Environment and Rural Affairs Monitoring & Modelling Programme (ERAMMP)

ERAMMP Technical Annex-105TA1S5: Wales National Trends and Glastir Evaluation Supplement-5: Pollinators

Macgregor, C.J.[1,2]

[1] British Trust for Ornithology, [2] British Trust for Ornithology Cymru

Version History

Version	Updated By	Date	Changes
1.0	PMO	04/04/2025	Publication

This report is available electronically at: **www.erammp.wales/105TA1S5**

Or by scanning the QR code shown.

Series	Environment and Rural Affairs Monitoring & Modelling Programme (ERAMMP)
Title	ERAMMP Technical Annex-105TA1S5: Wales National Trends and Glastir Evaluation Supplement-5: Pollinators
Client	Welsh Government
Client reference	C208/2021/2022
Confidentiality, copyright and reproduction	© Crown Copyright 2025. This report is licensed under the Open Government Licence 3.0.
UKCEH contact details	Bronwen Williams UK Centre for Ecology & Hydrology (UKCEH) Environment Centre Wales, Deiniol Road, Bangor, Gwynedd, LL57 2UW 01248 374500 erammp@ceh.ac.uk
Corresponding author	
Authors	Macgregor, C.J.[1,2] [1] British Trust for Ornithology, [2] British Trust for Ornithology Cymru
Contributing authors & reviewers	Siriwardena, G., Bowgen, K.M. British Trust for Ornithology
How to cite (long)	Macgregor, C.J. (2025). *Environment and Rural Affairs Monitoring & Modelling Programme (ERAMMP)*. ERAMMP Technical Annex-105TA1S5: Wales National Trends and Glastir Evaluation, Supplement-5: Pollinators. Report to Welsh Government (Contract C208/2021/2022) (UK Centre for Ecology & Hydrology Project 08435)
How to cite (short)	Macgregor, C.J. (2025). ERAMMP Technical Annex-105TA1S5: Wales National Trends and Glastir Evaluation, Supplement-5: Pollinators. Report to Welsh Government (Contract C208/2021/2022) (UKCEH Project 08435)
Approved by	Bridget Emmett (UKCEH) James Skates (Welsh Government)

Abbreviations Used in this Report

BSR	Butterfly Species Richness
BTO	British Trust for Ornithology
FGR	Functional Group Richness
GMEP	Glastir Monitoring and Evaluation Programme
GP	Generality of Pollinators
MBA	Mean Butterfly Abundance
PA	Pollinator Abundance
QA	Quality Assurance
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 pollinator survey data from the ERAMMP field surveys in 2021 and 2023. Full details of the methodology to collate the background information for this report can be found on the ERAMMP website in ERAMMP Report-76 Field handbook: Pollinators (Botham, M. 2021)[1].

---

[1] www.erammp.wales/76

2   QUALITY ASSURANCE

2.1 Fieldwork

Due to the highly mobile nature of pollinators quality control via repeat visits of the same survey transects is not possible. Testing of pollinator ID skills was carried out in both 2021 and 2023 before hiring for new surveyors and two days of pollinator training in methods and ID with two pollinator experts (Mark Botham, UKCEH and Mike Edwards, Edwards Ecological and Data Services Ltd) took place. Quality Assurance (QA) was carried out through visits to 40% of fieldworkers during their survey visits in 2021. In these QA visits we accompanied the fieldworkers around their survey square to confirm they followed the protocols correctly and were collecting their data in the required manner. This was confirmed to be the case for all visited surveyors.

2.2 Survey data

All survey data sheets were submitted by the fieldworkers after their visits and following the protocol document instructions 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.

3   METHODS

3.1 Calculation of indices

Five indices of pollinator abundance and diversity were calculated:

- **Pollinator abundance** - the combined sum across all pollinator species of the peak count per species, for each transect section.
- **Mean butterfly abundance** - the mean across all butterfly species of the peak count per species (including zeroes), for each transect section.
- **Butterfly species richness** - the total number of butterfly species recorded across all visits, for each transect section.
- **Functional group richness** - the total number of pollinator functional groups recorded across all visits, for each transect section. Bees and hoverflies were recorded in the field to functional group level already (honeybees, bumblebees, mining bees, leafcutter bees; aphid-eaters, plant-eaters, detritivores). For butterflies, taxonomic subfamilies were used as proxies for functional groups, since closely-related butterfly species often tend to share similar life-histories, habitat requirements and/or larval host-plants.
- **Generality of pollinators** - the mean number of plant species visited per pollinator species, for each timed observation location.

4 RESULTS

4.1 National Trend

At all-Wales scale, none of the five pollinator indicators (pollinator abundance, mean butterfly abundance, butterfly species richness, functional group richness, and generality of pollinators) have significantly changed between the GMEP and ERAMMP survey periods.

Table 4-1 National Trend analysis for pollinator indicators at all-Wales scale.

Indicator	2013-16 estimate	2021-23 estimate	Trend 2016-22	P value
Pollinator abundance	18.76	18.93	0.17	0.95
Mean butterfly abundance	0.17	0.13	-0.04	0.23
Butterfly species richness	2.6	2.19	-0.41	0.14
Functional group richness	4.2	4.39	0.19	0.28
Generality of pollinators	1.59	1.52	-0.07	0.3

4.2 Glastir Analysis

At all-Wales scale, pollinator indicators have responded positively to bundles 13 (Organic) and 12 (Woodland Creation). However, pollinator indicators have declined in areas where bundles 14 (Commons Management), 1 (Grassland: Grazing Lo/No Inputs), and possibly 11 (Habitat Corridors/Buffers) have been applied.

Table 4-1 Glastir analysis for pollinator indicators at all-Wales scale. Pollinator indicators are abbreviated as follows: PA = pollinator abundance; MBA = mean butterfly abundance; BSR = butterfly species richness; FGR = functional group richness; GP = generality of pollinators. 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. Cells containing a dash - indicate the bundle was a priori not considered relevant to test at this scale. Cells containing an asterisk * indicate the bundle was considered relevant a priori, but could not be modelled independently due to data deficiency; wherever possible, such bundles were incorporated into a combined "Other relevant bundles" variable (last column). N.b. significance of main effects (i.e. where areas under Glastir Management were higher or lower than the counterfactual across both time periods, with no trend difference) are not shown in this table.

| Indicator	Bundle 1 ΔT	Bundle 1 P	Bundle 2 ΔT	Bundle 2 P	Bundle 3 ΔT	Bundle 3 P	Bundle 4 ΔT	Bundle 4 P	Bundle 5 ΔT	Bundle 5 P	Bundle 6 ΔT	Bundle 6 P	Bundle 8 ΔT	Bundle 8 P	Bundle 10 ΔT	Bundle 10 P	Bundle 11 ΔT	Bundle 11 P	Bundle 12 ΔT	Bundle 12 P	Bundle 13 ΔT	Bundle 13 P	Bundle 14 ΔT	Bundle 14 P	Other ΔT	Other P
PA	-1.35	0.27	2.46	0.53	-5.81	0.01	2.54	0.22	-0.8	0.8	0.62	0.82	-1.99	0.52	-3.69	0.35	0.52	0.85	8.69	0.07	0.83	0.68	-2.84	0.04	-	-
MBA	0	0.54	0.01	0.33	-0.01	0.48	0	0.68	-	-	-	-	0.05	0.07	-	-	-0.01	0.64	0.02	0.42	0.03	0.01	0.01	0.65	-	-
BSR	-0.29	0.04	-0.03	0.67	0.29	0.14	0.16	0.35	-	-	-	-	0.34	0.34	-	-	-0.1	0.75	0.92	0.02	0.45	0.01	-0.81	<0.01	-	-
FGR	-0.25	0.21	-0.31	0.59	-0.25	0.33	0.45	0.1	-0.16	0.69	0.38	0.3	-0.3	0.55	-	-	-0.73	0.06	0.94	0.1	0.37	0.15	-1.09	<0.01	-	-
GP	0.09	0.52	-0.45	0.22	0.2	0.24	-0.04	0.85	-0.02	0.94	-0.09	0.79	-0.39	0.37	0.36	0.36	-0.56	0.05	0.26	0.39	-0.04	0.79	*	*	-	-
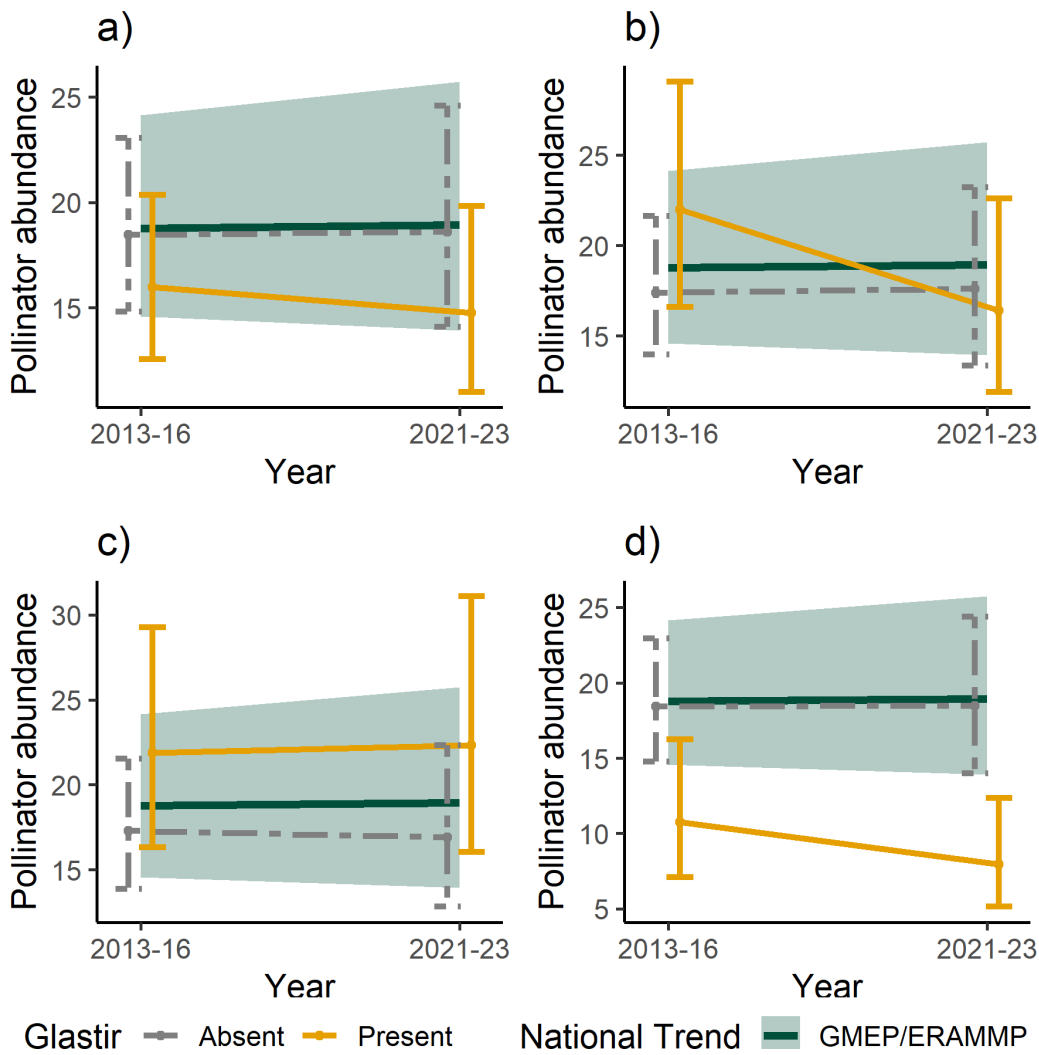
Figure 4-1 Effects of Glastir Management on pollinator abundance at all-Wales scale: a) pollinator abundance was lower where bundle 1 was applied across both GMEP and ERAMMP; b) pollinator abundance was higher where bundle 3 was applied during GMEP, but declined relative to the counterfactual; c) pollinator abundance was higher where bundle 13 was applied across both GMEP and ERAMMP; d) pollinator abundance was lower where bundle 14 was applied during GMEP, and declined further relative to the counterfactual.
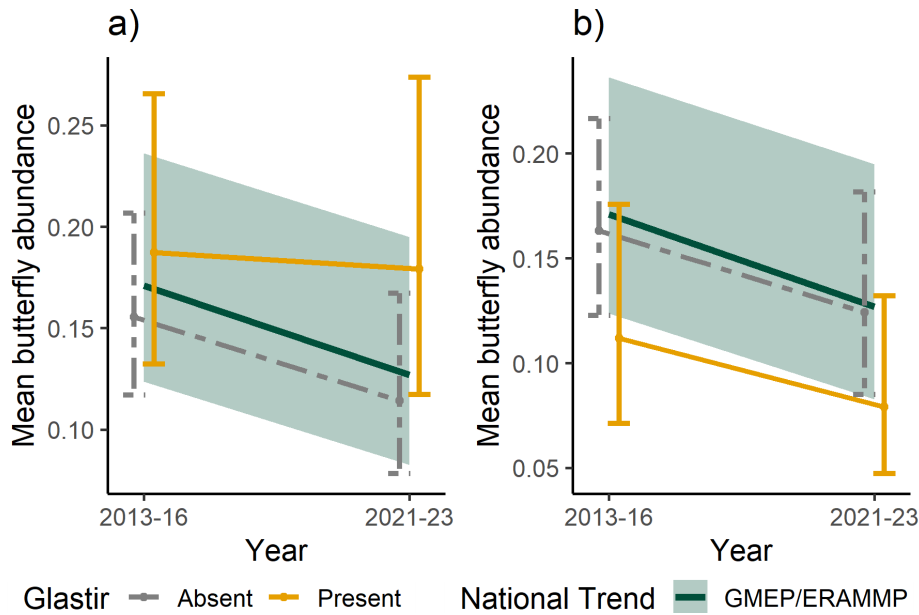
Figure 4-2: Effects of Glastir Management on mean butterfly abundance at all-Wales scale: a) mean butterfly abundance was stable relative to a declining counterfactual where bundle 13 was applied; b) mean butterfly abundance had a lower baseline where bundle 14 was applied across.
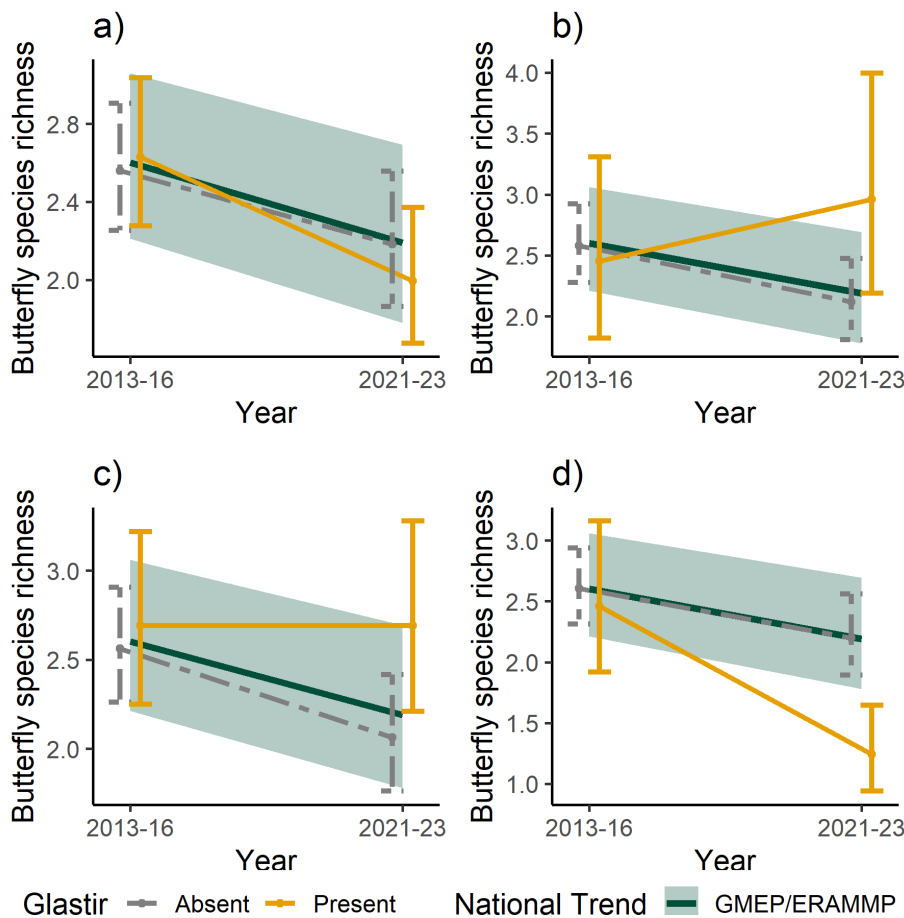

