Environment and Rural Affairs Monitoring & Modelling Programme (ERAMMP)

ERAMMP Technical Annex-105TA1S6: Wales National Trends and Glastir Evaluation Supplement-6: Birds

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Approved by Bridget Emmett (UKCEH)
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Abbreviations Used in this Report

BTO	British Trust for Ornithology
BBS	Breeding Bird Survey
UKCEH	UK Centre for Ecology & Hydrology

Contents

1 SUMMARY

1.1 Scope

This supplement presents the collated results and associated graphs for the analysis of the bird survey data from the ERAMMP field surveys in 2022 and 2023. Full details of the methodology to collate the background information for this report can be found on the ERAMMP website[1] in Siriwardena, G.M. & Bowgen, K.M. 2023 ERAMMP Document-88 Field-Survey Handbook (Procedures) Birds.

A summary of the quality assurance work undertaken to support the bird survey fieldwork is also included.

Finally, details of the BTO/JNCC/RSPB Breeding Bird Survey (BBS) results that are summarised in the main report are provided in Section 2 of this report.

[1] www.erammp.wales/88

2 BREEDING BIRD SURVEY DATA AND ANALYSES

2.1 Survey background and species trends

The BTO/JNCC/RSPB Breeding Bird Survey (BBS) has run since 1994. It is a volunteer survey, run by BTO staff, with assistance from a network of volunteer Regional Organisers, who are responsible for finding new volunteers and allocating squares to observers in their region. The BBS is a line-transect survey based on randomly located 1-km squares. Squares are chosen through stratified random sampling, with more squares in areas with more potential volunteers, which means that much of Wales has a lower density of squares than much of England, for example. The variation in sampling densities can be taken into account when calculating representative national trends, but clearly also has consequences for the analyses that are possible at regional levels. The square sampling and field survey designs are intended to inform at the national scale, i.e. not about individual (or small numbers of) squares.

BBS volunteers make two early-morning visits to their square during the April–June survey period, recording all adult birds encountered while walking two 1-km transects across their square. Each 1-km transect is divided into five 200-m sections for ease of recording. Birds are recorded in three distance categories, or as 'in flight', in order to support estimation of species' densities. As BBS squares are selected randomly, they cover all habitats, but are not targeted to areas of particular policy interest. Further, squares are made available for survey at random, but coverage is subject to volunteer interest and, in particular, observer turnover is unpredictable. Between 300 and 315 squares were covered annually during 2021-2023.

The BBS provides reliable population trends for breeding species that are recorded in large numbers of squares; following scoping and experience, a threshold of an average of 30 squares per year during the trend period of interest is used as the minimum for birds in Wales. As of 2023, long-term trends for Wales can be produced for 60 species. These trends are estimated using a standard log-linear Poisson modelling approach, modelling counts as a function of categorical site and year effects. The patterns of year effects over time then show long-term changes and smoothed trends, averaging over annual fluctuations, are estimated in a subsequent step, using smoothing spline functions. Confidence intervals for annual values and trends are estimated by bootstrapping by site.

2.2 Calculation of indices

To summarise trends across species, geometric average trend metrics, considering sets of species that are defined, nominally, by habitat preference, are used at UK level. Outside ERAMMP, these metrics are not currently reported for Wales. The standard indices take the national trends of annual index values for each species in an indicator list and take a geometric mean of the indices (which are standardized to a common initial value). Each index has a nominal species list at UK (and European) level, of which only a subset have sufficient data to support long-term index trend calculation for Wales, so only the latter can be included. For ERAMMP, the following indicators were calculated and are reported below, and in the bird results:

Birds of lowland farmland (13 spp)

Bird of upland farmland (7 spp)

Woodland birds (29 spp).

2.3 Results and final metric trends

The long-term indicator trends (based on smoothed species trends) that were calculated for ERAMMP are shown in Figure 2-1. The relevant data for comparison to GMEP and ERAMMP survey results are the average values of these trends for the specific time periods over which the two programmes operated. These values are shown in Table 2-1 and are also reported in relevant tables in Sections 4.2, 4.3, 4.5 and 4.8.

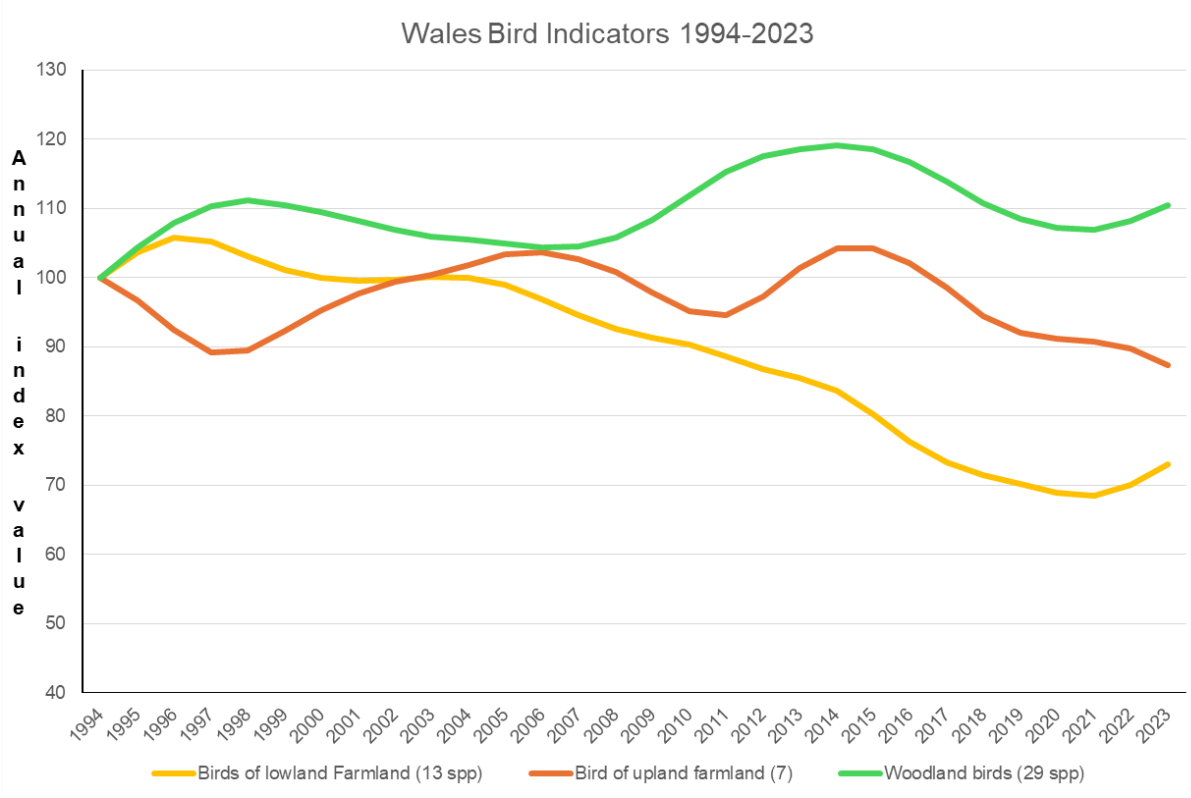

Figure 2-1 Long-term trends for the bird indicators presented as average values for the GMEP and ERAMMP periods in Section 4 and Table 2-1 below.

Table 2-1 Average BBS bird indicator values for the GMEP and ERAMMP survey periods

Indicator	Mean value	
	GMEP 2013-2016	ERAMMP 2021-2023
Birds of lowland farmland	81.4	70.5
Bird of upland farmland	103.0	89.2
Woodland birds	118.2	108.5

3 QUALITY ASSURANCE

3.1 Fieldwork

Due to the highly mobile nature of birds quality control via repeat visits of the same survey transects is not possible. Testing of bird ID before hiring processes were carried out in both 2022 and 2023 for new surveyors and two days of bird training in methods and ID with BTO staff, and then quality assurance was carried out through visits to 40% of fieldworkers during their survey visits in 2022. In these QA visits we accompanied the fieldworkers around their survey square to confirm they followed the protocols correctly (Siriwardena & Bowgen 2023) and were collecting their data in the required manner. This was confirmed for all surveyors.

