Table S1: Species for which we obtained behavioural data in the Kalahari Desert. Foraging location was grouped in arboreal (ARB) and terrestrial foragers (TER); diet grouped into omnivores (OMN), insectivores (INS), granivores (GRA), frugivores (FRU), nectarivores (NEC) and carnivores (CAR); and the dominant source of water into drinking (D) and non-drinking (ND). The proportion times each species spent panting/gular flutter (*prop\_pant*), wing-drooping (*prop\_wing*), mobile (*prop\_act*) and in full sun (*prop\_sun*) at 35 °C < air temperatures < 40 °C are shown for each species.

| **Species** | **Body mass (g)** | **Foraging location** | **Diet** | **Order** | **Family** | **Water source** | ***prop\_pant*** | ***prop\_wing*** | ***prop\_act*** | ***prop\_sun*** | **Number of observations** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Acacia Pied Barbet*, Tricholaema leucomelas* | 32 | ARB | OMN | Piciformes | Libidae | D | 0.62 | 0.48 | 0.54 | 0.26 | 105 |
| African Hoopoe*, Upupa africana* | 57 | TER | INS | Upupiformes | Upupidae | ND | 0.40 | 0.00 | 0.40 | 0.20 | 11 |
| African Red-eyed Bulbul*, Pycnonotus nigricans* | 30.8 | ARB | OMN | Passeriformes | Pycnonotidae | D | 0.70 | 0.30 | 0.67 | 0.45 | 61 |
| Anteating Chat*, Myrmecocichla formicivora* | 47.6 | ARB | INS | Passeriformes | Muscicapidae | ND | 0.08 | 0.20 | 0.06 | 0.82 | 714 |
| Ashy Tit*, Parus cinerascens* | 20.4 | ARB | INS | Passeriformes | Paridae | ND | 0.25 | 0.06 | 0.53 | 0.06 | 191 |
| Black-chested Prinia*, Prinia flavicans* | 8.9 | ARB | INS | Passeriformes | Cisticolidae | ND | 0.11 | 0.08 | 0.79 | 0.21 | 812 |
| Black-faced Waxbill*, Estrilda erythronotos* | 8.5 | TER | GRA | Passeriformes | Estrildidae | D |  |  |  |  | 5 |
| Black-throated Canary*, Crithagra atrogularis* | 12.7 | TER | GRA | Passeriformes | Fringilidae | D | 0.00 | 0.33 | 1.00 | 0.33 | 11 |
| Bokmakierie*, Telophorus zeylonus* | 65 | TER | INS | Passeriformes | Malaconotidae | ND | 0.00 | 0.40 | 1.00 | 0.29 | 53 |
| Brown-crowned Tchagra*, Tchagra australis* | 35 | TER | INS | Passeriformes | Malaconotidae | ND | 0.40 | 0.40 | 0.67 | 0.00 | 28 |
| Brubru*, Nilaus afer* | 24 | ARB | INS | Passeriformes | Malaconotidae | ND | 0.00 | 0.13 | 0.43 | 0.13 | 30 |
| Burchell's Sandgrouse*, Pterocles burchelli* | 250 | TER | GRA | Pterocliformes | Pteroclid | D |  |  |  |  | 20 |
| Cape Glossy Starling*, Lamprotornis australis* | 82.5 | TER | OMN | Passeriformes | Sturnidae | D | 0.41 | 0.38 | 0.17 | 0.37 | 95 |
| Cape Penduline-Tit, *Anthoscopus minutus* | 7 | ARB | INS | Passeriformes | Paridae | ND |  |  |  |  | 4 |
| Cape Sparrow*, Passer melanurus* | 29.5 | TER | GRA | Passeriformes | Passeridae | D | 0.46 | 0.46 | 0.67 | 0.08 | 39 |
| Cape Turtle-Dove*, Streptopelia capicola* | 130.3 | TER | GRA | Columbiformes | Columbidae | D | 0.17 | 0.14 | 0.17 | 0.12 | 379 |
| Capped Wheatear, *Oenanthe pileata* | 25 | TER | INS | Passeriformes | Muscicapidae | ND |  |  |  |  | 6 |
| Cardinal Woodpecker*, Dendropicus fuscescens* | 30 | ARB | INS | Piciformes | Picidae | ND |  |  |  |  | 6 |
| Chat Flycatcher*, Bradornis infuscatus* | 37 | ARB | INS | Passeriformes | Muscicapidae | ND | 0.05 | 0.59 | 0.25 | 0.73 | 112 |
