

Appendix A

Insectivorous birds are not effective pest control agents in olive groves

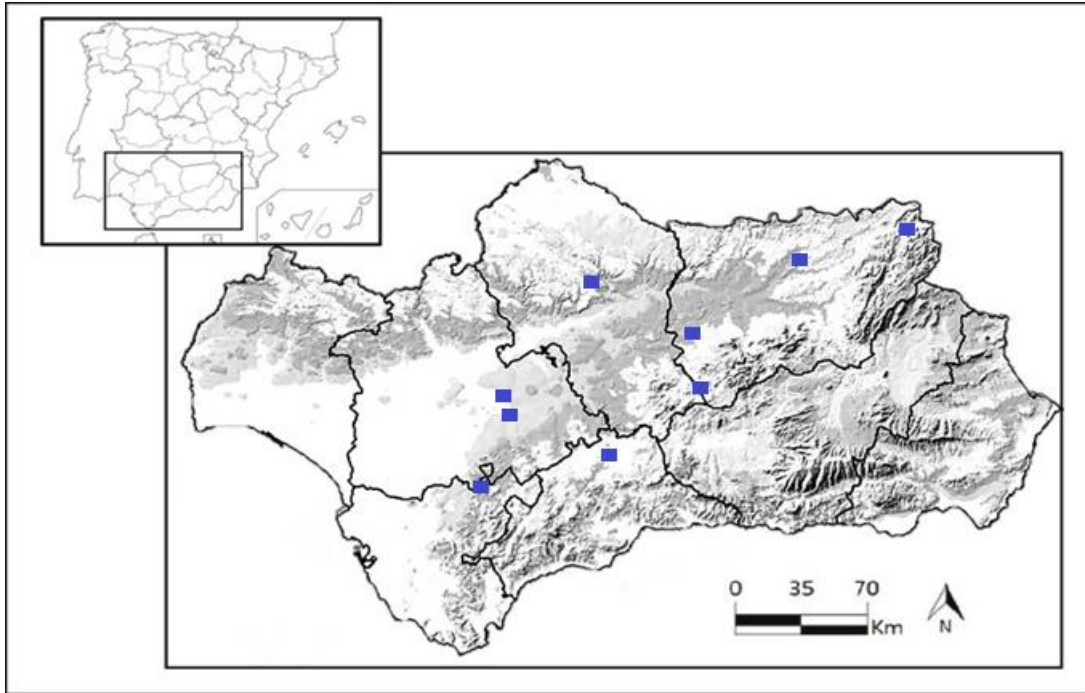


Fig. 1: The nine study sites (blue rectangles) distributed across the region of Andalusia (Southern Spain). In each farm we conducted: bird surveys, pest surveys, damage monitoring and two different experiments.

Table 1: Insectivorous bird species detected during the surveys. Birds were classified as insectivores according to the percentage of insectivory in their diets, and as from forest or not based on the habitat they live (F= Forest; 1=Yes, 0=No) following to Wilman, H. et al. (2014), and Storchova et al. (2018). Note that some species with low percentage of insectivory in this database (e.g. *Corvus corax* or *Lanius excubitor*), can be locally important insectivorous (expert knowledge).

