How British flora has changed over the past 30 years

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Botanical Society of Britain & Ireland

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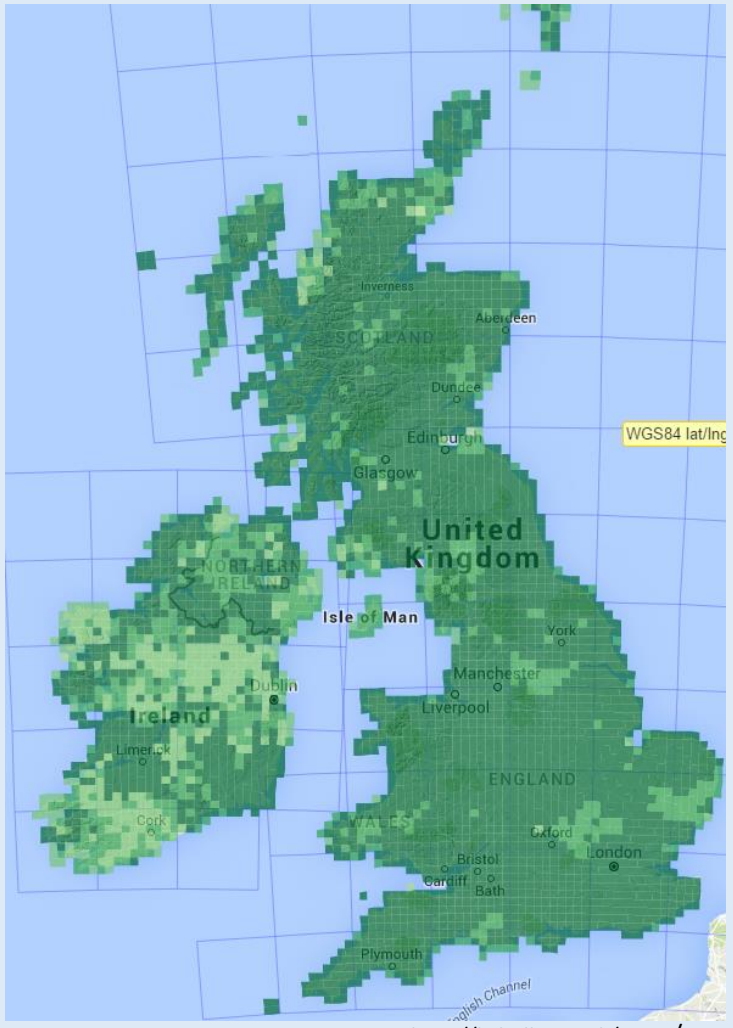
Botanical Society of Britain and Ireland Database

- First atlas published 1962.
- Worlds longest running natural history distribution mapping projects.
- Recordings made by researchers and county recorders.
- Uses Ordnance survey.
- Main resource for my primary data.