Figure 4-3 Effects of Glastir Management on butterfly species richness at all-Wales scale: relative to a declining counterfactual, butterfly species richness a) declined faster than the counterfactual where bundle 1 was applied; b) increased where bundle 12 was applied; c) was stable where bundle 13 was applied; and d) declined faster than the counterfactual where bundle 14 was applied.
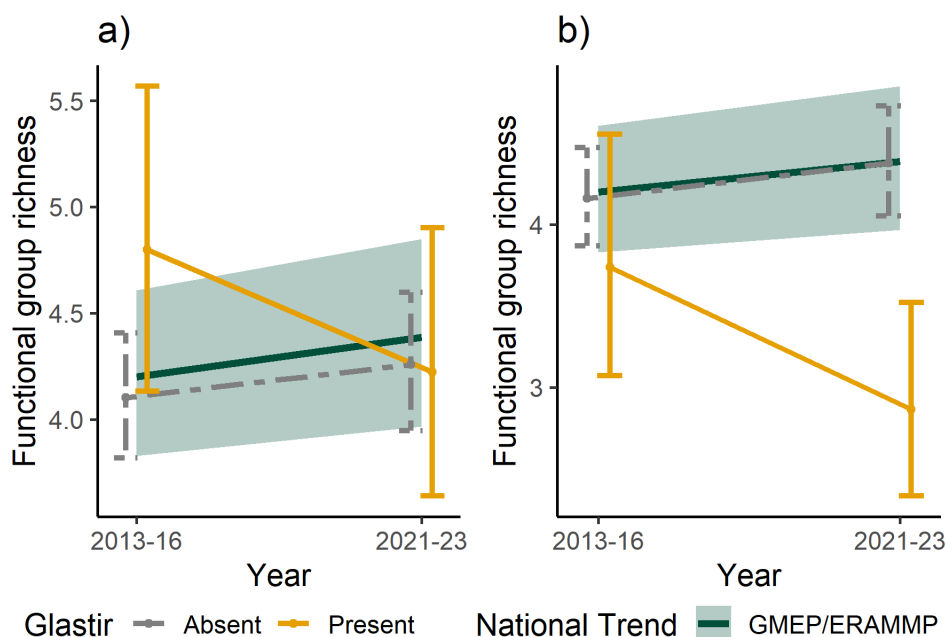
Figure 4-4 Effects of Glastir Management on functional group richness at all-Wales scale: functional group richness decreased where bundles a) 11 and b) 14 were applied.

4.3 Woodland

4.3.1 Broadleaved Mixed and Yew Woodland

4.3.1.1 National Trend

In Broadleaved, Mixed and Yew Woodland, significant declines have occurred in mean butterfly abundance and butterfly species richness, with no significant change in the other indicators.

Table 4-3 National Trend analysis for pollinator indicators in Broadleaved, Mixed and Yew Woodland. 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
Pollinator abundance	32.66	29.44	-3.22	0.65
Mean butterfly abundance	0.31	0.17	-0.14	0.02
Butterfly species richness	3.45	2.64	-0.82	<0.01
Functional group richness	5.2	5.26	0.05	0.87
Generality of pollinators	1.85	1.61	-0.24	0.33

4.3.1.2   Glastir Analysis

In Broadleaved, Mixed and Yew Woodland, pollinator indicators have shown mixed responses to bundle 6 suggesting a lower baseline during GMEP surveys, with subsequent improvements relative to the counterfactual. Pollinator indicators suggest a lower baseline where bundle 5 was applied.

*Table 4-4 Glastir analysis for pollinator indicators in Broadleaved, Mixed and Yew Woodland. Pollinator indicators are abbreviated as follows: PA = pollinator abundance; MBA = mean butterfly abundance; BSR = butterfly species richness; FGR = functional group richness; GP = generality of pollinators. 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. Cells containing a dash - indicate the bundle was a priori not considered relevant to test in this habitat. Cells containing an asterisk * indicate the bundle was considered relevant a priori, but could not be modelled independently due to data deficiency; wherever possible, such bundles were incorporated into a combined "Other relevant bundles" variable (last column). N.b. significance of main effects (i.e. where areas under Glastir Management were higher or lower than the counterfactual across both time periods, with no trend difference) are not shown in this table.*

| Indicator	Bundle 1 ΔT	P	Bundle 2 ΔT	P	Bundle 3 ΔT	P	Bundle 4 ΔT	P	Bundle 5 ΔT	P	Bundle 6 ΔT	P	Bundle 8 ΔT	P	Bundle 10 ΔT	P	Bundle 11 ΔT	P	Bundle 12 ΔT	P	Bundle 13 ΔT	P	Bundle 14 ΔT	P	Other ΔT	P
PA	-	-	-	-	-	-	8.2	0.62	-5.14	0.74	11.45	0.34	-	-	-	-	*	*	*	*	17.22	0.29	-	-	16.85	0.36
MBA	-	-	-	-	-	-	0.02	0.78	-0.21	0.47	0.22	0.06	-	-	-	-	*	*	*	*	0.16	0.09	-	-	-0.07	0.86
BSR	-	-	-	-	-	-	0	0.94	-0.44	0.81	0.78	0.59	-	-	-	-	*	*	*	*	0.74	0.36	-	-	0.51	0.66
FGR	-	-	-	-	-	-	0.37	0.78	-0.8	0.51	0.98	0.33	-	-	-	-	*	*	*	*	0.55	0.6	-	-	0.31	0.84
GP	-	-	-	-	-	-	-0.19	0.8	-0.22	0.81	0.01	0.99	-	-	-	-	*	*	*	*	0.02	0.97	-	-	0.07	0.93
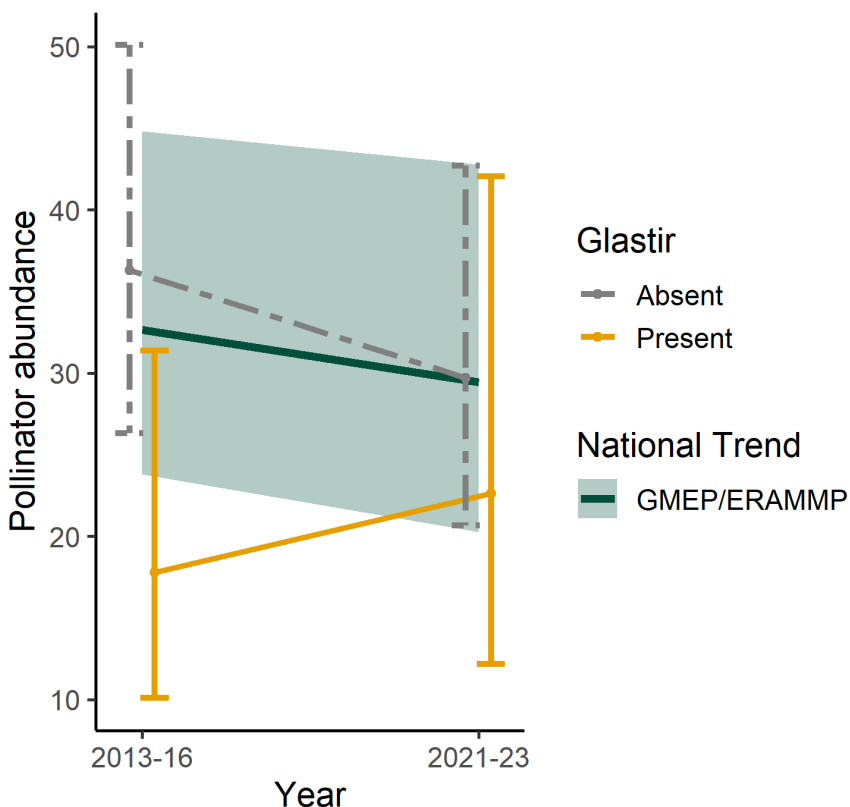
Figure 4-5 Effects of Glastir Management on pollinator abundance in Broadleaved, Mixed and Yew Woodland: bundle 6.
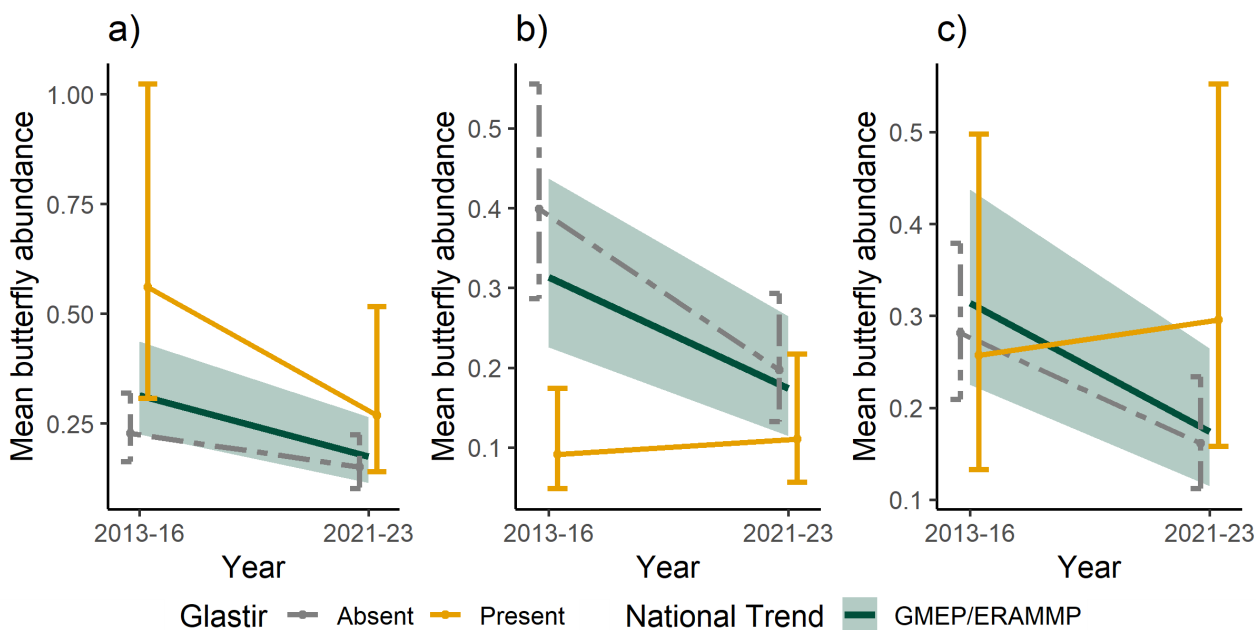

Figure 4-6 Effects of Glastir Management on mean butterfly abundance in Broadleaved, Mixed and Yew Woodland: a) bundle 5; b) bundle 6; c) bundle 13.

