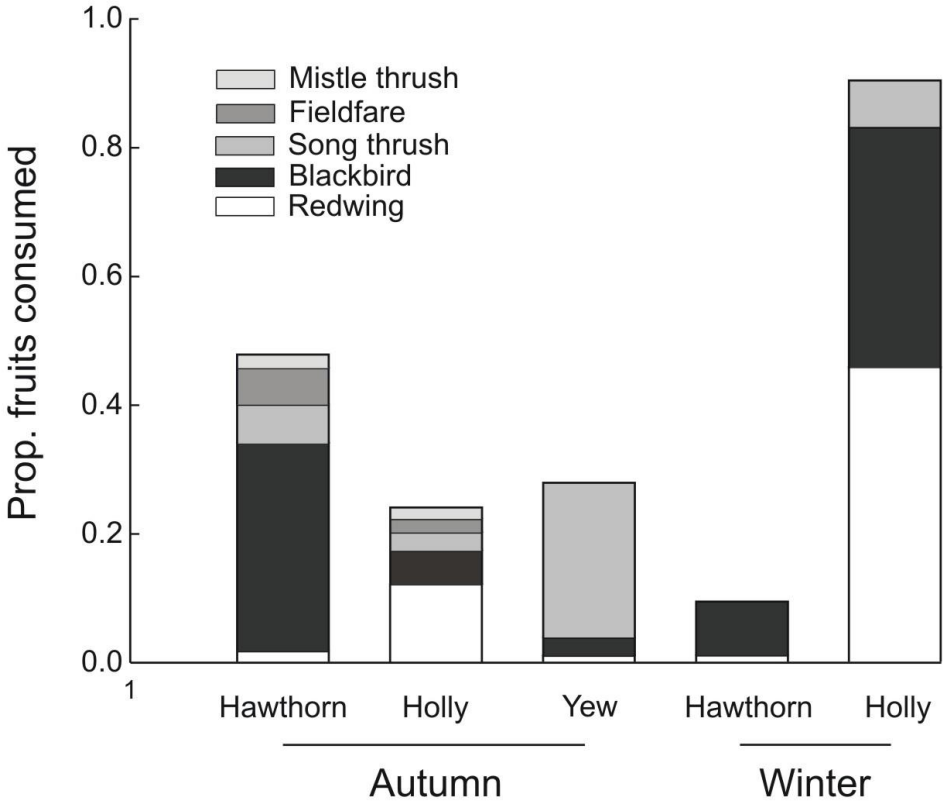
Appendix A.

Supplementary results for frugivory by birds, seasonal abundance of frugivorous birds and relationship between fruit abundance and forest cover

Consumption of tree fruits by frugivorous birds

Direct observation of consumption of fleshy fruits from trees by frugivorous birds (thrushes) was conducted in Sierra de Peña Mayor from October 2009 to January 2010, from five fixed vantage points distributed through a 17.6 Ha plot (see García et al. 2013, for a comprehensive description of methodology). These observations suggest some phenological variability in the frequency of interaction between different tree and bird species (Fig. 1). Namely, during autumn (October-November), all bird species fed on all tree species (with hawthorn being proportionally more consumed), whereas in winter (December-January), all bird species mostly fed on holly (with redwing *Turdus iliacus* being the main consumer), even when hawthorn fruits were still available in the site.