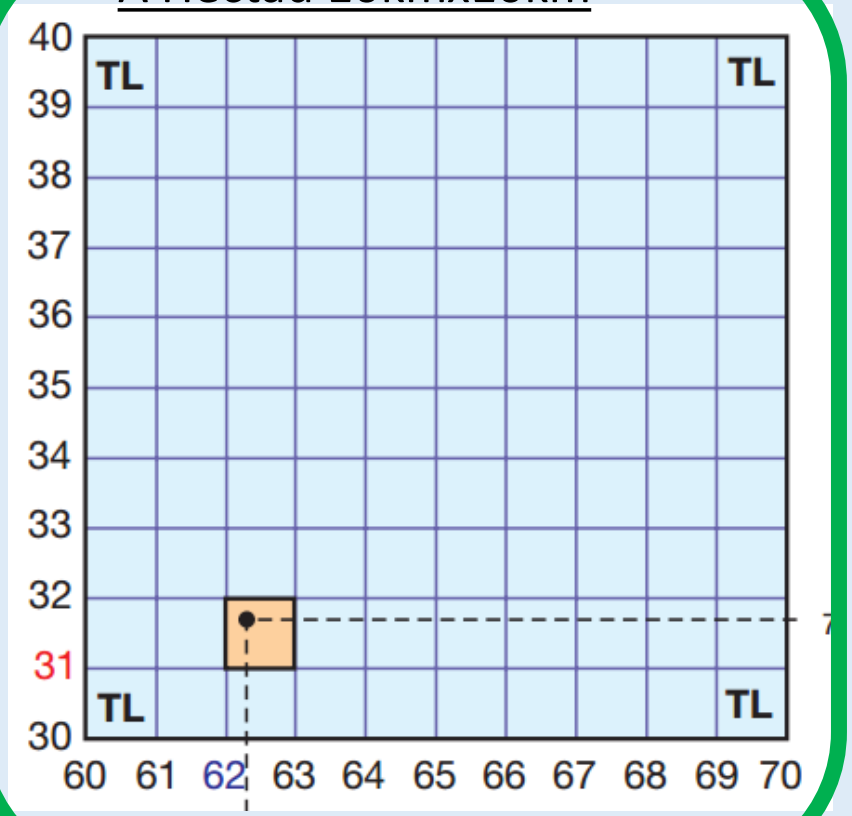


http://bsbidb.org.uk/maps/

OS Grid Reference

				HP (N42)		
			HT (N31)	HU (N41)		
	HW (N10)	HX (N20)	HY (N30)	HZ (N40)		
NA (09)	NB (19)	NC (29)	ND (39)			
NF (08)	NG (18)	NH (28)	NJ (38)	NK (48)		
NL (07)	NM (17)	NN (27)	NO (37)			
	NR (16)	NS (26)	NT (36)	NU (46)		
	NW (15)	NX (25)	NY (35)	NZ (45)		
		SC (24)	SD (34)	SE (44)	TA (54)	
		SH (23)	SJ (33)	SK (43)	TF (53)	TG (63)
	SM (12)	SN (22)	SO (32)	SP (42)	TL (52)	TM (62)
	SR (11)	SS (21)	ST (31)	SU (41)	TQ (51)	TR (61)
SV (00)	SW (10)	SX (20)	SY (30)	SZ (40)	TV (50)	

A Hectad 10kmx10km



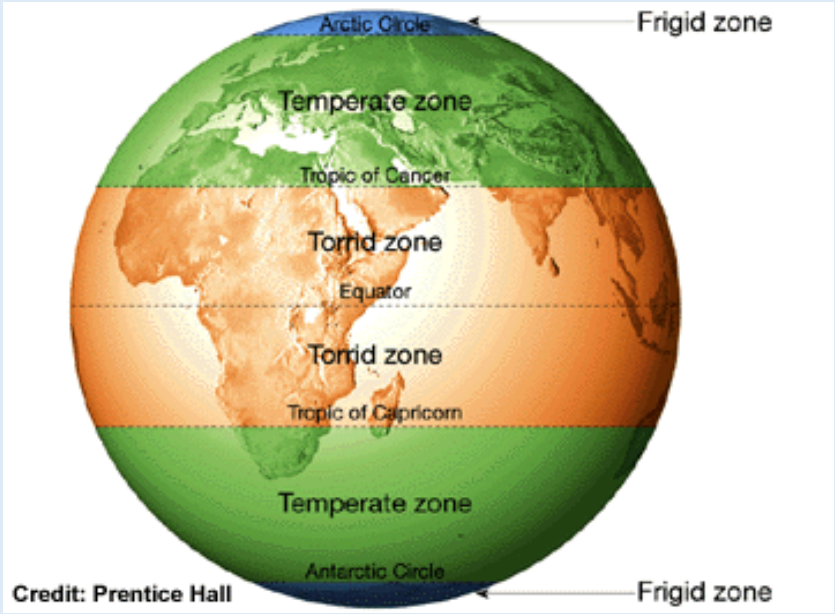
TL 63

Dinty system for tetrads

E	J	P	U	Z
D	I	N	T	Y
C	H	M	S	X
B	G	L	R	W
A	F	K	Q	V

The *Carex* genus

- Highly diverse
- Most abundant genus of plant in the UK
- Breaks the rule of latitudinal diversity gradient.
- Useful habitat indicator



