Supplementary material

Svein Dale* 2024: Facultative migration in two thrush species (Fieldfare and Redwing): Rowanberry abundance more important than winter weather. — Ornis Fennica 101: 1–15.

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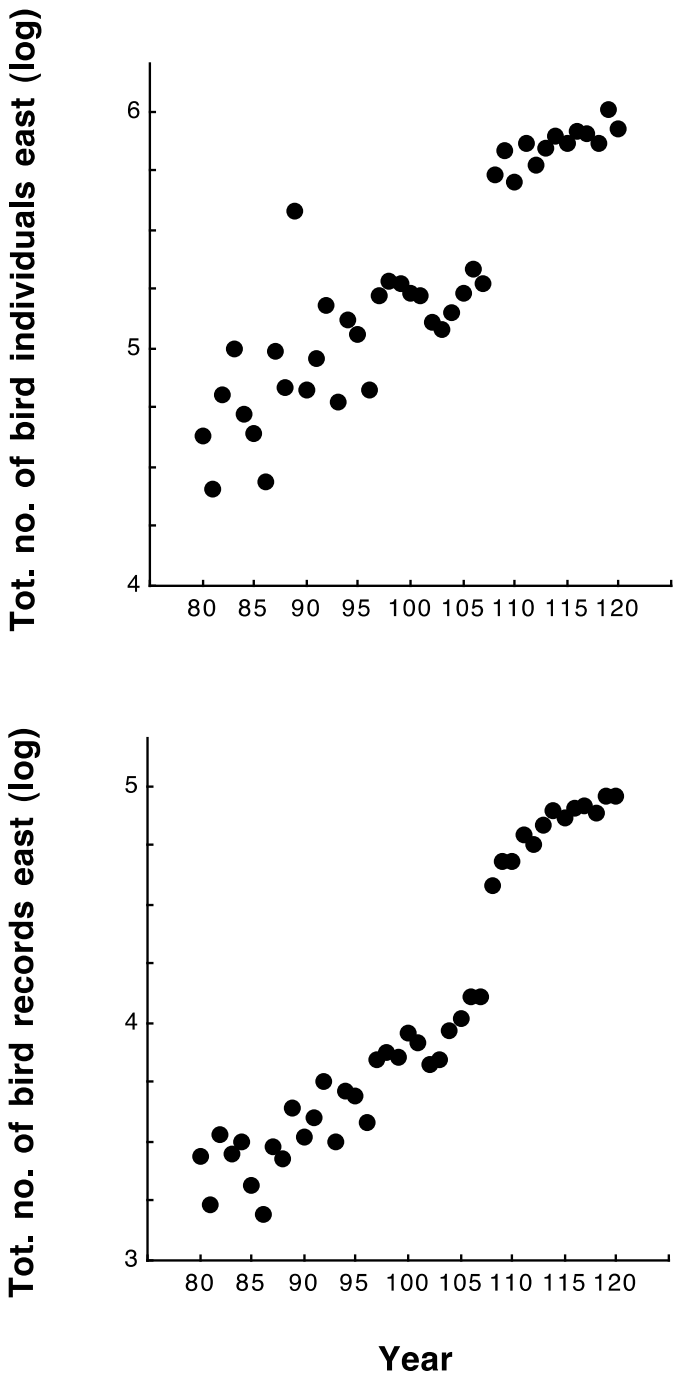

Fig. S1. Temporal trend in annual total number of bird individuals and number of bird records reported to the website artsobservasjoner.no in **eastern** Norway during 1980–2020. For year, 80 = 1980 and so forth.