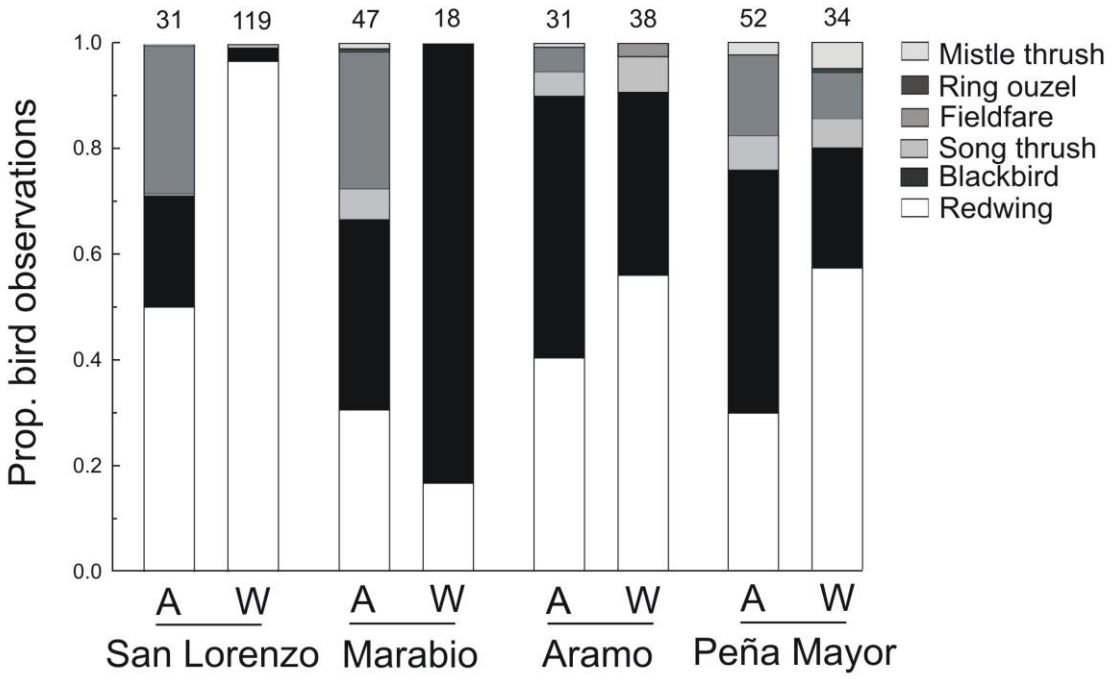
Figure 1. Proportion of fruits of different tree species (hawthorn *Crataegus monogyna*; holly *Ilex aquifolium*; yew *Taxus baccata*) consumed by different species of thrushes (mistle thrush *Turdus viscivorus*, fieldfare *T. pilaris*, song thrush *T. philomelos*, blackbird *T. merula*, redwing *T. iliacus*), in two seasons (autumn: n = 282 fruits; winter: n = 179 fruits) during the fruiting period.



Abundance of frugivorous birds

Censuses of frugivorous birds were performed in all study sites, by counting all individual birds of the different thrush species heard or seen along three 500 x 40 m permanent transects across each study site (see Peredo et al. 2013, for a comprehensive description of methodology). For each site, between 6 and 9 circuits were walked by transect from October 2009 to January 2010, totaling between 18 and 20 transect circuits per site. The relative abundance of different species was assessed for two different seasons during the sampling period (autumn: October-November; winter: December-January), as the proportion of observations (individuals) accounted for a given species of bird in relation to the total number of observation during a specific season at a given site. The relative abundance of the different species of thrushes changed between seasons across sites, with redwing increasing in importance during winter (Fig. 2).

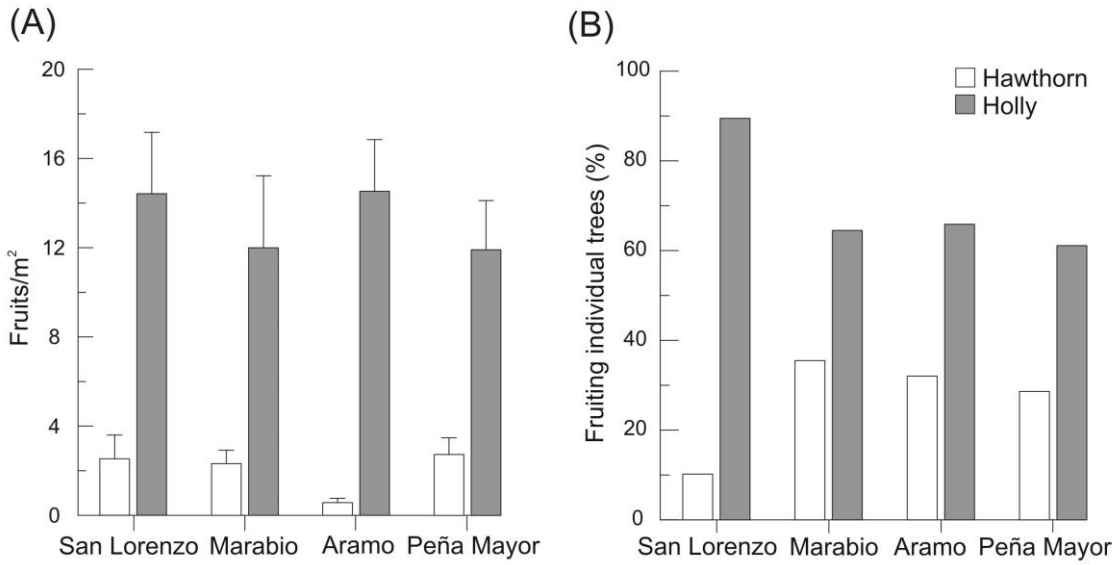
Figure 2. Relative abundances of different thrushes (proportion of total observations accounted for by each species) at the different sites for the two seasons (autumn, winter) of the fruiting period. The total number of observations is shown at the top of each column.



