### **Supplementary Material**

Arboreal birds do not avoid scattered trees in West Africa

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Table S1. Woody species attractive (20-40 migrants/ha canopy) and highly attractive (>40 migrants/ha canopy) to arboreal birds in West Africa; 98 other woody species are less attractive (<20 birds/ ha) and in 119 species we never recorded an arboreal bird. The table gives the average bird density per ha canopy, based on trees investigated in 1,327 randomly selected sites in West Africa between November and early March. *Acacia kirkii* did not occur in the random sites, but was sampled in some flooded forests (residents not recorded). The last column gives the average woody cover as percentage relative to the total woody cover (=100%) summated for all random sites. The contribution of the 6 highly attractive and 10 attractive woody species to total woody cover amounts to, in total, 6.84% and 7.88%. Thus, 85.28% of the woody vegetation is less attractive and partly ignored. Note that only three tree species are common as well as attractive to birds: *Balanites aegyptiaca*, *Acacia tortilis* and *Faidherbia albida* (in bold)*.* For an extensive analysis of tree selection by arboreal birds in West Africa, based on a smaller data set, see Zwarts *et al.* 2015.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | n/ha canopy | |  | woody |
| Woody species | migrants | residents |  | cover, % |
| *Ziziphus mauritiana* | 21 | 11 |  | 0.76 |
| *Acacia seyal* | 24 | 7 |  | 1.07 |
| *Acacia senegal* | 25 | 12 |  | 0.67 |
| *Euphorbia balsamifera* | 25 | 12 |  | 0.33 |
| *Tamarix senegalensis* | 25 | 2 |  | 0.92 |
| *Prosopis juliflora* | 26 | 1 |  | 0.36 |
| *Bauhinia rufescens* | 26 | 24 |  | 0.09 |
| ***Balanites aegyptiaca*** | **26** | **13** |  | **3.52** |
| *Maerua crassifolia* | 34 | 34 |  | 0.05 |
| *Ziziphus spina-christii* | 34 | 19 |  | 0.12 |
| *Acacia nilotica* | 46 | 9 |  | 0.41 |
| ***Acacia tortilis*** | **51** | **9** |  | **2.60** |
| ***Faidherbia albida*** | **60** | **17** |  | **3.75** |
| *Acacia kirkii* | 137 | ? |  | 0.00 |
| *Capparis decidua* | 144 | 4 |  | 0.04 |
| *Salvadora persica* | 171 | 16 |  | 0.05 |

Table S2. Number of arboreal bird species observed in three woody species: *Acacia tortilis*, *Balanites aegyptiaca* or *Faidherbia albida*; migrant species in bold. 26 bird species of which less than 10 individuals were seen are lumped as ‘six other migrants and ‘twenty other residents’.

|  |  |  |  |
| --- | --- | --- | --- |
| Bird species |  | N | note |
| Blue-naped Mousebird | *Urocolius macrourus* | 80 |  |
| Green Woodhoopoe | *Phoeniculus purpureus* | 16 |  |
| Vieillot's Barbet | *Lybius vieilloti* | 31 |  |
| **Eurasian Wryneck** | ***Jynx torquilla*** | 10 |  |
| Grey Woodpecker | *Dendropicos goertae* | 42 |  |
| Brubru | *Nilaus afer* | 10 |  |
| Sennar Penduline-tit | *Anthoscopus punctifrons* | 14 |  |
| Northern Crombec | *Sylvietta brachyura* | 57 |  |
| Yellow-bellied Eremomela | *Eremomela icteropygialis* | 33 |  |
| Senegal Eremomela | *Eremomela pusilla* | 98 |  |
| Cricket Longtail | *Spiloptila clamans* | 72 |  |
| Green-backed Camaroptera | *Camaroptera brachyura* | 63 |  |
| Tawny-flanked Prinia | *Prinia subflava* | 114 |  |
| **Olivaceous Warbler** | ***Iduna pallida*** | 18 | 1 |
| **Isabelline Warbler** | ***Iduna opaca*** | 135 | 1 |
| **Melodious Warbler** | ***Hippolais polyglotta*** | 77 |  |
| **Bonelli's Warbler** | ***Phylloscopus bonelli*** | 1695 |  |
| **Willow Warbler** | ***Phylloscopus trochilus*** | 75 |  |
| **Iberian Chiffchaff** | ***Phylloscopus ibericus*** | 18 |  |
| **Chiffchaff spec.** | ***Phylloscopus spec.*** | 103 | 2 |
| **Orphean Warbler** | ***Sylvia hortensis*** | 202 |  |
| **Subalpine Warbler** | ***Sylvia cantillans*** | 1130 |  |
| **Common Whitethroat** | ***Sylvia communis*** | 181 |  |
| Rufous-tailed Scrub-robin | *Cercotrichas galactotes* | 13 |  |
| Black Scrub-robin | *Cercotrichas podobe* | 34 |  |
| Pygmy Sunbird | *Hedydipna platura* | 119 |  |
| Scarlet-chested Sunbird | *Chalcomitra senegalensis* | 10 |  |
| Beautiful Sunbird | *Cinnyris pulchellus* | 193 |  |
| Splendid Sunbird | *Cinnyris coccinigastrus* | 10 |  |
| Variable Sunbird | *Cinnyris venustus* | 38 |  |
| Little Weaver | *Ploceus luteolus* | 287 |  |
| **six other migrants** | | 51 |  |
| twenty other residents | | 138 |  |