| Chestnut-vented Tit-Babbler*, Parisoma subcaeruelum* | 15.7 | ARB | INS | Passeriformes | Sylviidea | ND | 0.16 | 0.17 | 0.84 | 0.03 | 436 |
| Common Fiscal*, Lanius collaris* | 40.8 | ARB | INS | Passeriformes | Laniidae | ND | 0.19 | 0.31 | 0.20 | 0.57 | 213 |
| Common Ostrich*, Struthio camelus* | 68700 | TER | GRA | Struthioniformes | Struthionidae | D | 0.73 | 0.07 | 0.53 | 0.80 | 80 |
| Common Scimitarbill*, Rhinopomastus cyanomelas* | 32.5 | ARB | INS | Upupiformes | Rhinopomastodae | ND | 0.45 | 0.27 | 0.71 | 0.24 | 100 |
| Crimson-breasted Shrike*, Laniarius atrococcineus* | 45 | TER | INS | Passeriformes | Malaconotidae | ND | 0.27 | 0.27 | 0.45 | 0.10 | 106 |
| Crowned Lapwing*, Vanellus coronatus* | 195 | TER | INS | Charadriiformes | Charadrid | ND | 0.14 | 0.00 | 0.17 | 0.10 | 120 |
| Diderick cuckoo*, Chrysococcyx caprius* | 36.6 | ARB | INS | Cuculiformes | Cuculidea | ND | 0.60 | 0.80 | 0.40 | 0.20 | 12 |
| Dusky Sunbird*, Cinnyris fuscus* | 9.5 | ARB | OMN | Passeriformes | Nectariniidae | ND | 0.40 | 0.40 | 1.00 | 0.17 | 93 |
| Eastern Clapper Lark*, Mirafra fasciolata* | 30 | TER | OMN | Passeriformes | Auladidae | ND | 0.00 | 0.14 | 0.40 | 0.60 | 81 |
| Familiar Chat*, Cercomela familiaris* | 22 | ARB | INS | Passeriformes | Muscicapidae | ND | 0.00 | 0.00 | 0.00 | 0.00 | 13 |
| Fawn-coloured Lark, *Calendulauda africanoides* | 23.3 | TER | OMN | Passeriformes | Auladidae | ND | 0.14 | 0.40 | 0.26 | 0.54 | 978 |
| Fork-tailed Drongo*, Dicrurus adsimilis* | 43.8 | ARB | INS | Passeriformes | Dicruridae | ND | 0.14 | 0.14 | 0.00 | 0.18 | 229 |
| Golden-tailed Woodpecker*, Campethera abingoni* | 70 | ARB | INS | Piciformes | Picidae | ND |  |  |  |  | 6 |
| Green-winged Pytilia*, Pytilia melba* | 15 | TER | GRA | Passeriformes | Estrildidae | D |  |  |  |  | 7 |
| Grey-backed Sparrowlark*, Eremopterix verticalis* | 17 | TER | GRA | Passeriformes | Auladidae | D | 0.00 | 0.63 | 0.89 | 0.11 | 23 |
| Groundscraper Thrush*, Psophocichla litsitsirupa* | 76.1 | TER | INS | Passeriformes | Muscicapidae | ND | 0.20 | 0.10 | 0.20 | 0.00 | 15 |
| Jacobin Cuckoo*, Oxylophus jacobinus* | 83 | ARB | INS | Cuculiformes | Cuculidea | ND | 0.50 | 0.50 | 0.25 | 0.00 | 14 |
| Kalahari Scrub-Robin*, Erythropygia paeana* | 19.7 | TER | INS | Passeriformes | Muscicapidae | ND | 0.08 | 0.20 | 0.25 | 0.38 | 827 |
| Kori Bustard*, Ardeotis kori* | 9050 | TER | OMN | Gruiformes | Otidea | ND | 0.00 | 0.00 | 0.00 | 0.00 | 21 |
| Lark-like Bunting*, Emberiza impetuani* | 15 | TER | GRA | Passeriformes | Fringilidae | D | 0.00 | 0.43 | 0.14 | 0.00 | 84 |
| Laughing Dove*, Streptopelia senegalensis* | 98.8 | TER | GRA | Columbiformes | Columbidae | D | 0.12 | 0.42 | 0.06 | 0.11 | 163 |
| Lesser Grey Shrike*, Lanius minor* | 46 | ARB | INS | Passeriformes | Laniidae | ND | 0.03 | 0.43 | 0.15 | 0.48 | 209 |
| Lilac-breasted Roller*, Coracius caudatus* | 107.5 | ARB | INS | Coraciiformes | Coracid | ND | 0.12 | 0.00 | 0.05 | 0.55 | 51 |
| Long-billed Crombec*, Sylvietta rufescens* | 11.1 | ARB | INS | Passeriformes | Sylviidea | ND | 0.17 | 0.17 | 0.80 | 0.00 | 14 |
