Online Resource for

Spatial and temporal variation in farmland bird nesting ecology: Implications for effective Corn Bunting *Emberiza calandra* conservation

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Contents

Supplemental Figures

Figure S1 – Habitat composition per study area

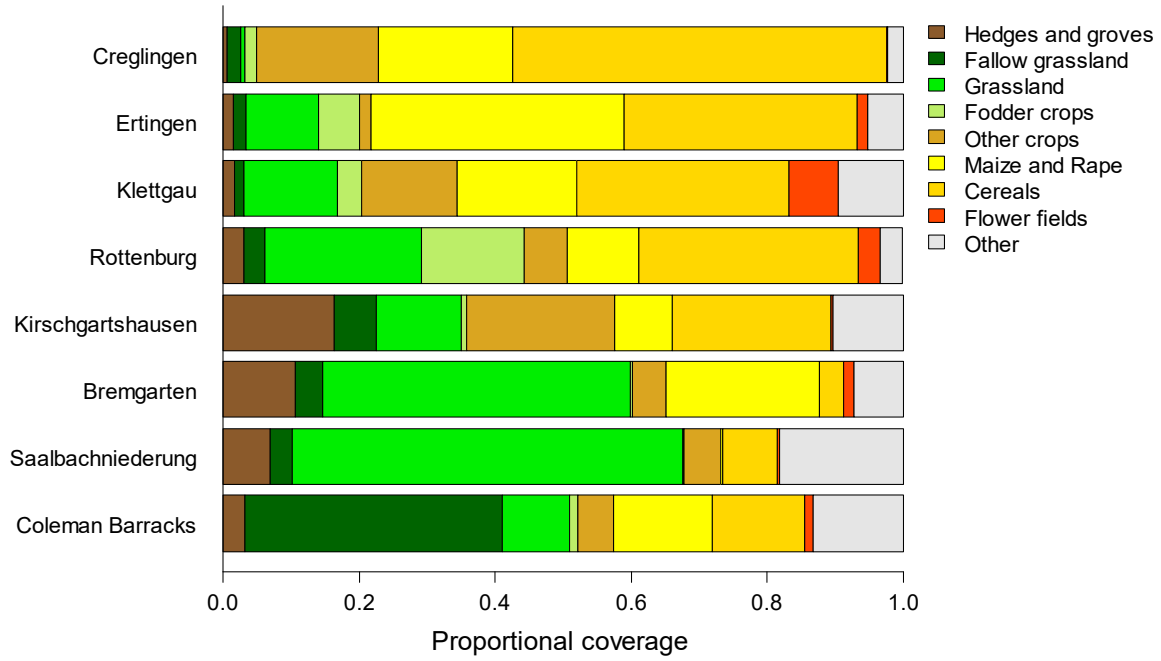

Figure S1. Habitat composition of the study areas by main land use types. Study areas are arranged from grassland-dominated (bottom) to cropland-dominated landscapes (top).

'Fodder crops': alfalfa, clover-grass leys, and field grass.
'Other crops': grain legumes and root crops.
'Other': mostly sealed road and airfield surfaces, homesteads or lake surfaces.

Note that landscape-level surveys did not differentiate *flower field* coverage between fields in year 2 since sowing and older fields. Generally, "old" 3yr+ flower fields were dominant within the 'flower field' category in Ertingen and Klettgau, while there was roughly a 1:1 mix in Rottenburg. In the four Rhine valley sites and in Creglingen, flower fields covered very low area fractions, and most of these were located at the periphery outside the core distribution of Corn Bunting.

Figure S2 – Corn Bunting nestling age

Figure S2. Calibrated pictures of Corn Bunting nestlings of known age post-hatching. Image © Nils Anthes & Markus Handschuh.

Figure S3 – Corn Bunting breeding phases

Figure S3. Corn Bunting breeding phases and their estimated duration. Image © Nils Anthes & Markus Handschuh.

Supplemental Tables

Table S1 – Study area: characteristics and sample sizes

Table S1. Characterisation of study areas and the number of nests per site that were integrated into the analysis of nesting habitats ('habitat'), nesting phenology ('phenology'), apparent nest survival ('app. surv.'), and Mayfield daily nest survival ('DSR'). Study areas with shared background colour were combined by 'Region' for statistical analysis.

Study area	Landscape type	Region	Area (ha)	Population size*	Study years	Sample size (# nests)			
						habitat	*phenology*	*app. surv.*	*DSR*
(1) Kirschgartshausen	Restored floodplain grasslands, in a forest and arable land matrix	Rhine valley grasslands	387	6	2018-2020	12	12	10	2
(2) Coleman Barracks	Extensive grasslands on airstrip, surrounded by arable fields	Rhine valley grasslands	316	7–11	2018-2020	16	16	11	2
(3) Saalbachniederung	Mesotrophic meadows in arable landscape matrix	Rhine valley grasslands	385	1–5	2018-2020	5	5	5	1
(4) Bremgarten	Extensive grasslands on airstrip fields and adjacent arable fields	Rhine valley grasslands	765	14–19	2018-2020	13	13	10	3
(5) Creglingen	Intense arable land	Creglingen cropland	650	9–13	2019-2022	30	30	23	8
(6) Rottenburg	Extensive arable land, high proportions of organic farming, meadows and cattle pastures	Rottenburg mixed	590	14–24	2014-2022	141	134	133	72
(7) Ertingen	Intense arable land, dedicated farmland eco schemes concentrate in centre	Ertingen / Klettgau cropland	439	3	2019	2	2	2	1
(8) Klettgau	Intense arable land, dedicated farmland eco schemes concentrate in centre	Ertingen / Klettgau cropland	305	4–5	2018-2019	6	6	6	4
Total						**225**	**218**	**200**	**93**

* Population size gives the span of territories recorded in the site-specific study years. Values from Staggenborg et al. (2024).