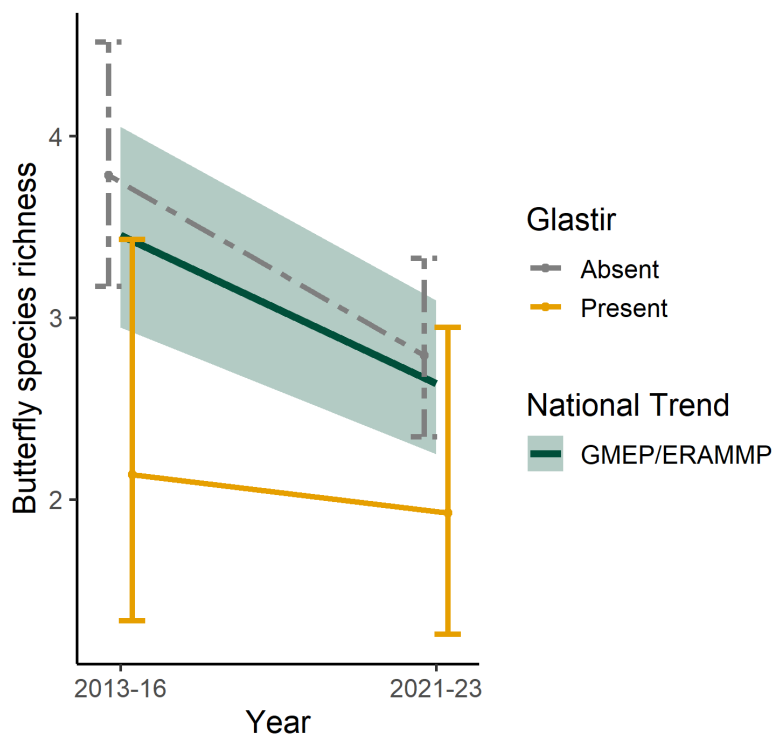*Figure 4-7 Effects of Glastir Management on butterfly species richness in Broadleaved, Mixed and Yew Woodland: bundle 6.*
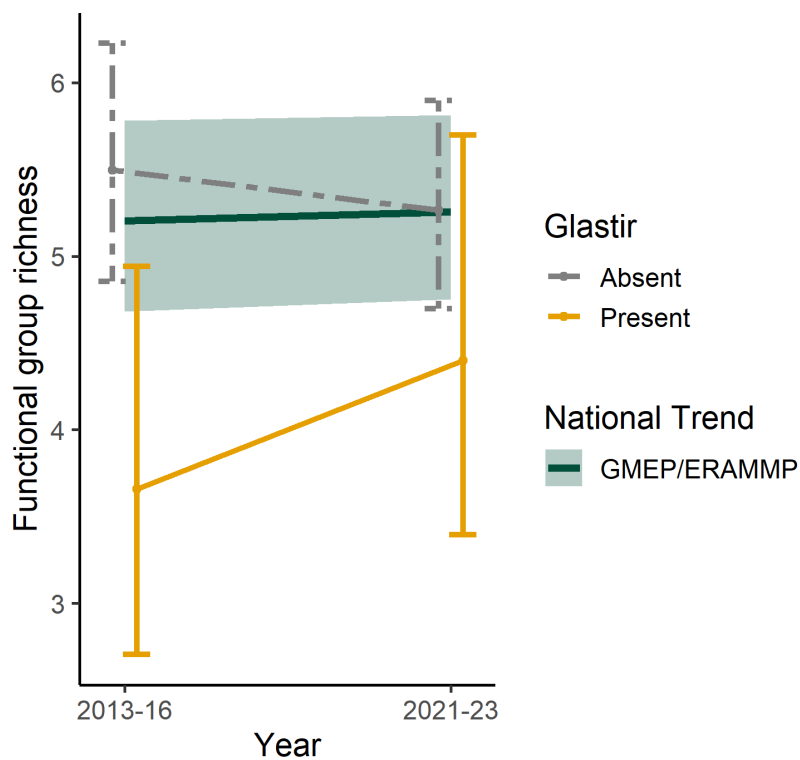

Figure 4-8 Effects of Glastir Management on functional group richness in Broadleaved, Mixed and Yew Woodland: bundle 6.

4.3.2   Coniferous Woodland

4.3.2.1   National Trend

In Coniferous Woodland, significant increases have occurred in pollinator abundance, with no significant change in the other indicators.

Table 4-5 National Trend analysis for pollinator indicators in Coniferous Woodland. 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
Pollinator abundance	22.92	35.1	12.18	0.01
Mean butterfly abundance	0.15	0.13	-0.02	0.73
Butterfly species richness	2.24	2.07	-0.17	0.51
Functional group richness	4.37	4.96	0.59	0.09
Generality of pollinators	1.83	1.94	0.11	0.75

4.3.2.2   Glastir Analysis

In Coniferous Woodland, increases in pollinator abundance appear to have taken place in areas where bundle 6 was not applied, with decreases in areas where this bundle was applied.

*Table 4-6 Glastir analysis for pollinator indicators in Coniferous Woodland. Pollinator indicators are abbreviated as follows: PA = pollinator abundance; MBA = mean butterfly abundance; BSR = butterfly species richness; FGR = functional group richness; GP = generality of pollinators. 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. Cells containing a dash - indicate the bundle was a priori not considered relevant to test in this habitat. Cells containing an asterisk * indicate the bundle was considered relevant a priori, but could not be modelled independently due to data deficiency; wherever possible, such bundles were incorporated into a combined "Other relevant bundles" variable (last column). N.b. significance of main effects (i.e. where areas under Glastir Management were higher or lower than the counterfactual across both time periods, with no trend difference) are not shown in this table.*

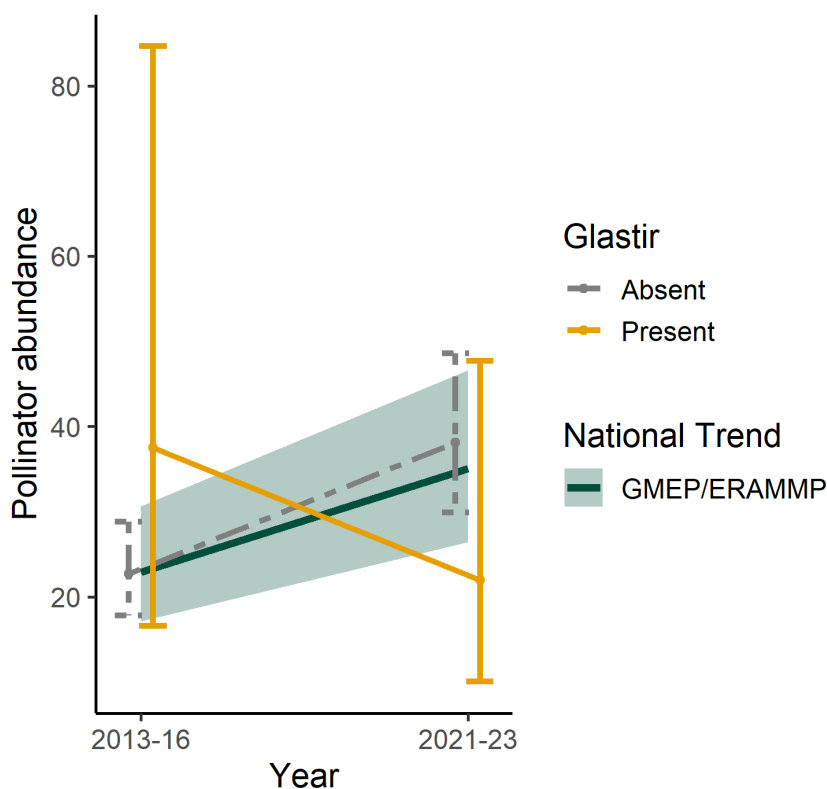| Indicator	Bundle 1		Bundle 2		Bundle 3		Bundle 4		Bundle 5		Bundle 6		Bundle 8		Bundle 10		Bundle 11		Bundle 12		Bundle 13		Bundle 14		Other	
	ΔT	P	ΔT	P	ΔT	P	ΔT	P	ΔT	P	ΔT	P	ΔT	P	ΔT	P	ΔT	P	ΔT	P	ΔT	P	ΔT	P	ΔT	P
PA	-	-	-	-	-	-	-48.42	0.24	34.86	0.25	-42.95	0.01	-	-	-	-	*	*	*	*	-	-	-	-	225.55	0.27
MBA	-	-	-	-	-	-	-0.2	0.42	0.18	0.54	-0.01	0.87	-	-	-	-	*	*	*	*	-	-	-	-	-0.28	0.88
BSR	-	-	-	-	-	-	-1.34	0.47	1.86	0.38	0.77	0.45	-	-	-	-	*	*	*	*	-	-	-	-	0.12	0.92
FGR	-	-	-	-	-	-	-0.81	0.69	1.54	0.58	-0.36	0.78	-	-	-	-	*	*	*	*	-	-	-	-	0.58	0.96
GP	-	-	-	-	-	-	*	*	*	*	*	*	-	-	-	-	*	*	*	*	-	-	-	-	0.32	0.84

Figure 4-9 Effects of Glastir Management on pollinator abundance in Coniferous Woodland: bundle 6.

4.4 Mountain, Moor and Heath

4.4.1   Dwarf Shrub Heath

4.4.1.1   National Trend

In Dwarf Shrub Heath, no significant change was detected in any indicator.

Table 4-7 National Trend analysis for pollinator indicators in Dwarf Shrub Heath. 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
Pollinator abundance	16.23	12.77	-3.45	0.37
Mean butterfly abundance	0.14	0.09	-0.05	0.45
Butterfly species richness	2.63	1.53	-1.1	0.09
Functional group richness	3.58	3.07	-0.5	0.25
Generality of pollinators	1.71	1.54	-0.18	0.64

4.4.1.2   Glastir Analysis

In Dwarf Shrub Heath, pollinator indicators responded negatively to bundle 14. Pollinator indicators showed a lower baseline where bundle 1 was applied, but a higher baseline where bundle 4 was applied.