3.2 Survey data

All survey data sheets were entered by the fieldworkers after their visits and following the protocol document instructions (Siriwardena & Bowgen 2023) and online training sessions. The data analysts checked the data sheets and maps whilst working with the data for analysis and compared paper sheets to the online data entry systems to confirm quality of data transcription.

4 METHODS

4.1 Calculation of indices

Eleven indices of bird abundance and diversity were calculated from using species found within preexisting indicators or were taken from published assessments of species and their broad habitat or dietary guilds. A total of 175 species were identified across all surveys and years in GMEP and ERAMMP but not all squares and survey years had all species. Note that more species can be included in the analogues of the national indicators that are described above because the latter are limited by which species from the nominal, UK, list support the calculation of long-term trends.

- **Priority Bird Species** – Any species present on the Section 7 list from the Welsh Environment Act 2016 (Environment (Wales) Act 2016).
- *38 species in GMEP and ERAMMP surveys*
- **Upland Farmland Bird Indicator Species** – Any species present on the upland farmland bird indicator list from Noble & Barnes 2023 BTO Research Report 757.
- 30 species *in GMEP and ERAMMP surveys*
- **Lowland Farmland Bird Indicator Species** – Any species present on the farmland bird indicator list from the UK Biodiversity Indicators report (Burns et al. 2023).
- 18 species *in GMEP and ERAMMP surveys*
- **Woodland Bird Indicator Species** – Any species present on the woodland bird indicator list from the UK Biodiversity Indicators report (Burns et al. 2023).
- 35 species *in GMEP and ERAMMP surveys*
- **Upland Bird Guild Species** – Any species present in species assessments from Siriwardena et al. 2019
- 21 species *in GMEP and ERAMMP surveys*
- **Arable Bird guild Species** – Any species present in species assessments from Siriwardena et al. 2019
- 39 species *in GMEP and ERAMMP surveys*
- **Grassland Bird Guild species** – Any species present in species assessments from Siriwardena et al. 2019
- 40 species *in GMEP and ERAMMP surveys*
- **Woodland Bird Guild Species** – Any species present in species assessments from Siriwardena et al. 2019
- 63 species *in GMEP and ERAMMP surveys*
- **Granivorous Bird Species** – Any species present in species assessments from Siriwardena et al. 2019
- 17 species *in GMEP and ERAMMP surveys*
- **Invertebrate-eating Bird Species** – Any species present in species assessments from Siriwardena et al. 2019
- 119 species *in GMEP and ERAMMP surveys*
- **Vertebrate-eating Bird Species** – Any species present in species assessments from Siriwardena et al. 2019
- 37 species *in GMEP and ERAMMP surveys*

5 RESULTS

5.1 All-Wales

5.1.1 National Trend

At an all-Wales scale, four of the eleven bird indicators (arable guild, grassland guild, granivore guild, vertebrate-eater guild) have significantly changed between the GMEP and ERAMMP survey periods.

Table 5-1 National Trend analysis for pollinator indicators at all-Wales scale. Mean estimate, change and p-values were extracted from models for periods 2013-16 and 2021-23.

Indicator	2013-16 estimate	2021-23 estimate	Trend 2016-22	P value
Priority bird species	6.025	6.037	0.00210	0.97824
Upland farmland bird indicator species	8.190	8.099	-0.01110	0.88132
Lowland farmland bird indicator species	7.589	7.227	-0.04887	0.56480
Woodland bird indicator species	7.279	7.340	0.00835	0.85492
Arable bird guild	9.895	8.626	-0.13718	0.00359
Grassland bird guild	10.413	8.497	-0.20333	0.0000178
Upland bird guild	4.536	4.357	-0.04027	0.79010
Woodland bird guild	7.646	7.266	-0.05101	0.20192
Granivore bird guild	5.350	6.652	0.21786	0.00784
Invertebrate-eater bird guild	7.846	7.320	-0.06948	0.07001
Vertebrate-eater bird guild	6.973	4.531	-0.43118	0.0001032

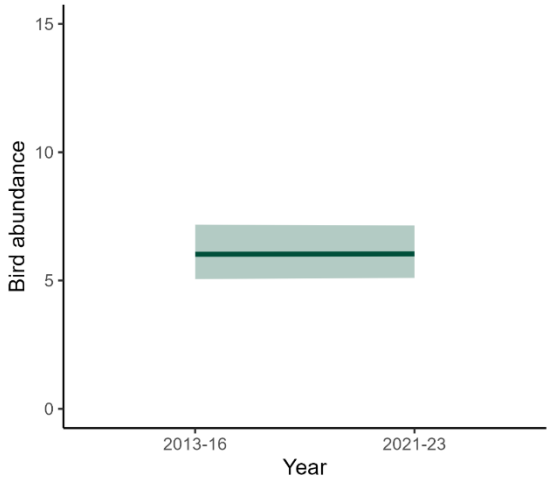

Figure 5-1 National Trend for the Priority bird species indicator at an all-Wales scale – comparing between GMEP and ERAMMP survey periods.

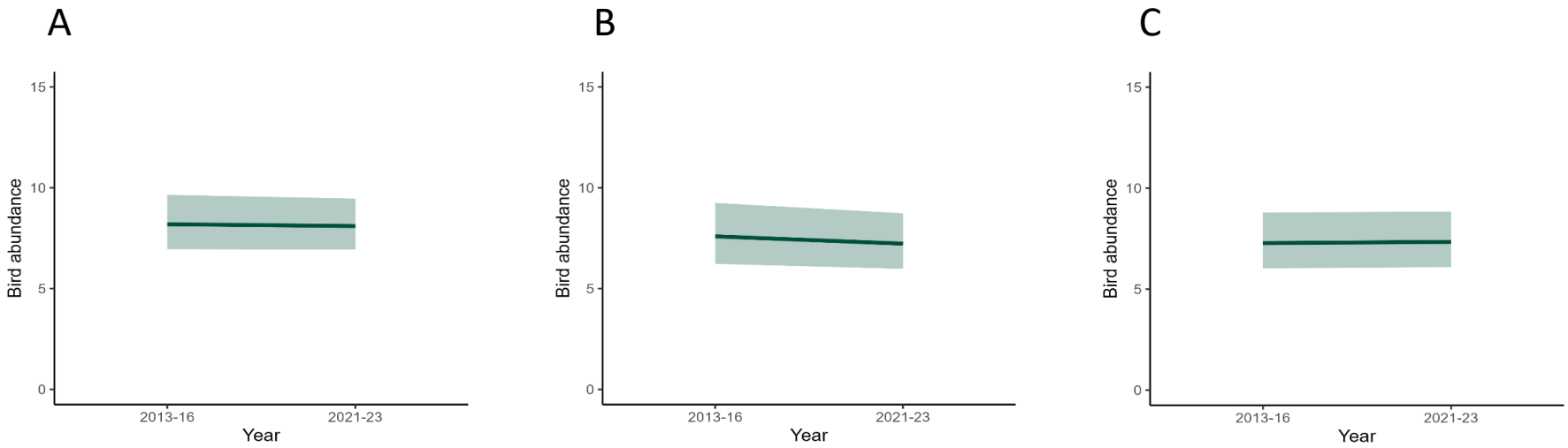

Figure 5-2 National Trend for the A) Upland farmland bird indicator, B) Lowland farmland bird indicator and C) Woodland bird indicator species at an all-Wales scale – comparing between GMEP and ERAMMP survey periods.