| Ludwig's Bustard*, Neotis ludwigii* | 4000 | TER | OMN | Gruiformes | Otidea | ND |  |  |  |  | 2 |
| Marico Flycatcher*, Bradornis marquensis* | 26.2 | ARB | INS | Passeriformes | Muscicapidae | ND | 0.10 | 0.26 | 0.11 | 0.20 | 417 |
| Namaqua Dove*, Onea capensis* | 39.9 | TER | GRA | Columbiformes | Columbidae | D | 0.02 | 0.17 | 0.35 | 0.44 | 254 |
| Namaqua Sandgrouse*, Pterocles namaqua* | 180.5 | TER | GRA | Pterocliformes | Pteroclid | D | 0.00 | 0.00 | 1.00 | 0.33 | 28 |
| Northern Black Korhaan*, Eupodotis afroides* | 739 | TER | OMN | Gruiformes | Otidea | ND | 0.09 | 0.00 | 0.09 | 0.08 | 68 |
| Pearl-spotted Owlet*, Glaucidium perlatum* | 75 | ARB | CAR | Strigiformes | Strigidea | ND |  |  |  |  | 6 |
| Pririt Batis*, Batis pririt* | 9.3 | ARB | INS | Passeriformes | Malaconotidae | ND | 0.04 | 0.11 | 0.48 | 0.11 | 82 |
| Pygmy Falcon*, Polinierax semitorquatus* | 60.5 | ARB | CAR | Falconiformes | Falconidea | ND | 0.22 | 0.26 | 0.04 | 0.42 | 61 |
| Red-backed Shrike*, Lanius collurio* | 28.9 | ARB | INS | Passeriformes | Laniidae | ND | 0.14 | 0.32 | 0.26 | 0.27 | 43 |
| Red-crested Korhaan*, Lophotis ruficrista* | 674.5 | TER | OMN | Gruiformes | Otidea | ND | 0.00 | 0.00 | 0.25 | 0.19 | 119 |
| Red-faced Mousebird*, Urocolias indicus* | 56.5 | ARB | FRU | Coliiformes | Coliidid | D | 0.57 | 0.43 | 0.50 | 0.00 | 33 |
| Red-headed Finch*, Amadina erythrocephalus* | 11.5 | TER | GRA | Passeriformes | Estrildidae | D |  |  |  |  | 18 |
| Rufous-eared Warbler*, Malcorus pectoralis* | 10.2 | TER | INS | Passeriformes | Sylviidea | ND | 0.00 | 0.00 |  | 0.00 | 10 |
| Sabota Lark*, Calendulauda sabota* | 25 | TER | OMN | Passeriformes | Auladidae | ND | 0.14 | 0.29 | 0.67 | 0.19 | 34 |
| Scaly-feathered Finch*, Sporopipes squamifrons* | 11.1 | TER | GRA | Passeriformes | Ploceidae | ND | 0.06 | 0.19 | 0.33 | 0.22 | 944 |
| Secretarybird, *Sagittarius serpentarius* | 3610 | TER | CAR | Accipitiriformes | Accipitar | D |  |  |  |  | 2 |
| Shaft-tailed Whydah*, Vidua regia* | 14.3 | TER | GRA | Passeriformes | Ploceidae | D |  |  |  |  | 5 |
| Sociable Weaver*, Philetairus socius* | 27.4 | TER | OMN | Passeriformes | Ploceidae | ND | 0.19 | 0.36 | 0.48 | 0.18 | 730 |
| Southern Grey-headed Sparrow*, Passer diffuses* | 24.7 | TER | GRA | Passeriformes | Passeridae | D |  |  |  |  | 4 |
| Southern Masked-Weaver*, Ploceus velatus* | 20.6 | TER | OMN | Passeriformes | Ploceidae | D | 0.42 | 0.21 | 0.63 | 0.35 | 128 |
| Southern Pale Chanting Goshawk*, Melierax canorus* | 822 | ARB | CAR | Accipitiriformes | Accipitar | ND | 0.00 | 0.10 | 0.00 | 0.50 | 31 |
| Southern Yellow-billed Hornbill*, Tockus leucomelas* | 189.5 | TER | OMN | Coraciiformes | Bucerat | ND | 0.43 | 0.09 | 0.00 | 0.22 | 111 |
| Spike-heeled Lark*, Chersomanes albofusciata* | 25.3 | TER | OMN | Passeriformes | Auladidae | ND | 0.57 | 0.50 | 0.29 | 0.55 | 124 |
| Spotted Eagle-Owl*, Bubo africanus* | 600 | ARB | CAR | Strigiformes | Strigidea | ND |  |  |  |  | 7 |
| Spotted Flycatcher*, Muscicapa caerulescens* | 15 | ARB | OMN | Passeriformes | Muscicapidae | ND | 0.00 | 0.67 | 0.33 | 0.00 | 13 |