Research questions

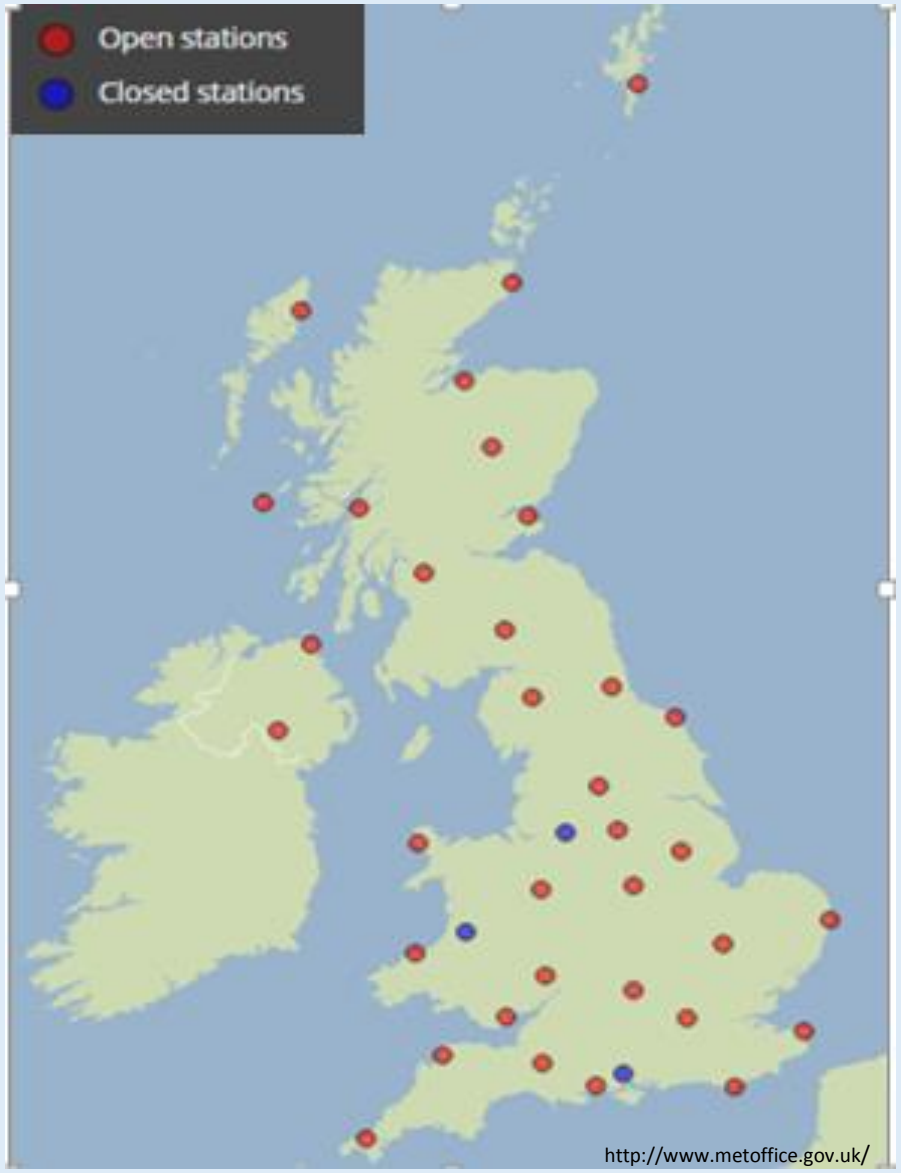
from 1974-2014….

