tier3 solutions

Ridgeway Eco
Integrating Ecotoxicology & Sustainable Crop Protection

Avian reproduction under real conditions: how to deal with variability and extrapolation in bird nest monitoring studies

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Introduction

Tier1 studies*		Nest monitoring studies
Mallard duck, Bobwhite/Japanese quail	Test species	Species colonizing orchard/agroecosystem
adults feed treated diet, 20 weeks	Exposure	all possible routes (diet, contact, indirect), adult & offspring, different breeding stages
stable housing conditions (22°C, 50-75 % humidity)	Environment	variable environmental conditions, incl. inclement weather
continued egg laying, eggs removed	Reproduction	entire reproductive cycle, one to several breeding attempts, parental care

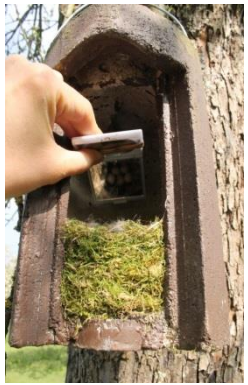
simple standardized test system

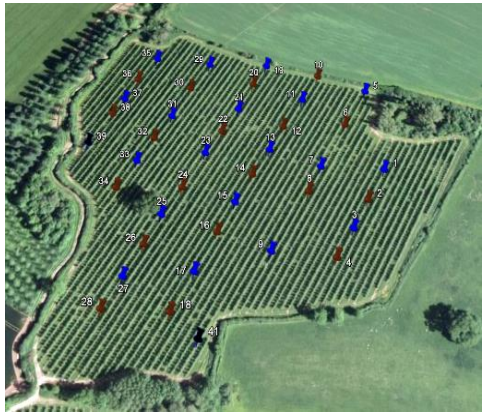
maximum level of realism

* Test Guidelines OECD 206 & Avian Reproduction Test EPA 712-C-96-141

Methods

- 10 conventional and 3 organic cider orchards in UK
- ~ 6 nest boxes/ha
- additional nest searches for cavity and open breeder
- repeated nest controls every 2 to 6 days





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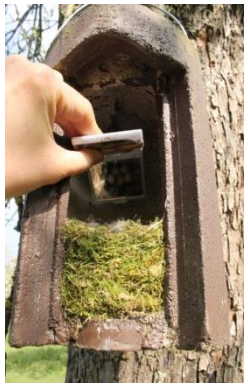

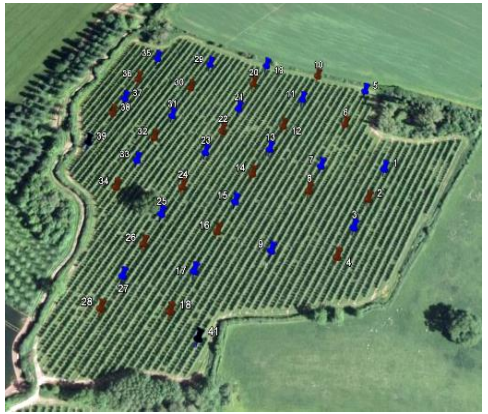

Great tit Breeding parameters	Study results		According to Bouvier et al. (2005)	
	Organic	Conventional	Organic	Conventional
Mean date of clutch initiation	112.5	112.0	112	106
Mean clutch size	6.5	6.6	6.2	6.7
Unsuccessful nest during incubation stage (%)	0.0	1.1	3.6	20
Hatching rate (%)	88.8	90.7	88.3	77.9
Dead chick rate in nest (%)	31.9	25.5	24	32.1
Fledglings per breeding pair	3.3	4.2	5.2	4.6

Methods

Breeding phase	Tier1 endpoint	Nest monitoring
Establishing breeding site, pairing	• Change in adult body weight	• Change in adult body weight before and after application • Behavioural observations
Copulation & egg laying	• Eggs laid/hen • Mean eggshell thickness • % fertile eggs/eggs set * hen	• Clutch size • Mean eggshell thickness/nest • Number of infertile eggs/nest
Incubation & hatching	• Change in adult body weight • % hatchlings/eggs set * hen	• Change in adult body weight • Number of hatched eggs/nest • Daily nest survival rate
Juvenile growth & survival until fledging	• % juveniles survived until day 14	• % fledglings/hatched eggs*nest • Daily nest survival rate
Post-fledging survival	• 14 d chick body weight/hen	• Body weight of chicks at age 8/14 days

