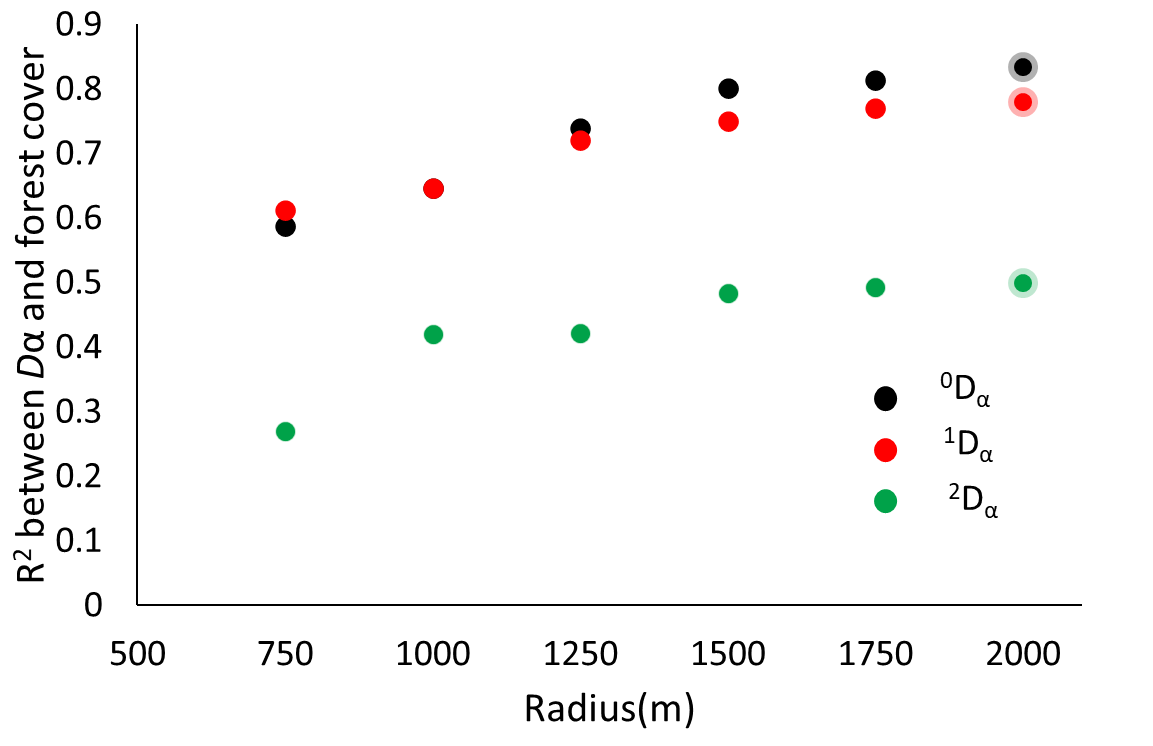
**Supplementary material for** “Landscape forest loss decreases bird diversity with strong negative impacts on forest species in a mountain region”