1. Has there been a change in species abundance, richness or diversity?

2. Are certain habitats more susceptible to this change?

3. And could this change be caused by climate change?

Site Selection

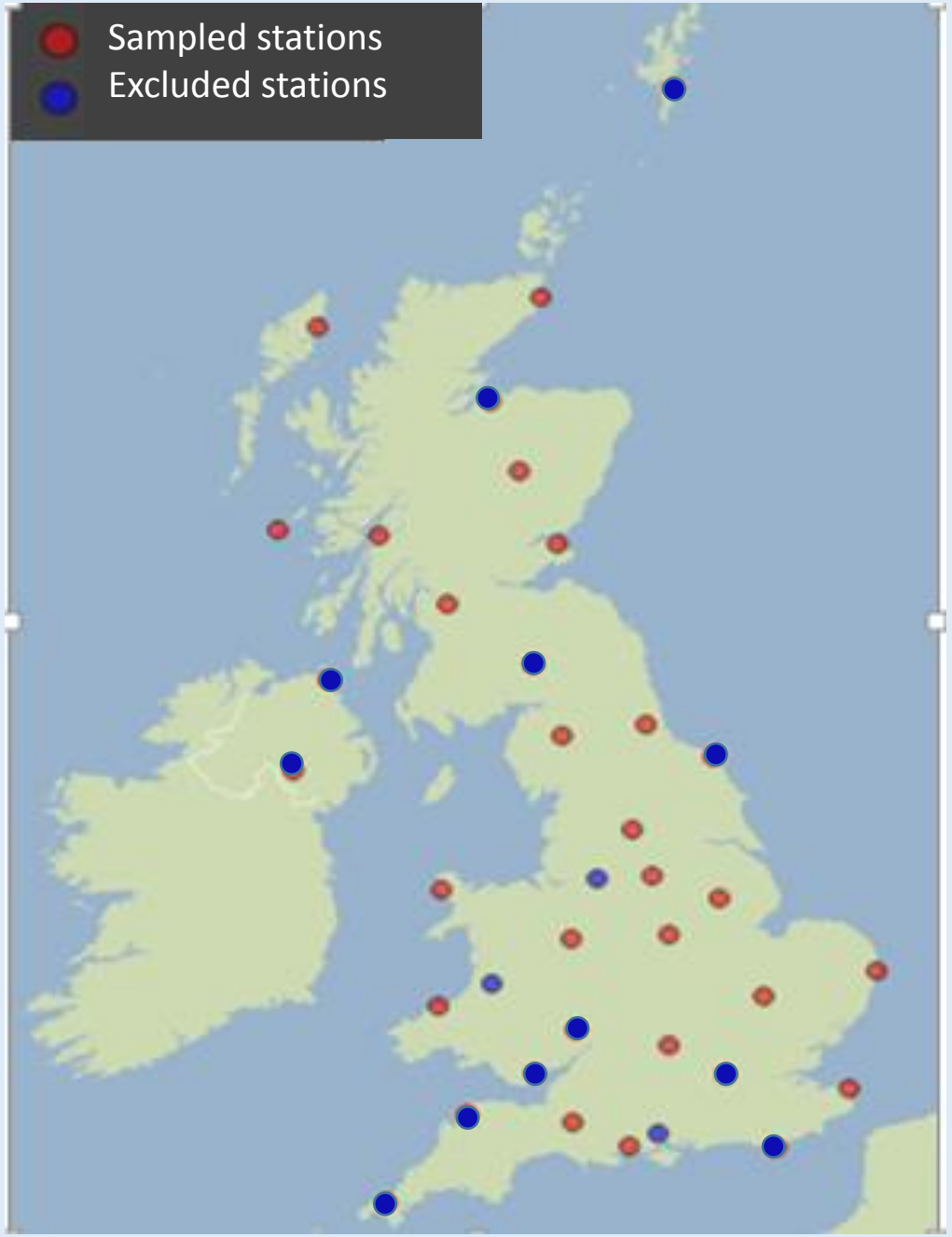


Total of 37 Met office historical weather station sites.

Criteria for sampling:

1. Has a full set of climatic records from December 1973 to January 2015.

2. The hectad the station is contained within has *Carex* species recorded both periods sampled.



37 historical stations

-3 closed sites
-4 missing data

30 historical stations

-8 hectads with no *Carex* species

22 historical site

Grid reference and habitat type

	name of site	lat/long	masl	coastal/non	OS ref	urban/rural
1	Aberorth	52.139, -4.570	133	coastal	SN 24221 52083	rural
2	Armagh	54.352, -6.649	62	non	NV 98032 05131	urban
3	Ballypatrick Forest	55.181, -6.153	156	coastal	NW 35707 95285	rural
4	Bradford	53.813, -1.772	134	non	SE 15110 35215	urban

Met Office Data

- Latitude/longitude = OS grid ref
- metres above sea (above 150/ below 150)

Satellite maps

- Coastal/ Non-coastal and Rural/Urban

Species Data collection

	A	B	C	D	E	F	G	H	I	J
1	taxon	brccode	ddb id	validation	record sta	external i	recorder	determine	compiler	vc
2	Carex demissa	Vas_361	2cd4p9h.c	unclassifie	unknown		Lockton, A.;Whild, S.			1
3	Carex leporina	Vas_397	2cd4p9h.c	unclassifie	unknown		Whild, S.;Lockton, A.			1
4	Carex nigra	Vas_393	2cd4p9h.c	unclassifie	unknown		Whild, S.;Lockton, A.			1
5	Carex demissa	Vas_361	2cd4p9h.c	unclassifie	unknown		Whild, S.;Lockton, A.			1
6	Carex echinata	Vas_370	2cd4p9h.c	unclassifie	unknown		Lockton, A.;Whild, S.			1
7	Carex flacca	Vas_376	2cd4p9h.c	unclassifie	unknown		Whild, S.;Lockton, A.			1
8	Carex leporina	Vas_397	2cd4p9h.c	unclassifie	unknown		Whild, S.;Lockton, A.			1
9	Carex echinata	Vas_370	2cd4p9h.c	unclassifie	unknown		Whild, S.;Lockton, A.			1

How were variables measured?

Data was mined from sources for both the ‘early’ (1974-1984) period to the ‘late’ (2004-2014) period and compared.