Methods

Breeding phase	Tier1 endpoint	Nest
Establishing breeding site, pairing	• Change in ad…	…weight before and …ns
Copulation		…s/nest …/nest
Incubation &		…ght …nest
Juvenile growth until fledging		…glings/hatched eggs*nest • Daily nest survival rate
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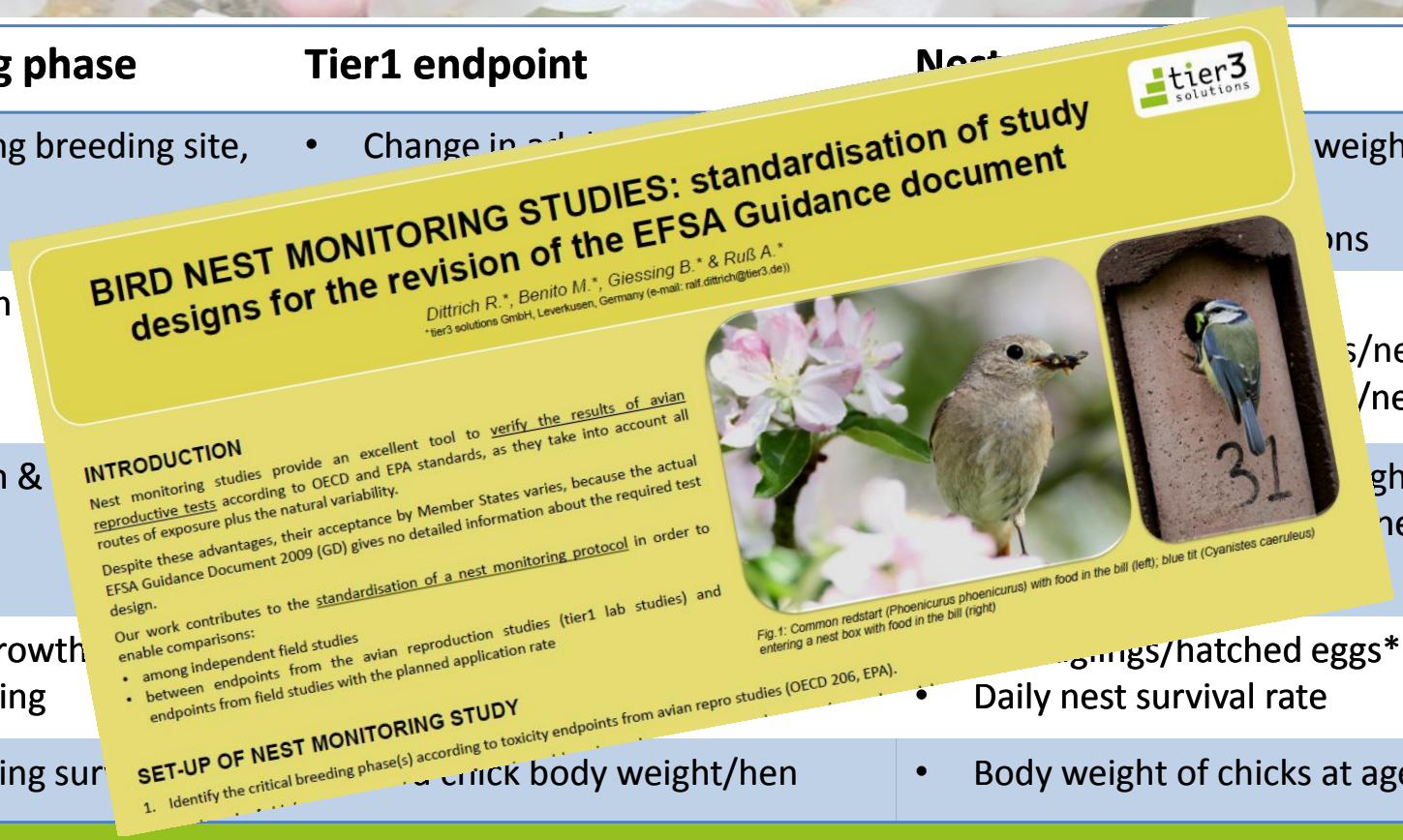

BIRD NEST MONITORING STUDIES: standardisation of study designs for the revision of the EFSA Guidance document

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INTRODUCTION

Nest monitoring studies provide an excellent tool to verify the results of avian reproductive tests according to OECD and EPA standards, as they take into account all routes of exposure plus the natural variability.