| Spotted Thick-knee*, Burhinus capensis* | 472.2 | TER | INS | Charadriiformes | Charadrid | D |  |  |  |  | 7 |
| Swallow-tailed bee-eater*, Merops hirundineus* | 20 | ARB | INS | Coraciiformes | Meropidae | ND | 0.03 | 0.07 | 0.07 | 0.34 | 77 |
| Verreaux's Eagle-Owl*, Bubo lacteus* | 2500 | ARB | CAR | Strigiformes | Strigidea | ND |  |  |  |  | 4 |
| Violet-eared Waxbill*, Uraeginthus granatinus* | 11.8 | TER | GRA | Passeriformes | Estrildidae | D | 0.00 | 0.00 | 0.75 | 0.00 | 20 |
| Wattled Starling*, Creatophora cinerea* | 73 | TER | OMN | Passeriformes | Sturnidae | D | 0.80 | 0.60 | 0.20 | 0.40 | 32 |
| White-backed Mousebird*, Colius colius* | 40 | ARB | FRU | Coliiformes | Coliidid | D | 0.74 | 0.47 | 0.28 | 0.10 | 79 |
| White-browed Sparrow-Weaver*, Plocepasser mahali* | 42.7 | TER | OMN | Passeriformes | Ploceidae | ND | 0.22 | 0.39 | 0.21 | 0.19 | 615 |
| Yellow Canary*, Crithagra flaviventris* | 17.5 | ARB | GRA | Passeriformes | Fringilidae | D | 0.13 | 0.04 | 0.38 | 0.21 | 213 |
| Yellow-bellied Eremomela*, Eremomela icteropygialis* | 7.9 | ARB | INS | Passeriformes | Sylviidea | ND | 0.08 | 0.06 | 0.87 | 0.27 | 212 |

**Table S2**: Coefficients (± standard error) of the logistic relationships of wing drooping, panting/gular flutter, shade-seeking, activity, as a result of air temperature in bird species observed in the Kalahari Desert. The median air temperature value where behaviour responses occurred in 50% of cases was calculated for each species when the beta estimate was significant at the 95% confidence level, or approached significance at the 90% confidence level.

| Species | Independent | Beta | Intercept | Median value | N |
| --- | --- | --- | --- | --- | --- |
| Acacia Pied Barbet*Tricholaema leucomelas* | *Wing-drooping* | 0.506\*\*±0.161 | -18.311\*\*±5.686 | 36.2 | 60 |
| *Panting* | 0.310\*\*±0.113 | -10.672\*\*±3.893 | 34.4 | 60 |
| *Shade-seeking* | -0.136˙±0.08 | 4.092±2.706 | 30.1 | 63 |
| *Resting* | -0.149±0.092 | 5.473˙±3.152 |  | 60 |
| African Red-eyed Bulbul*Pycnonotus nigricans* | *Wing-drooping* | 0.286˙±0.156 | -11.262\*±5.344 | 39.4 | 56 |
| *Panting* | 0.604\*\*±0.184 | -20.468\*\*±6.155 | 33.9 | 56 |
| *Shade-seeking* | -0.078±0.087 | 2.178±2.856 |  | 61 |
| *Resting* | 0.086±0.176 | -2.746±6.023 |  | 33 |
| Anteating Chat*Myrmecocichla formicivora* | *Wing-drooping* | 0.303\*\*±0.049 | -12.296\*\*±1.689 | 40.6 | 693 |
| *Panting* | 0.229\*\*±0.061 | -10.459\*\*±2.081 | 45.7 | 693 |
| *Shade-seeking* | -0.088\*±0.036 | 4.751\*\*±1.171 | 54.0 | 714 |
| *Resting* | -0.086˙±0.047 | 0.578±1.538 | 6.7 | 395 |
| Ashy Tit*Parus cinerascens* | *Wing-drooping* | 0.468\*\*±0.162 | -19.724\*\*±5.826 | 42.1 | 183 |
| *Panting* | 0.471\*±0.202 | -18.582\*±7.156 | 39.5 | 183 |
| *Shade-seeking* | -0.147\*\*±0.055 | 3.047˙±1.687 | 20.7 | 191 |
| *Resting* | -0.127\*±0.057 | 4.831\*±1.874 | 38.0 | 137 |
| Black-chested Prinia*Prinia flavicans* | *Wing-drooping* | 0.511\*\*±0.113 | -21.012\*\*±4.025 | 41.1 | 723 |
| *Panting* | 0.672\*\*±0.098 | -26.587\*\*±3.518 | 39.6 | 723 |
| *Shade-seeking* | -0.187\*\*±0.023 | 5.730\*\*±0.721 | 30.6 | 811 |
| *Resting* | -0.006±0.037 | 1.494±1.233 |  | 340 |
