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Electronic Supplementary Material

*This supplementary material has not been peer reviewed*

Title: Climate change stimulates the growth of the intertidal macroalgae *Ascophyllum nodosum* near the northern distribution limit

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**Table S1** Regression equations of temporal trends, for the entire time series and for the period since 1990, of annual mean air temperature, annual ice free days and *Ascophyllum nodosum* annual tip elongation rate at the study sites. The equations are of the form  $Y = a + (b \cdot X)$ . The p-value and the coefficient of determination are provided. The time periods of the series analysed are indicated.

Y	X	site	b	SE <sub>b</sub>	a	SE <sub>a</sub>	p-value	R <sup>2</sup>	time period
mean annual air temperature (oC)	time (year)	Tromsø	0.00	0.00	-2.96	3.45	0.08	0.03	1921-2015
		Tromsø	0.01	0.01	-10.92	23.96	0.56	0.02	1990-2012
		Lofoten	0.01	0.00	-20.44	3.21	<.0001	0.26	1900-2015
		Lofoten	0.02	0.01	-33.14	24.79	0.19	0.08	1990-2012
		Aasiaat	0.03	0.01	-63.98	24.15	0.02	0.10	1953-2012
		Aasiaat	0.25	0.02	-505.86	42.63	<.0001	0.87	1990-2012
		Sisimiut	0.04	0.01	-84.12	24.02	0.00	0.18	1961-2012
		Sisimiut	0.23	0.02	-462.28	44.03	<.0001	0.84	1990-2012
		Nuuk	0.00	0.01	-11.03	15.87	0.54	0.01	1953-2012
		Nuuk	0.13	0.02	-256.08	42.40	<.0001	0.63	1990-2012
annual ice-free days (days yr <sup>-1</sup> )	time (year)	Tromsø	-	-	-	-	-	-	1990-2009
		Lofoten	-	-	-	-	-	-	1990-2009

		Qeqertarsuaq	9.12	1.54	-18055.37	3083.33	<.0001	0.66	1990-2009
		Sisimiut	8.15	0.90	-16023.95	1791.25	<.0001	0.82	1990-2009
		Nuuk	2.56	0.71	-4773.49	1422.16	0.00	0.42	1990-2009
annual tip elongation (cm yr-1)	time (year)	Tromsø	0.09	0.06	-175.79	118.84	0.18	0.28	2002-2009
		Lofoten	0.24	0.03	-482.06	54.26	<.0001	0.88	1997-2009
		Kronprinsens	0.09	0.02	-169.95	31.06	<.0001	0.67	1995-2011
		Kronprinsens	0.03	0.01	-54.78	11.82	0.00	0.56	1958-2011
		Qeqertarsuaq	0.00	0.04	-4.99	79.53	0.92	0.00	1997-2008
		Sisimiut	0.01	0.03	-22.86	52.28	0.63	0.04	2000-2008
		Kobbe Inner	0.00	0.04	-0.94	72.56	0.93	0.00	1997-2009
		Kobbe Mid	0.17	0.06	-343.55	119.77	0.01	0.44	1997-2009
annual tip elongation (cm yr-1)	mean annual air temperature (oC)	Tromsø	0.49	0.44	4.33	1.61	0.32	0.17	2002-2009
		Lofoten	2.02	0.50	4.12	0.30	0.00	0.60	1997-2009
		Kronprinsens	0.40	0.10	4.23	0.32	0.00	0.50	1995-2011
		Kronprinsens	0.28	0.07	3.88	0.27	0.00	0.44	1958-2011
		Qeqertarsuaq	0.44	0.18	4.28	0.55	0.04	0.41	1997-2008

		Sisimiut	-0.05	0.12	3.56	0.20	0.70	0.02	2000-2008
		Kobbe Inner	-0.55	0.23	5.21	0.15	0.04	0.34	1997-2009
		Kobbe Mid	0.83	0.57	7.35	0.38	0.18	0.16	1997-2009
annual tip elongation (cm yr-1)	annual ice- free days (days yr-1)	Tromsø	-	-	-	-	-	-	2002-2009
		Lofoten	-	-	-	-	-	-	1997-2009
		Kronprinsens	0.003	0.002	2.32	0.34	0.07	0.23	1995-2011
		Qeqertarsuaq	0.000	0.002	3.05	0.48	0.88	0.00	1997-2008
		Sisimiut	0.001	0.002	3.44	0.55	0.72	0.02	2000-2008
		Kobbe Inner	0.002	0.016	0.91	5.54	0.92	0.00	1997-2009
		Kobbe Mid	0.082	0.024	-21.84	8.57	0.01	0.51	1997-2009

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**Table S2** Coefficients (and standard error of the coefficients), significance (p-value) and coefficient of determination ( $R^2$ ) of the models fit between annual air temperature, annual ice-free days or *Ascophyllum nodosum* growth and time (years, period 1990-2012) and latitude across all studied Arctic and subarctic populations. The model was  $Y = a_1 + b_1 \cdot \text{time} + a_2 \cdot \text{latitude} + b_2 (\text{time} \cdot \text{latitude})$ .

Y	Term	coefficient	Std Error	p-value	$R^2$
mean annual air temperature ( $^{\circ}\text{C}$ )	intercept	-305.16	63.02	<.0001	0.13
	time	0.15	0.03	<.0001	
	latitude	0.07	0.09	0.45	
	(latitude-67.3567)*(year-2000.73)	0.00	0.01	0.80	
annual ice-free days (days yr $^{-1}$ )	intercept	-8822.68	1885.24	<.0001	0.52
	time	5.37	0.94	<.0001	
	latitude	-24.38	2.62	<.0001	
	(latitude-66.9587)*(year-1999.59)	1.03	0.45	0.024	
annual tip elongation (cm yr $^{-1}$ )	intercept	-213.87	67.30	0.002	0.47
	time	0.12	0.03	0.000	
	latitude	-0.45	0.06	<.0001	
	(latitude-67.289)*(year-2003.27)	0.02	0.02	0.24	