**Table S1**. List of species and classification into ecological groups according to habitat requirements.

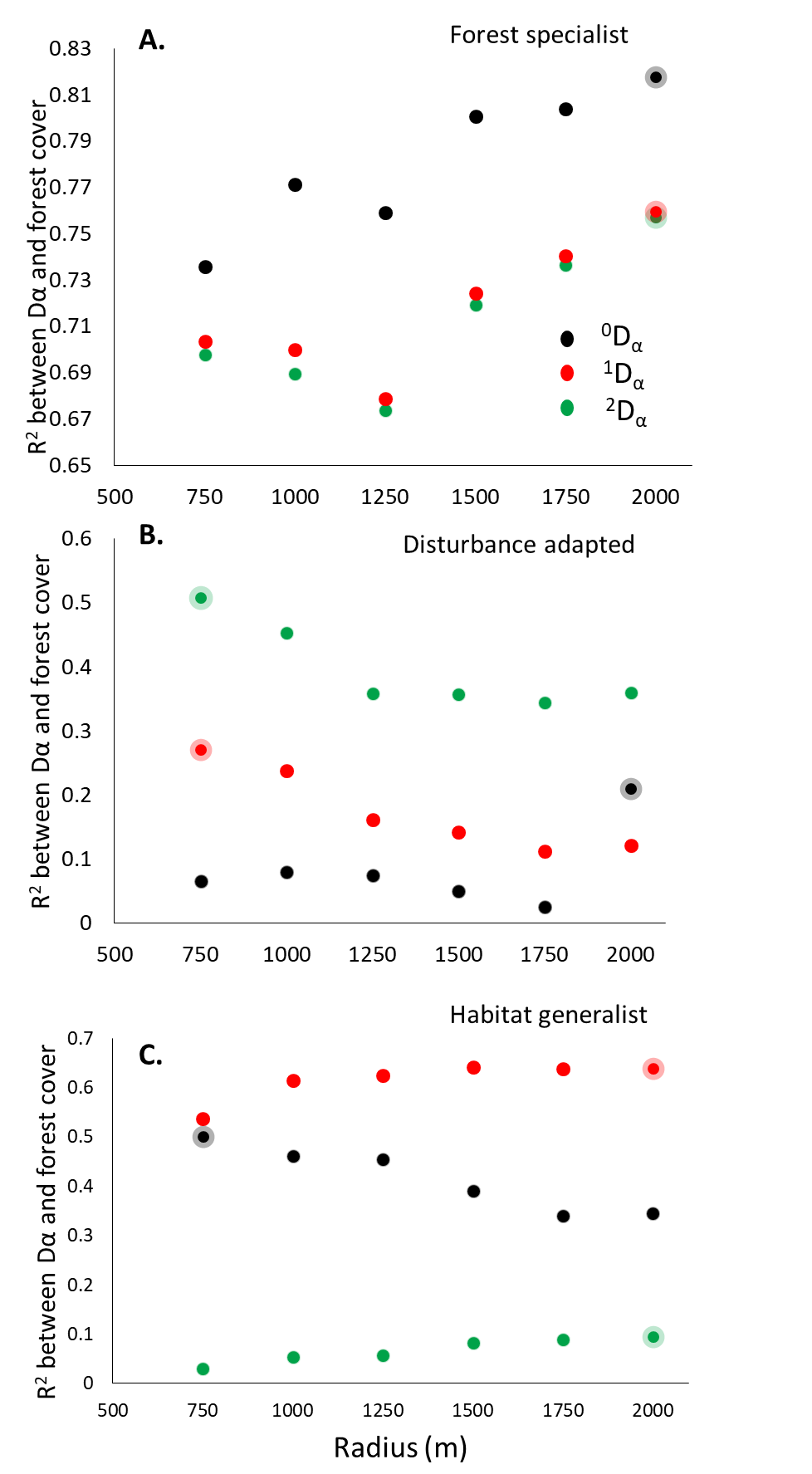
|  |  |
| --- | --- |
| **Specie** | **Habitat requeriment** |
| *Aimophila rufescens* | Disturbance adapted |
| *Amazilia beryllina* | Habitat generalist |
| *Amazilia rutila* | Habitat generalist |
| *Amazilia viridifrons* | Habitat generalist |
| *Aphelocoma woodhouseii* | Disturbance adapted |
| *Arremon brunneinucha* | Forest specialist |
| *Attila spadiceus* | Habitat generalist |
| *Basileuterus culicivorus* | Habitat generalist |
| *Basileuterus rufifrons* | Habitat generalist |
| *Camptostoma imberbe* | Habitat generalist |
| *Catharus aurantiirostris* | Disturbance adapted |
| *Clibanornis rubiginosus* | Forest specialist |
| *Colibri thalassinus* | Habitat generalist |
| *Columbina inca* | Disturbance adapted |
| *Contopus pertinax* | Habitat generalist |
| *Crotophaga sulcirostris* | Disturbance adapted |
| *Cynanthus latirostris* | Disturbance adapted |
| *Dryobates scalaris* | Habitat generalist |
| *Empidonax affinis* | Habitat generalist |
| *Icteria virens* | Disturbance adapted |
| *Icterus graduacauda* | Habitat generalist |
| *Lepidocolaptes affinis* | Forest specialist |
| *Melanerpes formicivorus* | Habitat generalist |
| *Melanotis caerulescens* | Habitat generalist |
| *Melozone Kieneri* | Habitat generalist |