Temperature

Mean t(min) for each hectad at each time period

Abundance

Measured by number of recorded *Carex* individuals in a hectad within ‘early’ or ‘late’ period

Winner and loser species

If each species gained or lost numbers from the ‘early’ period to the ‘late’ period.

Richness

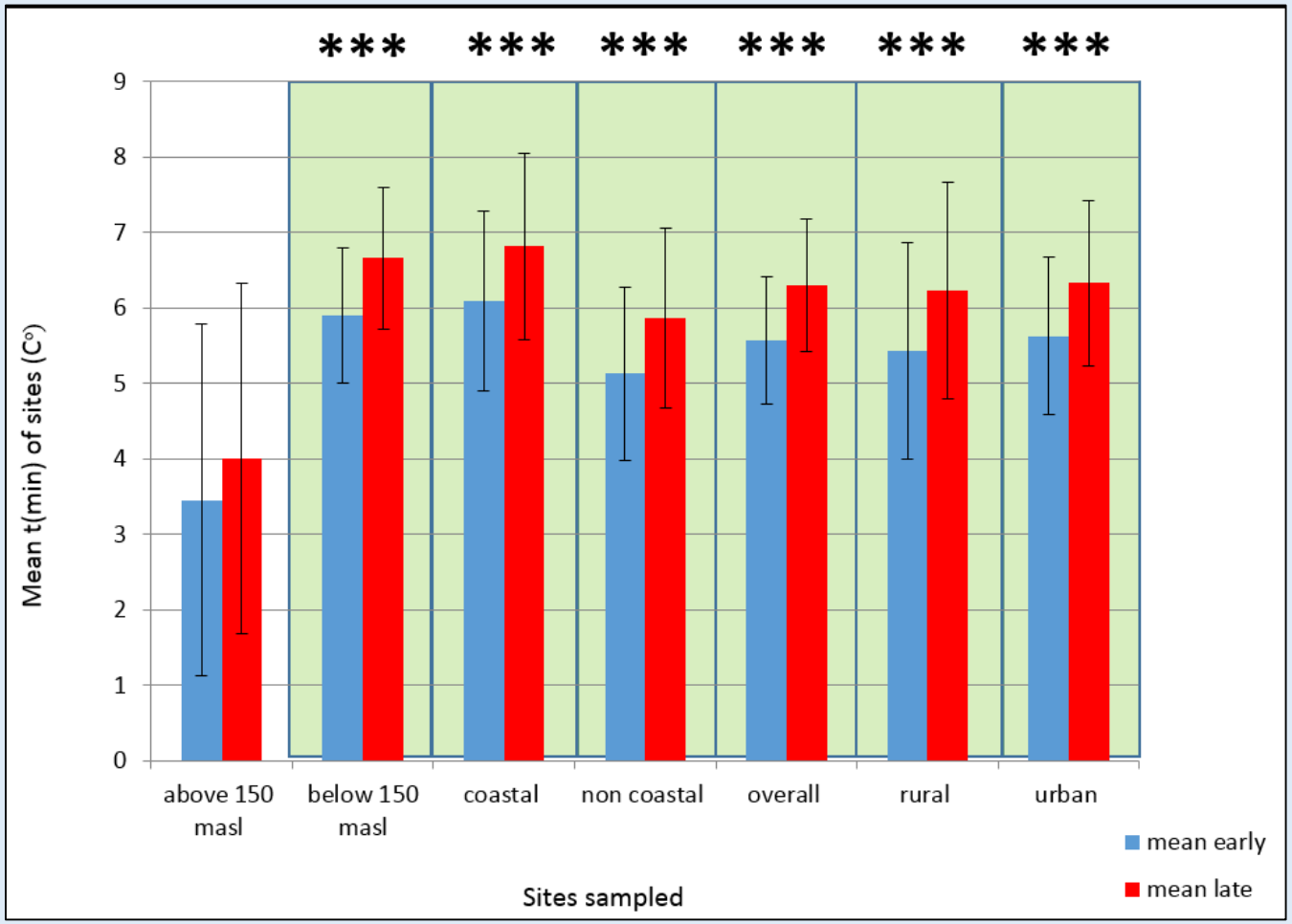
Number of *Carex* species recorded in each hectad within ‘early’ or ‘late’ period