Table 4-8 Glastir analysis for pollinator indicators in Dwarf Shrub Heath. Pollinator indicators are abbreviated as follows: PA = pollinator abundance; MBA = mean butterfly abundance; BSR = butterfly species richness; FGR = functional group richness; GP = generality of pollinators. 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. Cells containing a dash - indicate the bundle was a priori not considered relevant to test in this habitat. Cells containing an asterisk * indicate the bundle was considered relevant a priori, but could not be modelled independently due to data deficiency; wherever possible, such bundles were incorporated into a combined "Other relevant bundles" variable (last column). N.b. significance of main effects (i.e. where areas under Glastir Management were higher or lower than the counterfactual across both time periods, with no trend difference) are not shown in this table.

| Indicator	Bundle 1 ΔT	P	Bundle 2 ΔT	P	Bundle 3 ΔT	P	Bundle 4 ΔT	P	Bundle 5 ΔT	P	Bundle 6 ΔT	P	Bundle 8 ΔT	P	Bundle 10 ΔT	P	Bundle 11 ΔT	P	Bundle 12 ΔT	P	Bundle 13 ΔT	P	Bundle 14 ΔT	P	Other ΔT	P
PA	2.93	0.48	2.72	0.6	-	-	20.53	0.71	-	-	-	-	*	*	-0.67	0.9	*	*	*	*	-11.09	0.47	-1.55	0.62	-6.87	0.56
MBA	0.07	0.14	-0.02	0.85	-	-	-0.3	0.42	-	-	-	-	*	*	0.05	0.51	*	*	*	*	0.05	0.56	-0.02	0.4	0	0.75
BSR	0.27	0.86	0.62	0.43	-	-	-0.38	0.8	-	-	-	-	*	*	-0.18	0.73	*	*	*	*	1.14	0.35	-1.39	0.01	-0.66	0.54
FGR	0.1	0.96	-0.48	0.63	-	-	1.62	0.62	-	-	-	-	*	*	0.42	0.75	*	*	*	*	0.82	0.6	-0.65	0.29	-2.35	0.43
GP	-0.36	0.71	-0.43	0.61	-	-	*	*	-	-	-	-	*	*	0.76	0.48	*	*	*	*	-0.93	0.53	*	*	-	-
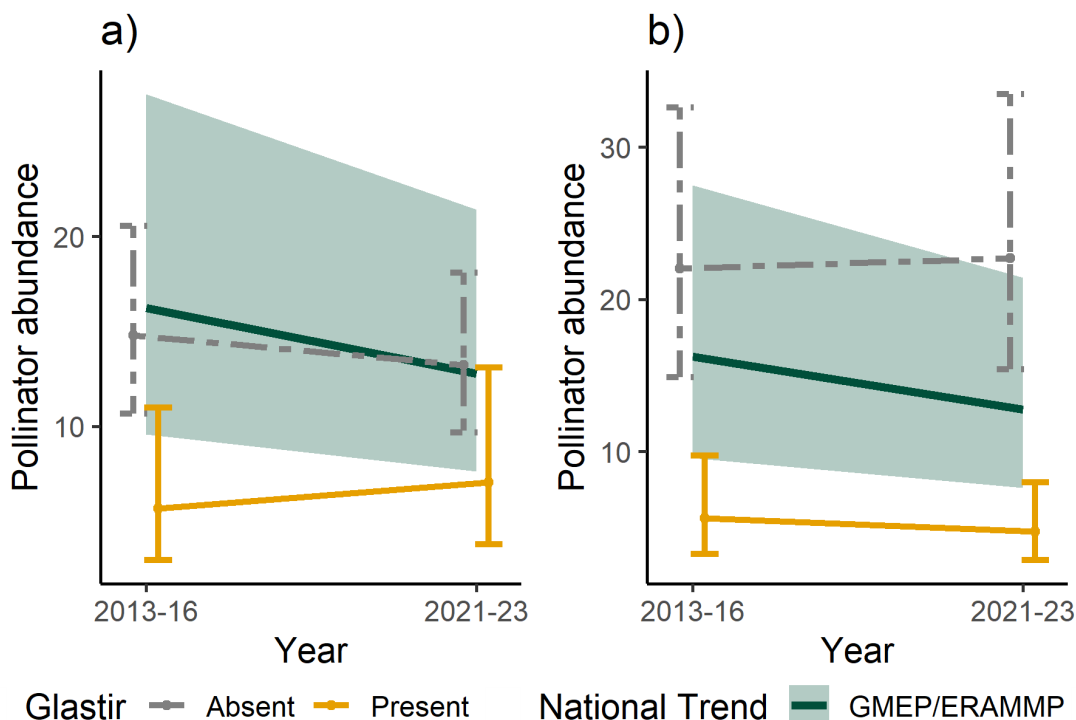
Figure 4-10 Effects of Glastir Management on pollinator abundance in Dwarf Shrub Heath: a) bundle 1; b) bundle 14.
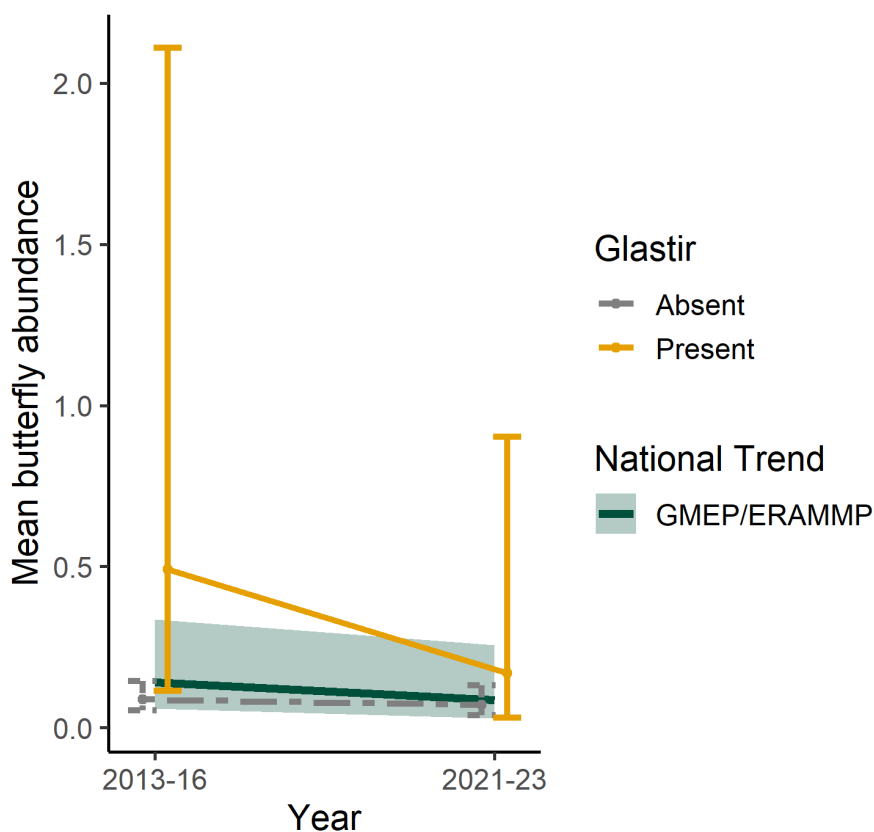

Figure 4-11 Effects of Glastir Management on mean butterfly abundance in Dwarf Shrub Heath: bundle 4.
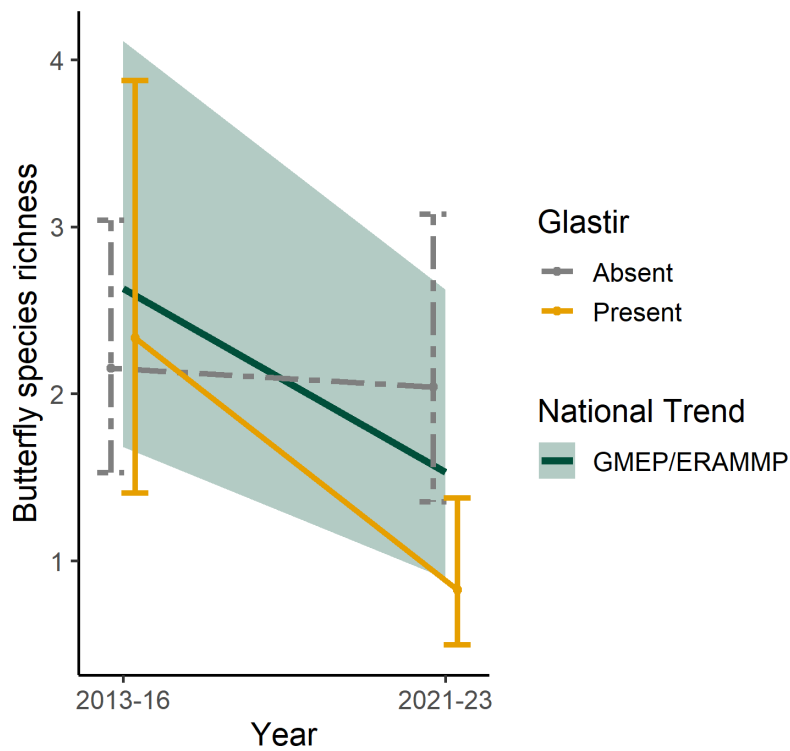
Figure 4-12 Effects of Glastir Management on butterfly species richness in Dwarf Shrub Heath: bundle 14
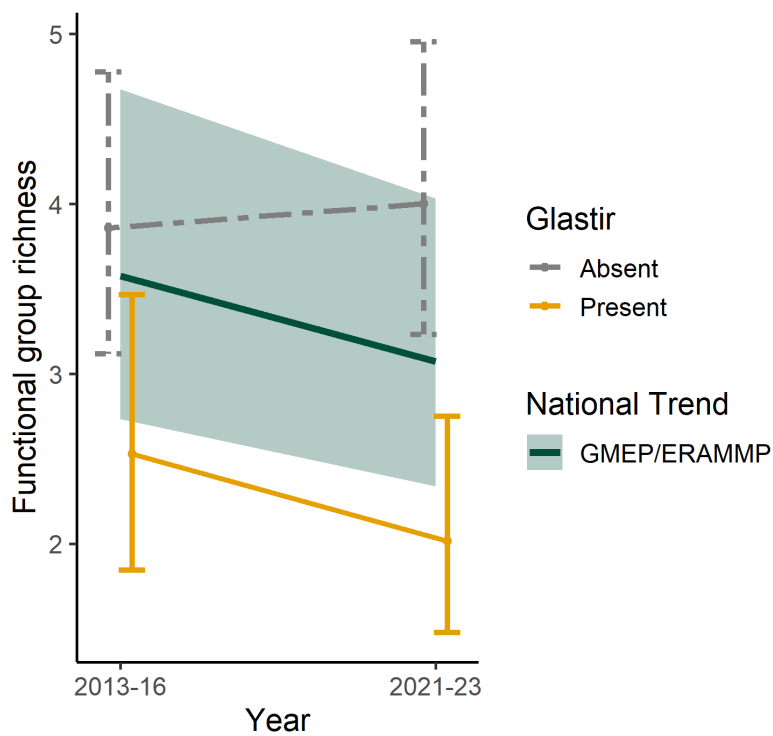

Figure 4-13 Effects of Glastir Management on functional group richness in Dwarf Shrub Heath: bundle 14.

4.4.2   Bog

4.4.2.1   National Trend

In Bog, no significant change was detected in any indicator.

Table 4-9 National Trend analysis for pollinator indicators in Bog. 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
Pollinator abundance	10.21	11.86	1.65	0.67
Mean butterfly abundance	0.12	0.09	-0.03	0.38
Butterfly species richness	1.56	1.69	0.14	0.81
Functional group richness	2.48	3.12	0.64	0.22
Generality of pollinators	1.31	1.3	0	0.99

4.4.2.2　Glastir Analysis

In Bog, there was no evidence for pollinator indicators responding to any Glastir bundle.

*Table 4-10 Glastir analysis for pollinator indicators in Bog. Pollinator indicators are abbreviated as follows: PA = pollinator abundance; MBA = mean butterfly abundance; BSR = butterfly species richness; FGR = functional group richness; GP = generality of pollinators. 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. Cells containing a dash - indicate the bundle was a priori not considered relevant to test in this habitat. Cells containing an asterisk * indicate the bundle was considered relevant a priori, but could not be modelled independently due to data deficiency; wherever possible, such bundles were incorporated into a combined "Other relevant bundles" variable (last column). N.b. significance of main effects (i.e. where areas under Glastir Management were higher or lower than the counterfactual across both time periods, with no trend difference) are not shown in this table.*

Indicator	Bundle 1 ΔT	P	Bundle 2 ΔT	P	Bundle 3 ΔT	P	Bundle 4 ΔT	P	Bundle 5 ΔT	P	Bundle 6 ΔT	P	Bundle 8 ΔT	P	Bundle 10 ΔT	P	Bundle 11 ΔT	P	Bundle 12 ΔT	P	Bundle 13 ΔT	P	Bundle 14 ΔT	P	Other ΔT	P
PA	-	-	2.83	0.91	-	-	-	-	-	-	-	-	*	*	6.04	0.83	*	*	*	*	-3.18	0.77	*	*	0.97	0.91
MBA	-	-	-0.2	0.68	-	-	-	-	-	-	-	-	*	*	0.06	0.74	*	*	*	*	-0.04	0.82	*	*	0.12	0.33
BSR	-	-	0.22	1	-	-	-	-	-	-	-	-	*	*	-0.09	0.99	*	*	*	*	1.07	0.44	*	*	-0.66	0.7
FGR	-	-	-2.29	0.55	-	-	-	-	-	-	-	-	*	*	2.59	0.52	*	*	*	*	-1.8	0.32	*	*	0	0.92
GP	-	-	-1.32	0.19	-	-	-	-	-	-	-	-	*	*	0.84	0.49	*	*	*	*	*	*	*	*	-0.37	0.85

4.4.3   Bracken

It was not possible to conduct a robust analysis for pollinator data for this habitat, because land cover data were not available in locations where pollinator transects (and their surrounding 100 m buffers) extended beyond survey squares.

4.4.4   Montane

It was not possible to conduct a robust analysis for pollinator data for this habitat, because no surveyed pollinator transects (including their surrounding 100 m buffers) intersected with land classified as Montane.

4.4.5   Fen, Marsh, Swamp

4.4.5.1   National Trend

In Fen, Marsh, Swamp, significant declines have occurred in mean butterfly abundance and butterfly species richness, with no significant change in the other indicators.

Table 4-11 National Trend analysis for pollinator indicators in Fen, Marsh, Swamp. 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
Pollinator abundance	17.29	17.13	-0.16	0.96
Mean butterfly abundance	0.31	0.14	-0.17	<0.01
Butterfly species richness	3.41	1.97	-1.44	0.01
Functional group richness	4.25	4.08	-0.16	0.76
Generality of pollinators	1.71	1.47	-0.23	0.5

4.4.5.2   Glastir Analysis

In Fen, Marsh and Swamp, pollinator indicators showed a lower baseline where bundle 14 was applied.