Staggenborg, J., Back, K., Debatin, F., Grom, J., Hielscher, S., Schneider, S., Teichert, T. & Anthes, N. (2024). Feldvogelschutz am Beispiel der Grauammer – Erkenntnisse aus großräumigen Untersuchungen zu Raumnutzung und Brutbiologie. Naturschutz und Landschaftspflege Bad.-Württ. 81, 1-78.

Table S2 – Model selection for Mayfield daily nest survival rates (DSR)

Table S2. Overview of MARK-models to predict variation in Daily nest survival rates (DSR). Model sets (a) and (b) served to extract predictor combinations for the combined model set (c). Within each model set, predictor combinations are sorted by AICc values. 'npar' is the number of estimated model parameters.

Model set and predictors	npar	AICc	Δ AICc	weight	Deviance
(a) Time and Region					
HatchingDay	2	144.68	0.00	0.41	140.66
Time	2	146.12	1.44	0.20	142.10
HatchingDay + Time	3	146.64	1.96	0.15	140.60
HatchingDay + NestAge	3	146.65	1.97	0.15	140.61
HatchingDay + Time + NestAge	4	148.59	3.91	0.06	140.53
NestAge	2	151.99	7.32	0.01	147.97
(Intercept)	1	153.30	8.63	0.01	151.30
Region	2	155.31	10.64	0.00	151.29
Year	7	161.28	16.60	0.00	147.11
(b) Nest and brood characteristics					
FirstBrood	2	149.71	0.00	0.48	145.69
NestHeight	2	150.56	0.85	0.32	146.54
(Intercept)	1	153.30	3.60	0.08	151.30
Clutch Size	2	154.11	4.40	0.05	150.09
VegetationCover	2	155.13	5.42	0.03	151.11
VegetationHeight	2	155.21	5.50	0.03	151.19
NestHabitat	7	160.71	11.00	0.00	146.54
(c) Combined models					
HatchingDay	2	144.68	0.00	0.29	140.66
HatchingDay + NestHeight	3	145.49	0.81	0.19	139.45
HatchingDay + FirstBrood	3	146.01	1.34	0.15	139.98
HatchingDay + Time	3	146.64	1.96	0.11	140.60
HatchingDay + NestHeight + FirstBrood	4	146.77	2.10	0.10	138.71
HatchingDay + Time + NestHeight	4	147.49	2.82	0.07	139.43
HatchingDay + Time + FirstBrood	4	148.02	3.34	0.05	139.96
FirstBrood	2	149.71	5.03	0.02	145.69
NestHeight	2	150.56	5.88	0.02	146.54
(Intercept)	1	153.30	8.63	0.00	151.30
HatchingDay + NestHabitat	8	153.70	9.02	0.00	137.48
HatchingDate + NestHabitat + NestHeight	9	154.84	10.16	0.00	136.57
HatchingDate + NestHabitat + NestHeight + FirstBrood	10	156.28	11.60	0.00	135.95
HatchingDate + NestHabitat + NestHeight + Time	10	156.89	12.21	0.00	136.56
NestHeight + NestHabitat	8	159.87	15.20	0.00	143.65
NestHabitat	7	160.71	16.03	0.00	146.54

Table S3 – Literature overview: Corn Bunting nest habitats and nest parameters

Table S3. Overview of literature values on Corn Bunting nest habitats and clutch parameters across regions and landscape types.
Numbers in white fonts (and the corresponding darkness of violet shading) are the proportion among 'N nests' found in the respective habitat. 'Clutch size': mean number of eggs per documented full clutch. 'Hatch rate': Mean fraction of eggs per full clutch that hatched a chicked. 'Jump/nest': mean number of jumplings per documented nest. 'Jump./succ.': mean number of jumplings per documented successful nest. Studies varied in the nomenclature of nest habitats and how these were combined into categories. We allocated values to nest habitat categories as precisely as possible, and comment on specific cases where this was only partially possible.