1 We noted, beside 18 *I. pallida* and 135 *I. opaca*, 228 *Iduna* being either *pallida* or *opaca*.

2 We noted, beside 18 *P. ibericus*, 103 Chiffchaffs being either *P. ibericus* or *P. collybita*.

Table S3A. The frequency at which 1, 2 …11 birds were seen in individual trees, given for three woody species, four bird species and for all migrants together. Only in tall trees we saw more than one bird. Large trees are relatively more common in our sample of *Faidherbia* and less common in *Balanites*. This explains why several birds in individual trees were seen more often in *Faidherbia* and hardly in *Balanites*.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| birds/tree | Frequency | | | | |
| ***A.tortilis*** (n=19,208) | Bonelli's | Subalpine | ‘Olivaceous' | Orphean | all migrants |
| 1 | 318 | 243 | 31 | 116 | 639 |
| 2 | 36 | 13 |  | 5 | 102 |
| 3 | 9 | 1 |  |  | 29 |
| 4 | 3 |  |  |  | 8 |
| 5 | 1 |  |  |  | 25 |
| 6 | 2 |  |  |  | 2 |
| 7 |  |  |  |  | 2 |
| Total number of birds | 446 | 272 | 31 | 126 | 1013 |
|  |  |  |  |  |  |
| ***Balanites*** (n=31,231) | Bonelli's | Subalpine | ‘Olivaceous' | Orphean | all migrants |
| 1 | 65 | 283 | 16 | 28 | 486 |
| 2 | 2 | 5 |  |  | 26 |
| 3 |  | 1 |  |  | 2 |
| 4 |  |  |  |  | 0 |
| 5 |  |  |  |  | 1 |
| Total number of birds | 69 | 296 | 16 | 28 | 549 |
|  |  |  |  |  |  |
| ***Faidherbia*** (n=7474) | Bonelli's | Subalpine | ‘Olivaceous' | Orphean | all migrants |
| 1 | 522 | 498 | 294 | 44 | 898 |
| 2 | 169 | 27 | 20 | 2 | 316 |
| 3 | 81 | 2 |  |  | 131 |
| 4 | 22 | 1 |  |  | 51 |
| 5 | 10 |  |  |  | 33 |
| 6 | 2 |  |  |  | 15 |
| 7 | 0 |  |  |  | 4 |
| 8 | 1 |  |  |  | 1 |
| 9 |  |  |  |  | 1 |
| 10 |  |  |  |  | 0 |
| 11 |  |  |  |  | 1 |
| Total number of birds | 1180 | 562 | 334 | 48 | 2438 |
|  |  |  |  |  |  |
| **three species** (n=57,913)***((nn=57,(n=57,913)*** | Bonelli's | Subalpine | ‘Olivaceous' | Orphean | all migrants |
| 1 | 905 | 1024 | 341 | 188 | 2023 |
| 2 | 207 | 45 | 20 | 7 | 444 |
| 3 | 63 | 4 |  |  | 162 |
| 4 | 25 | 1 |  |  | 59 |
| 5 | 11 |  |  |  | 39 |
| 6 | 4 |  |  |  | 17 |
| 7 | 0 |  |  |  | 6 |
| 8 | 1 |  |  |  | 1 |
| 9 |  |  |  |  | 1 |
| 10 |  |  |  |  | 0 |
| 11 |  |  |  |  | 1 |
| Total number of birds | 1695 | 1130 | 381 | 202 | 4000 |

