Trait correlates of distribution trends in the Odonata of Britain and Ireland: Southern species benefit from climate warming

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Supplementary Material

Appendix 1 The top subset of models for each of the alternative modelling approaches and response variables. A) Estimate linear non-phylogenetic regression, B) Weighted estimate non-phylogenetic regression, C) z-score PGLS, D) z-score linear model.

A)

	Model rank							
	1	2	3	4	5	6	7	8
Flight period	-0.025				-0.023	-0.025	-0.028	
Thorax length			0.002		0.002			0.002
Distribution				●		●		●
Breeding habitat							0.007	
Overwint. stage								
AICc	-149.7	-149.6	-149.4	-149.3	-149.0	-149.0	-148.5	-148.5
Δ AIC	0.000	0.09	0.30	0.42	0.65	0.68	1.15	1.16
AIC weight	0.114	0.109	0.098	0.093	0.082	0.081	0.064	0.064

	9	10	11	12	13	14	Importance
Flight period				-0.026	-0.024		0.431
Thorax length	0.002			0.002		0.002	0.390
Distribution							0.238
Breeding habitat			0.005	0.007		0.006	0.202
Overwint. stage	0.007	0.006			0.005		0.155
AICc	-148.3	-148.2	-148.0	-147.8	-147.8	-147.8	-
Δ AIC	1.39	1.51	1.66	1.89	1.90	1.93	-
AIC weight	0.057	0.054	0.050	0.044	0.044	0.044	-

B)

	Model rank					
	1	2	3	4	5	6
Distribution	●	●	●	●		●
Flight period	-0.023	-0.020		-0.029		
Breeding habitat	0.009			0.012		
Overwint. stage					0.009	0.007
Thorax length					0.003	
Habitat breadth				0.004		
AICc	-158.5	-158.0	-157.6	-157.5	-157.4	-157.3
Δ AIC	0	0.51	0.96	1.05	1.15	1.20
AIC weight	0.160	0.124	0.099	0.095	0.090	0.088

	7	8	9	10	11	Importance
Distribution	●			●	●	0.772
Flight period		-0.024	-0.026		-0.017	0.581
Breeding habitat	0.008	0.009	0.010			0.469
Overwint. stage				0.008	0.006	0.307
Thorax length		0.002		0.002		0.228
Habitat breadth						0.095
AICc	-157.0	-156.9	-156.7	-156.7	-156.7	-
Δ AIC	1.49	1.61	1.78	1.79	1.85	-
AIC weight	0.076	0.072	0.066	0.066	0.064	-

C)

	Model rank								
	1	2	3	4	5	6	7	8	9
Distribution	●	●	●	●	●	●	●	●	●
Flight period	-12.37			-10.56	-7.961	-6.667	-12.28		-14.33
Thorax length		0.830	0.757						
Overwint. stage		2.730							
Habitat breadth	2.653			2.136		0.641			
Breeding habitat	2.846								2.716
Status							2.771		3.857
AICc	253.7	253.8	254.0	254.1	254.2	254.5	254.5	254.7	254.9
Δ AIC	0.00	0.10	0.35	0.42	0.52	0.82	0.89	1.09	1.20
AIC weight	0.095	0.091	0.08	0.077	0.074	0.063	0.061	0.055	0.052

	10	11	12	13	14	15	16	17	Importance
Distribution	●	●	●	●	●	●	●	●	1.000
Flight period		-10.21	-5.563	-11.98	2.080	-11.81	-6.873		0.686
Thorax length		1.139	0.725	1.012				0.827	0.411
Overwint. stage	2.743		2.396			2.301	2.154		0.311
Habitat breadth		1.970		2.484	2.635				0.308
Breeding habitat				2.656				1.825	0.230
Status					-10.15	3.047			0.155
AICc	254.9	255	255.1	255.1	255.3	255.3	255.4	255.6	-
Δ AIC	1.25	1.36	1.43	1.48	1.68	1.68	1.74	1.94	-
AIC weight	0.051	0.048	0.047	0.046	0.041	0.041	0.04	0.036	-