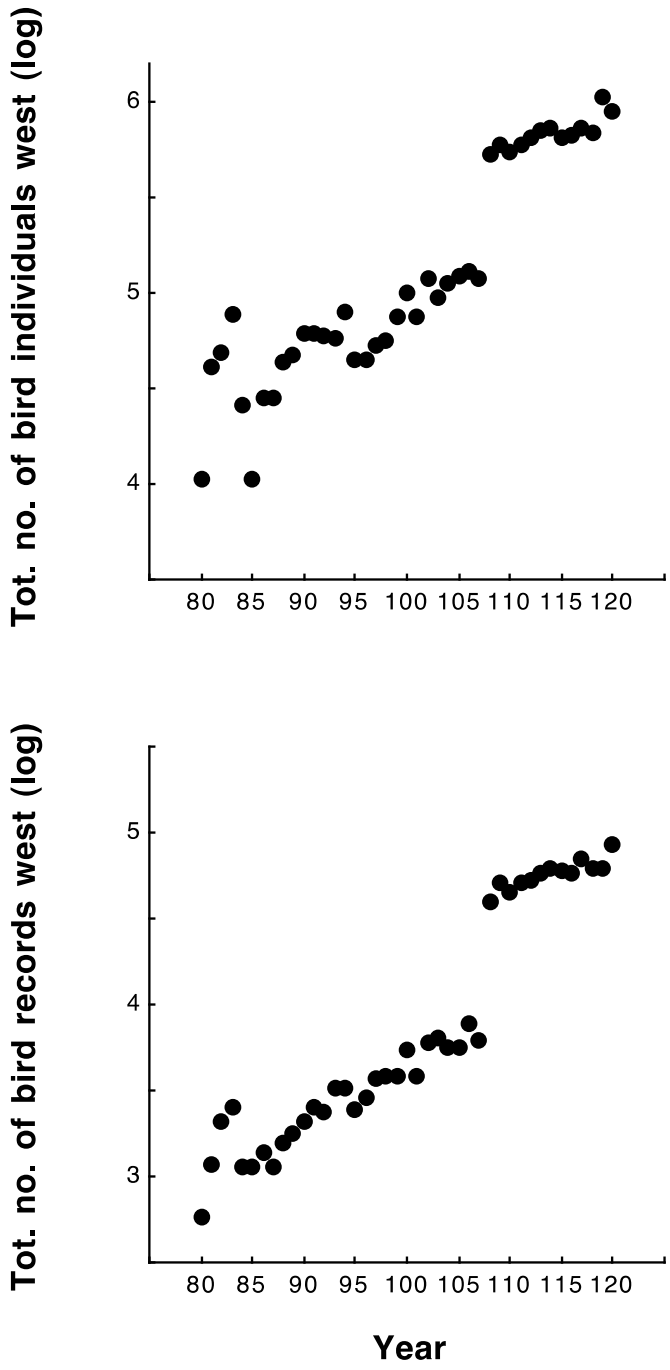

Fig. S2. Temporal trend in annual total number of bird individuals and number of bird records reported to the website artsobservasjoner.no in **western** Norway during 1980–2020. For year, 80 = 1980 and so forth.

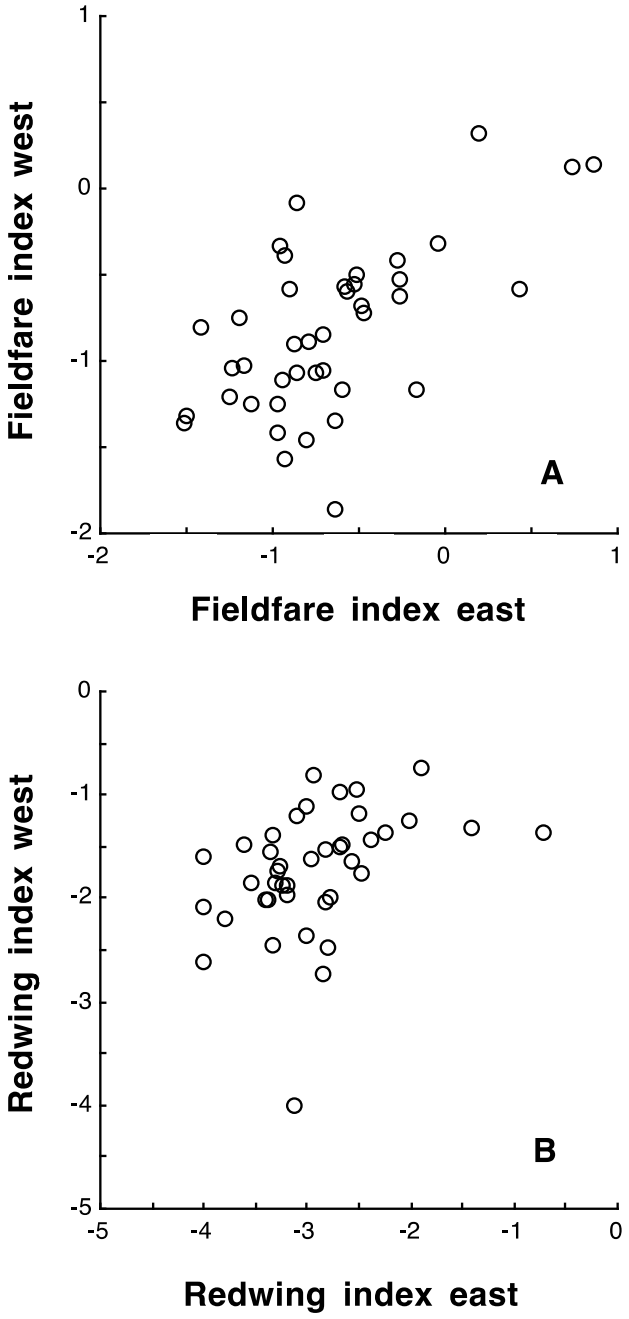

Fig. S3. Relationships between annual indices of winter numbers of (A) Fieldfare (*Turdus pilaris*) and (B) Redwing (*T. iliacus*) in eastern and western Norway during 1980–2020. Indices were log-transformed ratios of total number of thrush individuals recorded to total number of records of all bird species (an index of observation effort).