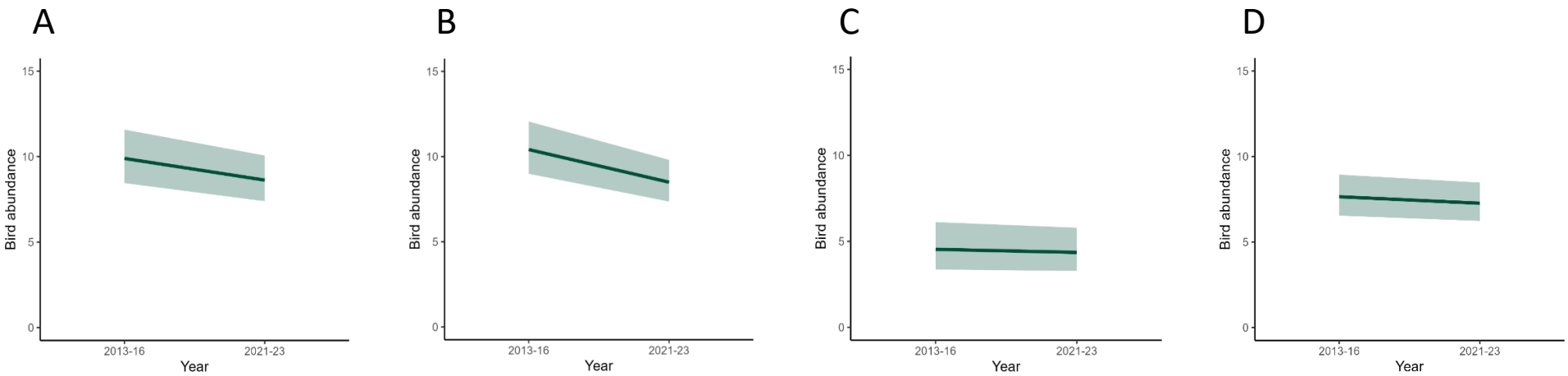

Figure 5-3 National Trend for four habitat guild indicators – A) Arable birds, B) Grassland birds, C) Upland birds and d) Woodland birds an all-Wales scale – comparing between GMEP and ERAMMP survey periods

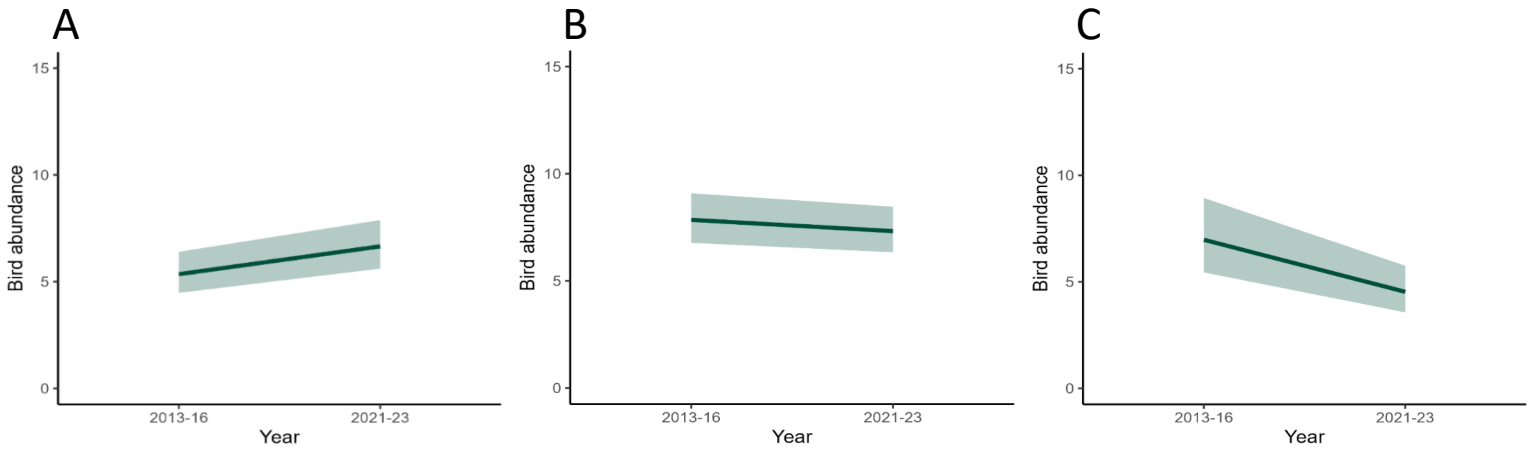

Figure 5-4 National Trend for the four dietary guild indicators – A) Granivorous birds, B) Invertebrate eating birds and C) Vertebrate eating birds at an all-Wales scale – comparing between GMEP and ERAMMP survey periods

5.1.2 Glastir Analysis

At the all-Wales scale, a large number of bird indicators have responded to a wide variety of Glastir option bundles (1, 2a, 2b, 2c, 3, 4, 5, 6, 8a, 8b, 8c, 9, 10, 11, 12) with 72 being positive and 28 negative. However, not all of these options are suitable for all indicators and so only a subset have been present in the main report where they are relevant to the indicator in question. Additionally, several options do not have enough square to make the analysis fully viable and so these results have been "greyed" out in the tables below.

Table 5-2a Glastir analysis for bird indicators at all-Wales scale. Trend difference (ΔT) in areas with each bundle of Glastir options applied (relative to a counterfactual where they were not applied) and p-values were extracted from models for periods 2013-16 and 2021-23. Bundles 1-4

	Bundle 1 Grassland Grazing Lo/No Inputs		Bundle 2A Habitat Management: General Grassland		Bundle 2B Habitat Management: Mountain Moor & Heath		Bundle 2C Habitat Management : General Coastal		Bundle 3 Arable Management		Bundle 4 Hedge Management	
Indicator	**ΔT**	**P**	**ΔT**	**P**	**ΔT**	**P**	**ΔT**	**P**	**ΔT**	**P**	**ΔT**	**P**
Priority bird species	-0.46	0.65	-1.59	<0.01	-0.55	0.87			8.54	<0.01	-0.7	0.72
Upland farmland bird indicator sp.	1.09	0.26			-0.28	0.49			7.34	<0.01		
Lowland farmland bird indicator sp.	1.63	<0.01							0.8	0.33	3.23	<0.01
Woodland bird indicator species												
Arable bird guild									2.3	<0.01	4.06	<0.01
Grassland bird guild	4.68	<0.01	-0.54	0.33								
Upland bird guild	-1.43	0.29	-0.96	0.21	-0.13	0.51						
Woodland bird guild												
Granivore bird guild	0.63	0.29	-2.91	<0.01	0.39	0.3			0.8	0.21	0.79	0.03
Invertebrate-eater bird guild	2.69	<0.01	-1.16	<0.01	-0.27	0.73			6.03	<0.01	2.51	<0.01
Vertebrate-eater bird guild	1.86	0.01	0.2	0.8	-2.75	<0.01			14.5	<0.01	2.05	<0.01

Table 5-2b Glastir analysis for bird indicators at all-Wales scale. Trend difference (ΔT) in areas with each bundle of Glastir options applied (relative to a counterfactual where they were not applied) and p-values were extracted from models for periods 2013-16 and 2021-23. Bundles 5-9

	Bundle 5 Woodland Stock Exclusion		Bundle 6 Woodland Management		Bundle 8A Habitat Reversion (Grass)		Bundle 8B Habitat Reversion (Lowland FMS)		Bundle 8D Habitat Reversion (Coastal)		Bundle 9 Peatland	
Indicator	**ΔT**	**P**	**ΔT**	**P**	**ΔT**	**P**	**ΔT**	**P**	**ΔT**	**P**	**ΔT**	**P**
Priority bird species	2.83	0.07	0.52	0.04								
Upland farmland bird indicator sp.												
Lowland farmland bird indicator sp.												
Woodland bird indicator species	2.01	0.01	2.22	<0.01								
Arable bird guild												
Grassland bird guild												
Upland bird guild												
Woodland bird guild	1.36	0.02	1.75	<0.01								
Granivore bird guild	-1.12	0.18	0.98	0.01								
Invertebrate-eater bird guild	1.79	<0.01	1.8	<0.01								
Vertebrate-eater bird guild	-4.48	0.06	-0.94	0.3								

Table 5-2a Glastir analysis for bird indicators at all-Wales scale. Trend difference (ΔT) in areas with each bundle of Glastir options applied (relative to a counterfactual where they were not applied) and p-values were extracted from models for periods 2013-16 and 2021-23. Bundles 10-15