*Table 4-12 Glastir analysis for pollinator indicators in Fen, Marsh, Swamp. Pollinator indicators are abbreviated as follows: PA = pollinator abundance; MBA = mean butterfly abundance; BSR = butterfly species richness; FGR = functional group richness; GP = generality of pollinators. 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. Cells containing a dash - indicate the bundle was a priori not considered relevant to test in this habitat. Cells containing an asterisk * indicate the bundle was considered relevant a priori, but could not be modelled independently due to data deficiency; wherever possible, such bundles were incorporated into a combined "Other relevant bundles" variable (last column). N.b. significance of main effects (i.e. where areas under Glastir Management were higher or lower than the counterfactual across both time periods, with no trend difference) are not shown in this table.*

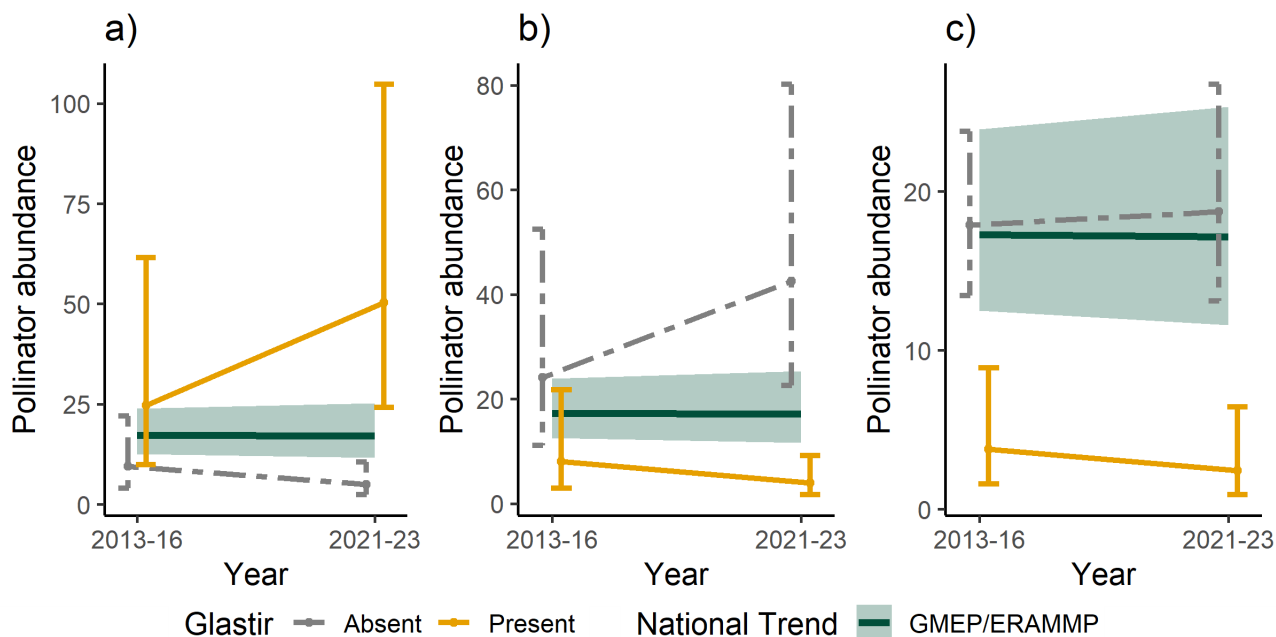| Indicator	Bundle 1 ΔT	P	Bundle 2 ΔT	P	Bundle 3 ΔT	P	Bundle 4 ΔT	P	Bundle 5 ΔT	P	Bundle 6 ΔT	P	Bundle 8 ΔT	P	Bundle 10 ΔT	P	Bundle 11 ΔT	P	Bundle 12 ΔT	P	Bundle 13 ΔT	P	Bundle 14 ΔT	P	Other ΔT	P
PA	-	-	30.13	0.08	-	-	-	-	-	-	-	-	*	*	-22.57	0.09	*	*	*	*	3.37	0.25	-2.21	0.23	4.65	0.1
MBA	-	-	-0.37	0.88	-	-	-	-	-	-	-	-	*	*	0.5	0.76	*	*	*	*	0.04	0.55	0.22	0.31	-0.06	0.62
BSR	-	-	-1.54	0.9	-	-	-	-	-	-	-	-	*	*	1.98	0.87	*	*	*	*	0.2	0.54	0.76	0.91	-1.06	0.45
FGR	-	-	3.3	0.64	-	-	-	-	-	-	-	-	*	*	-2.55	0.68	*	*	*	*	1.68	0.23	-0.7	0.45	-0.12	0.94
GP	-	-	-0.76	0.82	-	-	-	-	-	-	-	-	*	*	1.16	0.71	*	*	*	*	-0.34	0.69	*	*	-0.48	0.7

Figure 4-14 Effects of Glastir Management on pollinator abundance in Fen, Marsh, Swamp: a) bundle 2; b) bundle 10; c) bundle 14.
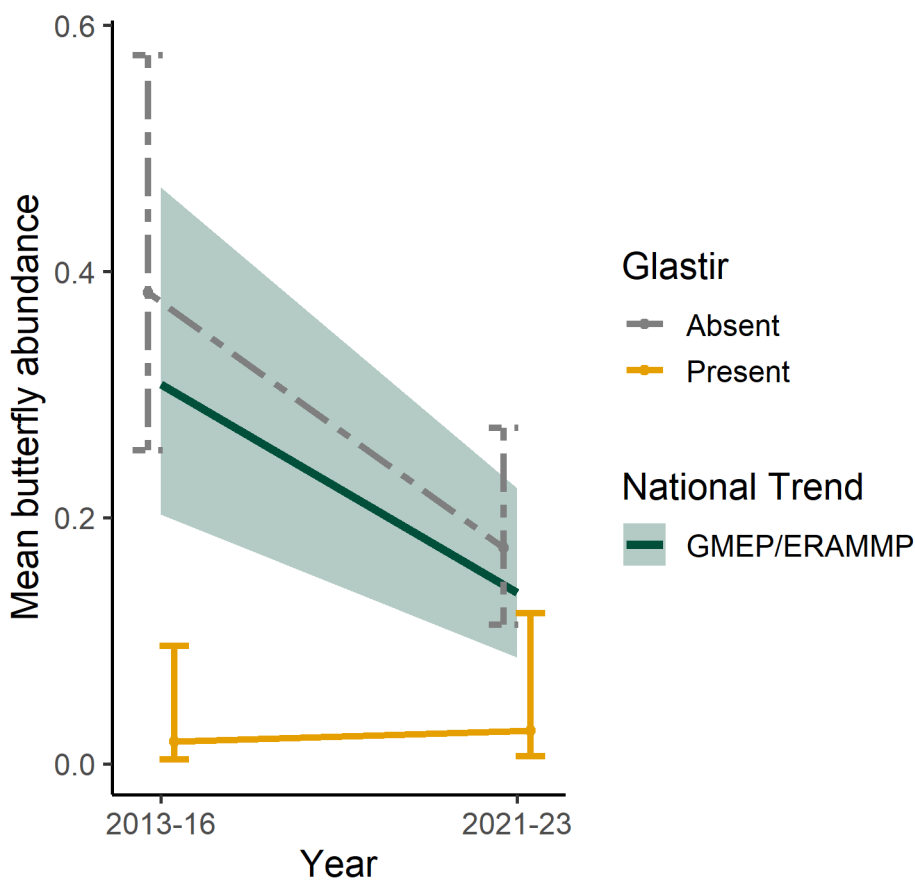

Figure 4-15 Effects of Glastir Management on mean butterfly abundance in Fen, Marsh, Swamp: bundle 14.
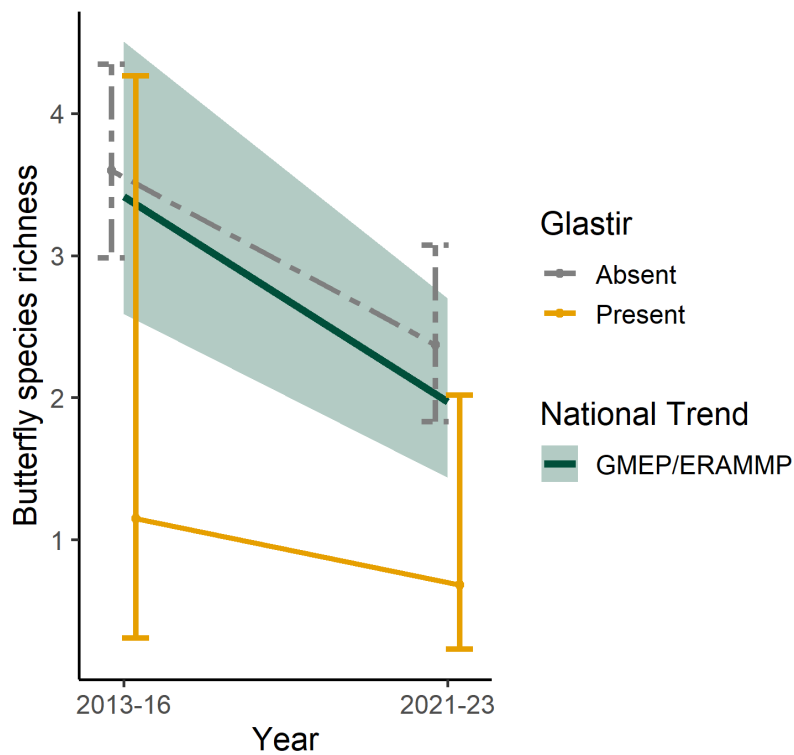
Figure 4-16 Effects of Glastir Management on butterfly species richness in Fen, Marsh, Swamp: bundle 14.
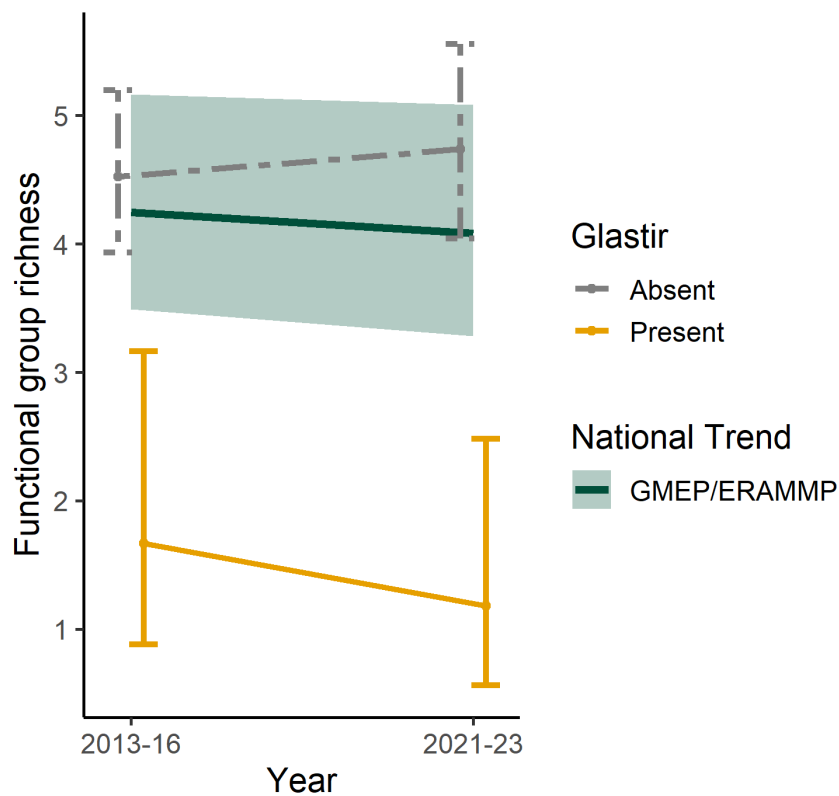

Figure 4-17 Effects of Glastir management on functional group richness richness in Fen, Marsh, Swamp: bundle 14.

4.4.6   Inland Rock

4.4.6.1   National Trend

In Inland Rock, no significant change was detected in any indicator.

Table 4-13 National Trend analysis for pollinator indicators in Inland Rock. 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
Pollinator abundance	9.35	6.34	-3.01	0.83
Mean butterfly abundance	0.12	0.05	-0.07	0.79
Butterfly species richness	1.62	0.9	-0.72	0.66
Functional group richness	3.46	1.62	-1.84	0.48
Generality of pollinators	1.83	1.78	-0.05	0.95

4.4.6.2   Glastir Analysis

In Inland Rock, there was no evidence for pollinator indicators responding to any Glastir bundle.

Table 4-14 Glastir analysis for pollinator indicators in Inland Rock. Pollinator indicators are abbreviated as follows: PA = pollinator abundance; MBA = mean butterfly abundance; BSR = butterfly species richness; FGR = functional group richness; GP = generality of pollinators. 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. Cells containing a dash - indicate the bundle was a priori not considered relevant to test in this habitat. Cells containing an asterisk * indicate the bundle was considered relevant a priori, but could not be modelled independently due to data deficiency; wherever possible, such bundles were incorporated into a combined "Other relevant bundles" variable (last column). N.b. significance of main effects (i.e. where areas under Glastir Management were higher or lower than the counterfactual across both time periods, with no trend difference) are not shown in this table.