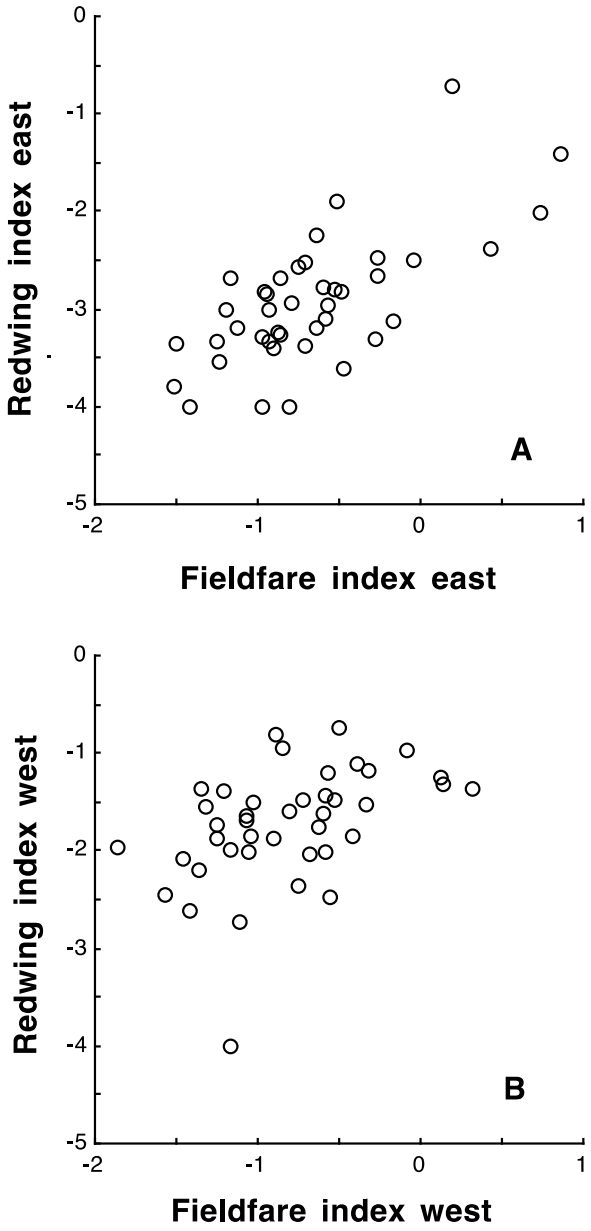

Fig. S4. Relationships between annual indices of winter numbers of Fieldfare (*Turdus pilaris*) and Redwing (*T. iliacus*) in **(**A) eastern and (B) western Norway during 1980–2020. Indices were log-transformed ratios of total number of thrush individuals recorded to total number of records of all bird species (an index of observation effort).

Table S1. Correlation coefficients between weather variables used in analyses of thrush winter numbers. Significant relationships ($p \leq 0.05$) are shown in bold. E = eastern Norway, W = western Norway.

NAO index		*NAO Dec*	*NAO Jan*	*NAO Nov-Jan*
November		**0.59**	0.04	**0.73**
December			**0.46**	**0.92**
January				**0.63**
Temperature E		*Temp Dec E*	*Temp Jan E*	*Temp Nov-Jan E*
November		**0.52**	-0.09	**0.58**
December			0.28	**0.85**
January				**0.66**
Temperature W		*Temp Dec W*	*Temp Jan W*	*Temp Nov-Jan W*
November		**0.42**	-0.14	**0.58**
December			0.27	**0.84**
January				**0.60**
Snow cover E		*Snow Dec E*	*Snow Jan E*	*Snow Nov-Jan E*
November		**0.43**	0.09	**0.58**
December			**0.48**	**0.88**
January				**0.75**
Snow cover W		*Snow Dec W*	*Snow Jan W*	*Snow Nov-Jan W*
November		0.13	-0.10	0.21
December			0.15	**0.72**
January				**0.84**
NAO index	*Temp Nov E*	*Temp Dec E*	*Temp Jan E*	*Temp Nov-Jan E*
November	**0.41**	**0.45**	0.01	**0.38**
December	0.22	**0.51**	0.25	**0.47**
January	-0.13	0.16	**0.69**	**0.41**
Mean Nov-Jan	0.23	**0.50**	**0.39**	**0.55**
NAO index	*Temp Nov W*	*Temp Dec W*	*Temp Jan W*	*Temp Nov-Jan W*
November	**0.41**	**0.39**	-0.09	**0.33**
December	**0.33**	**0.53**	0.18	**0.51**
January	-0.11	0.26	**0.57**	**0.39**
Mean Nov-Jan	0.29	**0.53**	0.27	**0.54**
NAO index	*Snow Nov E*	*Snow Dec E*	*Snow Jan E*	*Snow Nov-Jan E*
November	-0.14	-0.29	0.06	-0.17
December	-0.03	-0.21	-0.03	-0.13
January	0.15	0.03	**-0.32**	-0.09
Mean Nov-Jan	-0.02	-0.22	-0.11	-0.17
NAO index	*Snow Nov W*	*Snow Dec W*	*Snow Jan W*	*Snow Nov-Jan W*
November	-0.23	-0.11	0.15	0.02
December	-0.24	-0.23	-0.15	-0.29
January	0.14	-0.14	**-0.40**	**-0.36**
Mean Nov-Jan	-0.17	-0.22	-0.16	-0.28

Temperature E	*Snow Nov E*	*Snow Dec E*	*Snow Jan E*	*Snow Nov-Jan E*
November	**-0.56**	**-0.51**	-0.06	**-0.48**
December	-0.28	**-0.69**	**-0.34**	**-0.61**
January	0.03	-0.20	**-0.64**	**-0.40**
Mean Nov-Jan	**-0.33**	**-0.65**	**-0.55**	**-0.70**
Temperature W	*Snow Nov W*	*Snow Dec W*	*Snow Jan W*	*Snow Nov-Jan W*
November	**-0.42**	-0.21	-0.01	-0.20
December	-0.19	**-0.79**	-0.20	**-0.58**
January	0.09	-0.28	**-0.82**	**-0.77**
Mean Nov-Jan	-0.25	**-0.63**	**-0.55**	**-0.80**

Table S2. Annual indices of winter numbers of Fieldfare (*Turdus pilaris*) and Redwing (*T. iliacus*) in eastern and western Norway during 1980–2020 in relation to weather variables (Pearson correlations).