	Bundle 10 Heathland		Bundle 11 Corridors/Buffers		Bundle 12 Wood Creation		Bundle 15 For Birds	
Indicator	**ΔT**	**P**	**ΔT**	**P**	**ΔT**	**P**	**ΔT**	**P**
Priority bird species			3.13	<0.01	3.84	0.34		
Upland farmland bird indicator sp.								
Lowland farmland bird indicator sp.								
Woodland bird indicator species					4.67	0.07		
Arable bird guild								
Grassland bird guild								
Upland bird guild								
Woodland bird guild					4	0.27		
Granivore bird guild			1.51	0.07	2.55	0.6		
Invertebrate eater bird guild			3.09	<0.01	4.14	0.09		
Vertebrate eater bird guild			9.33	<0.01	2.49	0.75		

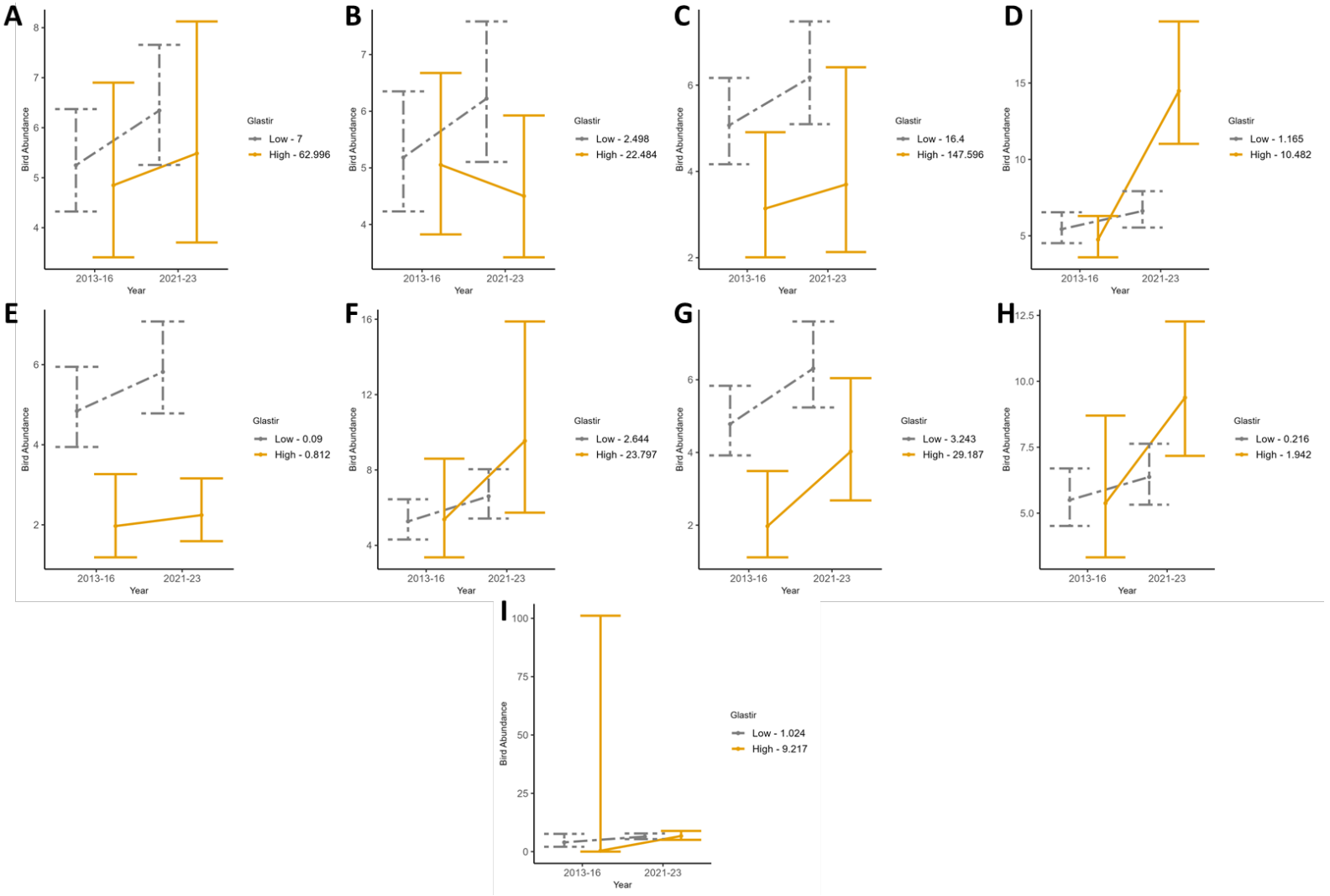

Figure 5-5 Glastir trends for Priority bird species indicators per Glastir options of interest with the full National Trend for the Priority bird species indicator at an all-Wales scale shown behind. Glastir option bundles: A) Grassland: Grazing Lo/No Inputs, B) Habitat Management (General) Grassland, C) Habitat Management Mountain Moor & Heath, D) Arable Management, E) Hedge Management, F) Woodland Stock Exclusion, G) Woodland Management, H) Corridors/Buffers, I) Wood Creation.

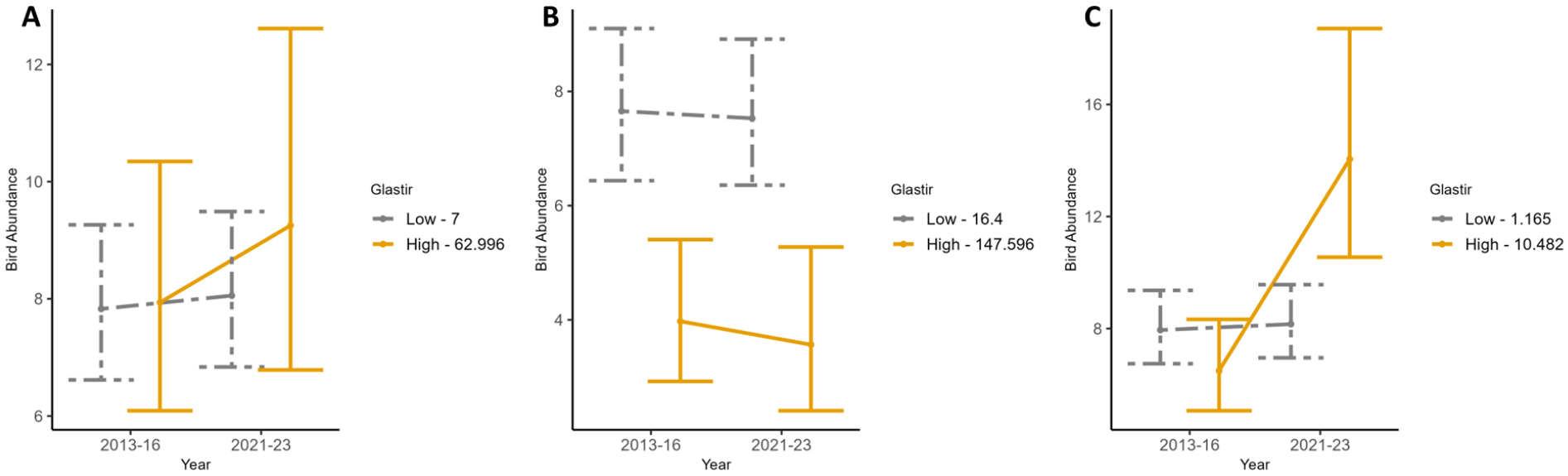

Figure 5-6 Glastir trends for Upland farmland bird indicator species per Glastir options of interest with the full National Trend for the Upland farmland bird indicator at an all-Wales scale shown behind. Glastir option bundles: A) Grassland: Grazing Lo/No Inputs, B) Habitat Management Mountain Moor & Heath, C) Arable Management.