Diversity

Using Shannon's diversity index

Results

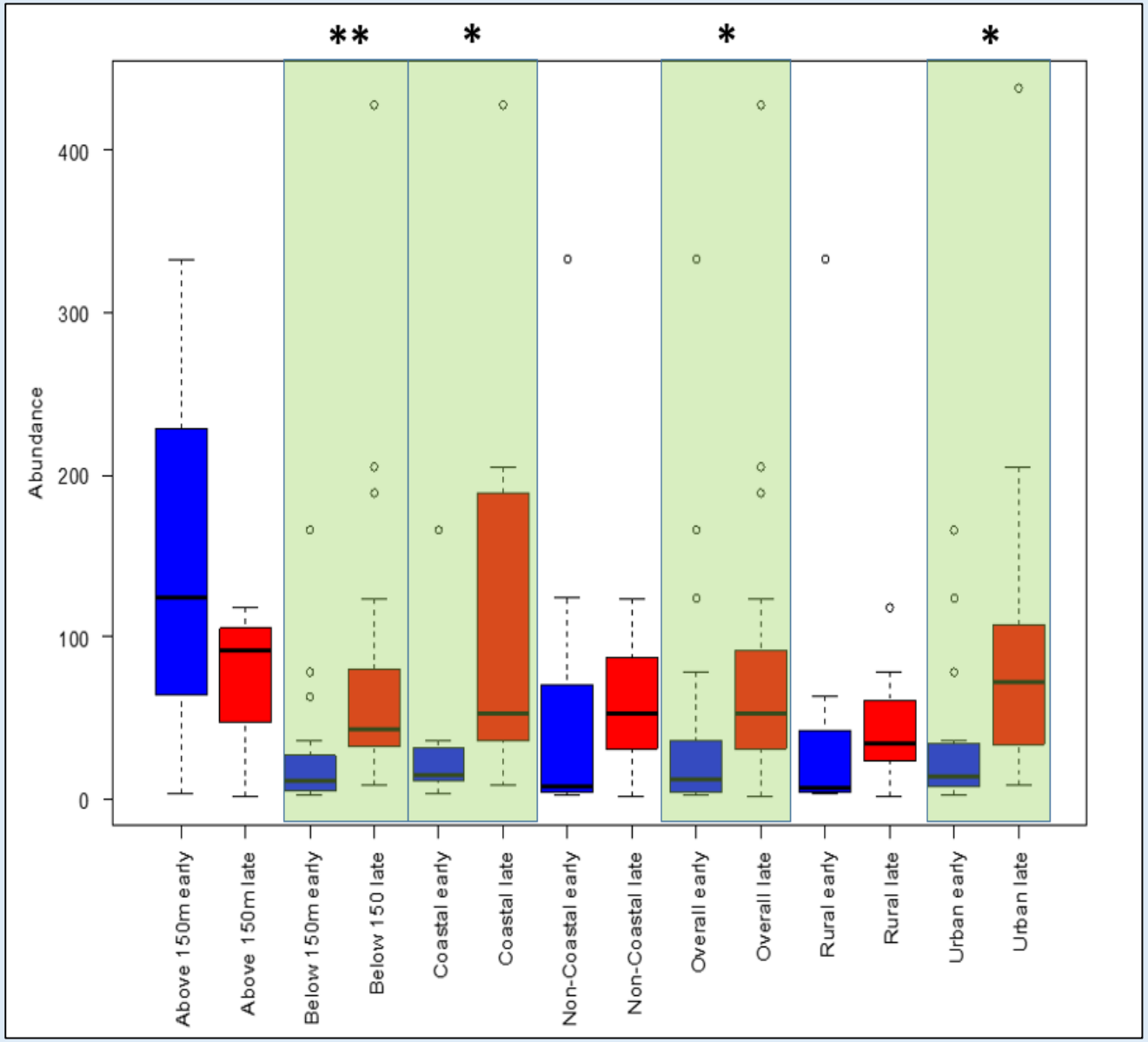
Changes in t(min)



Highlighted bars = significant change.
"*" represents a p-value<0.001**

Using a paired t test all categories of habitat found to be highly significant apart from sites above 150 m.a.s.l.

