Supplementary material

Pakanen, V.-M. 2018: Large scale climate affects the timing of spring arrival but local weather determines the start of breeding in a northern Little Tern (*Sternula albifrons*) population. — Ornis Fennica 95: 178–184.

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Figure S1. The location of the study area in Finland. The sampling area for arrival dates constituted the area of the North Ostrobothnian bird association (PPLY; red area in the map of Fennoscandia), but the terns are only seen at the coastline. The first observation sites are shown in the map with grey circles (Vihiluoto, Kempele; Toppilansaari, Oulu; Kutukari, Hailuoto; Merikylänlahti, Siikajoki; Pattijoensuu, Raahe; Parhalahti, Pyhäjoki). The breeding site in at the Harbour in Oulu is shown with an orange circle.

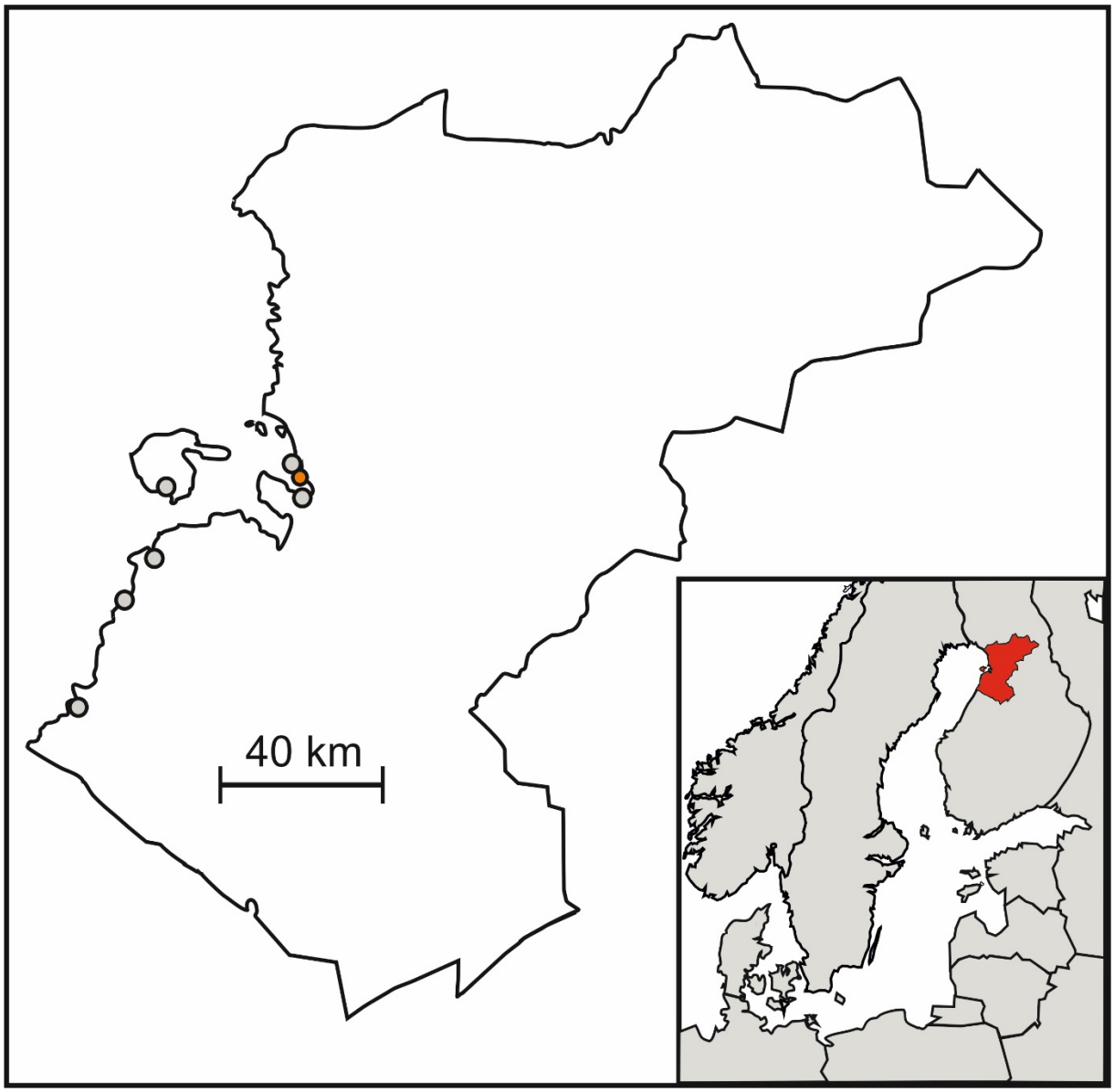

Table S1. Linear regression models explaining variation in annual first arrival dates of Little Terns with a temporal trend, North Atlantic Oscillation indices (NAO) and mean local temperatures (T) for different spring periods. The models were repeated with detrended variables. Only the best 25 models are shown.

First arrival date				Detrended first arrival date			
#	Model	AICc	ΔAICc	#	Model	AICc	ΔAICc
A1	NAO4-5	58.00	0.00	B1	NAO4-5	53.93	0.00
A2	NAO5	59.22	1.22	B2	NAO4-5+T(April13-May2)	56.02	2.09
A3	CONSTANT	59.68	1.69	B3	NAO4	56.26	2.33
A4	T(April23-May2)	60.17	2.17	B4	NAO4-5+T(April13-April22)	56.49	2.56
A5	NAO4	60.44	2.44	B5	NAO5	56.76	2.83
A6	T(April13-May2)	61.21	3.21	B6	NAO4-5+T(April13-May12)	57.26	3.33