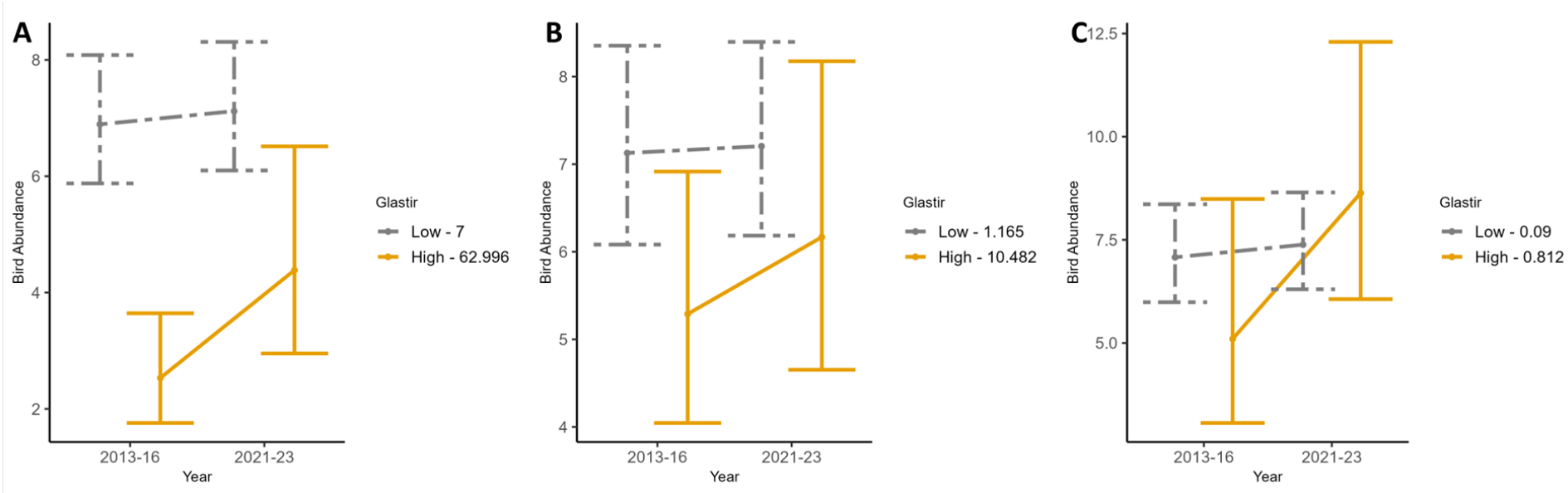

Figure 5-7 Glastir trends for Lowland farmland bird indicator species per Glastir options of interest with the full National Trend for the Lowland farmland species indicator at an all-Wales scale shown behind. Glastir option bundles: A) Grassland: Grazing Lo/No Inputs, B) Arable Management, C) Hedge Management.

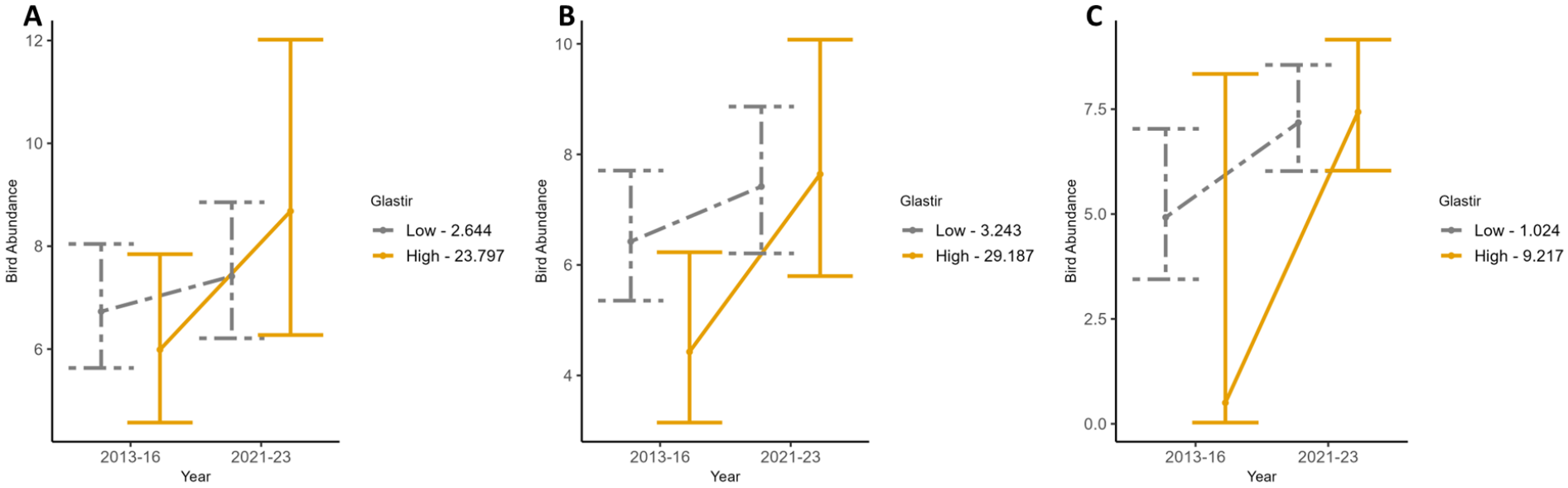

Figure 5-8 Glastir trends for Woodland bird indicator species per Glastir options of interest with the full National Trend for the Woodland bird indicator at an all-Wales scale shown behind. Glastir option bundles: A) Woodland Stock Exclusion, B) Woodland Management, C) Woodland

Creation.