Despite these advantages, their acceptance by Member States varies, because the actual EFSA Guidance Document 2009 (GD) gives no detailed information about the required test design.

Our work contributes to the standardisation of a nest monitoring protocol in order to enable comparisons:

- among independent field studies
- between endpoints from the avian reproduction studies (tier1 lab studies) and endpoints from field studies with the planned application rate

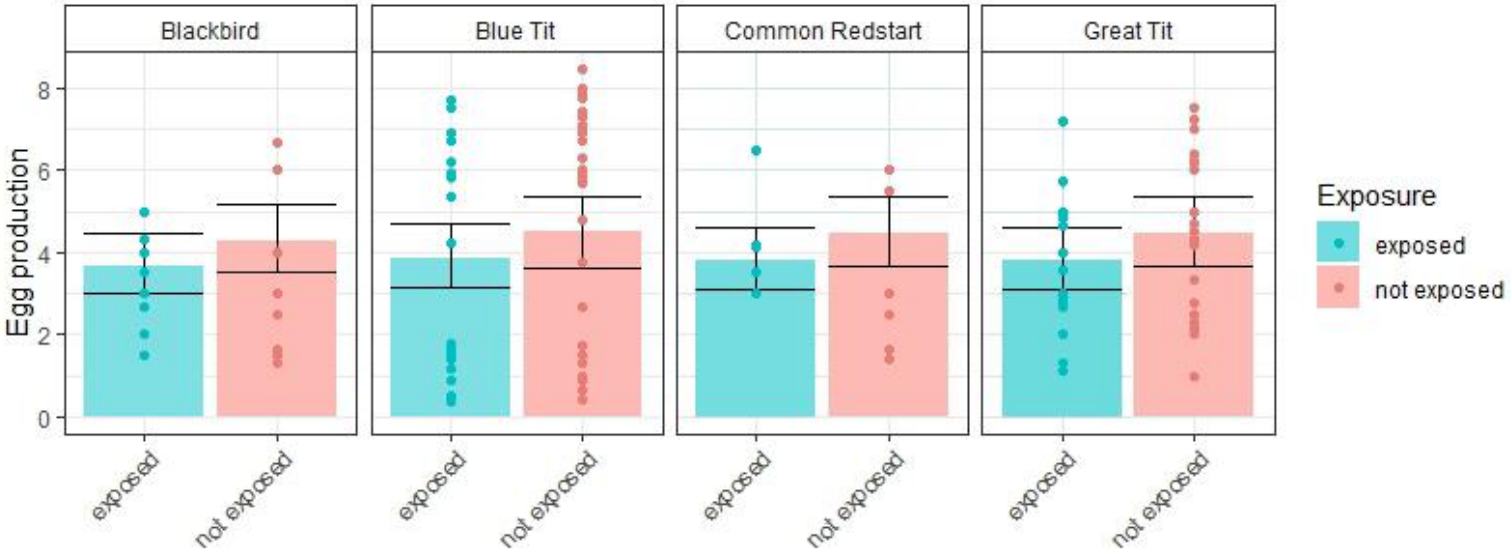
SET-UP OF NEST MONITORING STUDY

1. Identify the critical breeding phase(s) according to toxicity endpoints from avian repro studies (OECD 206, EPA).

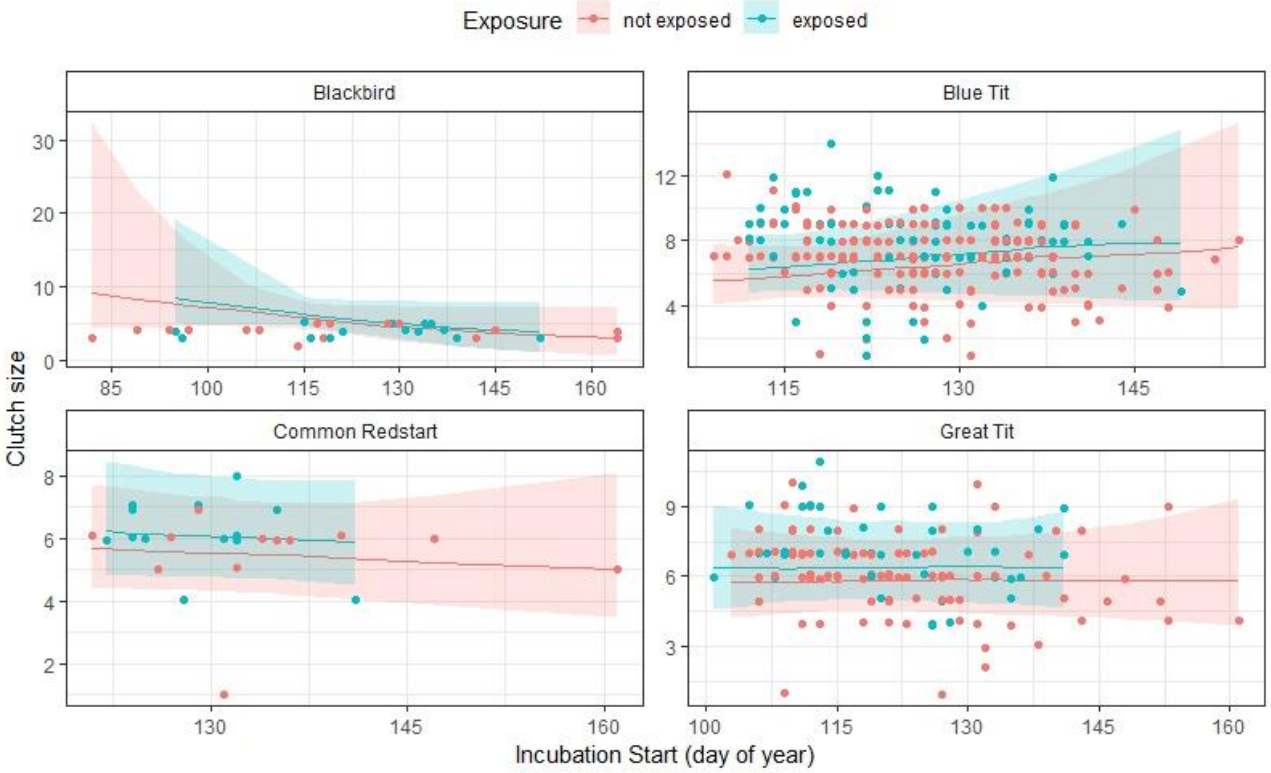
Fig.1: Common redstart (Phoenicurus phoenicurus) with food in the bill (left); blue tit (Cyanistes caeruleus) entering a nest box with food in the bill (right)