	Fieldfare		Redwing	
Weather variable	r	p	r	p
NAO index				
Eastern Norway				
November	-0.11	0.49	-0.11	0.51
December	**-0.26**	**0.10**	-0.15	0.35
January	0.11	0.49	0.16	0.32
Mean Nov–Jan	-0.13	0.41	-0.06	0.72
Western Norway				
November	**-0.28**	**0.07**	-0.23	0.16
December	-0.25	0.11	-0.17	0.30
January	0.22	0.17	0.15	0.36
Mean Nov–Jan	-0.16	0.32	-0.12	0.45
Temperature				
Eastern Norway				
November	-0.01	0.98	0.06	0.72
December	0.09	0.58	0.13	0.43
January	0.00	0.99	0.01	0.97
Mean Nov–Jan	0.04	0.78	0.09	0.58
Western Norway				
November	0.04	0.81	0.19	0.23
December	-0.05	0.78	0.12	0.46
January	0.10	0.53	0.09	0.58
Mean Nov–Jan	0.05	0.77	0.19	0.23
Duration of snow cover				
Eastern Norway				
November	0.02	0.91	-0.08	0.63
December	**-0.27**	**0.09**	-0.17	0.30
January	-0.21	0.19	0.01	0.93
Total Nov–Jan	-0.23	0.14	-0.10	0.52
Western Norway				
November	0.05	0.79	-0.04	0.80
December	-0.08	0.61	-0.23	0.16
January	0.00	1.00	-0.11	0.49
Total Nov–Jan	-0.03	0.86	-0.21	0.20

Weather variables were the North Atlantic Oscillation index (NAO), temperature, and number of days with snow cover (the latter two with data from corresponding parts of Norway). Thrush indices were log-transformed ratios of total number of thrush individuals recorded to total number of records of all bird species (an index of observation effort). Sample sizes were 41 years in all analyses except those of

number of days with snow cover in western Norway where n=38–39. P-values are not corrected for multiple testing. Uncorrected p-values ≤0.10 are shown in bold.

Table S3. Comparison of AIC_c-values of GLM analyses of winter numbers of Fieldfare (*Turdus pilaris*) and Redwing (*T. iliacus*) in eastern and western Norway during 1980–2020. Models included are (1) models with only rowanberry abundance, (2) models with rowanberry abundance and weather variables, and (3) models with rowanberry abundance, weather, and interactions between rowanberry abundance and weather.

	Fieldfare		Redwing	
Model	East	West	East	West
Rowanberry, NAO and temperature				
Intercept only	68.82	60.26	85.63	**77.65**
Rowan	52.46	*51.56*	77.02	79.56
Rowan + NAO November	54.74	52.83	79.28	80.23
Rowan + NAO December	51.22	*50.80*	78.63	80.88
Rowan + NAO January	54.92	53.88	79.25	81.42
Rowan + NAO Nov–Jan	53.66	52.64	79.27	81.41
Rowan + Temp November	54.52	*51.88*	78.62	79.72
Rowan + Temp December	53.73	53.99	78.02	81.25
Rowan + Temp January	54.90	53.81	79.46	81.75
Rowan + Temp Nov–Jan	54.17	53.11	78.41	80.12
Rowan + NAO Nov + interaction	54.57	**49.94**	74.20	81.53
Rowan + NAO Dec + interaction	**44.89**	*51.13*	**68.43**	83.24
Rowan + NAO Jan + interaction	57.35	54.66	81.43	83.16
Rowan + NAO Nov–Jan + interaction	51.24	52.35	72.10	83.76
Rowan + Temp Nov + interaction	57.02	53.88	80.87	81.88
Rowan + Temp Dec + interaction	55.87	54.00	76.48	81.02
Rowan + Temp Jan + interaction	57.41	54.72	81.58	83.77
Rowan + Temp Nov–Jan + interaction	56.42	54.87	79.31	81.05
Rowanberry and duration of snow cover				
Intercept only	As above	56.73	As above	*72.56*
Rowan	As above	**45.72**	As above	74.31
Rowan + Snow November	54.85	48.22	78.70	76.73
Rowan + Snow December	49.62	*47.52*	77.88	74.69
Rowan + Snow January	53.57	48.23	79.23	76.26
Rowan + Snow Nov–Jan	51.61	48.08	79.00	74.97
Rowan + Snow Nov + interaction	54.66	49.61	80.99	79.20
Rowan + Snow Dec + interaction	51.76	*46.38*	80.15	**72.13**
Rowan + Snow Jan + interaction	55.59	49.66	80.63	78.54
Rowan + Snow Nov–Jan + interaction	53.06	49.95	81.55	74.14

Weather variables were the North Atlantic Oscillation index (NAO), temperature, and number of days with snow cover (the latter two with data from corresponding parts of Norway). Thrush indices were log-transformed ratios of total number of thrush individuals recorded to total number of records of all bird species (an index of observation effort). Sample sizes were 41 years in all analyses except those of duration of snow cover in **western** Norway where n=38 (thus, AIC_c-values of all

models for each species from **eastern** Norway are directly comparable, but for **western** Norway models with duration of snow cover are not directly comparable to those with NAO and temperature). Best models are shown in bold, other models with $\Delta AIC_c < 2$ are shown in italics.