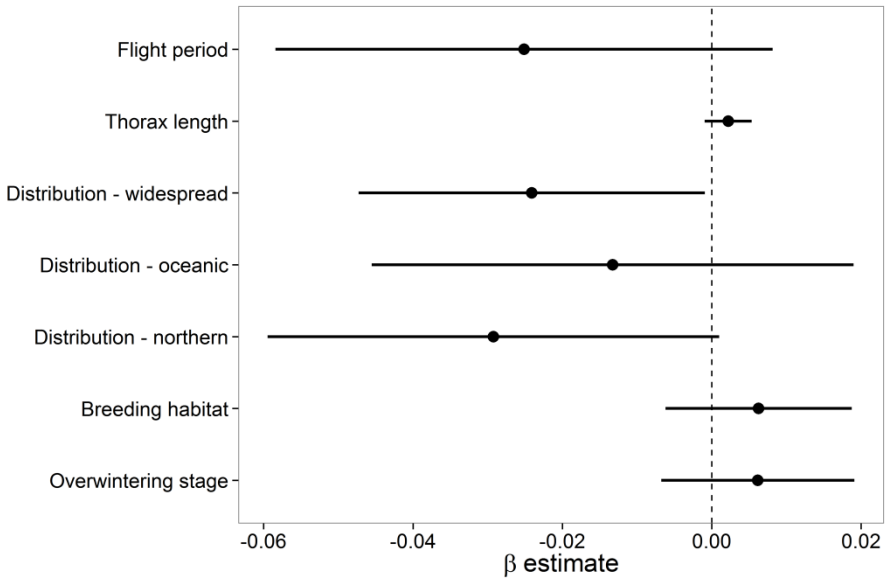
D)

	Model rank						
	1	2	3	4	5	6	7
Distribution	●	●	●	●	●	●	●
Flight period			-7.545	-8.984	-7.678		-6.31
Thorax length	0.943	0.841	0.708		0.796	0.93	0.818
Breeding habitat					2.784	2.728	
Overwint. stage	2.939						2.54
Status							
Habitat breadth							
AICc	257.9	258.3	258.4	258.4	258.8	258.9	258.9
Δ AIC	0	0.49	0.53	0.54	0.94	1.03	1.06
AIC weight	0.134	0.105	0.102	0.102	0.084	0.08	0.079

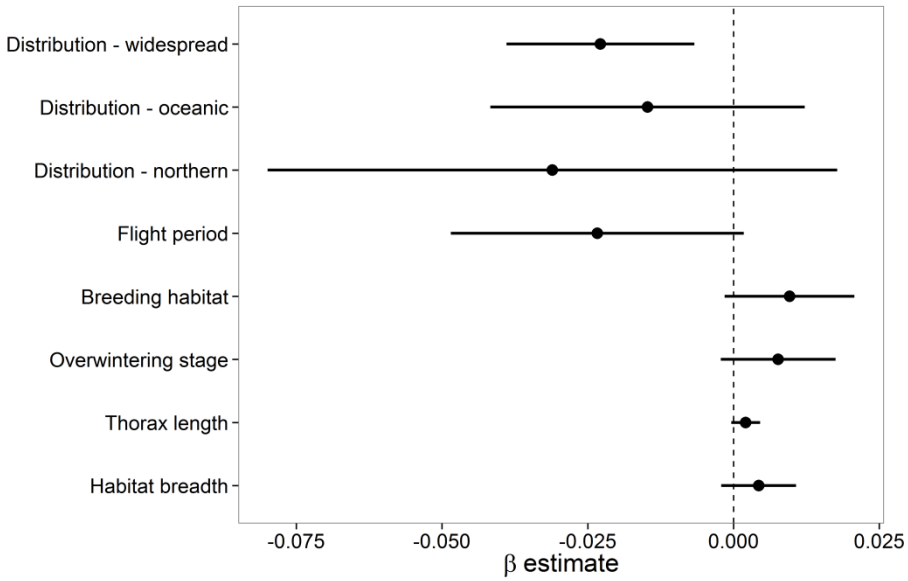
	8	9	10	11	12	Importance
Distribution	●	●	●	●	●	1.00
Flight period	-14.97	-13.07		-12.84	-9.247	0.63
Thorax length						0.58
Breeding habitat	3.403	3.549			2.341	0.37
Overwint. stage						0.21
Status	3.593			2.473		0.13
Habitat breadth		2.109				0.07
AICc	259.0	259.1	259.6	259.6	259.6	-
Δ AIC	1.13	1.27	1.72	1.74	1.74	-
AIC weight	0.076	0.071	0.057	0.056	0.056	-

Appendix 2 The model averaged coefficients for trait that was in the top subset of models. Each graph represents a different modelling approach/response variable combination. A) Estimate non-phylogenetic regression, B) weighted estimate non-phylogenetic regression, C) z-score PGLS, D) z-score non-phylogenetic regression. The reference distribution type was "*southern*", which has a parameter estimate set to 0.