Table S3B. Percent of woody plants without birds (top) and, if present, percent being single in three woody species (bottom), calculated for four bird species and for all migrants combined. Based on information given in Table S3A.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | % trees without birds | | | | |
|  | Bonelli's | Subalpine | ‘Olivaceous' | Orphean | all migrants |
| *A. tortilis* | 98.1 | 98.7 | 99.8 | 99.4 | 95.9 |
| *Balanites* | 99.8 | 99.1 | 99.9 | 99.9 | 98.4 |
| *Faidherbia* | 89.6 | 92.9 | 95.8 | 99.4 | 80.6 |
| 3 species | 97.9 | 98.1 | 99.4 | 99.7 | 95.2 |
|  |  |  |  |  |  |
|  | % birds being single | | | | |
|  | Bonelli's | Subalpine | ‘Olivaceous' | Orphean | all migrants |
| *A. tortilis* | 71.3 | 89.3 | 100.0 | 92.1 | 67.7 |
| *Balanites* | 94.2 | 95.6 | 100.0 | 100.0 | 88.5 |
| *Faidherbia* | 44.2 | 88.6 | 88.0 | 91.7 | 36.8 |
| 3 species | 53.4 | 90.6 | 89.5 | 93.1 | 51.1 |

Table S4. Results of 20 multiple regression analyses to investigate whether bird density per ha canopy is a function of woody cover and other variables. Analyses were done for the four most common bird species and for all migrants, all residents and all birds in sites where >70% of the woody vegetation consisted of *A. tortilis* (n=31), *Balanites* (n=36) or *Faidherbia* (n=60); ‘Olivaceous’ Warbler did not occur in the selected *Balanites* sites. Total woody cover in the selected sites varied between 0.03% and 12.3% in *Balanites*, 0.39% and 17.0% in *Faidherbia* and 0.19% and 28.6% in *A. tortilis*. The analyses were done in three steps: bird density per ha canopy as a function of (I) total canopy, (II) as (I) + % woody cover of the preferred woody species (>40 birds/ha; see Table S1) and % of woody vegetation >10 m high, (III) as (II) + month, month2, north, north2, west. The table gives for the total woody cover: the unstandardized coefficient (b), standardized coefficient (β) and significance (Pcover). The last two columns give the total explained variance of all variables entered in the equation (R2) and its significance (Pall).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Bonelli's Warbler |  | B | β | Pcover | R2 | Pall |
| *A. tortilis* | I | -0.134 | -0.050 | 0.789 | 0.003 | 0.789 |
|  | II | -0.097 | -0.036 | 0.857 | 0.031 | 0.930 |
|  | III | -0.571 | -0.213 | 0.258 | 0.392 | 0.211 |
| *Balanites* | I | 0.117 | 0.047 | 0.788 | 0.002 | 0.788 |
|  | II | 0.033 | 0.013 | 0.942 | 0.064 | 0.712 |
|  | III | 0.100 | 0.040 | 0.824 | 0.320 | 0.257 |
| *Faidherbia* | I | 0.177 | 0.028 | 0.831 | 0.001 | 0.831 |
|  | II | 0.201 | 0.032 | 0.797 | 0.175 | 0.029 |
|  | III | -0.108 | -0.017 | 0.865 | 0.544 | <0.001 |
|  |  |  |  |  |  |  |
| Subalpine Warbler | | B | β | Pcover | R2 | Pall |
| *A. tortilis* | I | -0.648 | -0.138 | 0.460 | 0.019 | 0.460 |
|  | II | 0.140 | 0.030 | 0.841 | 0.474 | 0.002 |
|  | III | 0.004 | 0.001 | 0.996 | 0.581 | 0.013 |
| *Balanites* | I | 1.360 | 0.281 | 0.097 | 0.079 | 0.097 |
|  | II | 1.297 | 0.268 | 0.137 | 0.099 | 0.505 |
|  | III | 1.258 | 0.260 | 0.172 | 0.259 | 0.459 |
| *Faidherbia* | I | 0.150 | 0.043 | 0.746 | 0.002 | 0.746 |
|  | II | 0.170 | 0.048 | 0.721 | 0.014 | 0.941 |
|  | III | 0.155 | 0.044 | 0.750 | 0.161 | 0.405 |
|  |  |  |  |  |  |  |
| ‘Olivaceous' Warbler | | B | β | Pcover | R2 | Pall |