| *Miniotilta varia* | Habitat generalist |
| *Molothrus ater* | Disturbance adapted |
| *Myadestes occidentalis* | Forest specialist |
| *Myiarchus nuttingi* | Habitat generalist |
| *Myioborus pictus* | Forest specialist |
| *Myiozetetes similis* | Disturbance adapted |
| *Phaethornis mexicanus* | Forest specialist |
| *Pheugopedius felix* | Habitat generalist |
| *Piaya cayana* | Habitat generalist |
| *Piranga erythrocephala* | Habitat generalist |
| *Piranga flava* | Forest specialist |
| *Pitangus sulphuratus* | Disturbance adapted |
| *Psaltriparus minimus* | Habitat generalist |
| *Ptiliogonys cinereus* | Habitat generalist |
| *Quiscalus mexicanus* | Disturbance adapted |
| *Saltator atriceps* | Disturbance adapted |
| *Saltator coerulescens* | Disturbance adapted |
| *Setophaga graciae* | Forest specialist |
| *Sittasomus griseicapillus* | Forest specialist |
| *Spinus psaltria* | Habitat generalist |
| *Sporophila torqueola* | Disturbance adapted |
| *Streptoprocne semicollaris* | Habitat generalist |
| *Sturnella magna* | Disturbance adapted |
| *Thryophilus sinaloa* | Disturbance adapted |
| *Trogon mexicanus* | Forest specialist |
| *Turdus assimilis* | Forest specialist |
| *Turdus rufopalliatus* | Habitat generalist |
| *Tyrannus melancholicus* | Disturbance adapted |
| *Vireo gilvus* | Habitat generalist |
| *Pachysylvia hypochrysea* | Habitat generalist |
| *Xenotrincus mexicanus* | Forest specialist |