Change in Abundance



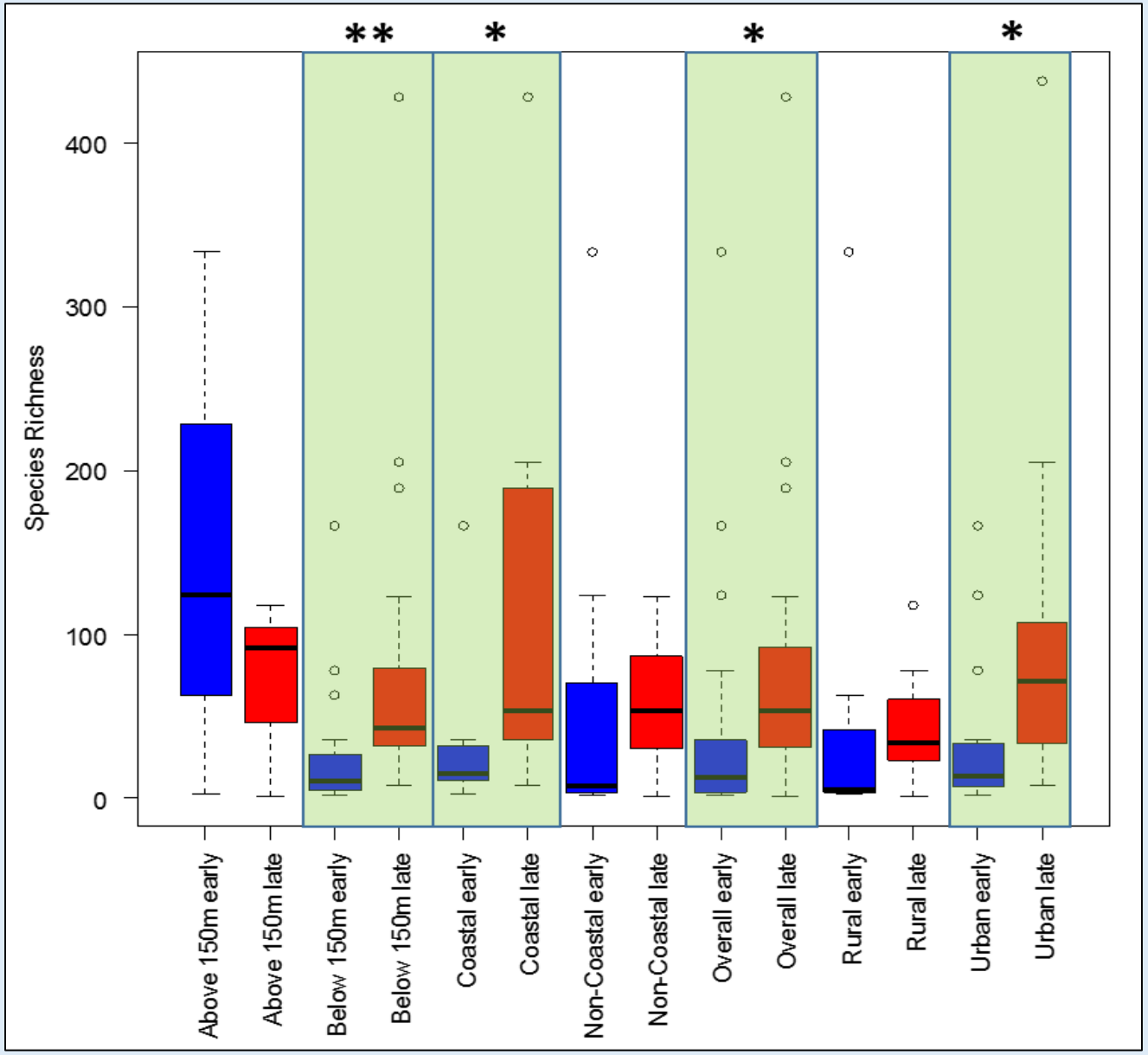
*** =P value<0.05**

**** = P value<0.01**

Significant change from the early to late period in:

- Overall
- Below 150 m.a.s.l
- Coastal
- Urban

Change in Richness



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Significant change from the early to late period in:

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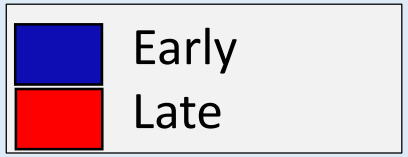
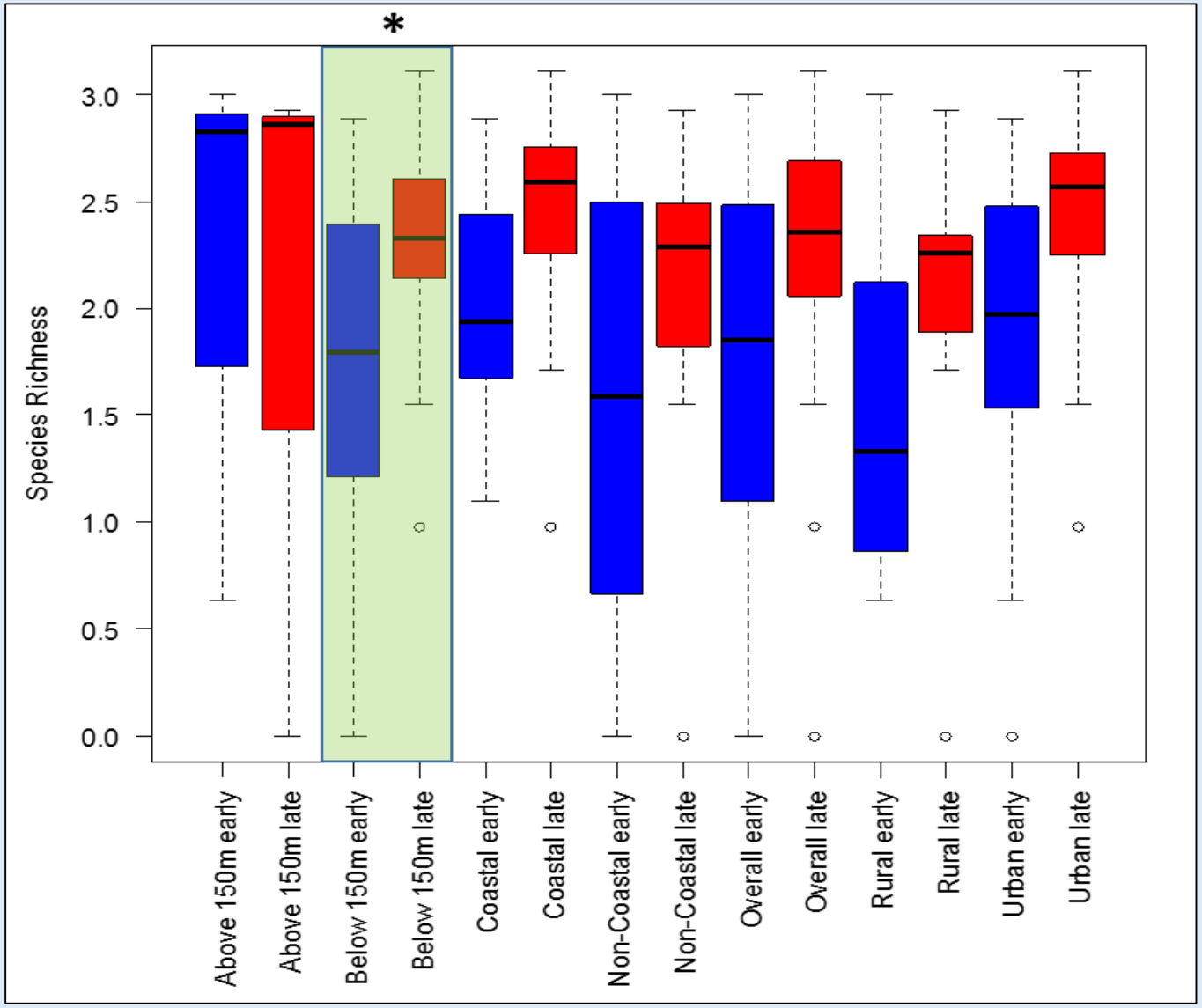
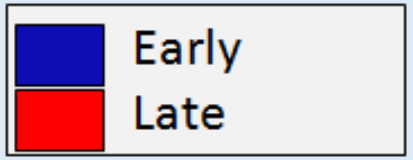


Change in Diversity



*** =P value<0.05**

Only sites below 150 m.a.s.l showed any significant change in diversity.



Results Summary

Variables tested **Habitat**	Change in temperature	Change in abundance	Change in richness	Change in diversity
Above 150m.a.s.l	NS	NS	NS	NS
Below 150ma.s.l	***	**	**	*
Coastal	***	*	*	NS
Non-Coastal	***	NS	NS	NS
Overall	***	*	*	NS
Rural	***	NS	NS	NS
Urban	***	*	*	NS

Discussion

- Consistent change in the averaged t(min) with Dušek *et al*.,(2013).

- Sites above 150m asl may not have as much direct stress from climate change but migration of flora may make these habitats vulnerable still.

- Species that increased the most in abundance are those that are known to be widespread. This could indicate an increase in recorder intensity.

- Could the *Carex* genus actually ‘benefit’ from temperature increase?

Limitations of Data

1. No indication of recorder intensity.
   - *2020 Atlas*
   - *Sedges of the British Isle.*
   - Popular sampling sites

2. Suitability of the classification of sites

3. Sites are not mutually exclusive from category to category .

4. Temperature database ability Vs. Sufficient sampling.

5. Complex hydrology system changes could be having an effect.

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Winning and losing species