Egg production

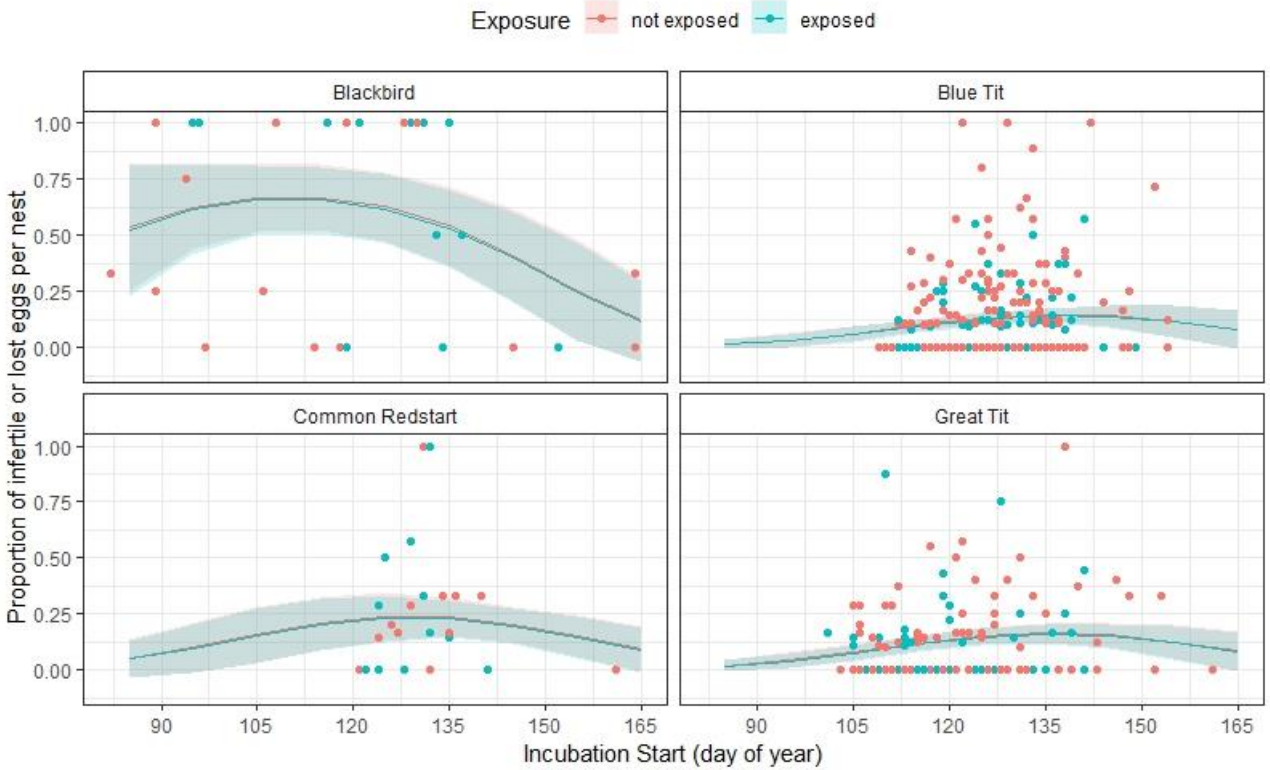
$$\frac{number\ of\ laid\ eggs}{maximum\ number\ of\ simultaneously\ active\ nests}$$