Source	LandscapeType	N nests	Winter cereals	Spring cereals	Fodder crops[1]	Root crops	Fallow & set aside[2]	Meadow intensive	Grassland extensive	Pasture	Margins[3]	Ruderal land	Bush-land	Other	Clutch size	Hatch rate	Jump/ nest	Jump/ succ.	Country	Region	Comment
Sacher & Bauschmann 2011	cropland-dom.	16	0.88	0.00	0.06	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	Germany	central and S Hessen	13 wheat, 1 barley, 1 alfalfa.
This study	cropland-dom.	30	0.77	0.00	0.03	0.10	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	4.25	1.00	2.83	4.25	Germany	Creglingen	
Hölker & Klähr 2004	cropland-dom.	27	0.56	0.04	0.07	0.11	0.15	0.00	0.00	0.00	0.04	0.00	0.04	0.00	4.3	-	2.75	-	Germany	Hellwegbörde (NRW)	
Fehn 2021	cropland-dom.	40	0.53	0.00	0.20	0.10	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	Germany	Zülpicher Börde region	Fodder crops: pea.
Brickle & Harper 2002	cropland-dom.	120	0.33	0.36	0.00	0.00	0.15	0.00	0.08	0.00	0.08	0.00	0.00	0.00	-	-	-	-	England	West Sussex	
Perkins et al. 2015	cropland-dom.	580	0.12	0.50	0.22	(**)	0.06			(**)	0.06		0.00	0.05	-	-	-	-	Scotland	4 regions in E Scotland	66 in "other grass types such as non-rotational set-aside, field margins, newly sown grass", here split 1:1 between fallow and margins. 'Other' = Rape, Root crops, and Pasture (**).
Stein-Bachinger et al. 2010	cropland-dom. (mostly organic)	77	0.16	0.08	0.47									0.30	4.8	0.95	1.84	-	Germany	Brandenburg	No further differentation by crop types.
Setchfield et al. 2012	cropland-dom.	200	0.00	0.59	0.08	(*)	0.04	0.08	0.04	0.04	0.04		(*)	0.10	-	-	-	2.78 - 3.33	England	Cornwall	Cereals = spring barley (often 'extensive'). 'silage & haylage': split among fodder crops + intense meadows. 'extensive grassland' split among pasture, margins, extensive grassland, set-aside. 'Others' also contain root crops, bushes (*).
Gyllin 1965 (from Gliemann 1973)	cropland-dom.	59	0.00	0.20	0.69	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	-	-	-	-	Sweden		
This study	cropland-dom.	8	0.00	0.00	0.13	0.00	0.63	0.00	0.13	0.00	0.13	0.00	0.00	0.00	4.4	0.70	3.25	3.25	Germany & Switzerland	Ertingen & Klettgau	
Eislöffel 1997	cropland-dom.	51					0.59				0.10			0.31	-	-	-	-	Germany	Rheinland-Pfalz	'Other' not further differentiated.
Suter et al. 2002	mixed	35	0.26	0.00	0.00	0.40	0.03	0.26	0.06	0.00	0.00	0.00	0.00	0.00	-	-	-	-	Switzerland	Großes Moos	
This study	mixed	134	0.13	0.02	0.19	0.01	0.10	0.02	0.34	0.15	0.04	0.00	0.01	0.00	4.5	0.88	3.11	3.80	Germany	Rottenburg	
Fischer 1999	mixed	106	0.04	0.01	0.06	0.00	0.49	0.06				0.31		0.04	4.7	-	-	-	Germany	Brandenburg	
Gliemann 1973	mixed	39	0.10		0.05	0.00	0.31	0.36		0.00	0.00	(*)	0.18	0.00	4.7	-	-	4.22	Germany	Oberlausitz region	Bushland = Broom *Genista* , Black- and Raspberry *Rubus* , 'fallow' also contains ruderal land (*).
Boschert 1997	various	60	0.03	0.02	0.03	0.00	0.02	0.47		0.00	0.32	0.12	0.00	0.00	4.5	-	-	-	Germany	Baden-Württemberg	'Ruderal land' contains nests in quarries and 'wasteland'.
Mildenberger 1984	various	129	0.37		0.08	0.00		0.52			0.00	0.03	0.00	0.00	-	-	-	-	Germany	Rheinland region	
This study	grassland-dom.	46	0.00	0.00	0.00	0.00	0.48	0.13	0.17	0.02	0.07	0.09	0.04	0.00	4.75	0.86	3.75	4.29	Germany	Rhine valley	
Hegelbach 1984	grassland-dom.	113	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	4.1			3.20	Switzerland	Reußtal	112 nests in extensive litter meadows, 1 in conv. meadow.
Ryves 1934 (from Gliemann 1973)	Coastal Heathland	54	0.09		0.00	0.00	0.00	0.00	0.89	0.00	0.00	0.02	0.00	0.00	3.9	-	-	-	England	N Cornwall	Study focus: coastal heathland, most nests in heather *Calluna,* Common Gorse *Ulex europ.*.

[1] Fodder crops: mostly alfalfa, clover-grass, field grass, pea.
[2] Fallows: temporarily unused cropland, also often termed 'set-aside'. Includes eco-scheme flower fields.
[3] Margins: Ditches, field margins, grass paths, grass seams.