A7	NAO4-5+T(April3-April12)	61.37	3.38	B7	NAO4-5+T(April3-April12)	57.53	3.60
A8	NAO4-5+T(April13-May2)	61.41	3.42	B8	NAO5+T(April13-April22)	57.72	3.79
A9	NAO4-5+T(April23-May2)	61.50	3.50	B9	CONSTANT	57.82	3.89
A10	TREND	61.75	3.75	B10	NAO4+T(April13-May2)	58.23	4.30
A11	NAO4+T(April23-May2)	61.77	3.77	B11	T(April13-May2)	58.49	4.56
A12	NAO4-5+T(April3-April22)	62.06	4.06	B12	NAO4-5+T(April23-May2)	58.54	4.61
A13	T(April23-May12)	62.06	4.07	B13	NAO4-5+T(April23-May12)	58.58	4.65
A14	NAO4-5+T(April13-May12)	62.14	4.14	B14	NAO4-5+T(MAy3-May12)	58.67	4.74
A15	T(April13-May12)	62.29	4.30	B15	NAO4+T(April23-May2)	58.86	4.93
A16	NAO4-5+T(April23-May12)	62.32	4.32	B16	NAO4+T(April13-May12)	58.92	5.00
A17	NAO5+T(April13-May2)	62.49	4.50	B17	NAO4-5+T(April3-April22)	59.02	5.09
A18	NAO4-5+T(MAy3-May12)	62.97	4.97	B18	NAO5+T(April13-May2)	59.02	5.09
A19	NAO4-5+T(April13-April22)	63.21	5.21	B19	NAO4-5+T(April3-May2)	59.15	5.23
A20	NAO5+T(April3-April12)	63.21	5.21	B20	T(April23-May2)	59.21	5.28
A21	NAO4-5+T(April3-May2)	63.21	5.21	B21	NAO4+T(April23-May12)	59.51	5.59
A22	T(April3-April22)	63.23	5.23	B22	T(April13-May12)	59.96	6.03
A23	NAO5+T(April23-May2)	63.33	5.34	B23	NAO4+T(MAy3-May12)	60.32	6.39
A24	T(April3-April12)	63.35	5.35	B24	T(April23-May12)	60.46	6.53
A25	T(April3-May2)	63.36	5.37	B25	NAO5+T(April13-May12)	60.64	6.71

Table S2. Linear regression models explaining variation in annual fifth arrival dates of Little Terns with a temporal trend, North Atlantic Oscillation indices (NAO) and mean local temperatures (T) for different spring periods. The models were repeated with detrended variables. Only the best 25 models are shown.

