The following supplements accompany the article

Rising air temperatures will increase intertidal mussel abundance in the Arctic

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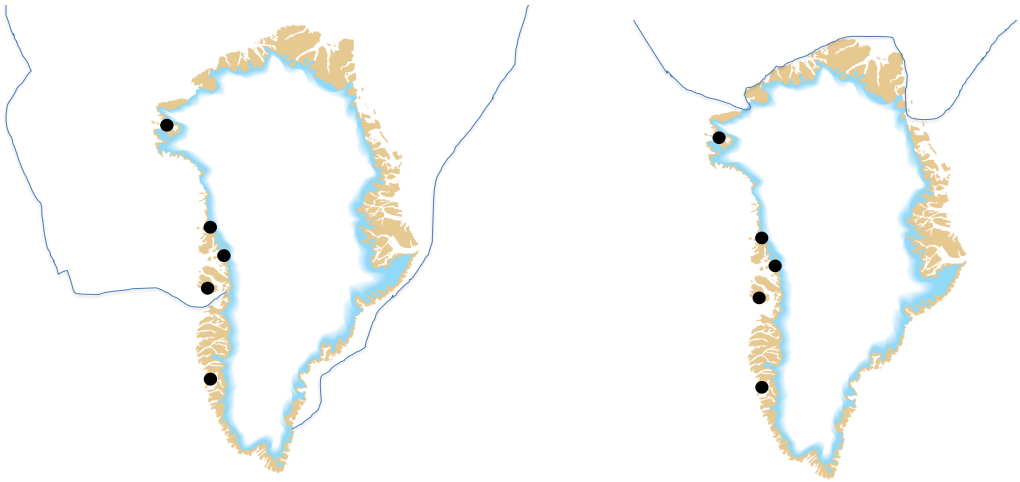
Supplement 1. ***Maps displaying the sea ice extent in winter (left) and summer (right) around Greenland.***

Black dots indicate the five sampling locations in West Greenland



Supplement 2. ***Environmental characteristics of the sites at the five locations in Greenland***

Nuuk

All the detailed environmental information can be found described in Blicher et al. (2013).

Disko Island

Site number	N latitude	W latitude	Orientation	Ice scour	Rugosity	Wave exposure
20	69°15.0756’	53°32.42’	SW	Low	Medium	1002.18
21	69°15.6084’	53°32.47’	SW	High	Medium	2600.91
22	69°09.74’	53°26.016’	NW	Low	Medium	634.99
23	69°15.2412’	53°44.29’	E	High	High	2085.08
24	69°15.2487’	53°33.19’	-	Low	High	1680.03
25	69°14.6’	53°32.27’	SE	High	High	997.94
26	69°14.5’	53°32.41’	-	High	Medium	2224.92

27	69°1.6204’	53°19.29’	NE	Low	Low	2444.91
28	69°1.247’	53°19.25’	NNE	High	Medium	3037.15
29	69°29.48’	53°52.25’	NE	High	Medium	10460.23
30	69°30.01’	53°52.24’	SE	High	High	3345.82
31	69°15.10’	53°36.26’	-	Low	low	9767.31

Uummannaq

Site number	N latitude	W latitude	Orientation	Ice scour	Rugosity	Wave exposure
1	70°40.717	52°08.976	W	High	Low	9563.07
2	70°45.636	51°04.144	W	High	Medium	2156.73
3	70°45.585	51°04.136	W	High	High	2178.63
4	70°44.697	51°04.872	N	High	High	4286.35
5a	70°36.302	51°13.445	W	High	Medium	8002.88
5b	70°36.346	51°13.215	-	Low	Low	14521.65
6	70°30.792	50°55.244	S	High	Medium	2683.53
7	70°59.551	52°15.187	N	High	High	2808.38
8	71°00.388	52°16.562	N	High	High	9638.71
9	71°00.264	52°16.643	S	High	Medium	724.09
10	71°41.526	52°08.561	NW	High	High	6539.39
11	70°40.510	52°08.241	SE	Low	High	7778.21
12	70°49.757	51°36.545	SSØ	Low	Low	550.68
13	70°51.839	51°38.123	SW	Low	High	1081.54
14	70°32.008	51°36.883	E	Low	High	6821.21
15	70°29.715	51°16.271	N	Low	High	3002.28
16	70°27.208	51°01.023	N	Low	High	2092.21
17	70°30.662	51°04.968	NE	Low	High	6617.17

Upernavik

Site number	N latitude	W latitude	Orientation	Ice scour	Rugosity	Wave exposure
Up40	72.48257	55.55743	N	Low	Medium	15927.35
Up41	72.47704	56.04981	NW	Low	Medium	3401.81
Up42	73.11160	55.25419	NW	High	Medium	1417.28
Up43	73.13887	55.36363	W	High	Medium	1627.90
Up44	73.18319	56.05404	SE	High	High	1031.73
Up45	73.34895	56.19292	NNW	Low	Medium	7693.47
Up46	73.27389	55.40398	W	Low	Low	733.00
Up47	73.22534	55.58809	S	High	Medium	3202.11
Up48	73.10297	56.04356	NE	High	Medium	1928.48
Up49	73.10131	55.57134	N	High	Medium	439.33
Up50	72.52268	55.33994	NW	High	Medium	751.05
Up51	72.55879	55.45300	NE	Low	Medium	23612.00
Up52	72.55448	55.45281	NE	High	High	2456.94