Sources for Table S3

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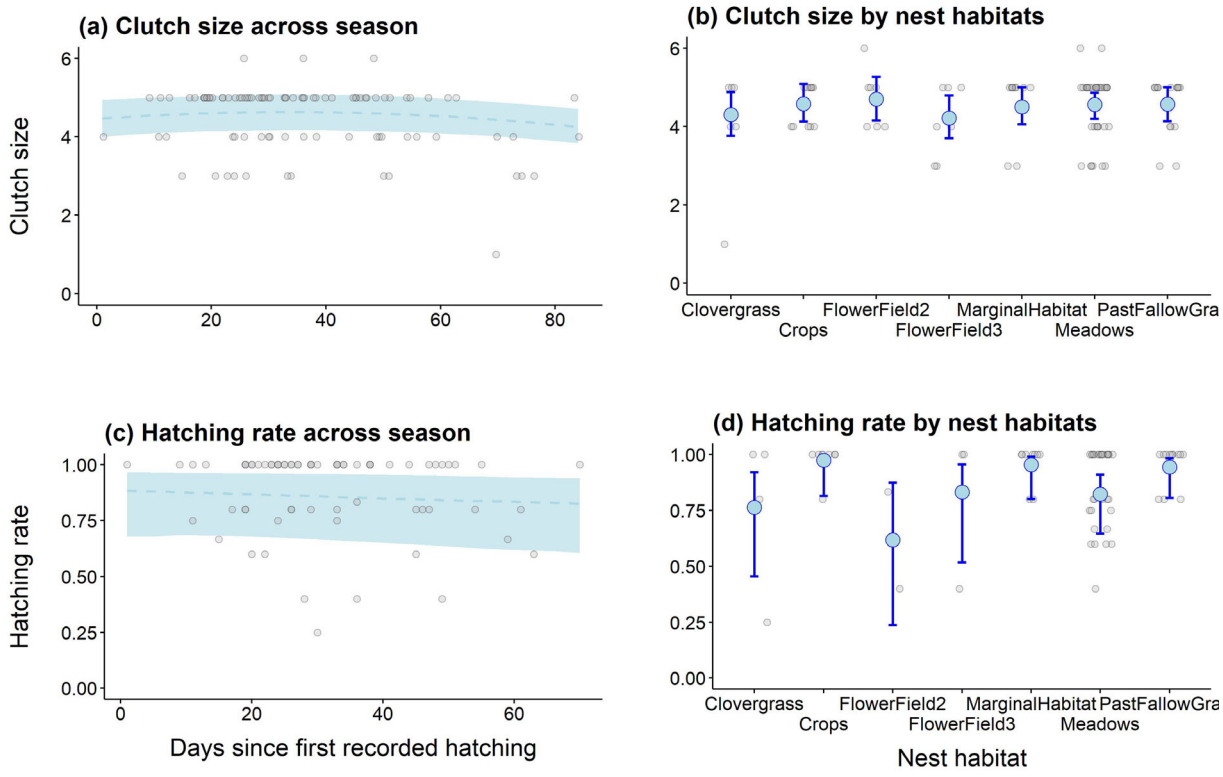
Supplemental statistical analyses

Statistical supplement A – Results for Clutch size and Hatching rate models

The figures and tables report estimates from generalized linear models predicting variation in Corn Bunting clutch size (log-link based on a generalized Poisson distribution) and in hatching rates (logit-link based on a binomial distribution).

(A.1) Graphical results display



(A.2) Coefficient estimates from full models

Model structures:

```
ClutchSize ~ poly(HatchingDate, 2) + Nest habitat + Region,
             family = genpois(link = "log")

HatchingRate ~ poly(HatchingDate, 2) + ClutchSize +
             Nest habitat + Region,
             weights = ClutchSize,
             family = binomial(link = "logit")
```

Table A.2a: Model parameter coefficient estimates.

Parameter	Coefficient*	SE	lwr.CI	upr.CI
(a) Clutch size model (log link)				
(Intercept) [Nest habitat: alfalfa; Region: other]	**1.455**	0.073	**1.313**	**1.598**
Hatching day (linear)	-0.245	0.158	-0.554	0.064
Hatching day (quadratic)	**-0.319**	0.144	**-0.602**	**-0.036**
Nest habitat: crops	0.062	0.077	-0.089	0.213
Nest habitat: Flower fields (year 2)	0.088	0.079	-0.068	0.243
Nest habitat: Flower fields (year 3+)	-0.021	0.090	-0.197	0.156
Nest habitat: seminatural margin habitat	0.045	0.078	-0.108	0.198
Nest habitat: meadows	0.058	0.063	-0.066	0.182
Nest habitat: Pasture, fallow grassland	0.060	0.070	-0.077	0.198
Region: Rottenburg	-0.005	0.046	-0.095	0.085
(b) Hatching rate model (logit link)				
(Intercept) [Nest habitat: alfalfa; Region: other]	1.214	1.465	-1.657	4.084
Hatching day (linear)	-2.375	1.575	-5.461	0.712
Hatching day (quadratic)	0.132	1.678	-3.158	3.421
Clutch size	-0.055	0.282	-0.607	0.498
Nest habitat: crops	**2.464**	1.181	**0.150**	**4.778**
Nest habitat: Flower fields (year 2)	-0.697	0.936	-2.532	1.138
Nest habitat: Flower fields (year 3+)	0.425	0.944	-1.425	2.275
Nest habitat: seminatural margin habitat	1.863	0.952	-0.002	3.729
Nest habitat: meadows	0.357	0.635	-0.888	1.602
Nest habitat: Pasture, fallow grassland	**1.654**	0.838	**0.012**	**3.296**
Region: Rottenburg	0.444	0.550	-0.634	1.523

** Note: all coefficient estimates given as differences in the log ratio (model a) and in the log of odds (model b). Bold face highlights 'robust' coefficient estimates in which the confidence interval does not include zero.*