Indicator	Bundle 1 ΔT	P	Bundle 2 ΔT	P	Bundle 3 ΔT	P	Bundle 4 ΔT	P	Bundle 5 ΔT	P	Bundle 6 ΔT	P	Bundle 8 ΔT	P	Bundle 10 ΔT	P	Bundle 11 ΔT	P	Bundle 12 ΔT	P	Bundle 13 ΔT	P	Bundle 14 ΔT	P	Other ΔT	P
PA	-	-	-9.94	0.99	-	-	-	-	-	-	-	-	-	-	-2.85	0.86	*	*	*	*	*	*	*	*	27.32	0.72
MBA	-	-	0.12	0.97	-	-	-	-	-	-	-	-	-	-	-0.09	0.95	*	*	*	*	*	*	*	*	0.05	1
BSR	-	-	-1.15	0.98	-	-	-	-	-	-	-	-	-	-	0.78	0.86	*	*	*	*	*	*	*	*	-0.29	0.9
FGR	-	-	-1.68	0.99	-	-	-	-	-	-	-	-	-	-	-0.62	0.71	*	*	*	*	*	*	*	*	-0.09	0.98
GP	-	-	0.89	0.25	-	-	-	-	-	-	-	-	-	-	*	*	*	*	*	*	*	*	*	*	-	-

4.5 Semi-Natural Grassland

4.5.1 Unimproved Neutral Grassland

4.5.1.1 National Trend

In Unimproved Neutral Grassland, significant declines have occurred in pollinator abundance and mean butterfly abundance, with no significant change in the other indicators. It was not possible to conduct a robust analysis of generality for this habitat, because no surveyed timed pollinator observation locations (including their surrounding 100 m buffers) intersected with land classified as Unimproved Neutral Grassland.

Table 4-15 National Trend analysis for pollinator indicators in Unimproved Neutral Grassland. 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
Pollinator abundance	49.35	20.92	-28.43	0.03
Mean butterfly abundance	0.53	0.15	-0.38	0.02
Butterfly species richness	3.93	2.63	-1.3	0.19
Functional group richness	6.38	5.51	-0.87	0.51
Generality of pollinators	N/A	N/A	N/A	N/A

4.5.1.2   Glastir Analysis

In Unimproved Neutral Grassland, there was no evidence for pollinator indicators responding to any Glastir bundle.

*Table 4-16 Glastir analysis for pollinator indicators in Unimproved Neutral Grassland. Pollinator indicators are abbreviated as follows: PA = pollinator abundance; MBA = mean butterfly abundance; BSR = butterfly species richness; FGR = functional group richness; GP = generality of pollinators. 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. Cells containing a dash - indicate the bundle was a priori not considered relevant to test in this habitat. Cells containing an asterisk * indicate the bundle was considered relevant a priori, but could not be modelled independently due to data deficiency; wherever possible, such bundles were incorporated into a combined "Other relevant bundles" variable (last column). N.b. significance of main effects (i.e. where areas under Glastir Management were higher or lower than the counterfactual across both time periods, with no trend difference) are not shown in this table.*

| Indicator	Bundle 1 ΔT	Bundle 1 P	Bundle 2 ΔT	Bundle 2 P	Bundle 3 ΔT	Bundle 3 P	Bundle 4 ΔT	Bundle 4 P	Bundle 5 ΔT	Bundle 5 P	Bundle 6 ΔT	Bundle 6 P	Bundle 8 ΔT	Bundle 8 P	Bundle 10 ΔT	Bundle 10 P	Bundle 11 ΔT	Bundle 11 P	Bundle 12 ΔT	Bundle 12 P	Bundle 13 ΔT	Bundle 13 P	Bundle 14 ΔT	Bundle 14 P	Other ΔT	Other P
PA	-16.78	0.79	34.73	0.31	-	-	*	*	-	-	-	-	*	*	*	*	*	*	*	*	*	*	*	*	36.2	0.42
MBA	-0.48	0.61	0.67	0.2	-	-	*	*	-	-	-	-	*	*	*	*	*	*	*	*	*	*	*	*	0.69	0.43
BSR	-2.1	0.56	5.82	0.09	-	-	*	*	-	-	-	-	*	*	*	*	*	*	*	*	*	*	*	*	1.58	0.65
FGR	-1.57	0.8	4.08	0.19	-	-	*	*	-	-	-	-	*	*	*	*	*	*	*	*	*	*	*	*	2.03	0.66
GP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
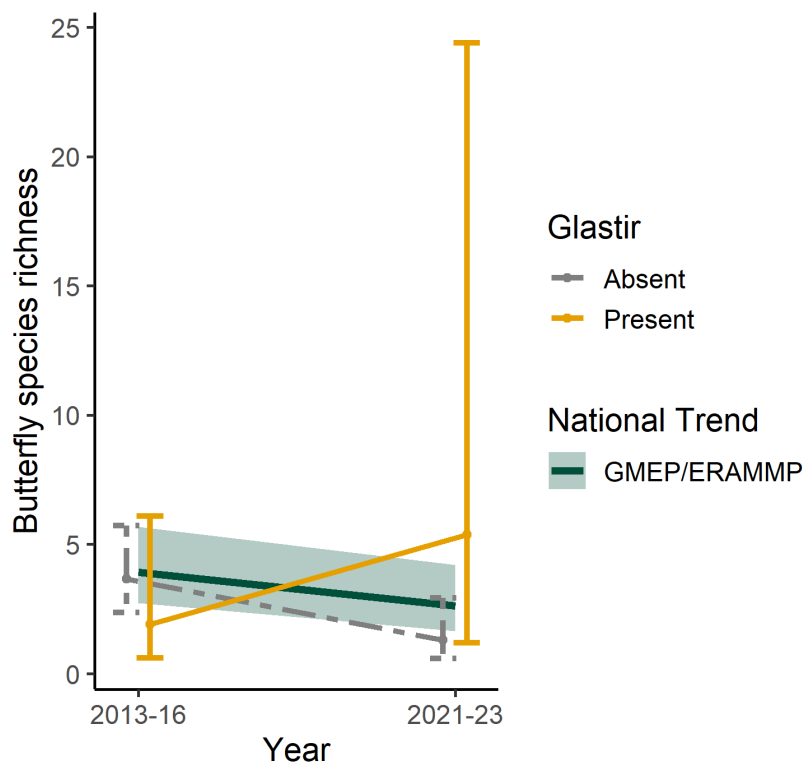
Figure 4-18 Effects of Glastir Management on butterfly species richness in Unimproved Neutral Grassland: bundle 2.
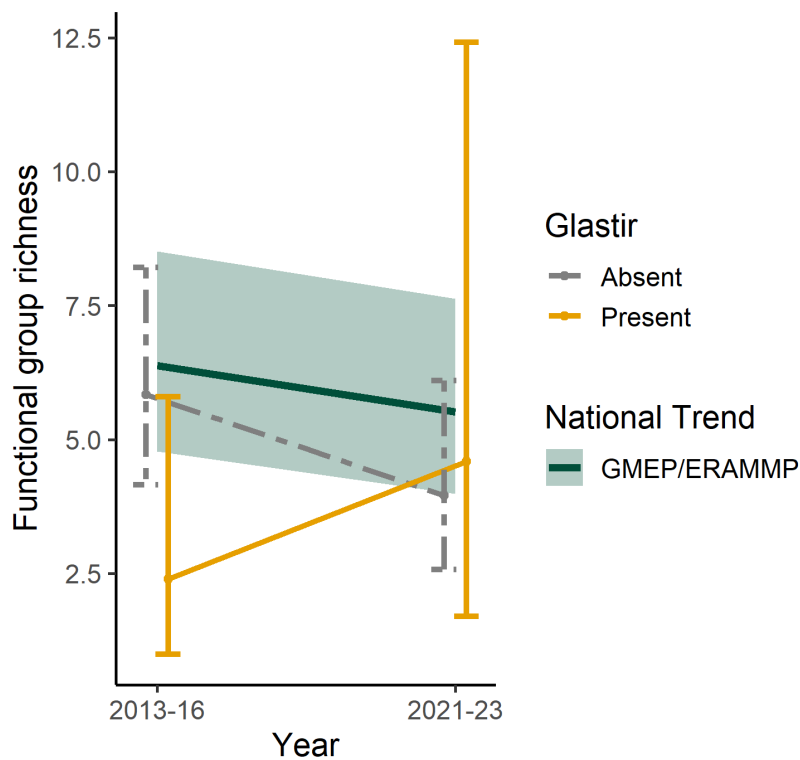

Figure 4-19 Effects of Glastir Management on functional group richness in Unimproved Neutral Grassland: bundle 2.

4.5.2　　Calcareous Grassland

It was not possible to conduct a robust analysis of the impact of Glastir Management on pollinators in this habitat, because too few surveyed pollinator transects (including their surrounding 100 m buffers) intersected with land classified as Calcareous grassland where Glastir options had been applied. Therefore, only national trend analyses were conducted.

4.5.2.1　National Trend
In Calcareous Grassland, significant declines have occurred in pollinator abundance, mean butterfly abundance, and butterfly species richness, with no significant change in the other indicators.

Table 4-17 National Trend analysis for pollinator indicators in Calcareous grassland. 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
Pollinator abundance	105.64	55.14	-50.5	<0.01
Mean butterfly abundance	1.26	0.31	-0.94	<0.01
Butterfly species richness	10.2	4.72	-5.48	0.02
Functional group richness	9.24	8.01	-1.23	0.61
Generality of pollinators	2.37	1.62	-0.75	0.77

4.5.3　　Acid Grassland

4.5.3.1　National Trend
In Acid Grassland, significant declines have occurred in mean butterfly abundance, with no significant change in the other indicators.

Table 4-18 National Trend analysis for pollinator indicators in Acid Grassland. 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
Pollinator abundance	20.41	21.39	0.98	0.51
Mean butterfly abundance	0.15	0.08	-0.07	0.01
Butterfly species richness	2.18	1.48	-0.71	0.08
Functional group richness	3.58	2.9	-0.68	0.23
Generality of pollinators	1.26	1.33	0.07	0.69

4.5.3.2   Glastir Analysis

In Acid Grassland, pollinator indicators showed a lower baseline where bundle 14 was applied.

*Table 4-19 Glastir analysis for pollinator indicators in Acid Grassland. Pollinator indicators are abbreviated as follows: PA = pollinator abundance; MBA = mean butterfly abundance; BSR = butterfly species richness; FGR = functional group richness; GP = generality of pollinators. 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. Cells containing a dash - indicate the bundle was a priori not considered relevant to test in this habitat. Cells containing an asterisk * indicate the bundle was considered relevant a priori, but could not be modelled independently due to data deficiency; wherever possible, such bundles were incorporated into a combined "Other relevant bundles" variable (last column). N.b. significance of main effects (i.e. where areas under Glastir Management were higher or lower than the counterfactual across both time periods, with no trend difference) are not shown in this table.*