Table S4. GLMs of annual indices of winter numbers of Fieldfare (*Turdus pilaris*) in eastern and western Norway during 1980–2020 in relation to rowanberry abundance and weather variables.

	Rowanberry abundance			Weather variable		
Weather variable	Estimate	SE	p	Estimate	SE	p
NAO index						
Eastern Norway						
November	2.041	0.440	**<0.001**	-0.185	0.440	0.68
December	2.019	0.421	**<0.001**	**-0.798**	**0.421**	**0.06**
January	2.062	0.448	**<0.001**	-0.019	0.448	0.97
Mean Nov–Jan	2.063	0.433	**<0.001**	-0.473	0.433	0.27
Western Norway						
November	1.353	0.447	**0.003**	-0.474	0.447	0.29
December	1.474	0.418	**<0.001**	**-0.737**	**0.418**	**0.08**
January	1.430	0.462	**0.002**	0.169	0.462	0.71
Mean Nov–Jan	1.489	0.427	**<0.001**	-0.488	0.427	0.25
Temperature						
Eastern Norway						
November	2.096	0.441	**<0.001**	0.272	0.441	0.54
December	2.093	0.434	**<0.001**	0.460	0.434	0.29
January	2.060	0.439	**<0.001**	0.067	0.439	0.88
Mean Nov–Jan	2.097	0.438	**<0.001**	0.369	0.438	0.40
Western Norway						
November	1.683	0.445	**<0.001**	0.635	0.445	0.15
December	1.500	0.439	**<0.001**	0.077	0.439	0.86
January	1.473	0.435	**<0.001**	0.014	0.435	0.66
Mean Nov–Jan	1.556	0.436	**<0.001**	0.047	0.436	0.36
Duration of snow cover						
Eastern Norway						
November	2.069	0.441	**<0.001**	-0.118	0.441	0.79
December	2.067	0.412	**<0.001**	**-0.944**	**0.412**	**0.022**
January	2.003	0.435	**<0.001**	-0.491	0.435	0.26
Total Nov–Jan	2.043	0.422	**<0.001**	**-0.755**	**0.422**	**0.07**
Western Norway						
November	1.616	0.422	**<0.001**	0.049	0.422	0.91
December	1.636	0.412	**<0.001**	-0.336	0.412	0.42
January	1.618	0.416	**<0.001**	-0.007	0.416	0.99
Total Nov–Jan	1.625	0.421	**<0.001**	-0.155	0.421	0.71

Weather variables were the North Atlantic Oscillation index (NAO), temperature, and number of days with snow cover (the latter two with data from corresponding parts of Norway). Thrush indices were log-transformed ratios of total number of thrush individuals recorded to total number of records of all bird species (an index of observation effort). Parameter estimates are for centered and scaled predictors. Sample sizes were 41 years in all analyses except those of number of days with snow

cover in western Norway where n=38–39. P-values are not corrected for multiple testing. Uncorrected p-values ≤0.10 are shown in bold.

Table S5. GLMs of annual indices of winter numbers of Fieldfare (*Turdus pilaris*) in eastern and western Norway during 1980–2020 in relation to rowanberry abundance and weather variables, including the interaction between rowanberries and weather.

	Rowanberry abundance			Weather variable			Interaction rowan x weather		
Weather variable	Estimate	SE	p	Estimate	SE	p	Estimate	SE	p
NAO index									
Eastern Norway									
November	2.149	0.437	**<0.001**	-0.228	0.432	0.60	-0.701	0.436	0.11
December	1.883	0.385	**<0.001**	**-0.854**	**0.383**	**0.026**	**-1.154**	**0.385**	**0.003**
January	2.091	0.459	**<0.001**	-0.020	0.453	0.96	0.181	0.450	0.69
Mean Nov–Jan	2.025	0.413	**<0.001**	-0.486	0.413	0.24	**-0.906**	**0.413**	**0.028**
Western Norway									
November	1.698	0.449	**<0.001**	-0.601	0.427	0.16	**-1.017**	**0.442**	**0.021**
December	1.270	0.435	**0.004**	**-0.761**	**0.412**	**0.06**	-0.632	0.435	0.15
January	1.716	0.508	**<0.001**	0.209	0.459	0.65	0.634	0.489	0.19
Mean Nov–Jan	1.389	0.422	**0.001**	-0.489	0.418	0.24	**-0.695**	**0.422**	**0.10**
Temperature									
Eastern Norway									
November	2.070	0.455	**<0.001**	0.275	0.447	0.54	0.133	0.452	0.77
December	2.134	0.442	**<0.001**	0.450	0.438	0.30	-0.287	0.441	0.52
January	2.036	0.453	**<0.001**	0.118	0.478	0.81	-0.141	0.486	0.77
Mean Nov–Jan	2.122	0.444	**<0.001**	0.424	0.452	0.35	-0.254	0.451	0.57
Western Norway									
November	1.794	0.472	**<0.001**	0.601	0.450	0.18	-0.340	0.458	0.46
December	1.639	0.440	**<0.001**	0.121	0.432	0.78	-0.677	0.436	0.12
January	1.821	0.513	**<0.001**	0.145	0.433	0.74	0.641	0.512	0.21
Mean Nov–Jan	1.562	0.437	**<0.001**	0.492	0.449	0.27	-0.388	0.443	0.38