(A.3) Pairwise comparisons among nest habitats

Contrasts	[odds]ratio*	SE	lower.CI	upper.CI
(a) Clutch size model (log link)				
Alfalfa.Clover.grass - Crops	0.940	0.072	0.808	1.093
Alfalfa.Clover.grass - Flower fields (year 2)	0.916	0.073	0.784	1.070
Alfalfa.Clover.grass - Flower fields (year 3+)	1.021	0.092	0.856	1.218
Alfalfa.Clover.grass - Marginal.habitats	0.956	0.075	0.820	1.114
Alfalfa.Clover.grass - Meadow	0.944	0.060	0.834	1.068
Alfalfa.Clover.grass - Pasture.Fallowgrassland	0.941	0.066	0.820	1.081
Crops - Flower fields (year 2)	0.975	0.072	0.843	1.127
Crops - Flower fields (year 3+)	1.087	0.082	0.938	1.259
Crops - Marginal.habitats	1.017	0.069	0.890	1.162
Crops - Meadow	1.005	0.058	0.898	1.124
Crops - Pasture.Fallowgrassland	1.002	0.062	0.888	1.130
Flower fields (year 2) - Flower fields (year 3+)	1.115	0.095	0.943	1.317
Flower fields (year 2) - Marginal.habitats	1.044	0.077	0.904	1.205
Flowerfield.2 - Meadow	1.031	0.060	0.919	1.156
Flower fields (year 2) - Pasture.Fallowgrassland	1.028	0.068	0.903	1.170
Flower fields (year 3+) - Marginal.habitats	0.936	0.071	0.806	1.087
Flower fields (year 3+) - Meadow	0.924	0.067	0.801	1.067
Flower fields (year 3+) - PastureFallow.grassland	0.922	0.072	0.792	1.074
Marginal.habitats - Meadow	0.987	0.056	0.884	1.103
Marginal.habitats - Pasture.Fallowgrassland	0.985	0.063	0.868	1.118
Meadow - Pasture.Fallowgrassland	0.997	0.046	0.911	1.092
(b) Hatching rate model (logit link)				
Alfalfa.Clover.grass - Crops	**0.085**	0.100	**0.008**	**0.861**
Alfalfa.Clover.grass - Flower fields (year 2)	2.008	1.880	0.321	12.583
Alfalfa.Clover.grass - Flower fields (year 3+)	0.654	0.617	0.103	4.157
Alfalfa.Clover.grass - Marginal.habitats	0.155	0.148	0.024	1.002
Alfalfa.Clover.grass - Meadow	0.700	0.445	0.201	2.431
Alfalfa.Clover.grass - Pasture.Fallowgrassland	**0.191**	0.160	**0.037**	**0.988**
Crops - Flower fields (year 2)	**23.598**	30.210	**1.919**	**290.132**
Crops - Flower fields (year 3+)	7.681	9.594	0.664	88.838
Crops - Marginal.habitats	1.823	2.284	0.156	21.245
Crops - Meadow	8.222	8.888	0.988	68.417
Crops - Pasture.Fallowgrassland	2.247	2.720	0.209	24.104
Flower fields (year 2) - Flower fields (year 3+)	0.326	0.362	0.037	2.879
Flower fields (year 2) - Marginal.habitats	**0.077**	0.083	**0.009**	**0.634**
Flower fields (year 2) - Meadow	0.348	0.257	0.082	1.476
Flower fields (year 2) - Pasture.Fallowgrassland	**0.095**	0.087	**0.016**	**0.568**
Flower fields (year 3+) - Marginal.habitats	0.237	0.241	0.032	1.737
Flower fields (year 3+) - Meadow	1.070	0.905	0.204	5.618
Flower fields (year 3+) - PastureFallow.grassland	0.293	0.286	0.043	1.991
Marginal.habitats - Meadow	4.511	3.731	0.892	22.820
Marginal.habitats - Pasture.Fallowgrassland	1.233	1.213	0.179	8.480
Meadow - Pasture.Fallowgrassland	**0.273**	0.177	**0.077**	**0.975**

** Note: all coefficient estimates are given as log ratios (model a) and odds ratios (model b). Bold face highlights 'robust' coefficient estimates in which the confidence interval does not include one.*

Statistical supplement B – Results for nesting phenology models (FED: first egg day)

The tables report coefficient estimates for Gaussian linear models predicting variation in Corn Bunting first egg days (FED) with region and nesting habitat.

(B.1) Overall differences in first egg day (FED) between study regions

Model structure:

```
FED ~ Region + (1|Year), family = gaussian
```

Table B.1a: Model parameter coefficient estimates.

Parameter	Coefficient*	SE	lwr.CI	upr.CI
(Intercept) [Creglingen]	**158.083**	3.497	**151.230**	**164.937**
Ertingen.Klettgau	-1.715	5.525	-12.544	9.114
Rhine valley	**-17.057**	3.278	**-23.481**	**-10.633**
Rottenburg	**-12.108**	3.117	**-18.217**	**-6.000**
(Random intercept 'Year': stand. dev.)	*5.532*		*2.619*	*11.685*

** Note: all coefficient estimates are given as (differences in) day of the year (DOY).*
Bold face highlights 'robust' coefficient estimates in which the confidence interval does not include zero.

Table B.1b: Posterior pairwise comparisons among regions.

Contrasts	difference*	lower.CI	upper.CI
Creglingen - Ertingen.Klettgau	1.715	-9.186	12.617
Creglingen - Rhine valley	**17.057**	**10.589**	**23.524**
Creglingen - Rottenburg	**12.108**	**5.959**	**18.258**
Ertingen.Klettgau - Rhine valley	**15.341**	**4.953**	**25.729**
Ertingen.Klettgau - Rottenburg	**10.393**	**0.006**	**20.779**
Rhine valley - Rottenburg	-4.949	-10.477	0.580

** Note: all contrasts are given as difference in day of the year (DOY).*
Bold face highlights 'robust' coefficient estimates in which the confidence interval does not include zero.