| Indicator	Bundle 1 ΔT	Bundle 1 P	Bundle 2 ΔT	Bundle 2 P	Bundle 3 ΔT	Bundle 3 P	Bundle 4 ΔT	Bundle 4 P	Bundle 5 ΔT	Bundle 5 P	Bundle 6 ΔT	Bundle 6 P	Bundle 8 ΔT	Bundle 8 P	Bundle 10 ΔT	Bundle 10 P	Bundle 11 ΔT	Bundle 11 P	Bundle 12 ΔT	Bundle 12 P	Bundle 13 ΔT	Bundle 13 P	Bundle 14 ΔT	Bundle 14 P	Other ΔT	Other P
PA	3.86	0.4	3.48	0.43	-	-	-11.74	0.68	-	-	-	-	*	*	-1.43	0.5	*	*	*	*	-2.16	0.71	2.82	0.73	1.9	0.8
MBA	0.03	0.54	-0.01	0.9	-	-	-0.1	0.58	-	-	-	-	*	*	0.02	0.83	*	*	*	*	0.02	0.6	0.07	0.42	0.04	0.63
BSR	-0.16	0.84	-0.57	0.62	-	-	-0.02	0.86	-	-	-	-	*	*	0.81	0.69	*	*	*	*	0.16	0.66	0.14	0.6	0.37	0.66
FGR	0.45	0.47	0.21	0.78	-	-	0.08	0.87	-	-	-	-	*	*	-0.23	0.68	*	*	*	*	0.4	0.64	0.02	0.67	-0.01	0.96
GP	-0.2	0.66	-0.34	0.71	-	-	*	*	-	-	-	-	*	*	0.28	0.76	*	*	*	*	-0.24	0.7	*	*	-	-
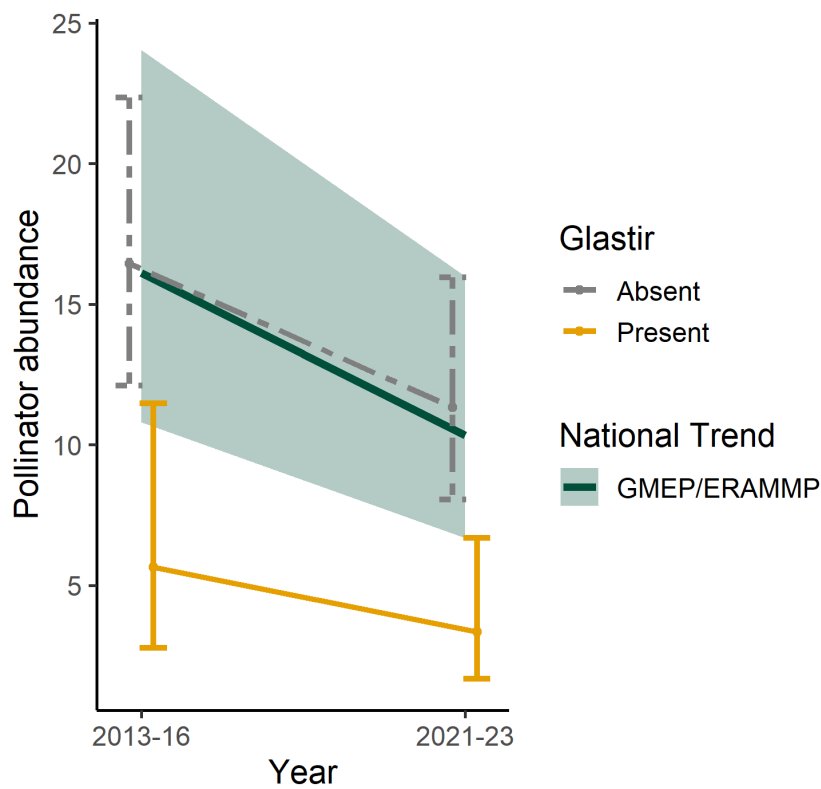
Figure 4-20 Effects of Glastir Management on pollinator abundance in Acid Grassland: bundle 14.
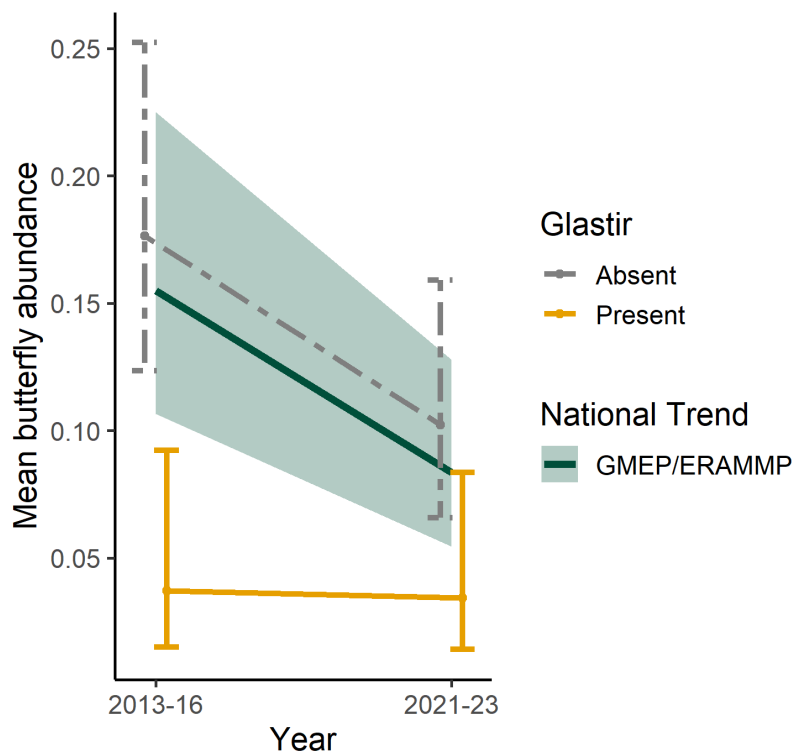

Figure 4-21 Effects of Glastir Management on pollinator abundance in Acid Grassland: bundle 14.
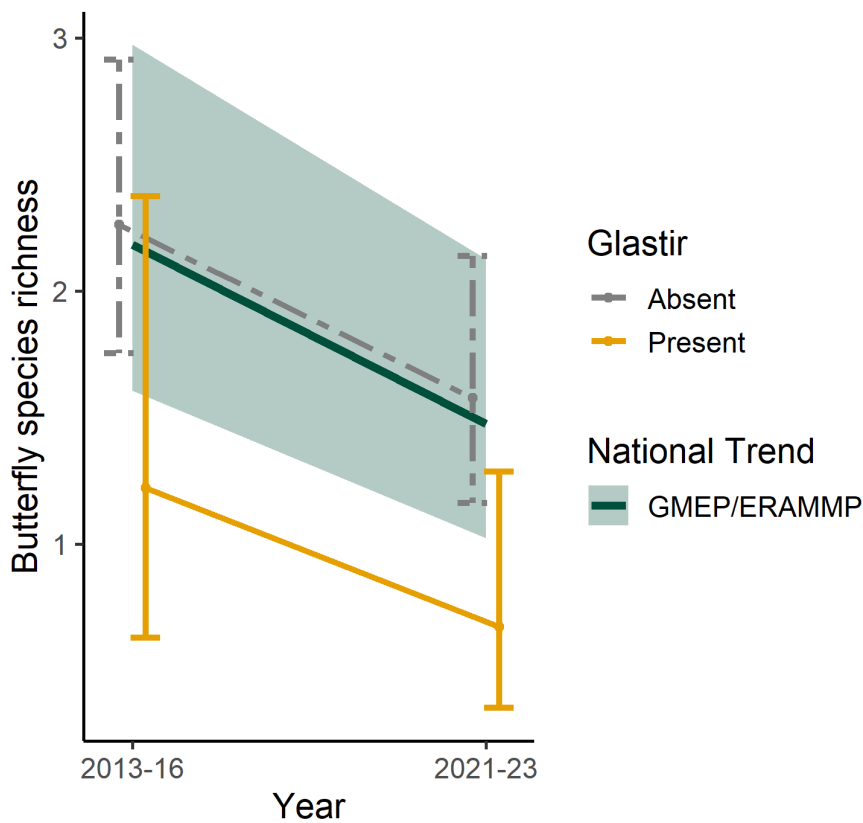
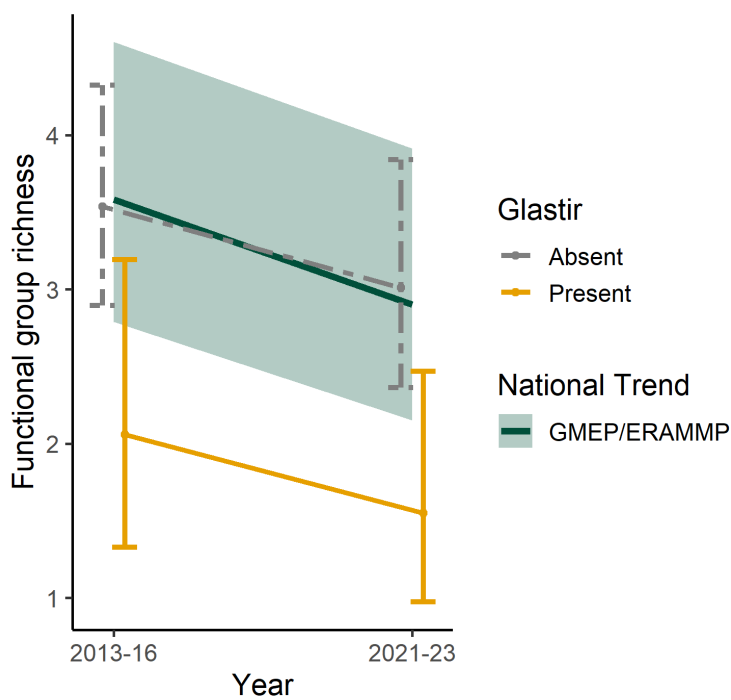*Figure 4-22 Effects of Glastir Management on butterfly species richness in Acid Grassland: bundle 14.*

Figure 4-23 Effects of Glastir management on functional group richness in Acid Grassland: bundle 14.

4.6　Enclosed Farmland

4.6.1　Arable and Horticultural

4.6.1.1　National Trend

In Arable and Horticultural, no significant change was detected in any indicator.

Table 4-20 National Trend analysis for pollinator indicators in Arable and Horticultural. 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
Pollinator abundance	36.12	39.65	3.53	0.72
Mean butterfly abundance	0.39	0.2	-0.19	0.13
Butterfly species richness	3.71	3.35	-0.35	0.43
Functional group richness	5.36	5.67	0.31	0.58
Generality of pollinators	1.54	1.73	0.19	0.56

4.6.1.2   Glastir Analysis

In Arable and Horticultural, pollinator indicators responded positively to bundles 3 and 13.

Table 4-21 Glastir analysis for pollinator indicators in Arable and Horticultural. Pollinator indicators are abbreviated as follows: PA = pollinator abundance; MBA = mean butterfly abundance; BSR = butterfly species richness; FGR = functional group richness; GP = generality of pollinators. 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. Cells containing a dash - indicate the bundle was a priori not considered relevant to test in this habitat. Cells containing an asterisk * indicate the bundle was considered relevant a priori, but could not be modelled independently due to data deficiency; wherever possible, such bundles were incorporated into a combined "Other relevant bundles" variable (last column). N.b. significance of main effects (i.e. where areas under Glastir Management were higher or lower than the counterfactual across both time periods, with no trend difference) are not shown in this table.

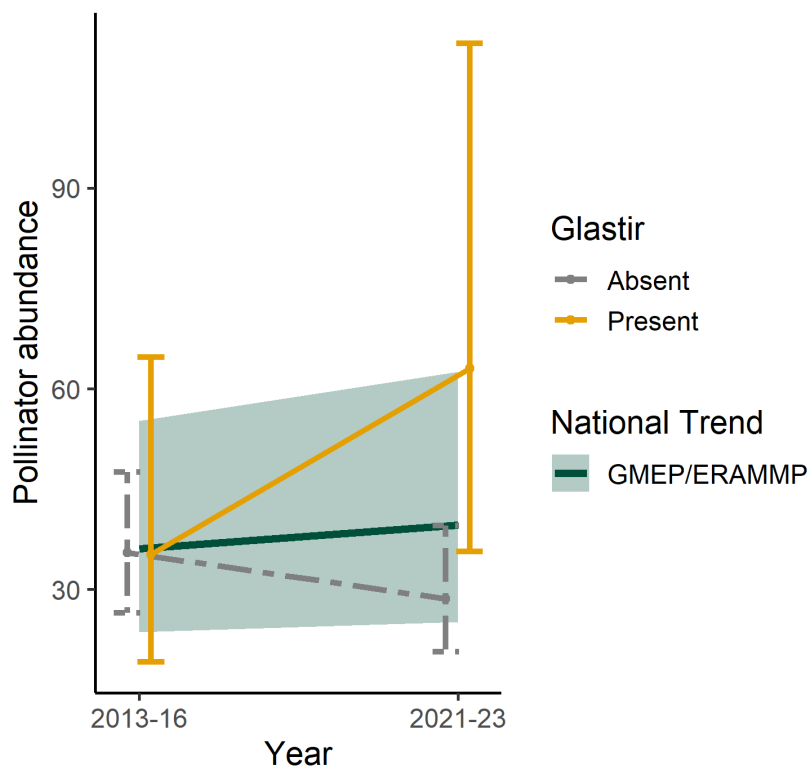| Indicator	Bundle 1 ΔT	P	Bundle 2 ΔT	P	Bundle 3 ΔT	P	Bundle 4 ΔT	P	Bundle 5 ΔT	P	Bundle 6 ΔT	P	Bundle 8 ΔT	P	Bundle 10 ΔT	P	Bundle 11 ΔT	P	Bundle 12 ΔT	P	Bundle 13 ΔT	P	Bundle 14 ΔT	P	Other ΔT	P
PA	-	-	-	-	-12.53	0.25	*	*	-	-	-	-	*	*	-	-	-6.1	0.63	*	*	34.79	0.03	-	-	-5.32	0.69
MBA	-	-	-	-	-0.14	0.79	*	*	-	-	-	-	*	*	-	-	-0.09	0.68	*	*	0.03	0.9	-	-	0.22	0.44
BSR	-	-	-	-	2.15	0.01	*	*	-	-	-	-	*	*	-	-	-0.49	0.68	*	*	0.35	0.78	-	-	0.62	0.57
FGR	-	-	-	-	1.18	0.25	*	*	-	-	-	-	*	*	-	-	-1.94	0.21	*	*	-0.33	0.84	-	-	-0.01	1
GP	-	-	-	-	0.58	0.36	*	*	-	-	-	-	*	*	-	-	-1.19	0.61	*	*	0.6	0.46	-	-	-0.18	0.83

