P
AUS	Varied sittella <i>(Daphoenositta chrysoptera)</i>	4	35.3			32.3	0	-2	1.1	Off	animal	P
AUS	Variegated fairywren <i>(Malurus lamberti)</i>	41	38.2	39.6	41.7	24.8	0.9	1.1	1	On	animal	P
AUS	White-plumed honeyeater <i>(Lichenostomus penicillatus)</i>	30	37.7	39.2	38.5	43.8	0.5	0	1.3	Off	plant	D
AUS	White-winged fairywren <i>(Malurus leucopterus)</i>	10	34.3	37.4			0.7	0.3	1	On	animal	P
AUS	Willie wagtail <i>(Rhipidura leucophrys)</i>	50	36		40.8		0.6	0.1	1.3	On	animal	P
AUS	Zebra finch <i>(Taeniopygia guttata)</i>	64	41.2	37.1		30.9	0.5	0.1	1.1	On	plant	D
AUS	Sample size summary		23	20	12	13	30	30	30	Off = 13; On = 17	animal = 20; omn = 0; plant = 10	D = 10; P = 20 D
SA	Acacia Pied Barbet <i>(Tricholaema leucomelas)</i>	79	36.2	34.4		30.1	0.5	0.1	1.5	Off	omn	D

SA	African Hoopoe (<i>Upupa africana</i>)	10					0.4	-0.2	1.8	On	animal	P
SA	African Red-eyed Bulbul (<i>Pycnonotus nigricans</i>)	46	39.4	33.9			0.7	0.3	1.5	Off	omn	D
SA	Anteater Chat (<i>Myrmecocichla formicivora</i>)	546	40.6	45.7	6.7	54	0.1	-1.2	1.7	Off	animal	P
SA	Ashy Tit (<i>Parus cinerascens</i>)	148	42.1	39.5	38	20.7	0.5	0.1	1.3	Off	animal	P
SA	Black-chested Prinia (<i>Prinia flavicans</i>)	529	41.1	39.6		30.6	0.8	0.6	0.9	Off	animal	P
SA	Black-throated Canary (<i>Crithagra atrogularis</i>)	9					1	2	1.1	On	plant	D
SA	Bokmakierie (<i>Telophorus zeylonus</i>)	31	37.8				1	2	1.8	On	animal	P
SA	Brown-crowned Tchagra (<i>Tchagra australis</i>)	15					0.7	0.3	1.5	Off	animal	P
SA	Brubru (<i>Nilaus afer</i>)	25					0.4	-0.1	1.4	Off	animal	P
SA	Cape Glossy Starling (<i>Lamprotornis nitens</i>)	72	38.6	37.9		31.1	0.2	-0.7	1.9	On	omn	D
SA	Cape Sparrow (<i>Passer melanurus</i>)	27	36.7	36.8		30.9	0.7	0.3	1.5	On	plant	D
SA	Cape Turtle-Dove (<i>Streptopelia capicola</i>)	307	44.6	40.3	7.5	14.2	0.2	-0.7	2.1	On	plant	D
SA	Capped Wheatear (<i>Oenanthe pileata</i>)	6					0	-2	1.4	On	animal	P

SA	Cardinal Woodpecker (<i>Dendropicos fuscescens</i>)	6				0	-2	1.5	Off	animal	P	
SA	Chat Flycatcher (<i>Bradornis infuscatus</i>)	92	35.3			0.3	-0.5	1.6	Off	animal	P	
SA	Chestnut-vented Tit- Babbler (<i>Sylvia subcaerulea</i>)	295	39.5	40.3		21	0.8	0.7	1.2	Off	animal	P
SA	Common Fiscal (<i>Lanius collaris subcoronatus</i>)	155	38.4	41.3		35.7	0.2	-0.6	1.6	Off	animal	P
SA	Common Scimitarbill (<i>Rhinopomastus cyanomelas</i>)	84	37.6	36.5		24.8	0.7	0.4	1.5	On	animal	P
SA	Crimson-breasted Shrike (<i>Laniarius atrococcineus</i>)	90	38.1	38.4			0.4	-0.1	1.7	On	animal	P
SA	Crowned Lapwing (<i>Vanellus coronatus</i>)	101		39	26.5	28	0.2	-0.7	2.3	On	animal	P
SA	Diderick cuckoo (<i>Chrysococcyx cupreas</i>)	9					0.4	-0.2	1.6	Off	animal	P
SA	Dusky Sunbird (<i>Nectarinia fusca</i>)	53	37.2	37.4		34.2	1	2	1	Off	omn	P
SA	Eastern Clapper Lark (<i>Mirafra apiata</i>)	32					0.4	-0.2	1.5	On	omn	P
SA	Familiar Chat (<i>Cercomela familiaris</i>)	11					0	-2	1.3	Off	animal	P
SA	Fawn-coloured Lark (<i>Mirafra africanoides</i>)	489	38.2	46		37.5	0.3	-0.5	1.4	On	omn	P
SA	Fork-tailed Drongo (<i>Dicrurus adsimilis</i>)	207	39.2	42.6		29.5	0	-2	1.6	Off	animal	P