Table B.1c: Random intercept estimates.

Year	estimate	intercept	SE	lwr.CI	upr.CI
2015	6.590	164.671	6.351	152.223	177.119
2016	3.695	161.776	5.153	151.677	171.875
2017	4.339	162.420	5.269	152.094	172.746
2018	-6.787	151.294	4.868	141.753	160.835
2019	2.420	160.501	4.498	151.686	169.316
2020	-4.163	153.918	4.583	144.935	162.901
2021	2.285	160.366	4.734	151.087	169.645
2022	-5.706	152.375	4.980	142.614	162.136
2023	-2.674	155.407	5.384	144.854	165.960

approximate SE from Clark, M. (2022): mixedup: Miscellaneous functions for mixed models. R package version 0.4.0.

(B.2) Within-region models: differences in FED between nesting habitats

Model structure:

```
FED ~ Habitat + (1|Year), family = gaussian
```

Table B.2a: Model parameter coefficient estimates.

Parameter	Coefficient*	SE	lwr.CI	upr.CI
(a) Within Region = Rottenburg				
(Intercept) [Alfalfa & Clover grass]	**145.992**	4.217	137.727	**154.258**
Cereals	4.028	5.484	-6.720	14.777
Flower fields	**14.104**	6.172	**2.008**	**26.200**
Marginal habitats	6.019	6.679	-7.072	19.110
Meadows	-5.167	4.364	-13.721	3.387
Pasture	-2.202	5.269	-12.530	8.126
(Random intercept 'Year': stand. dev.)	*5.819*		*2.513*	*13.472*
(b) Within Region = Rhine valley				
(Intercept) [Fallow grassland]	**142.474**	3.075	**136.447**	**148.500**
Marginal habitats	-3.585	5.423	-14.214	7.045
Meadows	-4.402	4.721	-13.655	4.850
(Random intercept 'Year': stand. dev.)	*0.002*		*n.a.*	*n.a.*

** Note: all coefficient estimates are given as (differences in) day of the year (DOY).*
Bold face highlights 'robust' coefficient estimates in which the confidence interval does not include zero.

Table B.2b: Posterior pairwise comparisons among nest habitats.

Contrasts	difference*	lower.CI	upper.CI
(a) Contrasts within Rottenburg region			
Alfalfa.Clover-grass - Cereals	-4.028	-14.914	6.857
Alfalfa.Clover-grass - Flower.field	**-14.104**	**-26.355**	**-1.853**
Alfalfa.Clover-grass - Marginal.habitats	-6.019	-19.277	7.239
Alfalfa.Clover-grass - Meadow	5.167	-3.496	13.830
Alfalfa.Clover-grass - Pasture	2.202	-8.257	12.662
Cereals - Flower.field	-10.076	-22.948	2.797
Cereals - Marginal.habitats	-1.991	-15.766	11.785
Cereals - Meadow	**9.195**	**0.237**	**18.154**
Cereals - Pasture	6.231	-4.036	16.497
Flower.field - Marginal.habitats	8.085	-6.194	22.364
Flower.field - Meadow	**19.271**	**8.982**	**29.560**
Flower.field - Pasture	**16.306**	**4.398**	**28.215**
Marginal.habitats - Meadow	11.186	-0.440	22.812
Marginal.habitats - Pasture	8.221	-4.859	21.302
Meadow - Pasture	-2.965	-10.889	4.960
(b) Contrasts within Rhine valley region			
Fallow.grassland - Marginal.habitats	3.585	-7.404	14.574
Fallow.grassland - Meadow	4.402	-5.163	13.967
Marginal.habitats - Meadow	0.817	-10.785	12.420

* Note: all contrasts are given as difference in day of the year (DOY).
Bold face highlights 'robust' coefficient estimates in which the confidence interval does not include zero.

Table B.2c: Random intercept estimates.

Year	estimate	intercept	SE	lwr.CI	upr.CI
Within Region = Rottenburg					
2015	7.442	153.434	7.238	139.247	167.621
2016	3.025	149.017	5.801	137.647	160.387
2017	4.254	150.246	6.012	138.463	162.029
2018	-6.795	139.197	6.320	126.809	151.585
2019	0.441	146.433	5.460	135.732	157.134
2020	-1.776	144.216	5.587	133.266	155.166
2021	3.875	149.867	5.395	139.293	160.441
2022	-6.168	139.824	5.783	128.490	151.158
2023	-4.298	141.694	6.131	129.677	153.711
Within Region = Rhine valley					
2018	0.000	142.474	3.075	136.447	148.501
2019	0.000	142.474	n.a.		
2020	0.000	142.474	n.a.		

approximate SE from Clark, M. (2022): mixedup: Miscellaneous functions for mixed models. R package version 0.4.0.

Statistical supplement C – Results for apparent nest survival models

Tables report coefficient estimates for linear models with binomial error families and logit-link to predict variation in apparent survival between nests depending on nest habitat, nest visitation, and agricultural land management.

(C.1) Variation in apparent survival between nest habitats

Model structure:

```
Nest.success ~ Habitat + (1|Year), family = binomial(link = "logit")
```

Table C.1a: Model parameter coefficient estimates.