| Bokmakierie*Telophorus zeylonus* | *Wing-drooping* | 0.780\*\*±0.225 | -29.490\*\*±8.199 | 37.8 | 36 |
| *Panting* | -0.059±0.191 | -0.482±6.156 |  | 36 |
| *Shade-seeking* | -0.029±0.097 | 0.701±3.156 |  | 48 |
| *Resting* | 0.098±0.123 | -2.548±4.022 |  | 29 |
| Cape Glossy Starling*Lamprotornis australis* | *Wing-drooping* | 0.403\*\*±0.129 | -15.536\*\*±4.575 | 38.6 | 92 |
| *Panting* | 0.337\*\*±0.102 | -12.761\*\*±3.566 | 37.9 | 92 |
| *Shade-seeking* | -0.103˙±0.053 | 3.206˙±1.716 | 31.1 | 95 |
| *Resting* | -0.033±0.06 | -0.156±1.964 |  | 75 |
| Cape Sparrow*Passer melanurus* | *Wing-drooping* | 0.296\*±0.12 | -10.863\*±4.09 | 36.7 | 38 |
| *Panting* | 0.233\*±0.108 | -8.582\*±3.612 | 36.8 | 38 |
| *Shade-seeking* | -0.277\*±0.106 | 8.552\*±3.344 | 30.9 | 39 |
| *Resting* | -0.088±0.106 | 3.807±3.432 |  | 26 |
| Cape Turtle-Dove*Streptopelia capicola* | *Wing-drooping* | 0.227\*\*±0.071 | -10.133\*\*±2.468 | 44.6 | 340 |
| *Panting* | 0.455\*\*±0.103 | -18.357\*\*±3.7 | 40.3 | 340 |
| *Shade-seeking* | -0.105\*\*±0.037 | 1.489±1.164 | 14.2 | 377 |
| *Resting* | -0.061˙±0.035 | 0.46±1.147 | 7.5 | 327 |
| Chat Flycatcher*Bradornis infuscatus* | *Wing-drooping* | 0.636\*\*±0.116 | -22.457\*\*±3.985 | 35.3 | 108 |
| *Panting* | 0.156±0.194 | -8.699±6.562 |  | 108 |
| *Shade-seeking* | -0.069±0.069 | 3.415±2.255 |  | 112 |
| *Resting* | 0.103±0.102 | -4.568±3.39 |  | 60 |
| Chestnut-vented Tit-Babbler*Parisoma subcaeruelum* | *Wing-drooping* | 0.498\*\*±0.094 | -19.679\*\*±3.332 | 39.5 | 378 |
| *Panting* | 0.464\*\*±0.116 | -18.697\*\*±4.103 | 40.3 | 378 |
| *Shade-seeking* | -0.173\*\*±0.038 | 3.639\*\*±1.163 | 21.0 | 435 |
| *Resting* | 0.019±0.061 | 1.559±2.006 |  | 224 |
| Common Ostrich*Struthio camelus* | *Wing-drooping* | 0.082±0.157 | -5.483±5.14 |  | 73 |
| *Panting* | 0.402\*\*±0.101 | -12.575\*\*±3.249 | 31.3 | 73 |
| *Shade-seeking* | -0.187±0.128 | 8.122˙±4.286 |  | 78 |
| *Resting* | 0.053±0.066 | -1.329±2.103 |  | 75 |
| Common Fiscal*Lanius collaris* | *Wing-drooping* | 0.481\*\*±0.101 | -18.490\*\*±3.529 | 38.4 | 203 |
| *Panting* | 0.318\*\*±0.101 | -13.129\*\*±3.482 | 41.3 | 203 |
| *Shade-seeking* | -0.277\*\*±0.057 | 9.900\*\*±1.879 | 35.7 | 213 |
| *Resting* | -0.036±0.061 | -0.2±1.981 |  | 112 |
| Common Scimitarbill*Rhinopomastus cyanomelas* | *Wing-drooping* | 0.830\*\*±0.198 | -31.213\*\*±7.149 | 37.6 | 92 |
| *Panting* | 0.556\*\*±0.136 | -20.289\*\*±4.743 | 36.5 | 92 |
| *Shade-seeking* | -0.128\*±0.063 | 3.177±2.005 | 24.8 | 98 |
| *Resting* | 0.024±0.069 | 0.174±2.241 |  | 82 |
| Crimson-breasted Shrike*Laniarius atrococcineus* | *Wing-drooping* | 0.554\*\*±0.163 | -21.124\*\*±5.776 | 38.1 | 100 |
| *Panting* | 0.480\*\*±0.159 | -18.429\*\*±5.587 | 38.4 | 100 |
| *Shade-seeking* | -0.028±0.084 | -1.01±2.757 |  | 102 |
| *Resting* | -0.079±0.062 | 2.902±2.049 |  | 101 |
| Crowned Lapwing*Vanellus coronatus* | *Wing-drooping* | 0±0.021 | -26.566\*\*±0.69 |  | 115 |
| *Panting* | 0.938\*\*±0.239 | -36.588\*\*±8.862 | 39.0 | 115 |
| *Shade-seeking* | -0.291\*\*±0.064 | 8.135\*\*±1.997 | 28.0 | 119 |
| *Resting* | -0.252\*\*±0.061 | 6.670\*\*±1.881 | 26.5 | 113 |