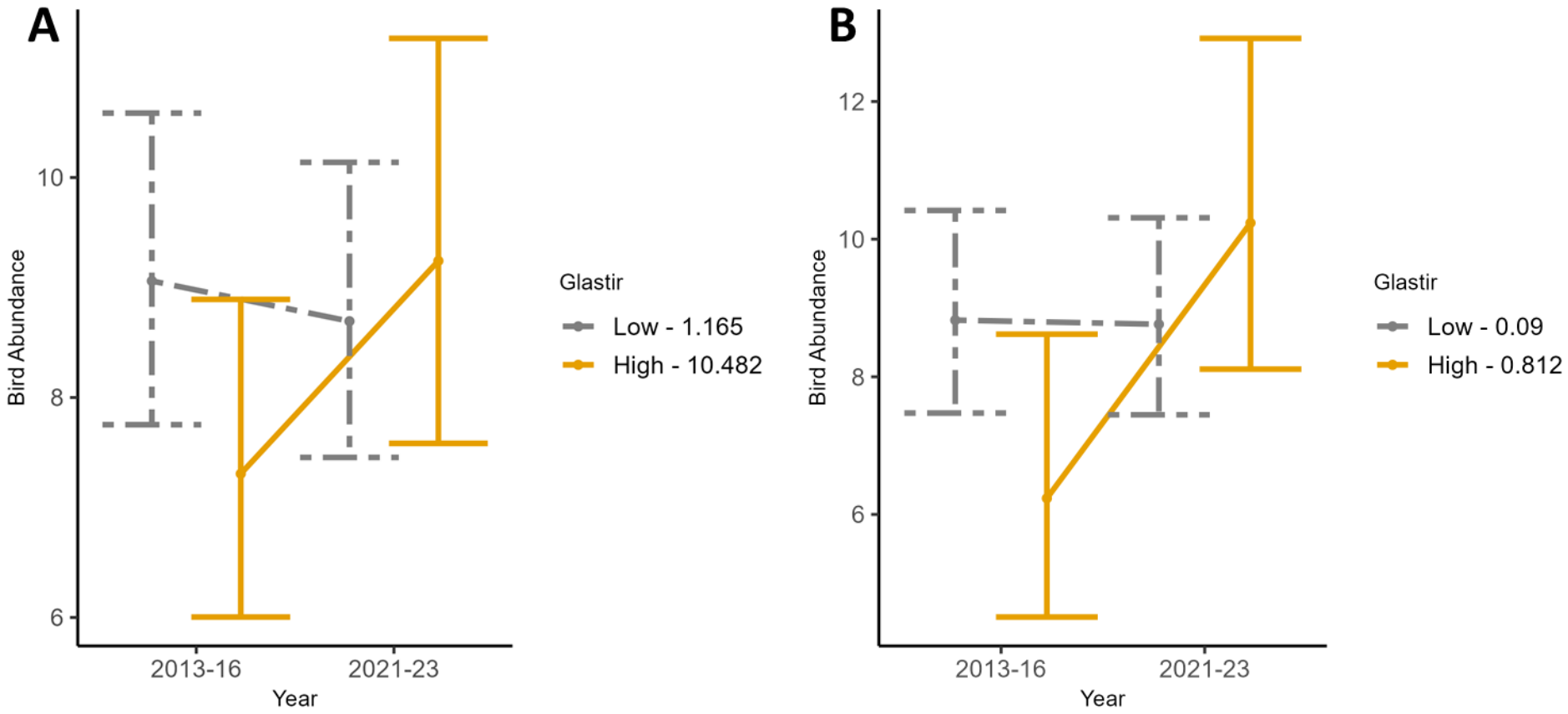

Figure 5-9 Glastir trends for Arable bird guild indicator per Glastir options of interest with the full National Trend for the Arable bird guild indicator at an all-Wales scale shown behind. Glastir option bundles: A) Arable Management, B) Hedge Management.

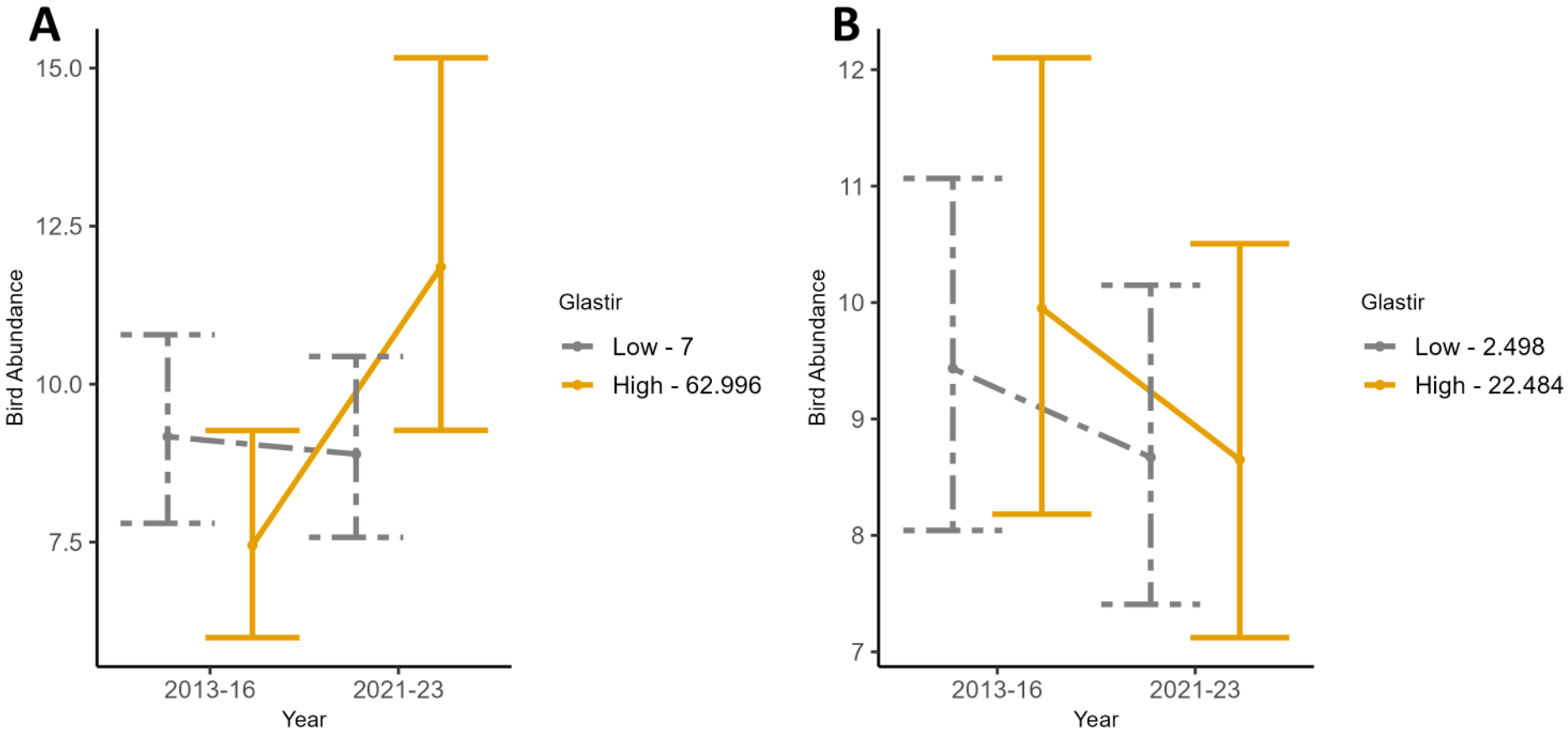

Figure 5-10 Glastir trends for Grassland bird guild indicator per Glastir options of interest with the full National Trend for the Grassland bird guild indicator at an all-Wales scale shown behind. Glastir option bundles: A) Grassland: Grazing Lo/No Inputs, B) Habitat Management (General) Grassland.

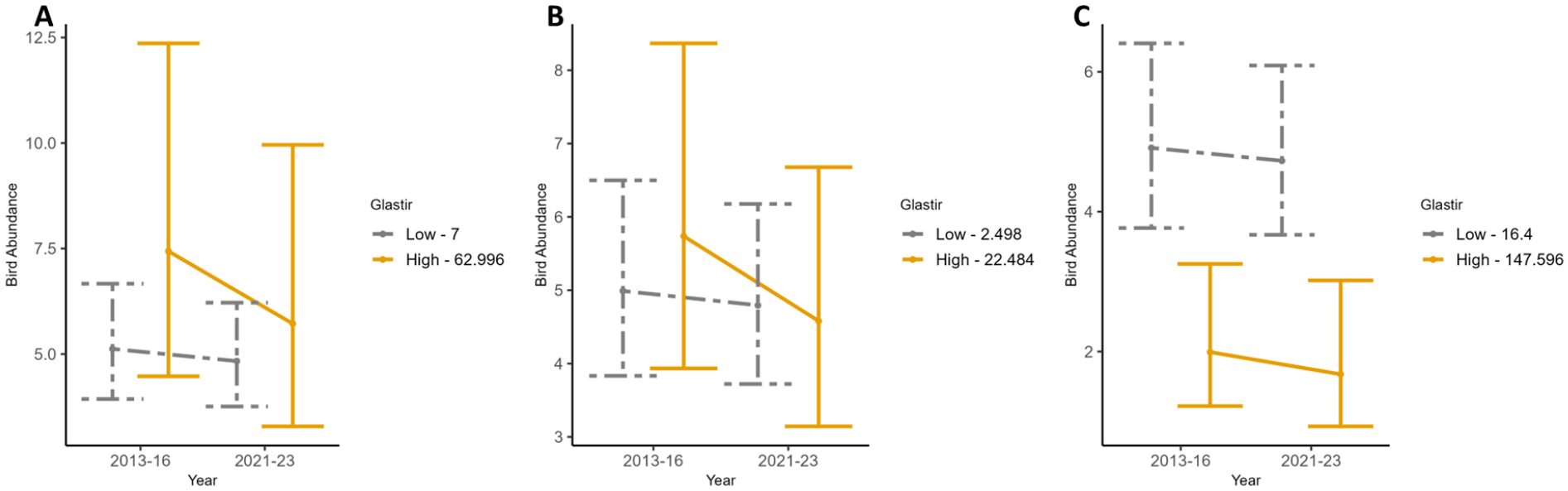

Figure 5-11Glastir trends for Upland bird guild indicator per Glastir options of interest with the full National Trend for the Upland bird guild indicator at an all-Wales scale shown behind. Glastir option bundles: A) Grassland: Grazing Lo/No Inputs, B) Habitat Management (General) Grassland, C) Habitat Management Mountain Moor & Heath.