Fifth arrival date				Detrended fifth arrival date			
#	Model	AICc	ΔAICc	#	Model	AICc	ΔAICc
A1	TREND	56.41	0.00	B1	NAO4+T(April3-April22)	46.12	0.00
A2	T(April3-April22)	61.29	4.88	B2	NAO4+T(April3-April12)	49.01	2.89
A3	CONSTANT	62.53	6.12	B3	NAO4+T(April3-May2)	49.50	3.38
A4	NAO4+T(April3-April22)	63.12	6.71	B4	NAO4	51.69	5.57
A5	T(April13-April22)	64.21	7.80	B5	NAO4-5+T(April3-April12)	52.24	6.11
A6	T(April3-April12)	64.30	7.90	B6	CONSTANT	52.48	6.36
A7	NAO4-5+T(April3-April22)	64.54	8.14	B7	NAO4-5+T(April3-May2)	52.54	6.41
A8	T(April3-May2)	64.81	8.40	B8	T(April3-April22)	53.21	7.08
A9	MAy3-May12)	65.60	9.19	B9	NAO4-5+T(April3-April22)	53.45	7.33
A10	NAO4-5	65.68	9.27	B10	NAO4-5	53.52	7.40
A11	NAO4	65.82	9.41	B11	T(April3-April12)	53.72	7.60
A12	T(April13-May12)	65.85	9.44	B12	T(April3-May2)	54.32	8.19
A13	NAO5	65.95	9.54	B13	T(MAy3-May12)	54.65	8.52
A14	NAO5+T(April3-April22)	65.96	9.56	B14	NAO4+T(April13-May12)	54.88	8.75
A15	T(April23-May2)	66.15	9.74	B15	NAO4+T(MAy3-May12)	55.08	8.95
A16	T(April13-May2)	66.20	9.79	B16	T(April13-May12)	55.35	9.23
A17	T(April23-May12)	66.43	10.02	B17	NAO4+T(April13-May2)	55.40	9.28
A18	NAO4-5+T(April3-April12)	67.58	11.18	B18	NAO5	55.56	9.43
A19	NAO4-5+T(April3-May2)	67.97	11.57	B19	NAO4+T(April23-May12)	55.56	9.44
A20	NAO4+T(April3-April12)	68.00	11.59	B20	T(April23-May12)	55.63	9.50
A21	NAO4+T(April13-April22)	68.14	11.74	B21	T(April13-May2)	56.07	9.95
A22	NAO5+T(April3-April12)	68.29	11.88	B22	NAO4+T(April23-May2)	56.11	9.98
A23	NAO4+T(April3-May2)	68.46	12.06	B23	NAO4-5+T(MAy3-May12)	56.16	10.04
A24	NAO5+T(April3-May2)	68.71	12.31	B24	T(April23-May2)	56.24	10.12
A25	NAO4-5+T(April13-April22)	69.00	12.59	B25	NAO4-5+T(April23-May12)	56.29	10.17

Table S3. Linear regression models explaining variation in annual first egg laying dates of Little Terns with a temporal trend, North Atlantic Oscillation indices (NAO) and mean local temperatures (T) for different spring periods, annual first and fifth arrival dates. The models were repeated with detrended variables. Only the best 25 models are shown.