Species	Insectivory (%)	F	Species	Insectivory (%)	F
<i>Acrocephalus schoenobaenus</i>	70	0	<i>Hirundo rustica</i>	80	0
<i>Acrocephalus scirpaceus</i>	70	0	<i>Iduna pallida</i>	80	1
<i>Aegithalos caudatus</i>	60	1	<i>Jynx torquilla</i>	100	1
<i>Alauda arvensis</i>	40	0	<i>Lanius excubitor</i>	10	1
<i>Anthus campestris</i>	70	0	<i>Lanius senator</i>	80	1
<i>Anthus pratensis</i>	80	0	<i>Lophophanes cristatus</i>	60	1
<i>Anthus spinoletta</i>	70	0	<i>Lullula arborea</i>	50	0
<i>Anthus trivialis</i>	60	1	<i>Luscinia megarhynchos</i>	70	1
<i>Apus apus</i>	100	0	<i>Melanocorypha calandra</i>	50	0
<i>Apus pallidus</i>	100	0	<i>Merops apiaster</i>	100	0
<i>Bubulcus ibis</i>	60	0	<i>Monticola solitarius</i>	40	0
<i>Burhinus oedicnemus</i>	50	0	<i>Motacilla alba</i>	100	0
<i>Calandrella brachydactyla</i>	60	0	<i>Motacilla cinerea</i>	100	0
<i>Cecropis daurica</i>	100	0	<i>Muscicapa striata</i>	80	1
<i>Certhia brachydactyla</i>	70	1	<i>Oenanthe hispanica</i>	60	0
<i>Cettia cetti</i>	90	0	<i>Oriolus oriolus</i>	30	1
<i>Cisticola juncidis</i>	80	0	<i>Otis tarda</i>	40	0
<i>Clamator glandarius</i>	90	1	<i>Otus scops</i>	80	1
<i>Coracias garrulus</i>	90	0	<i>Parus major</i>	40	1
<i>Corvus corax</i>	10	1	<i>Passer hispaniolensis</i>	20	0
<i>Corvus corone</i>	30	1	<i>Periparus ater</i>	40	1
<i>Corvus monedula</i>	30	1	<i>Phoenicurus ochruros</i>	60	0
<i>Coturnix coturnix</i>	20	0	<i>Phoenicurus phoenicurus</i>	80	1
<i>Cuculus canorus</i>	90	1	<i>Phylloscopus bonelli</i>	90	1
<i>Cyanistes caeruleus</i>	50	1	<i>Phylloscopus collybita</i>	80	1
<i>Cyanopica cyanus</i>	80	1	<i>Phylloscopus trochilus</i>	80	1
<i>Delichon urbicum</i>	100	0	<i>Pica pica</i>	20	1
<i>Dendrocopos major</i>	50	1	<i>Picus sharpei</i>	90	1
<i>Emberiza calandra</i>	30	0	<i>Ptyonoprogne rupestris</i>	100	0
<i>Emberiza cia</i>	20	1	<i>Regulus ignicapilla</i>	100	1
<i>Emberiza cirius</i>	30	1	<i>Saxicola rubetra</i>	70	0
<i>Erithacus rubecula</i>	40	1	<i>Saxicola torquatus</i>	70	0
<i>Ficedula hypoleuca</i>	100	1	<i>Sitta europaea</i>	70	1
<i>Fringilla coelebs</i>	60	1	<i>Sturnus unicolor</i>	20	0
<i>Galerida cristata</i>	40	0	<i>Sturnus vulgaris</i>	20	0
<i>Galerida theklae</i>	60	0	<i>Sylvia atricapilla</i>	50	1
<i>Garrulus glandarius</i>	40	1	<i>Sylvia borin</i>	50	1
<i>Hippolais polyglotta</i>	80	1	<i>Sylvia borin</i>	50	1

Species	Insectivory (%)	F
Sylvia cantillans	60	0
Sylvia hortensis	70	1
Sylvia melanocephala	50	0
Sylvia undata	70	0
Tachymarptis melba	100	0
Troglodytes troglodytes	60	1
Turdus iliacus	40	1
Turdus merula	50	1
Turdus philomelos	40	1
Turdus viscivorus	40	1
Upupa epops	80	1

Table 2. Results from Bayesian hierarchical models that show the estimated effect of insectivorous bird abundance and richness on the abundance of *P. oleae* and *B. oleae*. The table displays the estimates, standard error, 95% credible intervals, and probability of beta being lower than 0 (i.e. higher abundance of insectivores are related to lower abundance of pest).

Model	Fixed factors (beta/ slope)	Estimate	Standard error	95% LCI	95% UCI	Prob. $\beta < 0$
Abundance <i>P. oleae</i>	Abundance insectivorous	-0.00	0.00	-0.01	0.00	0.85
	Richness insectivorous	-0.01	0.02	-0.05	0.02	0.77
	Abundance forest insectivorous	-0.00	0.00	-0.01	0.00	0.82
	Richness forest insectivorous	-0.01	0.03	-0.07	0.04	0.71
Abundance <i>B. oleae</i>	Abundance insectivorous	-0.00	0.01	-0.01	0.01	0.71
	Richness insectivorous	-0.00	0.04	-0.08	0.07	0.53
	Abundance forest insectivorous	-0.00	0.01	-0.02	0.01	0.69
	Richness forest insectivorous	0.04	0.06	-0.07	0.15	0.23