Duration of snow cover									
Eastern Norway									
November	2.167	0.436	**<0.001**	-0.040	0.434	0.93	-0.706	0.438	0.11
December	2.003	0.427	**<0.001**	**-0.936**	**0.415**	**0.024**	-0.277	0.427	0.52
January	2.109	0.461	**<0.001**	-0.422	0.448	0.35	-0.340	0.465	0.46
Total Nov–Jan	2.074	0.423	**<0.001**	-0.652	0.433	0.13	-0.447	0.434	0.30
Western Norway									
November	1.624	0.421	**<0.001**	0.088	0.422	0.83	0.454	0.422	0.28
December	1.837	0.411	**<0.001**	-0.104	0.416	0.80	**0.824**	**0.430**	**0.06**
January	1.870	0.476	**<0.001**	0.137	0.436	0.75	-0.532	0.495	0.28
Total Nov–Jan	1.518	0.441	**<0.001**	-0.365	0.490	0.46	0.430	0.508	0.40

Weather variables were the North Atlantic Oscillation index (NAO), temperature, and number of days with snow cover (the latter two with data from corresponding parts of Norway). Thrush indices were log-transformed ratios of total number of thrush individuals recorded to total number of records of all bird species (an index of observation effort). Parameter estimates are for centered and scaled predictors. Sample sizes were 41 years in all analyses except those of number of days with snow cover in western Norway where n=38–39. P-values are not corrected for multiple testing. Uncorrected p-values ≤0.10 are shown in bold.

Table S6. GLMs of annual indices of winter numbers of Redwing (*Turdus iliacus*) in eastern and western Norway during 1980–2020 in relation to rowanberry abundance and weather variables.

	Rowanberry abundance			Weather variable		
Weather variable	Estimate	SE	p	Estimate	SE	p
NAO index						
Eastern Norway						
November	1.997	0.594	**<0.001**	-0.259	0.594	0.66
December	1.995	0.587	**<0.001**	-0.525	0.587	0.37
January	1.966	0.603	**0.001**	0.283	0.603	0.64
Mean Nov–Jan	2.024	0.591	**<0.001**	-0.261	0.591	0.66
Western Norway						
November	0.148	0.625	0.81	-0.131	0.625	0.19
December	0.369	0.603	0.54	-0.623	0.603	0.30
January	0.213	0.647	0.74	0.486	0.647	0.45
Mean Nov–Jan	0.381	0.607	0.53	-0.460	0.607	0.45
Temperature						
Eastern Norway						
November	2.094	0.592	**<0.001**	0.533	0.592	0.37
December	2.073	0.584	**<0.001**	0.686	0.584	0.24
January	2.024	0.593	**<0.001**	0.084	0.593	0.89
Mean Nov–Jan	2.082	0.588	**<0.001**	0.589	0.588	0.32
Western Norway						
November	0.664	0.625	0.29	0.923	0.625	0.14
December	0.456	0.612	0.46	0.520	0.612	0.40
January	0.356	0.611	0.56	0.311	0.611	0.61
Mean Nov–Jan	0.518	0.606	0.39	0.815	0.606	0.18
Duration of snow cover						
Eastern Norway						
November	2.065	0.590	**<0.001**	-0.504	0.590	0.39
December	2.028	0.581	**<0.001**	-0.715	0.581	0.22
January	2.054	0.595	**<0.001**	0.290	0.595	0.63
Total Nov–Jan	2.013	0.590	**<0.001**	-0.394	0.590	0.50
Western Norway						
November	0.472	0.614	0.44	-0.177	0.614	0.77
December	0.513	0.598	0.39	-0.875	0.598	0.14
January	0.467	0.610	0.44	-0.423	0.610	0.49
Total Nov–Jan	0.494	0.599	0.41	-0.792	0.599	0.19

Weather variables were the North Atlantic Oscillation index (NAO), temperature, and number of days with snow cover (the latter two with data from corresponding parts of Norway). Thrush indices were log-transformed ratios of total number of thrush individuals recorded to total number of records of all bird species (an index of observation effort). Parameter estimates are for centered and scaled predictors. Sample sizes were 41 years in all analyses except those of number of days with snow

cover in western Norway where n=38–39. P-values are not corrected for multiple testing. Uncorrected p-values ≤0.10 are shown in bold.

Table S7. GLMs of annual indices of winter numbers of Redwing (*Turdus iliacus*) in eastern and western Norway during 1980–2020 in relation to rowanberry abundance and weather variables, including the interaction between rowanberries and weather.

