

Dynamics in temporal use of orchards by small passerines during the breeding season, case studies in UK and Spain

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INTRODUCTION

A central feature of bird home ranges is that they include certain habitats in order to survive and reproduce. Here we determined the use of orchards, as a clearly defined habitat structure, by small passerine in UK (apple) and Spain (citrus).

Conventional orchards are commonly treated with pesticides according to GAP (Good Agricultural Practise), which defines an application period following the crop seasonal development. Therefore, knowledge on the composition and temporal dynamics in the abundance of the bird community within such orchards is required for a risk assessment of the applied pesticides.

MATERIALS & METHODS

Constant-effort mist netting was performed during several consecutive years in UK (2012 – 2014) and Spain (2010 – 2012) in ten orchards (3.5 to 10 ha).

Total trapping effort was 880h in UK (360m net line, 2.5m high, 16mm mesh wide) and 1594h (288m net line) in Spain. Systematic nest searches were conducted regularly. Nest boxes were installed in all study orchards in Spain in 2011 and UK in 2012.

The general structure of the bird community was analysed. Species-specific parameters such as frequency of occurrence (**FO**), dominance (including first traps and first re-traps in a year) and presence as breeding species were estimated. GLMM models with a Poisson distribution were fitted to the standardised trapping success of 6 species in citrus and 4 species in apple, including year as fixed factor and the day of year as linear, quadratic and cubic terms to allow for non-linear relationships between trapping success and season.

Aims were: to determine with respect to the abundance **(i)** Changes within a season **(ii)** Differences between species **(iii)** Differences between years by species

Tab.1: Dominant bird community in citrus orchards in Spain

Species	Dominance (% of all trapped birds)	Feeding Guild	FO _{trapping}	FO _{study orchards}	Breeding inside orchard ^a
Serin	17.6	Granivorous	85.2	100.0	common
Sardinian warbler	11.3	Insectivorous	85.2	100.0	rare ^b
House sparrow	10.1	Insectivorous	52.8	100.0	no
Blackbird	10.1	Omnivorous	83.5	100.0	common
Greenfinch	9.5	Granivorous	54.0	100.0	common
Goldfinch	6.0	Granivorous	45.5	100.0	common
Great tit	3.8	Insectivorous	58.5	100.0	rare
Blackcap	3.7	Insectivorous ^c	15.9	100.0	no
Barn swallow	3.4	Insectivorous	33.5	100.0	no
Linnet	2.8	Granivorous	13.1	70.0	rare
Tree sparrow	2.6	Insectivorous	26.7	90.0	no
Nightingale	2.2	Insectivorous	28.4	100.0	no
Total	83.3				

Number of individuals trapped = 13544 Number of species trapped = 81

^a Common = in most of the orchards, rare = in up to 3 orchards, ^b found mainly breeding in dense vegetation close by ^c trapped on migration mainly, then also frugivorous and nectar feeding

Tab.2: Dominant bird community in apple (cider) orchards in UK

Species	Dominance (% of all trapped birds)	Feeding Guild	FO _{trapping}	FO _{study orchards}	Breeding inside orchard ^a
Blue tit	19.4	Insectivorous	77.1	100.0	common
Great tit	17.2	Insectivorous	79.8	100.0	common
Robin	16.5	Insectivorous	77.6	100.0	rare
Blackbird	14.6	Omnivorous	72.2	100.0	no ^b
Chaffinch	5.4	Granivorous	49.8	100.0	no
Common redstart	2.9	Insectivorous	23.8	100.0	rare
Long-tailed tit	2.7	Insectivorous	13.0	90.0	no
Song thrush	2.4	Omnivorous	26.0	100.0	no
Blackcap	2.2	Insectivorous	20.6	90.0	no
Chiffchaff	2.1	Insectivorous	21.5	80.0	no
Mistle thrush	2.0	Omnivorous	18.8	90.0	no
Total	87.4				

Number of individuals trapped = 3230 Number of species trapped = 45

^a Common = in most of the orchards, rare = in up to 3 orchards, ^b found breeding in hedgerows close by



Fig.1: From left to right: mist nets in citrus orchard; tree rows in apple orchard for cider production; trapped Great Tit in citrus orchard; trapped Robin in cider orchard