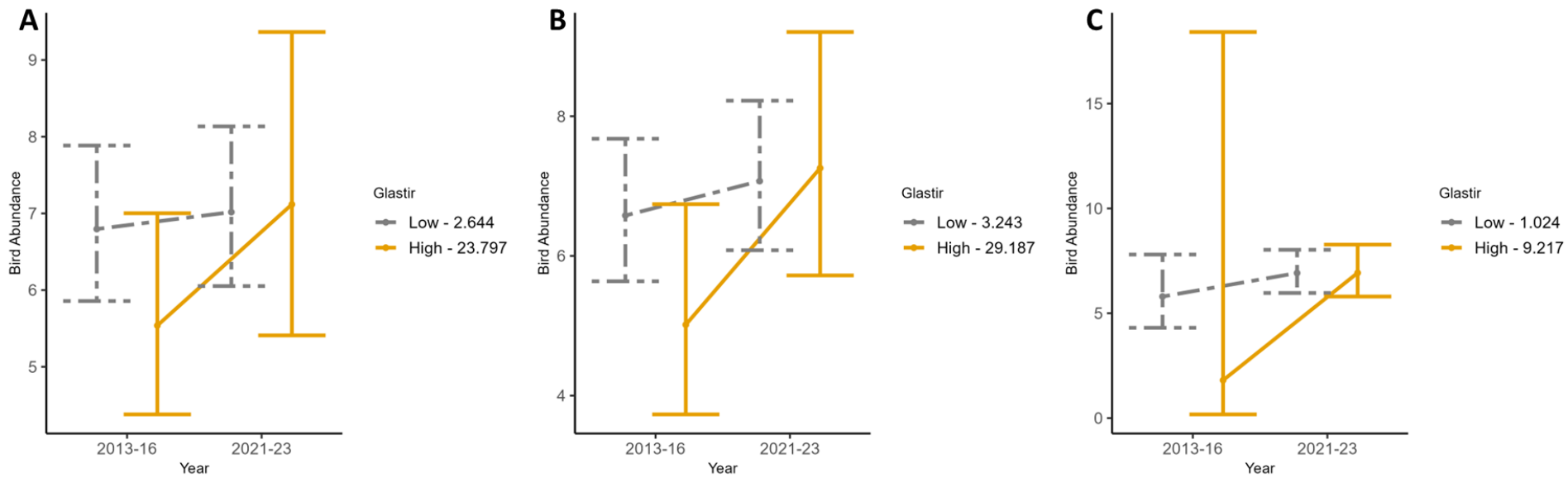

Figure 5-12 Glastir trends for Woodland bird guild indicator per Glastir options of interest with the full National Trend for the Woodland bird guild indicator at an all-Wales scale shown behind. Glastir option bundles: A) Woodland Stock Exclusion, B) Woodland Management, C) Woodland Creation.

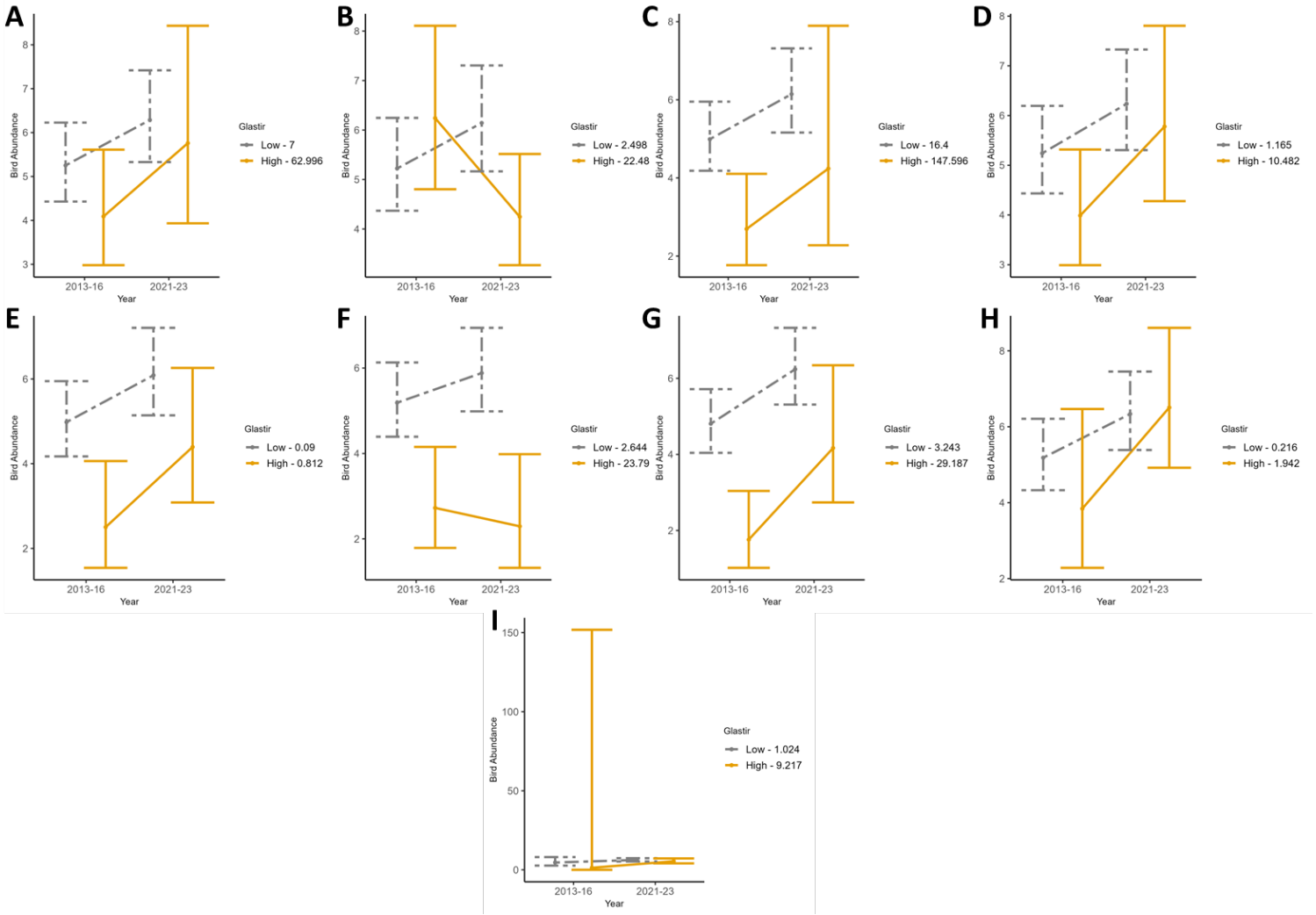

Figure 5-13 Glastir trends for Granivore bird guild indicator per Glastir options of interest with the full National Trend for the Granivore bird guild indicator at an all-Wales scale shown behind. Glastir option bundles: A) Grassland: Grazing Lo/No Inputs, B) Habitat Management (General) Grassland, C) Habitat Management Mountain Moor & Heath, D) Arable Management, E) Hedge Management, F) Woodland Stock Exclusion, G) Woodland Management, H) Corridors/Buffers, I) Wood Creation.