Figure 4-24 Effects of Glastir Management on pollinator abundance in Arable and Horticultural: bundle 13.
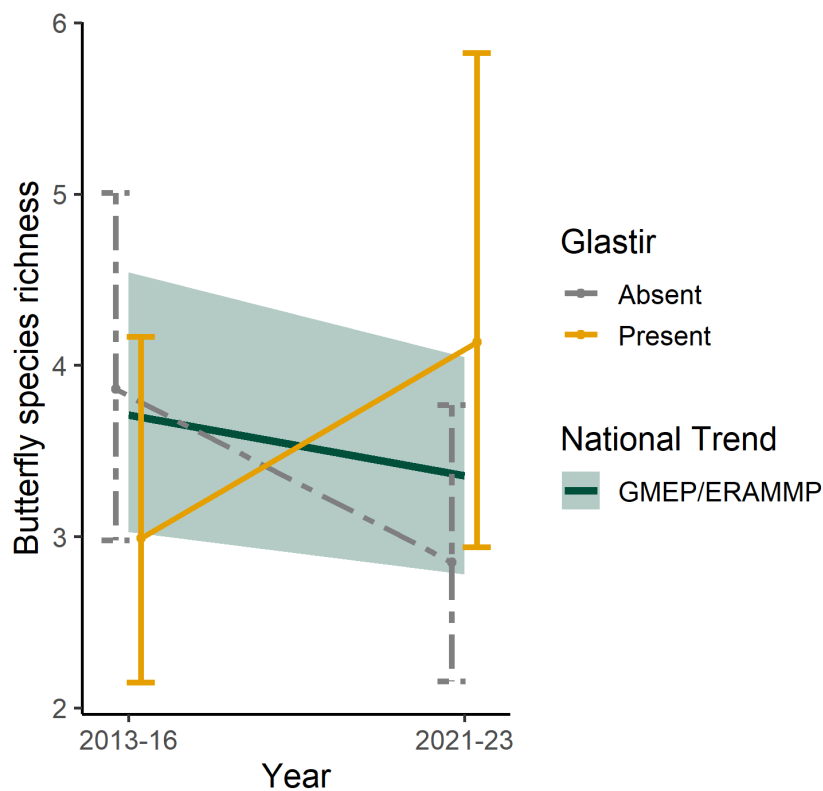

Figure 4-25 Effects of Glastir Management on butterfly species richness in Arable and Horticultural: bundle 3.

4.6.2   Improved Grassland

4.6.2.1   National Trend

In Improved Grassland, no significant change was detected in any indicator.

Table 4-22 National Trend analysis for pollinator indicators in Improved Grassland. 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
Pollinator abundance	20.41	21.39	0.98	0.51
Mean butterfly abundance	0.19	0.16	-0.02	0.32
Butterfly species richness	2.82	2.44	-0.38	0.08
Functional group richness	4.47	4.75	0.27	0.09
Generality of pollinators	1.68	1.6	-0.09	0.51

4.6.2.2   Glastir Analysis

In Improved Grassland, pollinator indicators responded positively to bundle 13.

Table 4-23 Glastir analysis for pollinator indicators in Improved Grassland. Pollinator indicators are abbreviated as follows: PA = pollinator abundance; MBA = mean butterfly abundance; BSR = butterfly species richness; FGR = functional group richness; GP = generality of pollinators. 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. Cells containing a dash - indicate the bundle was a priori not considered relevant to test in this habitat. Cells containing an asterisk * indicate the bundle was considered relevant a priori, but could not be modelled independently due to data deficiency; wherever possible, such bundles were incorporated into a combined "Other relevant bundles" variable (last column). N.b. significance of main effects (i.e. where areas under Glastir Management were higher or lower than the counterfactual across both time periods, with no trend difference) are not shown in this table.

| Indicator	Bundle 1 ΔT	P	Bundle 2 ΔT	P	Bundle 3 ΔT	P	Bundle 4 ΔT	P	Bundle 5 ΔT	P	Bundle 6 ΔT	P	Bundle 8 ΔT	P	Bundle 10 ΔT	P	Bundle 11 ΔT	P	Bundle 12 ΔT	P	Bundle 13 ΔT	P	Bundle 14 ΔT	P	Other ΔT	P
PA	-4.08	0.13	0.52	0.85	-	-	3.38	0.33	-	-	-	-	-6.23	0.45	-	-	1.76	0.69	12.74	0.3	2.1	0.72	-3.03	0.75	-	-
MBA	0	0.95	0	0.94	-	-	0.05	0.11	-	-	-	-	0.01	0.84	-	-	-0.03	0.49	0.06	0.48	0.07	0.03	-0.01	0.75	-	-
BSR	-0.26	0.25	0.06	0.87	-	-	0.43	0.2	-	-	-	-	-0.04	0.98	-	-	-0.25	0.58	1.42	0.09	0.97	<0.01	-0.59	0.39	-	-
FGR	-0.51	0.11	0.12	0.77	-	-	0.49	0.23	-	-	-	-	-0.37	0.74	-	-	-0.36	0.52	0.83	0.48	0.59	0.2	-1.44	0.27	-	-
GP	0.07	0.75	-0.24	0.42	-	-	0.06	0.85	-	-	-	-	*	*	-	-	-0.94	0.07	*	*	0.26	0.65	*	*	-0.07	0.89
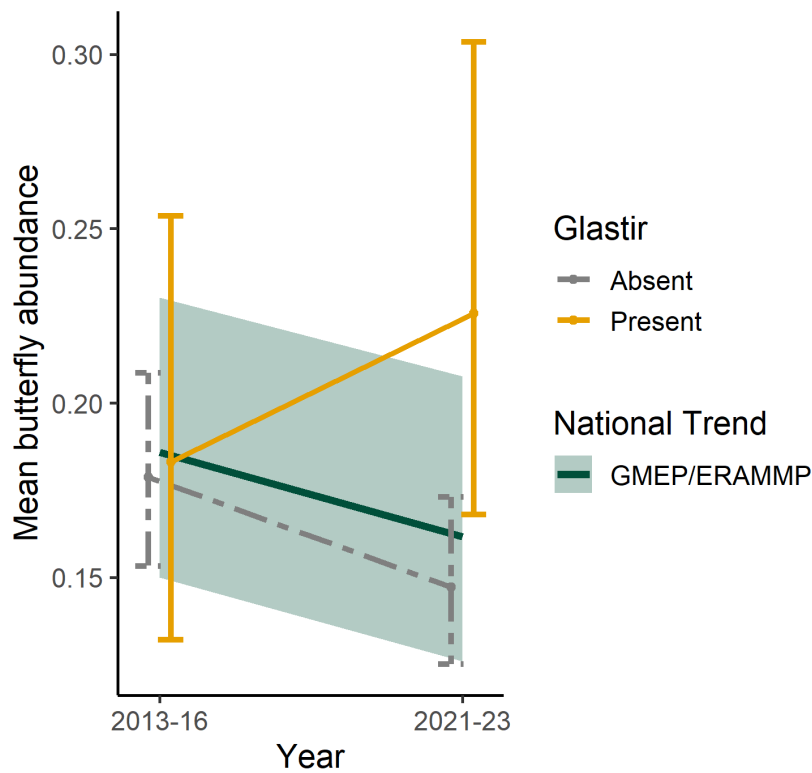
Figure 4-26 Effects of Glastir Management on mean butterfly abundance in Improved Grassland: bundle 13.
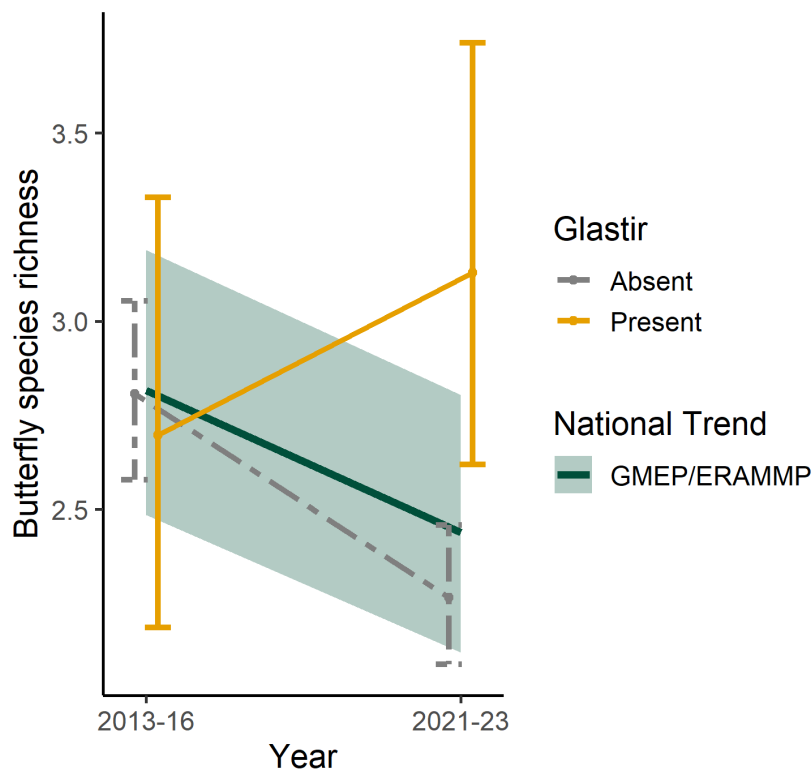

Figure 4-27 Effects of Glastir Management on mean butterfly abundance in Improved Grassland: bundle 13.

4.6.3　　Semi-Improved Grassland

4.6.3.1　National Trend

In Semi-Improved Grassland, significant increases have occurred in functional group richness, with no significant change in the other indicators.

Table 4-24 National Trend analysis for pollinator indicators in Semi-Improved Grassland. 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
Pollinator abundance	21.81	24.51	2.7	0.24
Mean butterfly abundance	0.24	0.19	-0.05	0.29
Butterfly species richness	2.95	2.6	-0.35	0.09
Functional group richness	4.47	4.93	0.46	0.05
Generality of pollinators	1.6	1.52	-0.07	0.64

4.6.3.2   Glastir Analysis

In Semi-Improved Grassland, there was no evidence for pollinator indicators responding to any Glastir bundle.

*Table 4-25 Glastir analysis for pollinator indicators in Semi-Improved Grassland. Pollinator indicators are abbreviated as follows: PA = pollinator abundance; MBA = mean butterfly abundance; BSR = butterfly species richness; FGR = functional group richness; GP = generality of pollinators. 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. Cells containing a dash - indicate the bundle was a priori not considered relevant to test in this habitat. Cells containing an asterisk * indicate the bundle was considered relevant a priori, but could not be modelled independently due to data deficiency; wherever possible, such bundles were incorporated into a combined "Other relevant bundles" variable (last column). N.b. significance of main effects (i.e. where areas under Glastir Management were higher or lower than the counterfactual across both time periods, with no trend difference) are not shown in this table.*

Indicator	Bundle 1 ΔT	P	Bundle 2 ΔT	P	Bundle 3 ΔT	P	Bundle 4 ΔT	P	Bundle 5 ΔT	P	Bundle 6 ΔT	P	Bundle 8 ΔT	P	Bundle 10 ΔT	P	Bundle 11 ΔT	P	Bundle 12 ΔT	P	Bundle 13 ΔT	P	Bundle 14 ΔT	P	Other ΔT	P
PA	-2.83	0.52	0.69	0.97	-	-	3.84	0.53	-	-	-	-	-5.09	0.51	0.49	0.96	-0.51	0.95	12.54	0.24	11.7	0.18	4.04	0.72	-	-
MBA	-0.02	0.44	0.05	0.78	-	-	-0.06	0.24	-	-	-	-	0.07	0.49	-0.01	0.96	0.06	0.58	0.03	0.68	0.08	0.21	0.14	0.27	-	-
BSR	-0.25	0.41	-1.74	0.26	-	-	-0.51	0.34	-	-	-	-	0.51	0.59	2.42	0.18	0.42	0.64	0.46	0.59	0.29	0.58	0.61	0.54	-	-
FGR	-0.04	1	-1.3	0.46	-	-	0.11	0.88	-	-	-	-	-0.7	0.53	1.31	0.43	-0.76	0.49	0.86	0.47	0.61	0.44	-1.14	0.32	-	-
GP	0.03	0.92	1.53	0.47	-	-	-0.51	0.56	-	-	-	-	*	*	-1.45	0.45	*	*	*	*	-0.03	0.96	*	*	0.13	0.79

4.6.4   Hedgerows

As for Bracken, it was not possible to conduct a robust analysis for pollinator data for this habitat, because land cover data were not available in locations where pollinator transects (and their surrounding 100 m buffers) extended beyond survey squares.

5 REFERENCES

Botham, M., Alison, J., Peyton, J., Edwards, M., Tordoff, G., Hobson, R., Roy, D.1, Siriwardena, G. & Bowgen, K. 2021. ERAMMP Document-76: Field-Survey Handbook (Procedures) Pollinators. Report to Welsh Government (Contract C210/2016/2017)(UKCEH 06297/06810)

This page intentionally blank.

ERAMMP Programme Office
UKCEH Bangor
Environment Centre Wales
Deiniol Road
Bangor, Gwynedd
LL57 2UW
+ 44 (0)1248 374500
erammp@ceh.ac.uk

www.erammp.cymru

www.erammp.wales