Qaanaaq

Site number	N latitude	W latitude	Orientation	Ice scour	Rugosity
1	77°27.901	069°14.418	S	Low	High
2	77°27.463	069°11.327	S	Low	High
3	77°25.423	070°08.051	N	Low	Medium
4	77°13.722	068°41.364	SW	High	High
5	77°29.731	066°39.382	SW	High	Medium
6	77°36.607	070°01.382	N	High	Low
7	77º48.801	070º30.679	SE	High	High
8	77º43.740	069º29.404	E	High	Medium
9	77º38.990	068º33.849	W	High	High
10	77º16.560	069º05.719	NW	Low	Medium
11	77º29.712	066º41.288	W	High	Low
12	77º29.995	066º30.765	SW	High	Low
13	77º47.096	070º17.617	W	High	High
14	77º42.034	070º40.985	SW	Low	High
15	77º39.227	069º42.463	NW	High	Low
16	77º36.163	068º26.797	W	High	High
17	77º11.482	068º51.948	N	Low	Medium
18	77º12.203	069º04.926	NW	Low	Low

Supplement 3. ***Growth pattern analysis***

Size-at-age data was analysis was based on Maximum Likelihood estimation (Berry & Lindgren 1996). An initial model proposed that growth would follow a sigmoidal growth curve of the Richards family (Richards 1959, Sugden et al. 1981, Blicher et al. 2007):

$$S_t\left(S_\infty, m, t_*, T\right) = S_\infty\left[1-(1-m)\exp\left\{\frac{-(t-t_*)}{Tm^{m/(1-m)}}\right\}\right]^{1/(1-m)} \quad (1)$$

□□ is an age-at-growth inflexion, T (yr) is the time needed to grow from zero to S_∞ at maximum growth rate, and m is a shape factor for Richards curves. An $m \rightarrow 0$ corresponds to von Bertalanffy growth, $m \rightarrow 1$ to Gompertz, and $m = 2$ to single logistic. An error term was considered, such that:

$$S_t = S_t\left(S_\infty, m, t_*, T\right) + \varepsilon_t \quad (2)$$

where S_t is the actual shell length. E_t is assumed to be normally distributed with zero mean and a power relationship between its variance and the predicted shell length, $S_t(S_\infty, m, t_*, T)$:

$$\varepsilon_t \sim N\left\{0, \left(aS_t\left(S_\infty, m, t_*, T\right)^b\right)^2\right\} \quad (3)$$

where a and b define the variance. This is a flexible expression of variance, which includes potential heteroscedasticity. Parameters were fitted by maximising the joint likelihood of the ε_t values, Ln(L). An initial model fitted values of all six parameters to each of 6 groups: Nuuk, Disko Island, Uummannaq, Upernavik, Upernavik MTL – 30 and Qaanaaq LTZ. The model was reduced by constraining parameter values for different groups to be equal or to have specific values. Constraints were tested by likelihood-ratio tests, where the value $-2\text{Ln}(L_0/L_1)$ was tested as chi squared (χ^2) with degrees of freedom equal to the number of constraints. Akaike's Information Criterion, AIC = -2Ln(L) + 2K, and Bayesian Information Cristerion, BIC = -2Ln(L) + K*Ln(n) where K is the number of parameters in the model and n is the number of observations, were used to choosing one model over another (Lebreton et al. 1992). The model fitting was done using Microsoft Excel Solver.

Supplement 4. ***Regression parameters for statistical models.***

For the generalized mixed effects models, we show estimated regression parameters (Estimate), standard errors (Std. Error) and t-values. For each generalised linear model we show degrees of freedom (d.f.), variables deviance (Deviance), likelihood ratio test value (LRT) and significant p values ($p < 0.05$).

	Mytilus abundance			
GLMM Model	**Estimate**	**Std. Error**	**t value**	**p value**
Model 1 (Abundance ~ Location, random = sampling site)				
Intercept	2.632	0.421	6.239	< 0.0001
Nuuk	1.984	0.565	3.505	= 0.0008
Qaanaaq	-26.934	0.565	-47.589	< 0.0001
Upernavik	-2.997	0.585	-5.124	< 0.0001
Uummannaq	-1.066	0.544	-1.958	= 0.0542
Correlation of Fixed Effects:				

	Intercept	Nuuk	Qaanaaq	Upernavik
Nuuk	-0.745			
Qaanaaq	-0.745	0.556		
Upernavik	-0.721	0.537	0.537	
Uummannaq	-0.775	0.577	0.577	0.559

Model 2 (1 yr old recruits ~ Location, random = sampling site)				
(Intercept)	2.307	0.400	5.763	< 0.0001
Nuuk	1.364	0.390	3.465	= 0.0015
Qaanaaq	-25.592	65614.7	-0.001	= 0.9997
Upernavik	-2.646	1.160	-2.279	= 0.0293
Uummannaq	-1.106	0.000	-2.300	< 0.0001

Correlation of Fixed Effects:

	Intercept	Nuuk	Qaanaaq	Upernavik
Nuuk	-0.629			
Qaanaaq	0.000	0.000		
Upernavik	-0.254	0.239	0.000	
Uummannaq	-0.401	0.427	0.000	0.160

Mytilus thermal tolerance

GLM Models (Binomial distribution)	**d.f.**	**Deviance**	**LRT**	**p value**
Model 3 (Survival ~ temperature + Location)				
Temperature	11	109.001	98.930	< 0.0001
Location	1	17.072	7.001	= 0.0082
Model 4 Survival ~ temperature + Size				
Temperature	10	149.589	142.253	< 0.0001
Size	1	12.450	5.114	= 0.0237
Model 5 (Survival ~ temperature + Exposure)				
Temperature	10	185.030	174.810	< 0.0001
Exposure	2	23.613	13.393	= 0.0012

Literature Cited

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