| Dusky Sunbird*Cinnyris fuscus* | *Wing-drooping* | 0.834\*\*±0.17 | -31.023\*\*±5.934 | 37.2 | 91 |
| *Panting* | 0.638\*\*±0.236 | -23.857\*\*±8.076 | 37.4 | 91 |
| *Shade-seeking* | -0.111±0.07 | 3.795˙±2.152 |  | 93 |
| *Resting* | 0.056±0.121 | -0.877±3.856 |  | 35 |
| Fawn-coloured Lark*Calendulauda africanoides* | *Wing-drooping* | 0.267\*\*±0.034 | -10.207\*\*±1.134 | 38.2 | 743 |
| *Panting* | 0.191\*\*±0.047 | -8.789\*\*±1.574 | 46.0 | 743 |
| *Shade-seeking* | -0.150\*\*±0.023 | 5.629\*\*±0.738 | 37.5 | 977 |
| *Resting* | -0.053±0.035 | 0.703±1.151 |  | 318 |
| Fork-tailed Drongo*Dicrurus adsimilis* | *Wing-drooping* | 0.798\*\*±0.161 | -31.243\*\*±5.946 | 39.2 | 229 |
| *Panting* | 0.315\*\*±0.114 | -13.421\*\*±4.031 | 42.6 | 229 |
| *Shade-seeking* | -0.219\*\*±0.044 | 6.455\*\*±1.427 | 29.5 | 229 |
| *Resting* | -0.238±0.161 | 3.072±4.76 |  | 228 |
| Kalahari Scrub-Robin*Erythropygia paeana* | *Wing-drooping* | 0.332\*\*±0.048 | -13.389\*\*±1.65 | 40.3 | 732 |
| *Panting* | 0.360\*\*±0.078 | -15.421\*\*±2.721 | 42.8 | 732 |
| *Shade-seeking* | -0.127\*\*±0.022 | 3.979\*\*±0.695 | 31.3 | 827 |
| *Resting* | -0.052±0.034 | 0.881±1.115 |  | 407 |
| Lark-like Bunting*Emberiza impetuani* | *Wing-drooping* | 0.436±0.262 | -16.784\*±9.006 |  | 63 |
| *Panting* | 0.222±0.33 | -11.422±11.164 |  | 63 |
| *Shade-seeking* | -0.327\*\*±0.104 | 10.111\*\*±3.343 | 30.9 | 84 |
| *Resting* | -0.449\*±0.173 | 13.694\*±5.498 | 30.5 | 59 |
| Laughing Dove*Streptopelia senegalensis* | *Wing-drooping* | 0.339\*\*±0.086 | -12.598\*\*±2.931 | 37.2 | 133 |
| *Panting* | 0.944\*\*±0.241 | -36.951\*\*±8.907 | 39.1 | 133 |
| *Shade-seeking* | -0.264\*\*±0.061 | 7.656\*\*±1.934 | 29.0 | 162 |
| *Resting* | -0.244\*\*±0.079 | 6.262\*±2.535 | 25.7 | 109 |
| Lesser Grey Shrike*Lanius minor* | *Wing-drooping* | 0.641\*\*±0.146 | -23.728\*\*±5.095 | 37.0 | 196 |
| *Panting* | 0.223±0.137 | -10.722\*±4.588 |  | 196 |
| *Shade-seeking* | -0.125\*±0.05 | 4.482\*\*±1.602 | 35.9 | 209 |
| *Resting* | -0.104±0.119 | 1.64±3.935 | 15.8 | 99 |
| Lilac-breasted Roller*Coracius caudatus* | *Wing-drooping* | 0±0.04 | -26.566\*\*±1.328 |  | 45 |
| *Panting* | 0.508˙±0.269 | -20.528\*±9.872 | 40.4 | 45 |
| *Shade-seeking* | -0.155±0.098 | 6.080\*±3.339 |  | 51 |
| *Resting* | 0.17±0.233 | -8.983±8.145 |  | 51 |
| Marico Flycatcher*Bradornis marquensis* | *Wing-drooping* | 0.430\*\*±0.07 | -16.810\*\*±2.473 | 39.1 | 415 |
| *Panting* | 0.443\*\*±0.121 | -18.517\*\*±4.319 | 41.8 | 415 |
| *Shade-seeking* | -0.167\*\*±0.033 | 4.696\*\*±1.045 | 28.1 | 417 |
| *Resting* | -0.082˙±0.042 | 0.897±1.359 | 10.9 | 358 |
| Namaqua Dove*Onea capensis* | *Wing-drooping* | 0.173\*±0.071 | -7.703\*\*±2.444 | 44.5 | 201 |
| *Panting* | 0.361˙±0.21 | -16.617\*±7.511 | 46.0 | 201 |
| *Shade-seeking* | -0.142\*\*±0.044 | 4.906\*\*±1.444 | 34.5 | 253 |
| *Resting* | -0.042±0.058 | 0.568±1.958 |  | 176 |
| Northern Black Korhaan*Eupodotis afroides* | *Wing-drooping* | 0±0.037 | -26.566\*\*±1.207 |  | 50 |
| *Panting* | 0.294±0.273 | -13.105±9.544 |  | 50 |
| *Shade-seeking* | -0.681\*\*±0.186 | 22.717\*\*±6.228 | 33.4 | 59 |
| *Resting* | -0.235\*±0.091 | 7.002\*±2.914 | 29.8 | 51 |