SA	Green-winged Pytilia (<i>Pytilia melba</i>)	7					1	2	1.2	On	plant	D
SA	Grey-backed Sparrowlark (<i>Eremopterix verticalis</i>)	18					0.9	0.9	1.2	On	plant	D
SA	Groundscraper Thrush (<i>Psophocichla litsitsirupa</i>)	15					0.2	-0.6	1.9	On	animal	P
SA	Jacobin Cuckoo (<i>Clamator jacobinus</i>)	11					0.3	-0.5	1.9	On	animal	P
SA	Kalahari Scrub-Robin (<i>Erythropygia paena</i>)	541	40.3	42.8		31.3	0.2	-0.5	1.3	On	animal	P
SA	Kori Bustard (<i>Ardeotis kori</i>)	18					0	-2	4	On	omn	P
SA	Lark-like Bunting (<i>Emberiza impetuanii</i>)	40			30.5		0.1	-0.8	1.2	On	plant	D
SA	Laughing Dove (<i>Streptopelia senegalensis</i>)	108	37.2	39.1	25.7	29	0.1	-1.2	2	On	plant	D
SA	Lesser Grey Shrike (<i>Lanius minor</i>)	119	37			35.9	0.1	-0.8	1.7	Off	animal	P
SA	Lilac-breasted Roller (<i>Coracias caudatus</i>)	36		40.4			0.1	-1.3	2	Off	animal	P
SA	Long-billed Crombec (<i>Sylvietta rufescens</i>)	11					0.8	0.6	1	Off	animal	P
SA	Marico Flycatcher (<i>Bradornis mariquensis</i>)	360	39.1	41.8	10.9	28.1	0.1	-0.9	1.4	Off	animal	P
SA	Namaqua Dove (<i>Oena capensis</i>)	172	44.5	46		34.5	0.4	-0.3	1.6	On	plant	D

SA	Namaqua Sandgrouse (<i>Pterocles namaqua</i>)	8					1	2	2.3	On	plant	D
SA	Northern Black Korhaan (<i>Eupodotis afraoides</i>)	43			29.8	33.4	0.1	-1	2.9	On	omn	P
SA	Pearl-spotted Owlet (<i>Glaucidium perlatum</i>)	5					0.3	-0.5	1.9	Off	animal	P
SA	Pririt Batis (<i>Batis pririt</i>)	64					0.5	0	1	Off	animal	P
SA	Pygmy Falcon (<i>Polihierax semitorquatus</i>)	53	38.3	39.1		36.2	0	-1.3	1.8	Off	animal	P
SA	Red-backed Shrike (<i>Lanius collurio</i>)	35	37.6				0.3	-0.4	1.5	Off	animal	P
SA	Red-crested Korhaan (<i>Eupodotis ruficrista</i>)	55			30	30.5	0.3	-0.5	2.8	On	omn	P
SA	Red-faced Mousebird (<i>Urocolius indicus</i>)	28				27.6	0.5	0	1.8	Off	plant	D
SA	Sabota Lark (<i>Mirafra sabota</i>)	31					0.7	0.3	1.4	On	omn	P
SA	Scaly-feathered Weaver (<i>Sporopipes squamifrons</i>)	611	39.3	41.4	29.3	30.2	0.3	-0.3	1	On	plant	P
SA	Shaft-tailed Whydah (<i>Vidua regia</i>)	5					0.3	-0.5	1.2	On	plant	D
SA	Sociable Weaver (<i>Philetairus socius</i>)	538	39.1	42.2	33.6	28.6	0.5	0	1.4	On	omn	P
SA	Southern Grey-headed Sparrow (<i>Passer diffusus</i>)	4					0	-2	1.4	On	plant	D

SA	Southern Masked-Weaver (<i>Ploceus velatus</i>)	74	42.3	37.9		33.4	0.6	0.2	1.3	On	omn	D
SA	Southern Pale Chanting Goshawk (<i>Melierax canorus</i>)	26	39.7				0	-2	2.9	Off	animal	P
SA	Southern Yellow-billed Hornbill (<i>Tockus leucomelas</i>)	99		36.8		27.2	0	-2	2.3	On	omn	P
SA	Spike-heeled Lark (<i>Chersomanes albofasciata</i>)	50	36	35.9		38.6	0.3	-0.4	1.4	On	omn	P
SA	Spotted Eagle-Owl (<i>Bubu africanus</i>)	6					0	-2	2.8	Off	animal	P
SA	Spotted Flycatcher (<i>Muscicapa striata</i>)	13					0.3	-0.3	1.2	Off	omn	P
SA	Spotted Thick-knee (<i>Burhinus capensis</i>)	5					0	-2	2.7	On	animal	D
SA	Swallow-tailed Bee-eater (<i>Merops hirundineus</i>)	67					0.1	-1.1	1.3	Off	animal	P
SA	Verreaux's Eagle-Owl (<i>Bubu lacteus</i>)	3					0	-2	3.4	Off	animal	P
SA	Violet-eared Waxbill (<i>Granatina granatina</i>)	14					0.8	0.5	1.1	On	plant	D
SA	Wattled Starling (<i>Creatophora cinerea</i>)	19	36.1	34.9			0.2	-0.6	1.9	On	omn	D
SA	White-backed Mousebird (<i>Colius colius</i>)	50	36.4	34.5	30.9	28.2	0.3	-0.4	1.6	Off	plant	D

SA	White-browed Sparrow-Weaver (<i>Plocepasser mahali</i>)	449	38.6	41.7	28.7	28.3	0.2	-0.6	1.7	On	omn	P
SA	Yellow Canary (<i>Serinus flaviventris</i>)	124		39.5		31	0.4	-0.2	1.2	On	plant	D
SA	Yellow-bellied Eremomela (<i>Eremomela icteropygialis</i>)	159	42.2	41.2		23.6	0.9	0.8	0.9	Off	animal	P
SA	Sample size summary		33	32	13	32	68	68	68	Off = 31; On = 37	animal = 35; omn = 17; plant = 16	D = 21; P = 47