First egg date				Detrended first egg date			
#	Model	AICc	ΔAICc	#	Model	AICc	ΔAICc
A1	NAO4-5+T(May16-May25)	58.70	0.00	B1	1.ARRIVAL+T(May16-May25)	51.79	0.00
A2	NAO5+T(May16-May25)	59.66	0.95	B2	NAO4-5+T(May16-May25)	54.70	2.91
A3	NAO5+T(May16-June4)	60.24	1.53	B3	NAO5+T(May16-May25)	54.73	2.93
A4	NAO5+T(May6-June4)	60.28	1.58	B4	1.ARRIVAL+T(May6-May25)	55.76	3.97
A5	NAO4-5+T(May6-May25)	61.03	2.33	B5	NAO4-5+T(May6-May25)	57.41	5.62
A6	NAO4-5+T(May6-June4)	61.44	2.73	B6	NAO5+T(May16-June4)	58.13	6.34
A7	NAO4-5+T(May16-June4)	61.95	3.25	B7	NAO5+T(May6-June4)	58.16	6.37
A8	NAO5+T(May6-May25)	62.74	4.04	B8	NAO5+T(May6-May25)	58.59	6.79
A9	T(May16-May25)	62.77	4.07	B9	NAO5+T(May16-June14)	59.59	7.79
A10	NAO4-5+T(May16-June14)	62.84	4.14	B10	NAO4-5+T(May6-June4)	59.69	7.90
A11	NAO6+T(May16-May25)	62.91	4.21	B11	NAO4-5+T(May16-June14)	60.03	8.24
A12	NAO5+T(May16-June14)	63.25	4.55	B12	NAO4-5+T(May16-June4)	60.20	8.41
A13	1.ARRIVAL+T(May16-May25)	63.54	4.83	B13	T(May16-May25)	60.47	8.68
A14	T(May6-May25)	63.69	4.99	B14	T(April26-May25)	60.47	8.68
A15	NAO4+T(May16-May25)	63.74	5.03	B15	1.ARRIVAL+T(April26-May25)	60.92	9.13
A16	T(April26-May25)	63.83	5.13	B16	NAO6+T(May16-May25)	60.99	9.20
A17	NAO6	63.96	5.25	B17	T(May6-May25)	61.37	9.57
A18	NAO4+T(May6-May25)	64.56	5.86	B18	NAO6	61.42	9.62
A19	NAO6+T(May6-May25)	64.79	6.09	B19	NAO4+T(May16-May25)	61.49	9.70
A20	T(May6-June4)	64.93	6.23	B20	CONSTANT	62.02	10.23
A21	T(May16-June4)	65.14	6.44	B21	NAO4-5+T(April26-May25)	62.04	10.25
A22	CONSTANT	65.32	6.62	B22	NAO4+T(May6-May25)	62.35	10.55
A23	1.ARRIVAL+T(May6-May25)	65.35	6.65	B23	NAO4-5	62.48	10.69
A24	TREND	65.95	7.25	B24	5.ARRIVAL+T(April26-May25)	62.61	10.81
A25	NAO4	66.35	7.65	B25	NAO6+T(May6-May25)	62.80	11.01

Table S4. Linear regression models explaining variation in annual mean egg laying dates of Little Terns with a temporal trend, North Atlantic Oscillation indices (NAO) and mean local temperatures (T) for different spring periods, annual first and fifth arrival dates. The models were repeated with detrended variables. Only the best 25 models are shown.

Mean first egg date				Detrended mean first egg date			
#	Model	AICc	ΔAICc	#	Model	AICc	ΔAICc
A1	TREND	64.53	0.00	B1	NAO4-5+T(June5-June14)	57.50	0.00
A2	CONSTANT	65.17	0.64	B2	NAO5+T(June5-June14)	59.96	2.46
A3	5.ARRIVAL	65.28	0.75	B3	CONSTANT	60.60	3.10
A4	T(May16-May25)	66.69	2.16	B4	NAO5+T(May16-June14)	62.34	4.84
A5	NAO5+T(May16-June14)	67.07	2.54	B5	NAO4-5	62.48	4.98
A6	T(May6-May25)	67.50	2.97	B6	NAO5	62.61	5.11
A7	NAO4-5	67.50	2.98	B7	T(May16-May25)	63.13	5.62
A8	T(May16-June14)	67.57	3.05	B8	T(June5-June14)	63.29	5.79
A9	T(May16-June4)	67.67	3.15	B9	NAO4	63.50	6.00
A10	NAO6	67.76	3.23	B10	T(May6-May25)	63.80	6.30
A11	NAO4	67.76	3.24	B11	T(May16-June14)	63.82	6.32
A12	T(May6-June4)	67.88	3.36	B12	T(April26-May25)	63.84	6.34
A13	NAO4-5+T(May16-June14)	67.92	3.40	B13	NAO6	63.91	6.41
A14	T(April26-May25)	68.04	3.51	B14	1.ARRIVAL	64.04	6.53
A15	NAO5	68.09	3.57	B15	5.ARRIVAL	64.18	6.68
A16	T(May26-June14)	68.61	4.09	B16	NAO4-5+T(May16-June14)	64.19	6.69
A17	T(June5-June14)	68.67	4.14	B17	T(May16-June4)	64.27	6.77
A18	NAO4-5+T(June5-June14)	68.72	4.19	B18	T(May26-June4)	64.37	6.87
A19	T(April26-May5)	68.83	4.30	B19	T(May6-June4)	64.38	6.88
A20	T(May26-June4)	68.88	4.35	B20	T(May26-June14)	64.38	6.88
A21	T(April26-May15)	68.88	4.36	B21	T(May6-May15)	64.42	6.92
A22	1.ARRIVAL	69.03	4.51	B22	T(April26-May15)	64.44	6.94
A23	NAO5+T(May16-May25)	69.08	4.55	B23	NAO5+T(May26-June14)	64.46	6.95
A24	T(May6-May15)	69.09	4.56	B24	T(April26-May5)	64.50	7.00
A25	NAO4-5+T(May16-May25)	69.12	4.59	B25	NAO5+T(May16-May25)	64.53	7.03