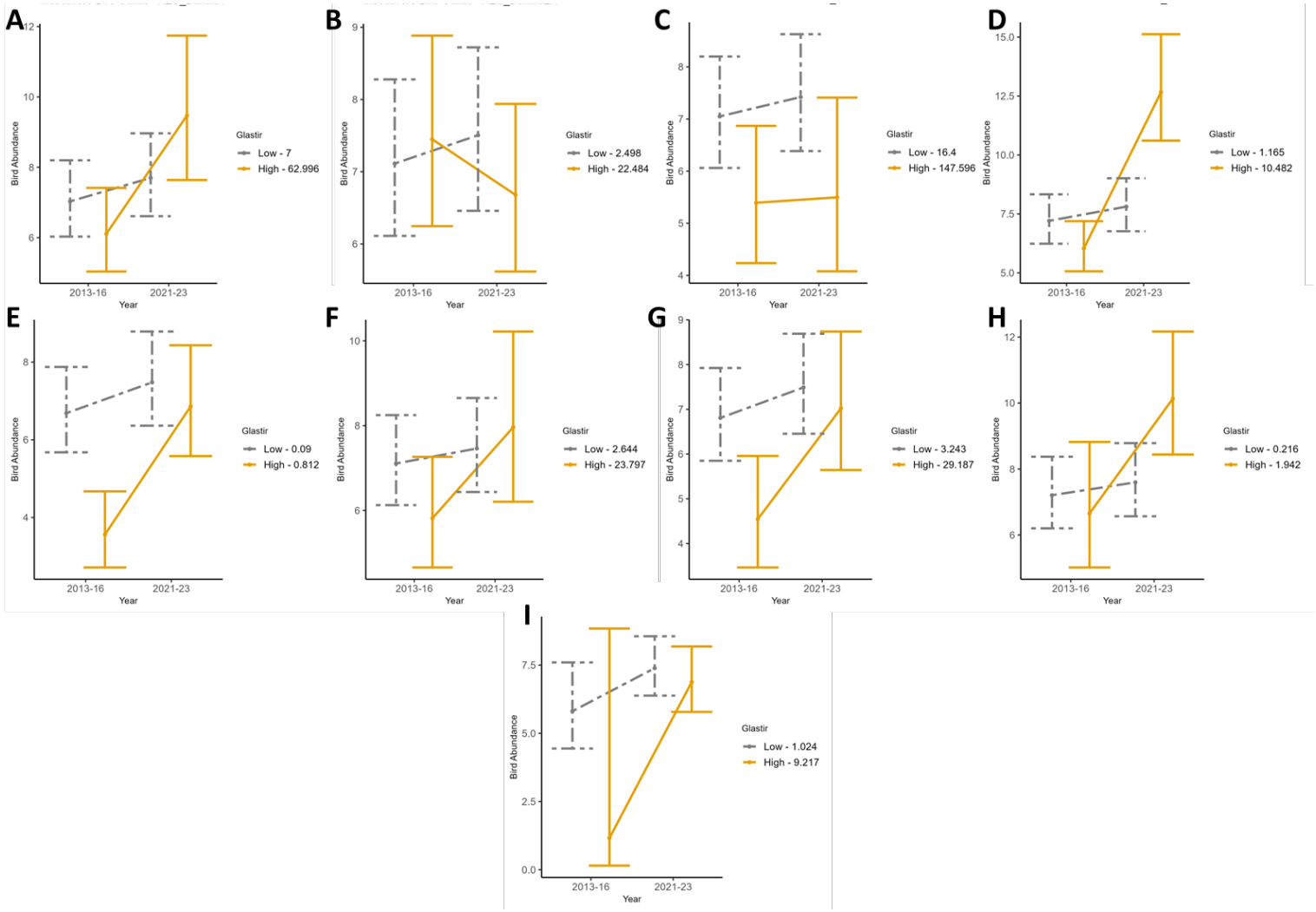

Figure 5-14 Glastir trends for Invertebrate-eater bird guild indicator per Glastir options of interest with the full National Trend for the Invertebrate eater guild indicator at an all-Wales scale shown behind. Glastir option bundles: A) Grassland: Grazing Lo/No Iinputs, B) Habitat Management General Grassland, C) Habitat Management Mountain Moor & Meath, D) Arable Management, E) Hedge Management, F) Woodland Stock Exclusion, G) Woodland Management, H) Corridors/Buffers, I) Wood Creation.

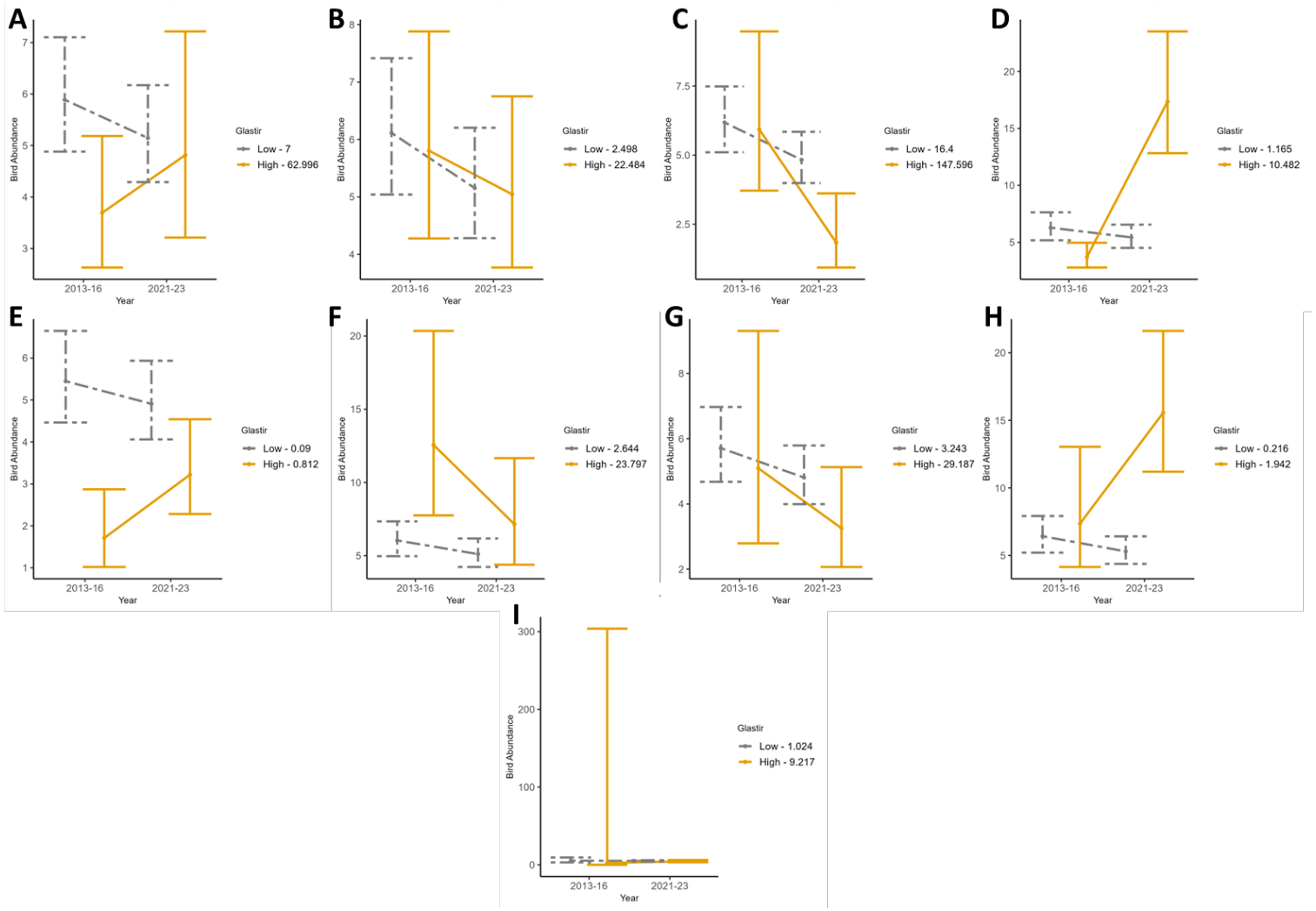

Figure 5-15 Glastir trends for Vertebrate-eater bird guild indicator per Glastir options of interest with the full National Trend for the Vertebrate eater guild indicator at an all-Wales scale shown behind. Glastir option bundles: A) Grassland: Grazing Lo/No Inputs, B) Habitat Management General Grassland, C) Habitat Management Mountain Moor & Heath, D) Arable Management, E) Hedge Management, F) Woodland Stock Exclusion, G) Woodland Management, H) Corridors/Buffers, I) Wood Creation

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