**Appendix S1. Multi-scale analysis**

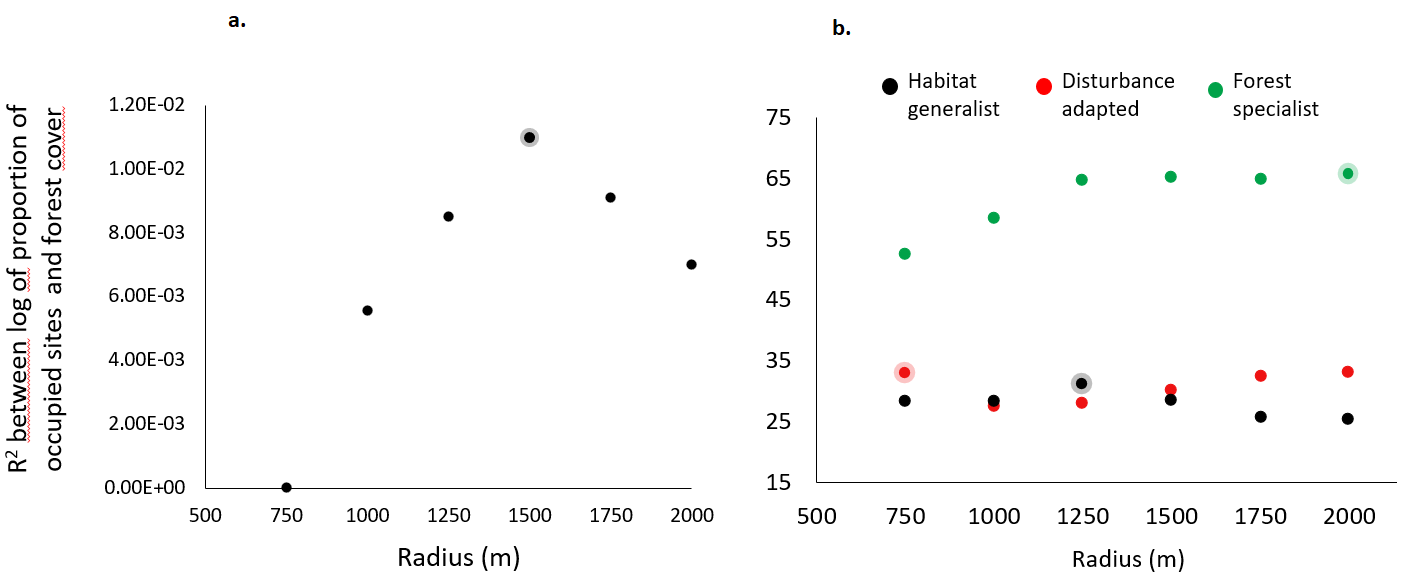
We followed the multi-scale analysis protocol proposed by Fahrig (2013) to identify the so-called ‘scale of effect’. For this we calculated forest cover within six different-sized buffers (i.e., landscapes), ranging from 750 to 2000-m radius, every 250 m. The smallest landscape represents the minimum size to cover all the sampling sites (n = 16) surrounding of each village and the largest landscape was established based on the maximum distance where landscapes did not overlap in space. We included both old-growth forest and open-forest to quantify the percentage of forest cover within each landscape. Then, we evaluated the strength of the relationship (*R2*) between forest cover surrounding all the sampling sites and the bird diversity (considering three diversity orders: 0Dα, 1Dα and 2Dα; Jost, 2006,Tuomisto, 2010), and between forest cover and the logarithm of the proportion of occupied sites, analyzing the complete assemblage and the ecological groups of birds separately. We found that the strength of the relationship between forest cover and both the diversity of the complete assemblage and forest specialist birds was highest in 2000-m radius (Figs. S1 and S2A) for the three diversity orders. For disturbance-adapted species, we found that strength of the relationship between forest cover and the diversity was highest in 750-m radius for 1Dα and 2Dα, and 2000-m radius for 0Dα (Fig. S2B). As to habitat-generalist birds the highest strength of the relationship between forest cover and the diversity was 2000-m radius for 1Dα and 2Dα, and 750-m radius for 0Dα (Fig. S2C). Regarding the strength of the relationship between forest cover and the proportion of occupied sites, we found that the strength was highest at 1500-m radius for the complete assemblage (Fig. S3A), 2000-m radius for forest-specialist birds, 1250 for habitat-generalist birds, and 750-m for disturbance-adapted species (Fig. S3B).



**Figure S1**. Multi-scale analysis bird responses to forest cover of complete assemblage to identify the scale of effect, i.e. the spatial scale that yields the strongest relationship (i.e. measured as the goodness-of-fit, R2) between bird diversity and forest cover. Species diversity is assessed with Hill numbers, considering three orders of q: 0, species richness (0Dα); 1, exponential Shannon entropy (1Dα); and 2, inverse Simpson concentration (2Dα). The scale of effect is indicated with shaded dots.

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**Figure S2**. Multiscale analysis of bird ecological groups responses to forest cover to identify the scale of effect, i.e. the spatial scale that yields the strongest relationship (i.e. measured as the goodness-of-fit, R2) between bird diversity and forest cover. Species diversity is assessed with Hill numbers, considering three orders of q: 0, species richness (0Dα); 1, exponential Shannon entropy (1Dα); and 2, inverse Simpson concentration (2Dα). The scale of effect is indicated with shaded dots.