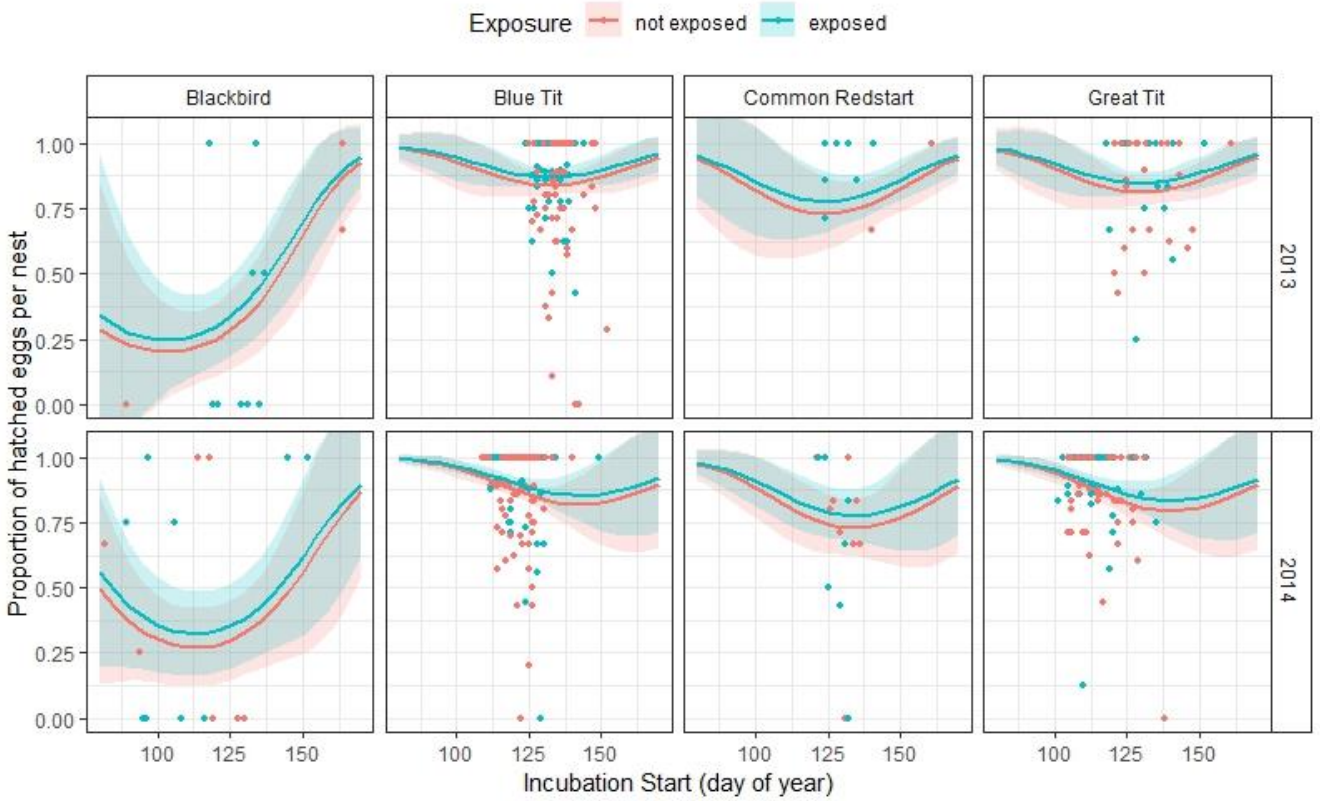
Clutch size


Exposure
not exposed
exposed
Blackbird
Blue Tit
Common Redstart
Great Tit
Clutch size
Incubation Start (day of year)