	Rowanberry abundance			Weather variable			Interaction rowan x weather		
Weather variable	Estimate	SE	p	Estimate	SE	p	Estimate	SE	p
NAO index									
Eastern Norway									
November	2.233	0.555	**<0.001**	-0.354	0.549	0.52	**-1.530**	**0.554**	**0.006**
December	1.773	0.513	**<0.001**	-0.618	0.510	0.23	**-1.888**	**0.513**	**<0.001**
January	2.025	0.615	**0.001**	0.281	0.608	0.64	0.370	0.604	0.54
Mean Nov–Jan	1.954	0.532	**<0.001**	-0.284	0.532	0.59	**-1.680**	**0.532**	**0.002**
Western Norway									
November	0.389	0.661	0.56	-0.902	0.628	0.15	-0.710	0.649	0.27
December	0.270	0.644	0.68	-0.635	0.610	0.30	-0.307	0.644	0.63
January	0.490	0.720	0.50	0.526	0.650	0.42	0.615	0.692	0.37
Mean Nov–Jan	0.338	0.620	0.59	-0.460	0.613	0.45	-0.300	0.620	0.63
Temperature									
Eastern Norway									
November	2.160	0.609	**<0.001**	0.523	0.598	0.38	-0.343	0.604	0.57
December	2.235	0.569	**<0.001**	0.650	0.563	0.25	**-1.126**	**0.568**	**0.047**
January	2.098	0.608	**<0.001**	-0.072	0.642	0.91	0.432	0.653	0.51
Mean Nov–Jan	2.155	0.587	**<0.001**	0.752	0.598	0.21	-0.749	0.597	0.21
Western Norway									
November	0.798	0.664	0.23	0.885	0.633	0.16	-0.410	0.645	0.53
December	0.659	0.612	0.28	0.584	0.601	0.34	**-0.986**	**0.606**	**0.10**
January	0.638	0.732	0.38	0.274	0.618	0.66	0.517	0.730	0.48
Mean Nov–Jan	0.529	0.602	0.38	0.989	0.618	0.11	-0.756	0.609	0.21
Duration of snow cover									
Eastern Norway									
November	2.110	0.601	**<0.001**	-0.468	0.599	0.43	-0.322	0.603	0.59
December	2.105	0.604	**<0.001**	-0.725	0.587	0.22	0.332	0.604	0.58

January	2.260	0.626	**<0.001**	0.424	0.608	0.49	-0.662	0.630	0.29
Total Nov–Jan	2.023	0.599	**<0.001**	-0.362	0.614	0.55	-0.139	0.615	0.82
Western Norway									
November	0.477	0.621	0.44	-0.154	0.624	0.80	0.261	0.623	0.68
December	0.845	0.587	0.15	-0.490	0.593	0.41	**1.368**	**0.613**	**0.026**
January	0.675	0.708	0.34	-0.304	0.647	0.64	-0.439	0.735	0.55
Total Nov–Jan	0.181	0.606	0.77	**-1.408**	**0.673**	**0.037**	**1.262**	**0.698**	**0.07**

Weather variables were the North Atlantic Oscillation index (NAO), temperature, and number of days with snow cover (the latter two with data from corresponding parts of Norway). Thrush indices were log-transformed ratios of total number of thrush individuals recorded to total number of records of all bird species (an index of observation effort). Parameter estimates are for centered and scaled predictors. Sample sizes were 41 years in all analyses except those of number of days with snow cover in western Norway where n=38–39. P-values are not corrected for multiple testing. Uncorrected p-values ≤0.10 are shown in bold.

Table S8. Parameter estimates for models of winter numbers of Fieldfare (*Turdus pilaris*) and Redwing (*T. iliacus*) in Norway during 1980–2020 in relation to rowanberry abundance, weather variables, the interaction between rowanberries and weather, **region (eastern versus western Norway)**, and the **interaction between region and weather**.

Model/variables	Estimate	SE	p
Fieldfare (model 1)			
Rowanberry abundance	2.30	0.41	<0.001
NAO index December	-0.81	0.56	0.15
Rowan * NAO	-1.34	0.41	0.001
Region	1.17	0.40	0.004
Region * NAO	-0.47	0.57	0.40
Fieldfare (model 2)			
Rowanberry abundance	2.77	0.44	<0.001
NAO index November	-0.65	0.59	0.28
Rowan * NAO	-1.19	0.43	0.006
Region	1.34	0.42	0.002
Region * NAO	0.10	0.59	0.87
Redwing (model 1)			
Rowanberry abundance	1.54	0.60	0.010
NAO index December	-0.56	0.82	0.49
Rowan * NAO	-1.72	0.60	0.004
Region	-5.16	0.59	<0.001
Region * NAO	-0.48	0.83	0.57
Redwing (model 2)			
Rowanberry abundance	2.02	0.59	<0.001
Duration of snow cover December	-2.18	1.48	0.14
Rowan * Snow	1.08	0.59	0.07
Region	-4.21	0.77	<0.001
Region * Snow	1.05	1.31	0.65

Thrush indices were log-transformed ratios of total number of thrush individuals recorded to total number of records of all bird species (an index of observation effort). For each species, different models correspond to the weather variables included in Table 1 in the main text. Parameter estimates are for centered and scaled predictors.