Table S5. Linear regression models explaining variation in annual interval between arrival and first laying of Little Terns with a temporal trend, North Atlantic Oscillation indices (NAO) and mean local temperatures (T) for different spring periods. The models were repeated with detrended variables. Only the best 25 models are shown.

Interval between arrival and laying				Detrended Interval between arrival and laying			
#	Model	AICc	ΔAICc	#	Model	AICc	ΔAICc
A1	1.ARRIVAL+T(May16-May25)	63.54	0.00	B1	1.ARRIVAL+T(May16_May25)	51.79	0.00
A2	1.ARRIVAL+T(May6-May25)	65.35	1.82	B2	1.ARRIVAL+T(May6_May25)	55.76	3.97
A3	1.ARRIVAL+T(May6-June4)	68.06	4.52	B3	1.ARRIVAL+T(April26_May25)	60.92	9.13
A4	1.ARRIVAL+T(April26-May25)	68.26	4.73	B4	1.ARRIVAL	62.93	11.14
A5	1.ARRIVAL+T(May16-June4)	68.47	4.93	B5	1.ARRIVAL+T(May6_June4)	63.32	11.52
A6	NAO4-5	68.77	5.23	B6	1.ARRIVAL+T(May16_June4)	63.82	12.03
A7	1.ARRIVAL	68.86	5.33	B7	1.ARRIVAL+T(May16_June14)	64.81	13.02
A8	NAO4-5+T(April13-April22)	68.88	5.35	B8	1.ARRIVAL+T(MAy3_May12)	66.05	14.26
A9	NAO4-5+T(May16-June14)	68.90	5.36	B9	1.ARRIVAL+April23_May12)	66.89	15.10
A10	NAO4-5+T(May16-June4)	69.07	5.53	B10	1.ARRIVAL+T(April26_May5)	67.29	15.50
A11	NAO4-5+T(May6-June4)	69.08	5.54	B11	1.ARRIVAL+T(April13_April22)	67.43	15.64
A12	NAO5+T(April13-April22)	69.31	5.77	B12	1.ARRIVAL+T(April13_May12)	67.50	15.71
A13	NAO6	69.59	6.05	B13	1.ARRIVAL+T(April23_May2)	67.65	15.86
A14	NAO5+T(May16-June4)	69.83	6.29	B14	1.ARRIVAL+T(May6_May15)	67.73	15.94
A15	NAO4-5+T(May16-May25)	70.07	6.53	B15	1.ARRIVAL+T(June5_June14)	67.91	16.12
A16	NAO5+T(May6-June4)	70.34	6.81	B16	1.ARRIVAL+T(April26_May15)	68.02	16.23
A17	NAO4	70.61	7.08	B17	1.ARRIVAL+T(May26_June14)	68.03	16.24
A18	NAO4-5+T(May6-May25)	70.62	7.09	B18	1.ARRIVAL+T(April3_April22)	68.12	16.32
A19	1.ARRIVAL+T(May16-June14)	70.90	7.36	B19	1.ARRIVAL+T(April3_April12)	68.13	16.33
A20	NAO4-5+T(May26-June14)	70.91	7.38	B20	1.ARRIVAL+T(April3_May2)	68.14	16.35
A21	1.ARRIVAL+T(April13-April22)	71.10	7.56	B21	1.ARRIVAL+T(May26_June4)	68.15	16.35
A22	NAO4-5+T(May26-June4)	71.25	7.71	B22	1.ARRIVAL+T(April13_May2)	68.17	16.38
A23	NAO5+T(May16-June14)	71.29	7.75	B23	NAO4_5+T(April13_April22)	68.29	16.50
A24	NAO4-5+T(April26-May25)	71.69	8.15	B24	NAO4_5	68.50	16.71
A25	NAO5	71.81	8.28	B25	NAO5+T(April13_April22)	68.62	16.83