Relationship between forest cover and the abundance of fruits of different tree species

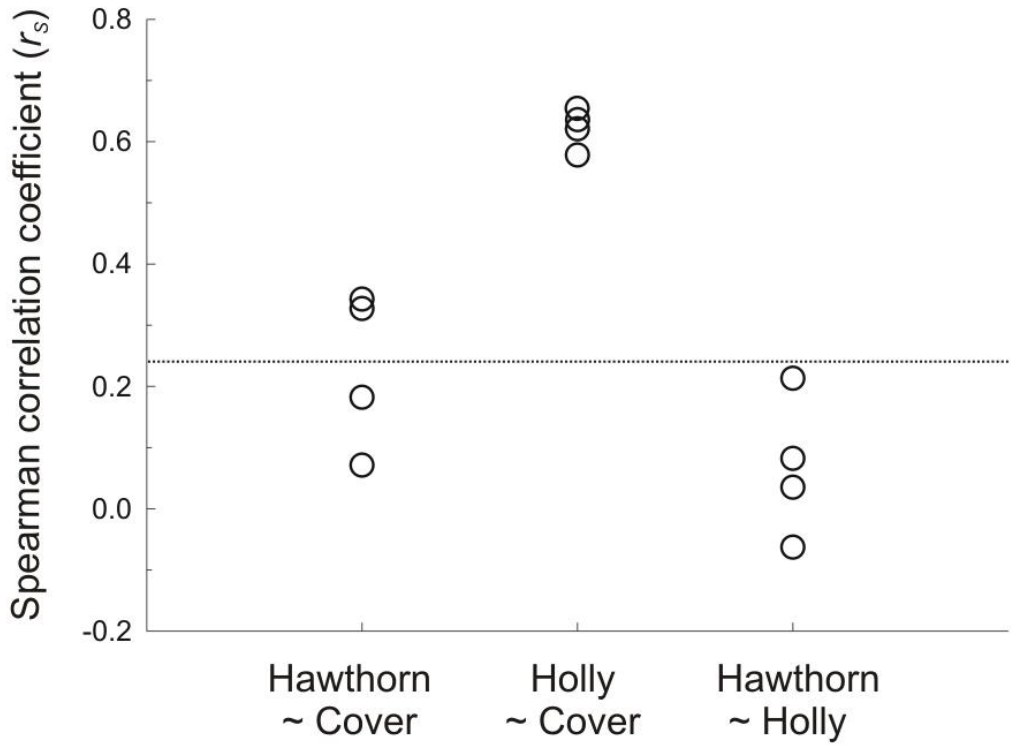
Counts of fruits and estimations of forest cover were also carried out in September 2009, in three 500 x 20 m permanent transects across each study site, corresponding to transects used for bird censuses (see above). Each transect was subdivided in twenty five 25 x 20 m sampling sections. For each section, the crop size of all individual fruiting trees belonging to different species was estimated in the field (see Peredo et al. 2013, for a comprehensive description of methodology). Fruit production in holly was 7-fold greater than in hawthorn, accounting for >60% of tree fruit production in all localities studied (Fig. 3A). Holly accounted for ca. 70% of the individuals of all fleshy-fruited tree species, and hawthorn for ca. 27% Fig. 3B).

Figure 3. A) Mean (±SE) values of the number of fruits per square meter in sampling transects (n = 75 sampling sections) in the different study sites, in 2009, for hawthorn (*Crataegus monogyna*) and holly (*Ilex aquifolium*). B) Proportion of individual fruiting trees found along sampling transects, belonging to hawthorn and holly, in the different study sites.



Forest cover was estimated from the vertical projection of all tree canopy, using a digitized layer created in a geographic information system (GIS, ArcGIS9.3, ESRI, Redland, CA, US) based on 1:5000-scale orthophotographs. The correlation between the proportion of forest cover and the total number of fruits per sampling section was estimated for hawthorn and holly fruits at the different sites. Strong positive significant correlations were always found between forest cover and the abundance of holly fruits, but weakly positive or null correlations were found in the case of hawthorn (Fig. 4). No relationship between the abundances of fruits of hawthorn and holly was found anywhere (Fig. 4).

Figure 4. Values of the Spearman's coefficient of correlation between the abundance of fruits of hawthorn and holly, and forest cover, in the four study sites in 2009. Dotted line represents the r_s threshold value for P < 0.05 (n = 75 sampling sections).



References

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