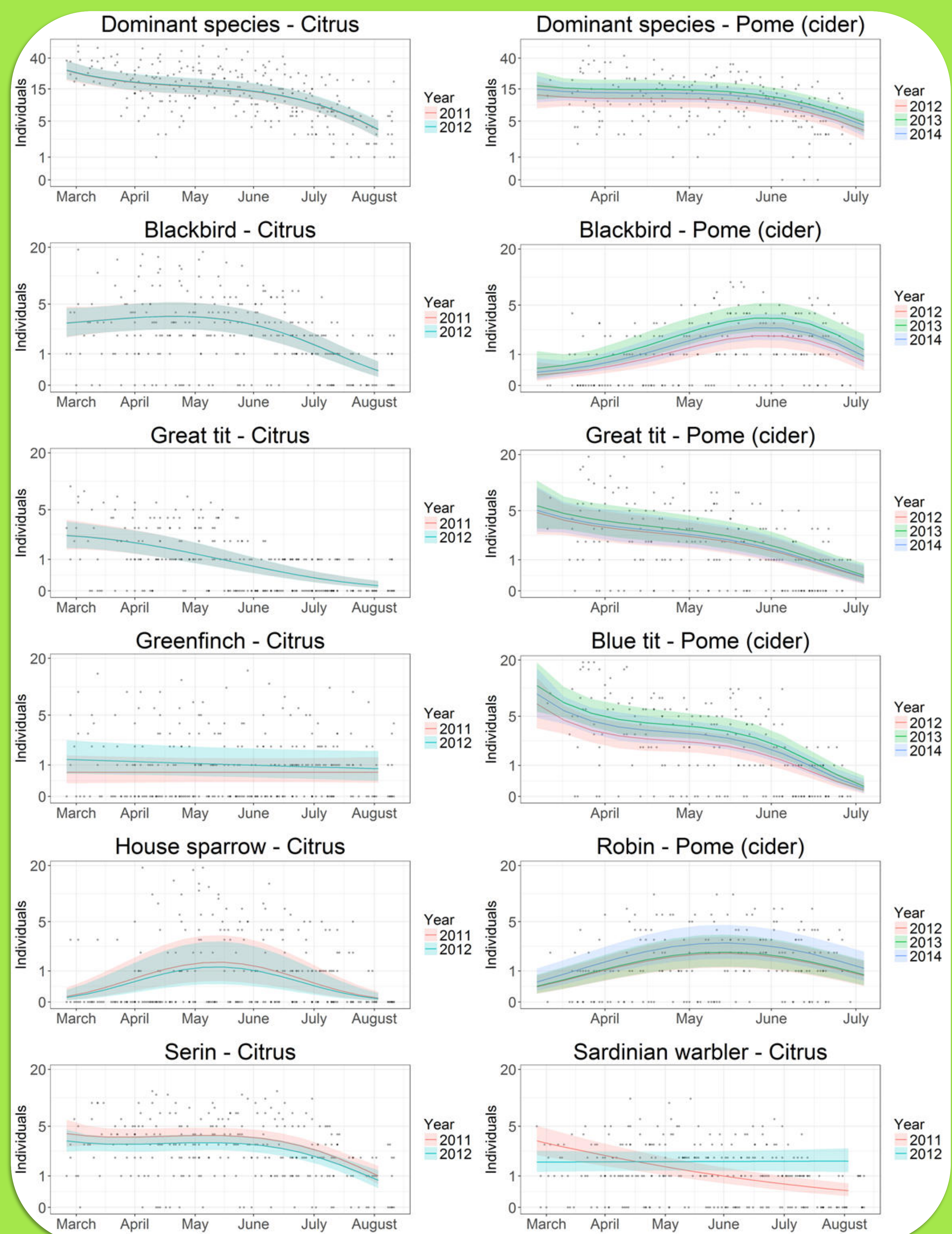


Fig.2: Standardised no. of adult individuals of dominant species trapped in CITRUS (left) and APPLE/CIDER (right) orchards in 2011-2014 in relation to the month (10-day periods). Lines = regression line and 95% C.I., log-transf. y-axis. No. of individuals standardised per average trapping effort in 10-day periods (citrus, 288m net line/3h; cider, 360m net line/4h).

In citrus: a) variation over the years was so small for Dominant Species, Blackbird and Great tit that the C.I.s of the 2 years overlap completely b) 2010 not included in the analysis as trapping was conducted only in July and August.

RESULTS & DISCUSSION

- Spanish orchards were rich in bird numbers and in species; the UK bird community was more uniform and scarce. However, only a few species were abundant in the orchard communities.
- Twelve and eleven species in Spain and UK respectively (out of 81 and 45 trapped) exceeded the 2% dominance value (= dominant species).
- Overall, 15.4% (Spain) and 21.5% (UK) of the adult birds were re-trapped in the following year, although with great differences between species.
- The effect of seasonality shown by the GLMMs was significant in four out of the six species (Great tit, House sparrow, Sardinian warbler, Serin) in citrus and in three of four species (Blue tit, Great tit, Robin) in apple/cider orchards.
- A significant negative effect of the year on the number of trapped birds was only found for Serin from 2011 to 2012 in citrus orchards. All other nine species showed no indication of a reduction in population size, as no negative trend within consecutive years was found.

CONCLUSIONS

- ✓ **Similarities** in bird community: a similar number of dominant species (~12) represent the community. Great tit and Blackbird are relevant species in both orchard types.
- ✓ **Differences** in bird community: more species altogether, greater number of individuals and more breeding species were found in **citrus orchards** in Spain.
- ✓ **Use** of the orchards: population sizes remained stable with individual site-fidelity throughout the years. Most of the species show a distinct seasonal occurrence pattern, which defines changes in habitat use along the breeding season something which requires flexibility in bird home-ranges.
- ✓ **Applied method:** **mist netting** is advisable for defining a bird community; it offers more accurate results than other methods (e.g. bird counts)

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