Table S9. Relationships between annual indices of number of thrushes [Fieldfare (*Turdus pilaris*) and Redwing (*T. iliacus*)] during winter in eastern and western Norway, between indices of the two species, between thrush indices and rowanberry (*Sorbus aucuparia*) indices, and between thrush indices and weather variables (North Atlantic Oscillation index (NAO), temperature, number of days with snow cover) during **2008–2020.**

Variable 1	Variable 2	r	p
Fieldfare east	Fieldfare west	0.50	**0.08**
Redwing east	Redwing west	0.68	**0.010**
Fieldfare east	Redwing east	0.78	**0.002**
Fieldfare west	Redwing west	0.76	**0.003**
Fieldfare east	Rowanberry east	0.66	**0.015**
Fieldfare west	Rowanberry west	0.40	0.17
Redwing east	Rowanberry east	0.54	**0.06**
Redwing west	Rowanberry west	0.06	0.85
Fieldfare east	NAO	-0.19–0.08	0.54–0.80
Fieldfare east	Temperature east	-0.24–0.18	0.42–0.96
Fieldfare east	Snow cover east	-0.24–0.12	0.43–0.69
Fieldfare west	NAO	-0.10–0.39	0.19–0.80
Fieldfare west	Temperature west	-0.06–0.12	0.70–0.99
Fieldfare west	Snow cover west	-0.10–0.42	0.15–0.85
Redwing east	NAO	-0.06–0.12	0.76–0.88
Redwing east	Temperature east	-0.24–0.18	0.42–0.96
Redwing east	Snow cover east	-0.15–0.00	0.63–0.99
Redwing west	NAO	0.20–0.43	0.15–0.51
Redwing west	Temperature west	0.06–0.33	0.27–0.84
Redwing west	Snow cover west	-0.44–0.03	0.13–0.92

Thrush indices were log-transformed ratios of total number of thrush individuals recorded to total number of records of all bird species (an index of observation effort). Each weather variable included four different variants (values for November, for December, for January, and mean or sum for November–January). Sample sizes were n =13 years in all analyses. P-values are not corrected for multiple testing. Uncorrected p-values ≤0.10 are shown in bold.

Table S10. GLMs of selected relationships between annual indices of number of thrushes [Fieldfare (*Turdus pilaris*) and Redwing (*T. iliacus*)] during winter in eastern and western Norway, and rowanberry (*Sorbus aucuparia*) indices, weather variables (North Atlantic Oscillation index (NAO), temperature, number of days with snow cover), and the interaction between rowanberries and weather during **2008–2020.**

Thrush species	Rowanberry abundance			Weather variable			Interaction rowan x weather		
Weather variable	Estimate	SE	p	Estimate	SE	p	Estimate	SE	p
Fieldfare									
NAO index									
Eastern Norway									
December	**0.791**	**0.324**	**0.015**	-0.253	0.305	0.41	**-0.938**	**0.327**	**0.004**
Western Norway									
November	**1.484**	**0.683**	**0.030**	-0.427	0.520	0.41	-1.292	0.800	0.11
Duration of snow cover									
Eastern Norway									
December	**1.296**	**0.396**	**0.001**	-0.070	0.439	0.87	0.627	0.457	0.17
Western Norway									
December	**1.044**	**0.625**	**0.09**	-0.138	0.459	0.76	0.577	0652	0.38
Redwing									
NAO index									
Eastern Norway									
December	0.409	0.331	0.22	0.008	0.310	0.98	**-0.717**	**0.334**	**0.032**
Temperature									
Eastern Norway									
December	**1.082**	**0.222**	**<0.001**	-0.362	0.235	0.12	**-1.088**	**0.249**	**<0.001**
Western Norway									
December	0.715	0.472	0.13	0.178	0.352	0.61	**-0.929**	**0.487**	**0.06**
Duration of snow cover									
Western Norway									
December	0.637	0.487	0.19	-0.440	0.358	0.22	0.679	0.508	0.18

Parameter estimates are for centered and scaled predictors. Sample sizes were n=13 years in all analyses. The selection of models shown was based on which models revealed important relationships in the analyses of the full data set (n=38–41 years) in Tables S4 and S6. Thrush indices were log-transformed ratios of total number of thrush individuals recorded to total number of records of all bird species (an index of observation effort). P-values are not corrected for multiple testing. Uncorrected p-values ≤0.10 are shown in bold.

Table S11. Parameter estimates for models of **detrended** winter numbers of Fieldfare (*Turdus pilaris*) and Redwing (*T. iliacus*) in eastern and western Norway during 1980–2020 in relation to rowanberry abundance, weather variables and the interaction between rowanberries and weather. Models correspond to those presented in Table 1 in the main text.

Model/variables	Estimate	SE	p
Fieldfare, eastern Norway			
Rowanberry abundance	1.80	0.41	<0.001
NAO index December	-0.63	0.41	0.12
Rowan * NAO	-1.06	0.41	0.010
Fieldfare, western Norway			
Rowanberry abundance	1.59	0.57	0.005
NAO index November	-0.55	0.54	0.31
Rowan * NAO	-0.99	0.56	0.07
Redwing, eastern Norway			
Rowanberry abundance	1.64	0.48	<0.001
NAO index December	-0.41	0.47	0.38
Rowan * NAO	-1.73	0.48	<0.001
Redwing, western Norway			
Rowanberry abundance	1.09	0.51	0.033
Duration of snow cover December	-0.14	0.52	0.79
Rowan * Snow	1.39	0.53	0.009

Detrended thrush numbers were based on residuals from a regression of the number of individuals recorded ($\log_{10}(x)$ for Fieldfare, $\log_{10}(x+1)$ for Redwing) on year. Parameter estimates are for centered and scaled predictors.