Parameter	Coefficient*	SE	lwr.CI	upr.CI
(Intercept) [Alfalfa & Clover grass]	-0.369	0.444	-1.239	0.501
Cereals	0.864	0.548	-0.209	1.938
Fallow grassland	1.518	0.792	-0.034	3.070
Flower fields (year 2)	-0.849	0.922	-2.656	0.957
Flower fields (year 3+)	1.050	0.836	-0.590	2.689
Marginal habitats	0.592	0.647	-0.675	1.859
Meadows	0.975	0.507	-0.020	1.969
Pasture	0.984	0.641	-0.274	2.241
Rape and root crops	1.464	1.240	-0.966	3.895
(Random intercept 'Year': stand. dev.)	*0.373*		*0.085*	*1.630*

** Note: coefficient estimates in this logit-link model are given as (differences in) the log of odds.*
Bold face highlights 'robust' coefficient estimates in which the confidence interval does not include zero.

Table C.1b Posterior contrasts in apparent nest survival among nest habitats.

Contrasts	odds ratio*	lower.CI	upper.CI
Alfalfa.Clover.grass - Cereals	0.421	0.144	1.233
Alfalfa.Clover.grass - Fallow.grassland	0.219	0.046	1.034
Alfalfa.Clover.grass - Flower fields (year 2)	2.338	0.384	14.235
Alfalfa.Clover.grass - Flower fields (year 3+)	0.350	0.068	1.803
Alfalfa.Clover.grass - Marginal.habitats	0.553	0.156	1.964
Alfalfa.Clover.grass - Meadow	0.377	0.140	1.020
Alfalfa.Clover.grass - Pasture	0.374	0.106	1.315
Alfalfa.Clover.grass - Rape.Rootcrops	0.231	0.020	2.628
Cereals - Fallow.grassland	0.520	0.118	2.295
Cereals - Flower fields (year 2)	5.548	0.968	31.795
Cereals - Flower fields (year 3+)	0.831	0.173	3.996
Cereals - Marginal.habitats	1.313	0.407	4.238
Cereals - Meadow	0.896	0.371	2.160
Cereals - Pasture	0.887	0.273	2.889
Cereals - Rape.Rootcrops	0.549	0.050	6.062
Fallow grassland - Flower fields (year 2)	**10.667**	**1.338**	**85.030**

Fallow grassland - Flower fields (year 3+)	1.597	0.234	10.919
Fallow grassland - Marginal.habitats	2.524	0.509	12.510
Fallow grassland - Meadow	1.722	0.410	7.235
Fallow grassland - Pasture	1.706	0.326	8.918
Fallow grassland - Rape.Rootcrops	1.055	0.076	14.686
Flower fields (year 2) - Flower fields (year 3+)	0.150	0.018	1.270
Flower fields (year 2) - Marginal.habitats	0.237	0.037	1.528
Flower fields (year 2) - Meadow	**0.161**	**0.030**	**0.870**
Flower fields (year 2) - Pasture	0.160	0.025	1.018
Flower fields (year 2) - Rape.Rootcrops	0.099	0.006	1.644
Flower fields (year 3+) - Marginal.habitats	1.581	0.290	8.623
Flower fields (year 3+) - Meadow	1.078	0.236	4.925
Flower fields (year 3+) - Pasture	1.068	0.191	5.975
Flower fields (year 3+) - Rape.Rootcrops	0.661	0.045	9.798
Marginal.habitats - Meadow	0.682	0.225	2.066
Marginal.habitats - Pasture	0.676	0.169	2.701
Marginal.habitats - RapeRootcrops	0.418	0.035	4.980
Meadow - Pasture	0.991	0.344	2.852
Meadow - Rape.Rootcrops	0.613	0.057	6.566
Pasture - Rape.Rootcrops	0.618	0.051	7.571

* Note: all contrasts are given as survival odds ratios.
Bold face highlights 'robust' coefficient estimates in which the confidence interval does not include one.

Table C.1c: Random intercept estimates.

Year	estimate	intercept	SE	lwr.CI	upr.CI
2014	0.098	-0.271	0.577	-1.403	0.861
2015	0.068	-0.301	0.577	-1.431	0.829
2016	-0.104	-0.473	0.562	-1.574	0.628
2017	0.251	-0.118	0.626	-1.346	1.110
2018	0.355	-0.014	0.625	-1.239	1.211
2019	0.081	-0.288	0.522	-1.311	0.735
2020	-0.005	-0.374	0.527	-1.407	0.659
2021	-0.371	-0.740	0.630	-1.975	0.495
2022	-0.060	-0.429	0.542	-1.491	0.633
2023	-0.338	-0.707	0.648	-1.977	0.563

approximate SE from Clark, M. (2022): mixedup: Miscellaneous functions for mixed models. R package version 0.4.0.

(C.2) Variation in predicted survival of land use activity between nest habitats

Model structure:

```
Landuse.survival ~ Habitat + (1|Year), weights = N_cases,
        family = betabinomial(link = "logit")
```

Table C.2a: Model parameter coefficient estimates.

Parameter	Coefficient*	SE	lwr.CI	upr.CI
(Intercept) [Alfalfa & Clover grass]	**-0.576**	0.280	**-1.124**	**-0.028**
Meadows	0.331	0.323	-0.301	0.963
Pasture	**1.085**	0.405	**0.291**	**1.880**
(Random intercept 'Year': stand. dev.)	*<0.0001*		*n.a.*	*n.a.*

** Note: coefficient estimates in this logit-link model are given as (differences in) the log of odds.*
Bold face highlights 'robust' coefficient estimates in which the confidence interval does not include zero.