| Pririt Batis*Batis pririt* | *Wing-drooping* | 0.422\*±0.186 | -17.184\*±6.611 | 40.7 | 79 |
| *Panting* | 0.28±0.354 | -13.868±12.475 |  | 79 |
| *Shade-seeking* | -0.198\*±0.077 | 5.106\*±2.433 | 25.8 | 82 |
| *Resting* | -0.149±0.106 | 5.637±3.643 |  | 50 |
| Pygmy Falcon*Polinierax semitorquatus* | *Wing-drooping* | 0.802\*\*±0.292 | -30.728\*\*±10.818 | 38.3 | 60 |
| *Panting* | 0.724\*\*±0.259 | -28.328\*\*±9.619 | 39.1 | 60 |
| *Shade-seeking* | -0.334\*\*±0.115 | 12.083\*\*±4.008 | 36.2 | 61 |
| *Resting* | 0.229±0.372 | -11.942±13.418 |  | 51 |
| Red-backed Shrike*Lanius collurio* | *Wing-drooping* | 0.609\*±0.278 | -22.921\*±10.045 | 37.6 | 43 |
| *Panting* | 0.146±0.187 | -7.289±6.538 |  | 43 |
| *Shade-seeking* | -0.054±0.084 | 0.729±2.797 |  | 43 |
| *Resting* | -0.037±0.108 | 0.189±3.727 |  | 28 |
| Red-crested Korhaan*Lophotis ruficrista* | *Wing-drooping* | 0±0.03 | -26.566\*\*±0.976 |  | 66 |
| *Panting* | -0.108±0.199 | -0.75±6.145 |  | 66 |
| *Shade-seeking* | -0.238\*\*±0.074 | 7.249\*\*±2.421 | 30.5 | 86 |
| *Resting* | -0.224\*\*±0.076 | 6.712\*\*±2.454 | 30.0 | 71 |
| Red-faced Mousebird*Urocolias indicus* | *Wing-drooping* | 0.115±0.13 | -4.683±4.281 |  | 32 |
| *Panting* | 0.19±0.132 | -6.693±4.367 |  | 32 |
| *Shade-seeking* | -0.243\*±0.118 | 6.706˙±3.74 | 27.6 | 33 |
| *Resting* | 0.01±0.123 | -0.041±4.028 |  | 28 |
| Scaly-feathered Finch*Sporopipes squamifrons* | *Wing-drooping* | 0.333\*\*±0.045 | -13.097\*\*±1.506 | 39.3 | 822 |
| *Panting* | 0.513\*\*±0.116 | -21.257\*\*±4.07 | 41.4 | 822 |
| *Shade-seeking* | -0.188\*\*±0.023 | 5.680\*\*±0.727 | 30.2 | 943 |
| *Resting* | -0.068\*±0.033 | 1.990˙±1.063 | 29.3 | 447 |
| Sociable Weaver*Philetairus socius* | *Wing-drooping* | 0.253\*\*±0.034 | -9.893\*\*±1.176 | 39.1 | 665 |
| *Panting* | 0.276\*\*±0.052 | -11.635\*\*±1.833 | 42.2 | 665 |
| *Shade-seeking* | -0.167\*\*±0.023 | 4.773\*\*±0.733 | 28.6 | 730 |
| *Resting* | -0.061\*±0.026 | 2.049\*±0.866 | 33.6 | 435 |
| Southern Masked-Weaver*Ploceus velatus* | *Wing-drooping* | 0.305±0.203 | -12.907˙±7.005 |  | 120 |
| *Panting* | 0.317\*\*±0.108 | -12.012\*\*±3.674 | 37.9 | 120 |
| *Shade-seeking* | -0.145\*\*±0.055 | 4.838\*\*±1.75 | 33.4 | 128 |
| *Resting* | -0.107±0.09 | 4.452±3.019 |  | 82 |
| Southern Pale Chanting Goshawk*Melierax canorus* | *Wing-drooping* | 0.779˙±0.395 | -30.912\*±14.465 | 39.7 | 31 |
| *Panting* | 0±0.071 | -25.566\*\*±2.364 |  | 31 |
| *Shade-seeking* | -0.291±0.172 | 10.250\*±5.818 |  | 31 |
| *Resting* | -0.088±0.232 | 0.845±7.659 |  | 27 |
| Southern Yellow-billed Hornbill*Tockus leucomelas* | *Wing-drooping* | 0.173±0.163 | -8.807±5.638 |  | 105 |
| *Panting* | 0.516\*\*±0.153 | -18.969\*\*±5.376 | 36.8 | 105 |
| *Shade-seeking* | -0.101˙±0.053 | 2.746±1.715 | 27.2 | 111 |
| *Resting* | -0.001±0.157 | -3.503±5.161 |  | 106 |
| Spike-heeled Lark*Chersomanes albofusciata* | *Wing-drooping* | 0.400\*\*±0.124 | -14.408\*\*±4.24 | 36.0 | 61 |
| *Panting* | 0.369\*\*±0.118 | -13.233\*\*±4.002 | 35.9 | 61 |
| *Shade-seeking* | -0.094˙±0.053 | 3.630\*±1.678 | 38.6 | 123 |
| *Resting* | -0.043±0.072 | 1.009±2.238 |  | 28 |