| *A. tortilis* | I | 0.101 | 0.180 | 0.333 | 0.032 | 0.333 |
|  | II | 0.110 | 0.195 | 0.329 | 0.057 | 0.811 |
|  | III | 0.086 | 0.153 | 0.477 | 0.191 | 0.821 |
| *Faidherbia* | I | 0.368 | 0.248 | 0.056 | 0.062 | 0.056 |
|  | II | 0.388 | 0.261 | 0.048 | 0.099 | 0.210 |
|  | III | 0.291 | 0.197 | 0.114 | 0.338 | 0.009 |
|  |  |  |  |  |  |  |
| Orphean Warbler | | B | β | Pcover | R2 | Pall |
| *A. tortilis* | I | -0.939 | -0.250 | 0.175 | 0.062 | 0.175 |
|  | II | -1.149 | -0.306 | 0.116 | 0.137 | 0.409 |
|  | III | -1.473 | -0.392 | 0.034 | 0.459 | 0.095 |
| *Balanites* | I | 0.129 | 0.168 | 0.326 | 0.028 | 0.326 |
|  | II | 0.102 | 0.132 | 0.445 | 0.144 | 0.290 |
|  | III | 0.048 | 0.062 | 0.680 | 0.515 | 0.012 |
| *Faidherbia* | I | -0.204 | -0.167 | 0.202 | 0.028 | 0.202 |
|  | II | -0.219 | -0.179 | 0.175 | 0.092 | 0.249 |
|  | III | -0.209 | -0.171 | 0.161 | 0.360 | 0.005 |
|  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| all migrants | | B | β | Pcover | R2 | Pall |
| *A. tortilis* | I | -3.645 | -0.230 | 0.212 | 0.053 | 0.212 |
|  | II | -2.274 | -0.144 | 0.440 | 0.178 | 0.258 |
|  | III | -1.947 | -0.123 | 0.497 | 0.425 | 0.146 |
| *Balanites* | I | 0.600 | 0.080 | 0.644 | 0.006 | 0.644 |
|  | II | 1.376 | 0.183 | 0.255 | 0.273 | 0.037 |
|  | III | 1.286 | 0.171 | 0.306 | 0.420 | 0.069 |
| *Faidherbia* | I | 0.767 | 0.066 | 0.614 | 0.004 | 0.614 |
|  | II | 0.886 | 0.077 | 0.544 | 0.147 | 0.064 |
|  | III | 0.455 | 0.039 | 0.704 | 0.528 | <0.001 |
|  |  |  |  |  |  |  |
| all residents |  | B | β | Pcover | R2 | Pall |
| *A. tortilis* | I | 0.092 | 0.026 | 0.889 | 0.001 | 0.889 |
|  | II | -0.048 | -0.014 | 0.945 | 0.054 | 0.828 |
|  | III | 0.070 | 0.020 | 0.925 | 0.191 | 0.820 |
| *Balanites* | I | -0.770 | -0.098 | 0.727 | 0.010 | 0.727 |
|  | II | 0.220 | 0.280 | 0.937 | 0.113 | 0.859 |
|  | III | 2.523 | 0.323 | 0.508 | 0.522 | 0.757 |
| *Faidherbia* | I | 0.276 | 0.070 | 0.594 | 0.005 | 0.594 |
|  | II | 0.226 | 0.058 | 0.671 | 0.019 | 0.896 |
|  | III | 0.258 | 0.066 | 0.642 | 0.124 | 0.632 |
|  |  |  |  |  |  |  |
| all birds |  | B | β | Pcover | R2 | Pall |
| *A. tortilis* | I | -3.554 | -0.219 | 0.237 | 0.015 | 0.237 |
|  | II | -2.322 | -0.143 | 0.450 | 0.020 | 0.353 |
|  | III | -1.877 | -0.116 | 0.543 | 0.094 | 0.272 |
| *Balanites* | I | 0.704 | 0.064 | 0.820 | 0.004 | 0.820 |
|  | II | 1.428 | 0.131 | 0.720 | 0.082 | 0.918 |
|  | III | 4.612 | 0.422 | 0.407 | 0.495 | 0.799 |
| *Faidherbia* | I | 1.043 | 0.086 | 0.511 | 0.007 | 0.511 |
|  | II | 1.112 | 0.092 | 0.472 | 0.127 | 0.106 |
|  | III | 0.713 | 0.059 | 0.586 | 0.485 | <0.004 |

Table S5. Number of birds per *Faidherbia* tree in 5 isolated trees (woody cover 0.1-0.5%) compared to 81 less isolated trees (woody cover 3.6-9.9%) for the four most common bird species and for residents and migrants combined. We tested the difference with a one-way analysis of variance; P is significance.

|  |  |  |  |
| --- | --- | --- | --- |
| woody cover | 0.1-0.5% | 4-10% | P |
| n of trees | 5 | 81 |  |
| Bonelli's Warbler | 0.60 | 0.75 | 0.728 |
| Subalpine Warbler | 1.20 | 0.42 | 0.006 |
| ‘Olivaceous' Warbler | 0.60 | 0.36 | 0.327 |
| (Iberian) Chiffchaff | 1.40 | 0.06 | <0.001 |
| all migrants | 4.00 | 1.77 | 0.010 |
| all residents | 0.80 | 0.51 | 0.665 |
| all birds | 4.80 | 2.27 | 0.027 |