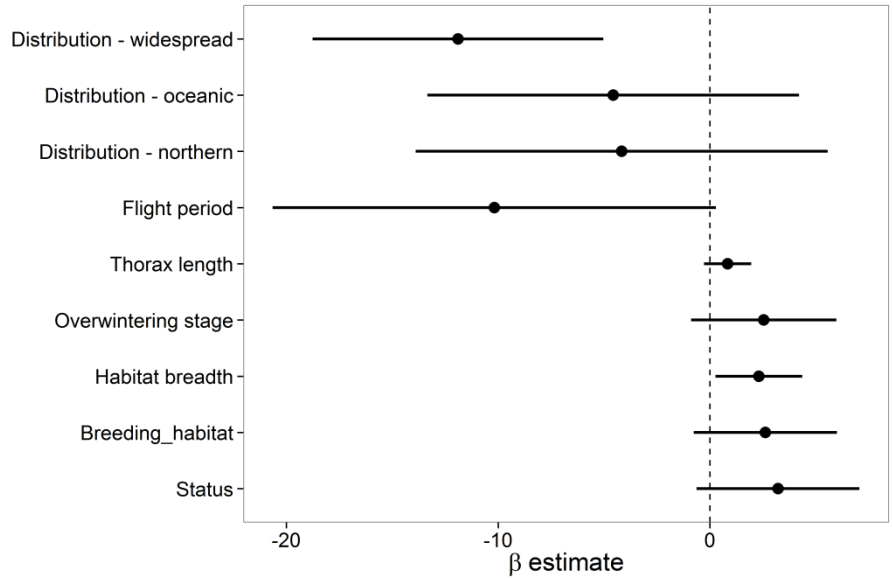
A)



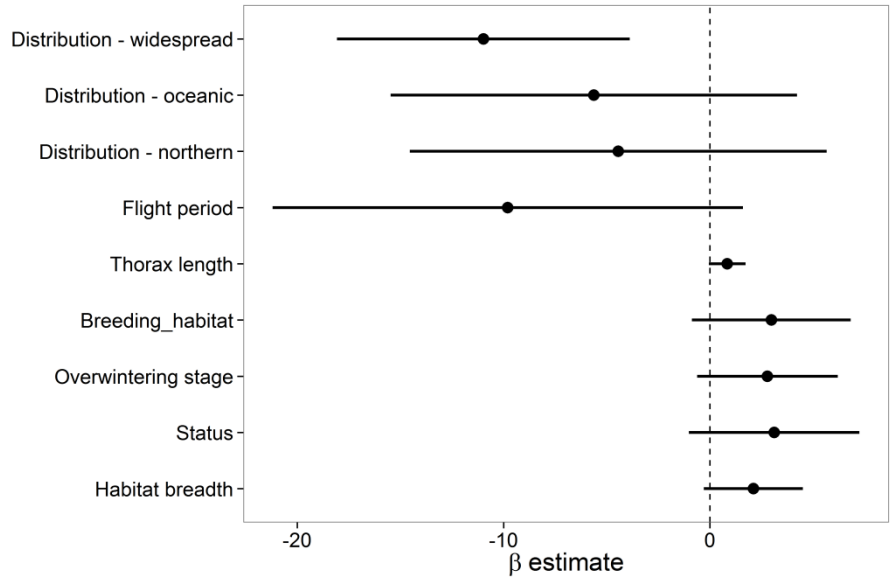
B)



C)


Distribution - widespread
Distribution - oceanic
Distribution - northern
Flight period
Thorax length
Overwintering stage
Habitat breadth
Breeding_habitat
Status
-20
-10
0
β estimate

D)


Distribution - widespread
Distribution - oceanic
Distribution - northern
Flight period
Thorax length
Breeding_habitat
Overwintering stage
Status
Habitat breadth
-20
-10
0
β estimate

Appendix 3 A comparison of the importance scores for each trait across each of the modelling and response variable combinations.

Trait	Estimate - PGLS	Estimate - LM	W. Estimate - LM	z-score - PGLS	z-score - LM
Distribution type	0.6	0.23	0.77	1	1
Flight period	0.34	0.43	0.58	0.69	0.63
Thorax length	0.24	0.39	0.23	0.41	0.58
Breeding habitat	0	0.2	0.47	0.23	0.37
Overwint. stage	0	0.15	0.31	0.31	0.21
Status	0	0	0	0.16	0.13
Habitat breadth	0	0	0.10	0.31	0.07