| Wattled Starling*Creatophora cinerea* | *Wing-drooping* | 0.324˙±0.185 | -11.692˙±6.233 | 36.1 | 32 |
| *Panting* | 0.363˙±0.184 | -12.663\*±6.158 | 34.9 | 32 |
| *Shade-seeking* | -0.195±0.142 | 5.341±4.576 |  | 32 |
| *Resting* | -0.009±0.121 | -0.347±3.952 |  | 32 |
| White-backed Mousebird*Colius colius* | *Wing-drooping* | 0.308\*\*±0.099 | -11.204\*\*±3.37 | 36.4 | 69 |
| *Panting* | 0.578\*\*±0.126 | -19.929\*\*±4.306 | 34.5 | 69 |
| *Shade-seeking* | -0.228\*\*±0.08 | 6.436\*±2.537 | 28.2 | 79 |
| *Resting* | -0.186\*±0.089 | 5.751˙±2.936 | 30.9 | 57 |
| White-browed Sparrow-Weaver*Plocepasser mahali* | *Wing-drooping* | 0.236\*\*±0.037 | -9.099\*\*±1.235 | 38.6 | 582 |
| *Panting* | 0.244\*\*±0.048 | -10.172\*\*±1.647 | 41.7 | 582 |
| *Shade-seeking* | -0.182\*\*±0.027 | 5.153\*\*±0.865 | 28.3 | 615 |
| *Resting* | -0.156\*\*±0.034 | 4.473\*\*±1.105 | 28.7 | 397 |
| Yellow Canary*Crithagra flaviventris* | *Wing-drooping* | 0.229±0.145 | -10.741\*\*±4.837 |  | 176 |
| *Panting* | 0.511\*\*±0.138 | -20.195\*\*±4.791 | 39.5 | 176 |
| *Shade-seeking* | -0.174\*\*±0.046 | 5.394\*\*±1.452 | 31.0 | 213 |
| *Resting* | -0.068±0.068 | 2.551±2.191 |  | 77 |
| Yellow-bellied Eremomela*Eremomela icteropygialis* | *Wing-drooping* | 0.419\*±0.174 | -17.671\*\*±6.157 | 42.2 | 198 |
| *Panting* | 0.488\*\*±0.166 | -20.105\*\*±5.912 | 41.2 | 198 |
| *Shade-seeking* | -0.084\*±0.042 | 1.983±1.344 | 23.6 | 212 |
| *Resting* | 0.01±0.083 | 1.673±2.738 |   | 116 |
| ˙ p<0.1 ;\*p<0.05; \*\*p<0.01 |  |  |  |  |

Table S3: Three top-weighted models explaining median *T*air values in shade-seeking behaviour (*shade*50) using both generalized linear models (GLS) and phylogenetic independent analyses (PGLS). The global model included: log10 body mass (log10 *M*b); proportion of observations where birds were mobile (*prop\_act*) (see methods for details); drinking dependency; foraging location; and diet as independent variables. Only the variables that were influential in the three top weighted models are shown. For each variable we provide the contrast (± standard error), and significance level (see note below Table).

|  |  |
| --- | --- |
| Independent | Model |
|   | 1 | 2 | 3 |
|  | *GLS* |
| Proportion active |  | -3.63±3.43 |  |
|  |  |  |  |
| Foraging location (terrestrial) |  |  | 1.26±1.89 |
|  |  |  |  |
| Intercept | 29.8±0.94\*\* | 31.1±1.56\*\* | 29.2±1.36\*\* |
|  |  |  |  |
| Observations | 31 | 31 | 31 |
| AICc | 193.8 | 195.1 | 195.8 |
|  | *PGLS* |
| Proportion active |  | -6.30±5.71 |  |
|  |  |  |  |
| Foraging location (terrestrial) |  |  | -1.35±3.06 |
|  |  |  |  |
| Intercept | 29.4±7.33\*\* | 31.2±7.35\*\* | 30.1±7.67\*\* |
|  |  |  |  |
| Observations | 31 | 31 | 31 |
| AICc | 218.2 | 219.3 | 220.3 |
| Note: \*p<0.05; \*\*p<0.01 |



Figure S1: Correlations between proportion of observations where birds were A) panting (*prop\_pant*) and the air temperature where panting behaviour occurred in 50% of cases(*pant*50); and B) proportion of observations where birds were wing-drooping (*prop\_wing*) as a function air temperature where wing-drooping behaviour occurred in 50% of cases(*wing*50).