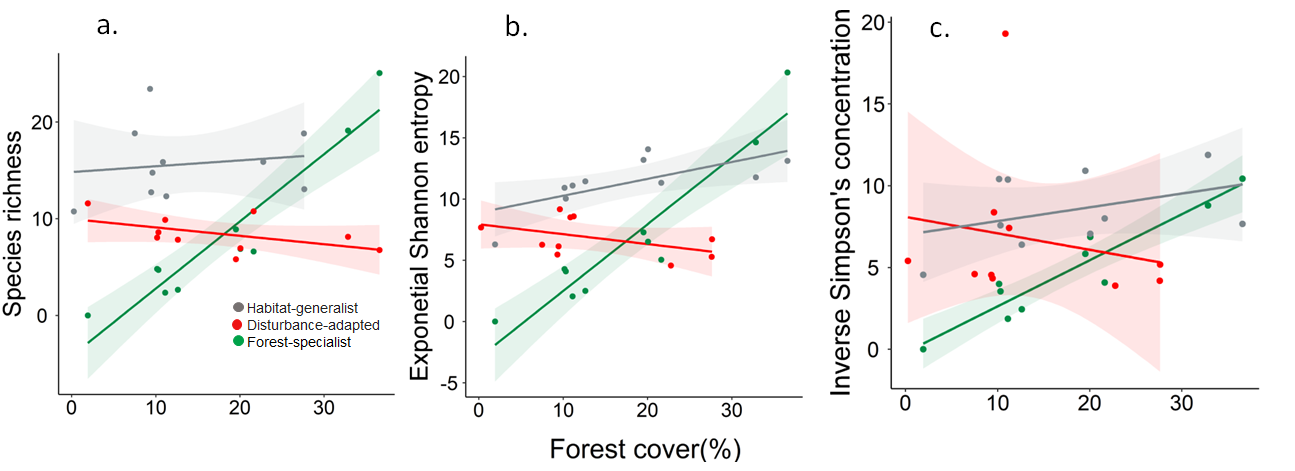
**Figure S3**. Multiscale analysis to identify the scale of effect, i.e. the spatial scale that yields the strongest relationship (i.e. measured as the R2) between logarithm of the proportion of occupied sites and forest cover, analyzing separately the complete assemblage (a) and ecological groups of birds: forest-specialist, disturbance-adapted and habitat-generalist birds (b). The scale of effect is indicated with shaded dots.

**Table S2.** ANCOVA analysis results in which was assessed the response of ecological groups of bird to forest cover. F value and P value are the statistics for the interaction between the two covariates (ecological group and forest cover).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Response variable** | **F value** | **P value** | **Ecological group** | **Slope** |
| 0Dα | 14.896 | 6.22E-05 | Forest specialist | 0.351 |
| Distirbance adapted | -0.060 |
| Habitat generalist | 0.031 |
| 1Dα | 19.76 | 8.47E-06 | Forest specialist | 0.277 |
| Distirbance adapted | -0.038 |
| Habitat generalis | 0.088 |
| 2Dα | 3.172 | 0.0599 | Forest specialist | 0.148 |
| Distirbance adapted | -0.038 |
| Habitat generalist | 0.075 |
| Ocuppied sites | 20.992 | 5.36E-06 | Forest specialist | 0.059 |
| Distirbance adapted | -0.017 |
| Habitat generalist | -0.020 |

**Appendix S2. Diversity analysis considering only old-growth forests**

We performed an analysis of the relationship of bird diversity and forest cover considering only old-growth forest to quantify percentage of forest cover at the landscape, to assess of influence of open forests on our previous results. We observed similar effects on bird groups when forest cover was estimated considering open and old-growth forest or only old-growth forest (Fig. S4).



**Figure S4.** Response of species richness (0Dγ,A), diversity of common species (1Dγ, Shannon's entropy exponential; B) and diversity of dominant species (2Dγ, Simpson's inverse concentration; C) of different ecological bird groups (forest-specialist birds, disturbance-adapted birds, and habitat-generalist birds) to landscape forest cover considering only old-growth forest to quantify percentage of forest cover. In all cases, we showed the accumulated alpha diversity in 16-point counts (i.e., gamma diversity per landscape). The shaded area is the 95% confidence interval of the linear models.