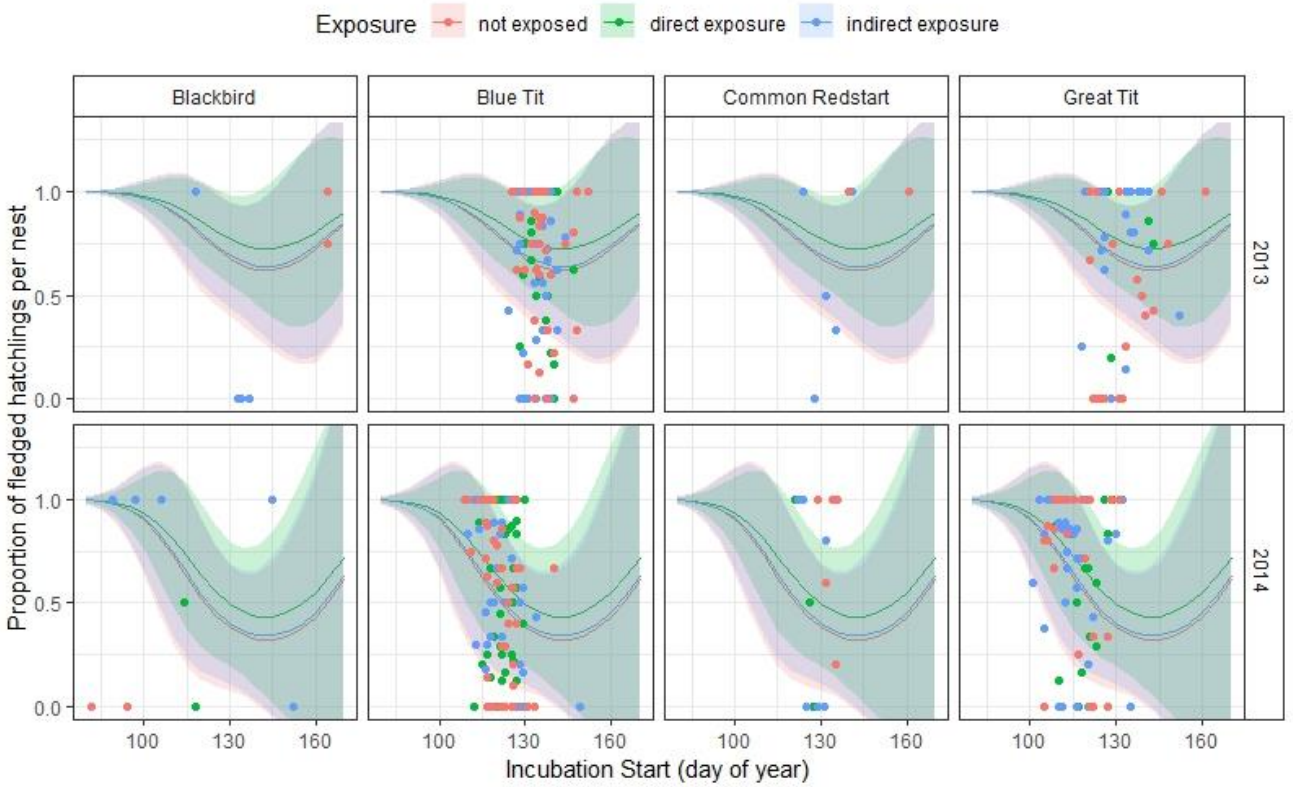
Infertile eggs



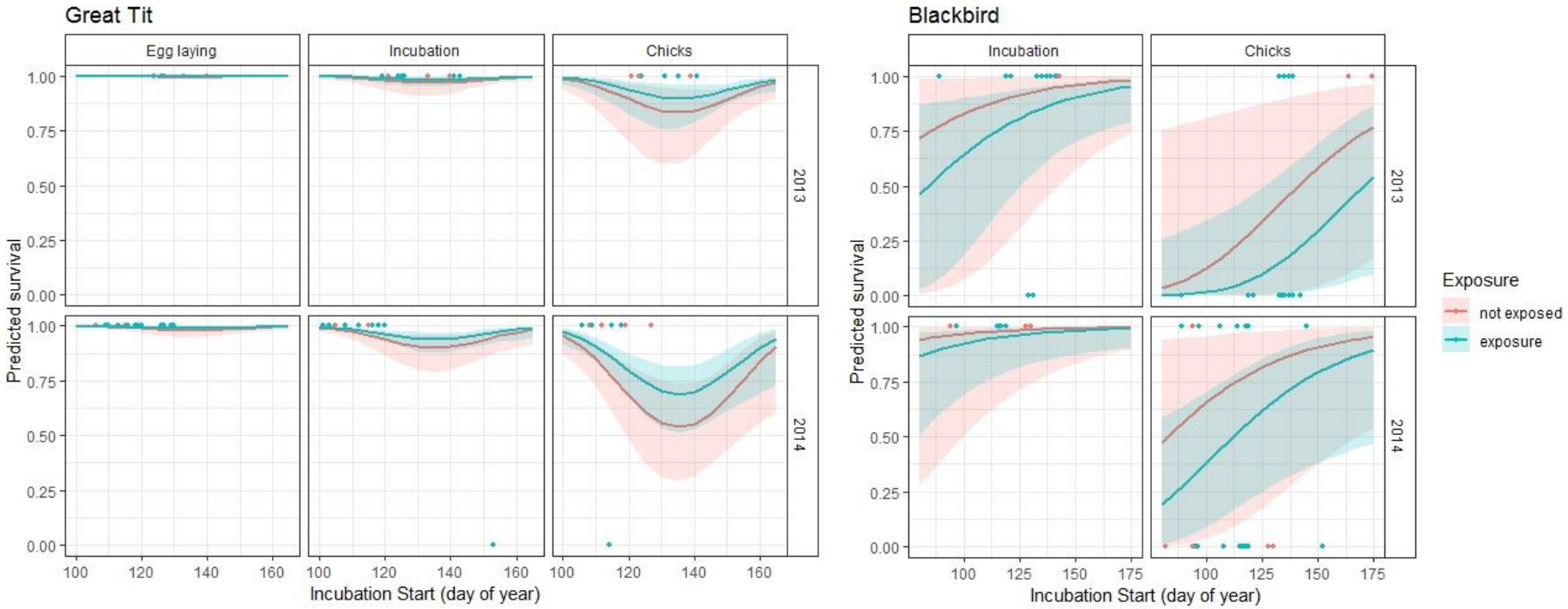
Hatching success



Fledging success



Nest survival probability



Conclusion

- ✓ Nest monitoring studies are feasible to investigate the effects of PPP in the field
- ✓ great and blue tits well suited:
  - ✓ representing insectivorous species
  - ✓ as cavity nesters less prone to disturbance due to application
- ✓ Endpoints of nest monitoring studies are comparable to endpoints from avian reproductive studies
- ✓ Agreed standards for nest monitoring studies should be defined in the new EFSA Guidance on Birds and Mammals