Table C.2b Posterior contrasts in predicted survival of land use activity among nest habitats.

Contrasts	odds ratio*	lower.CI	upper.CI
(Alfalfa.Clover-grass) / Meadow	0.718	0.382	1.352
(Alfalfa.Clover-grass) / Pasture	**0.338**	**0.153**	**0.748**
Meadow / Pasture	**0.470**	**0.244**	**0.906**

* Note: all contrasts are given as survival odds ratios.
Bold face highlights 'robust' coefficient estimates in which the confidence interval does not include one.

Given random intercept SD essentially zero, random intercepts per year could not reliably be estimated.

(C.3) Variation in apparent survival of visited and non-visited nests

Model structure:

```
Nest.success ~ Visited + (1|Year), family = binomial(link = "logit")
```

Table C.3a: Model parameter coefficient estimates.

Parameter	Coefficient*	SE	lwr.CI	upr.CI
(Intercept) [Nest not visited]	0.074	0.256	-0.428	0.576
Nest visited at least once	**0.729**	0.323	**0.095**	**1.363**
(Random intercept 'Year': stand. dev.)	*0.446*		*0.149*	*1.33*

** Note: coefficient estimates in this logit-link model are given as (differences in) the log of odds.*
Bold face highlights 'robust' coefficient estimates in which the confidence interval does not include zero.

Table C.3b Posterior contrasts in predicted survival depending on nest visitation.

Contrasts	odds ratio*	lower.CI	upper.CI
not visited / visited at least once	**0.482**	**0.256**	**0.909**

* Note: contrasts are given as survival odds ratios.
Bold face highlights 'robust' coefficient estimates in which the confidence interval does not include one.

Table C.3c: Random intercept estimates.

Year	estimate	intercept	SE	lwr.CI	upr.CI
2014	0.225	0.299	0.517	-0.714	1.312
2015	0.077	0.151	0.495	-0.820	1.122
2016	-0.028	0.046	0.447	-0.831	0.923
2017	0.284	0.358	0.515	-0.652	1.368
2018	0.334	0.408	0.459	-0.492	1.308
2019	0.226	0.300	0.395	-0.474	1.074
2020	0.041	0.115	0.397	-0.662	0.892
2021	-0.518	-0.444	0.497	-1.418	0.530
2022	-0.214	-0.140	0.446	-1.014	0.734
2023	-0.462	-0.388	0.538	-1.442	0.666

Approximate SE from Clark, M. (2022): mixedup: Miscellaneous functions for mixed models. R package version 0.4.0.

Raw data supplement

Documentation of raw data table columns

A raw data file is provided separately in two formats (*.xlsx, *.csv). The following table provides information on each data column in the raw data file.

Column name	Content
Year	Year of data collection
StudyArea	Study area (8 levels, as given in supplemental Table S1)
Region	Study region (4 levels, as given in supplemental Table S1).
Region_Mayfield	Study region (2 levels, simplified as used for Mayfield DSR analysis).
FirstEggDate	FED: Absolute date of first egg laying (observed or backdated as given in manuscript).
FirstEggDay_DOY	FED: expressed as Day of the Year (DOY).
HatchDate	Absolute data of hatching (observed or backdated as given in manuscript. Used in analysis of Mayfield DSR).
NestHabitat	Habitat or land use at nesting site.
FirstBrood	Categorization as first brood (1) or any later (replacement or second) broods (0). Inferred as plausible as possible based on previous observations in same territory.
NestSuccess	TRUE: nest successful as inferred from parents feeding jumplings in vicinity of previously known nest. FALSE: nest failed, either directly confirmed or deduced from lack of jumpling feeding after expected date of nest leaving.
Nest.visited	TRUE: Nest visited at least once for confirmation and control of nest status. FALSE: All nest observations were done from a distance without nest visit.
LandUseSurvival	Fraction of years in which this nest's breeding phase did not overlap with any land use activity (harvest, mowing, grazing) on the very same patch as documented in other years.
N_cases	Land use survival: number of years for which information on land use dates were available for this particular patch.
Eggs.full	Clutch size (number of eggs).
Eggs.lost	Number of eggs lost from known clutch prior to hatching.
Eggs.hatched	Number of eggs that hatched.
Eggs.deaf	Number of unhatched eggs that remained in nest (infertile or non-developing for other reasons).
Clutch.Complete	Identifies nests with information on full clutch size.
LastPres	Mayfield DSR: Day number (counted from earliest record in dataset) on which this nest was last present.
LastCh	Mayfield DSR: Day number (counted from earliest record in dataset) on which this nest was last checked.
VegHeight	Dominant vegetation height at nest site (in cm).
VegCover	Cover of herbaceous vegetation layer in 1m circle around the nest (in %).
NestHeight	Height of upper nest rim above ground (cm).
Analysis1.NestHabitat	Data included into the analysis of nest habitats.
Analysis2.ClutchSize	Data included into the analysis of clutch sizes.
Analysis3.HatchRate	Data included into the analysis of hatch rates.
Analysis4.FED	Data included into the analysis of First Egg Dates (FED).
Analysis5.ApparentSurvival	Data included into the analysis of apparent survival.
Analysis6.LandUseSurvival	Data included into the analysis of land use survival.
Analysis7.DSR	Data included into the analysis of Daily nest Survival Rates (DSR).