S1. Arrhenius correction

$$T_c = exp\left(\frac{T_A}{T_{ref}} - \frac{T_A}{T}\right)$$

S2. Feeding

$$f_X = \frac{X^2}{X^2 + X_K^2}$$

S3. Assimilation

$$p_A = T_c * p_{Am} * L^2 * s_M * f_X$$

With $p_{Am} = \frac{z * p_M}{\kappa}$

S4. Reserve dynamics

$$dE = p_A - p_C$$

$$p_C = T_c * p_{Am} * L^2 * \frac{g * s_M + \frac{L}{L_M}}{1 + \frac{g}{e}}$$

With $= \frac{v * E}{p_{Am} * V}$, $L_M = z * 1\ (cm)$

S5. Somatic maintenance

$$p_S = T_C * p_M * L^3$$

S6. Somatic growth

$$dV = \begin{cases} if\ H < E_{Hp} \begin{cases} if\ \kappa * p_C \geq p_S\ (i.e.\ \kappa\ rule\ applies): & \frac{\kappa * p_C - p_S}{E_G} \\ if\ \kappa * p_C < p_S\ and\ p_C - p_S - p_J \geq 0: & 0 \\ if\ p_C - p_S - p_J < 0\ and\ V \geq 0.7 * V_{init}: & \frac{p_C - p_S - p_J}{\rho_V} \end{cases} \\ if\ H \geq E_{Hp} \begin{cases} if\ \kappa * p_C \geq p_S: & \frac{\kappa * p_C - p_S}{E_G} \\ if\ \kappa * p_C < p_S\ and\ p_C - p_S - p_J \geq 0: & 0 \\ if\ p_C - p_S - p_J < 0\ and\ V \geq 0.7 * V_{init}: & \frac{p_C - p_S - p_J}{\rho_V} \\ if\ p_C - p_S - p_J < 0\ and\ V < 0.7 * V_{init}: & 0 \end{cases} \end{cases}$$

S7. Maturity maintenance

$$p_J = T_C * k_J * H$$

S8. Development: energy allocation to maturity

$$dH = \begin{cases} if\ H < E_{Hp} \begin{cases} if\ \kappa * p_C \geq p_S: & (1-\kappa) * p_C - p_J \\ if\ \kappa * p_C < p_S\ and\ p_C - p_S - p_J \geq 0: & p_C - p_S - p_J \\ if\ p_C - p_S - p_J < 0: & 0 \end{cases} \\ if\ H \geq E_{Hp}: 0 \end{cases}$$

S9. Energy allocation to reproduction

$$dR = \begin{cases} if\ H \geq E_{Hp} \begin{cases} if\ \kappa * p_C \geq p_S: & (1-\kappa) * p_C - p_J \\ if\ \kappa * p_C < p_S\ and\ p_C - p_S - p_J \geq 0: & p_C - p_S - p_J \\ if\ p_C - p_S - p_J < 0\ and\ V \geq 0.7 * V_{init}: & 0 \\ if\ p_C - p_S - p_J < 0\ and\ V < 0.7 * V_{init}: & p_C - p_S - p_J \end{cases} \\ if\ H < E_{Hp}: 0 \end{cases}$$

Egg batches are released by a given individual if older than 6 months, if its gonado-somatic index (GSI) is above 0.3, and if the current date is within April and September.

$$GSI = \frac{m_R}{m_V + m_E + m_R} = \frac{R * \frac{w_R}{\mu_R}}{V * d_V + E * \frac{w_E}{\mu_E} + R * \frac{w_R}{\mu_R}}$$

Whenever these conditions are fulfilled, the reproductive energy reserves (R) are mobilised to produce an egg batch.

S10. Tables and figures

Table S1. DEB parameters calibrated for Mytilus edulis in the Hardangerfjord. Most parameters are the result of this study. * indicates parameters for which values are taken from Kooijman (2010)

Description	Symbol	Value	Unit
Temperature for which parameters are given	T_{ref}	293.15	K
Zoom factor	z	1.3612	-
Digestion efficiency of food to reserves	K_X	0.7	-
Energy conductance	ν	0.0308	$cm.d^{-1}$
Allocation fraction to soma	κ	0.6287	-
Vol-specific somatic maintenance	p_M	29.2341	$J.d^{-1}.cm^{-3}$
Maturity maintenance rate coefficient	k_J	0.002	d^{-1}
Specific cost for structure	E_G	2326	$J.cm^{-3}$
Maturity at metamorphosis	E_{Hj}	0.0121	J
Maturity at puberty	E_{Hp}	56.2	J
Arrhenius Temperature	T_A	7773	K
Shape coefficient	δ_M	0.2582	-
Half saturation for food	X_K	1.03	$J.l^{-1}$
Structure specific density*	d_V	0.09	$gDW.cm^{-3}$
Food chemical potential*	μ_X	525000	$J.mol^{-1}$
Structure chemical potential*	μ_V	500000	$J.mol^{-1}$
Energy reserves chemical potential*	$\mu_E = \mu_R$	550000	$J.mol^{-1}$
Molecular weight of reserves*	$\omega_E = \omega_R$	23.9	$gDW.mol^{-1}$

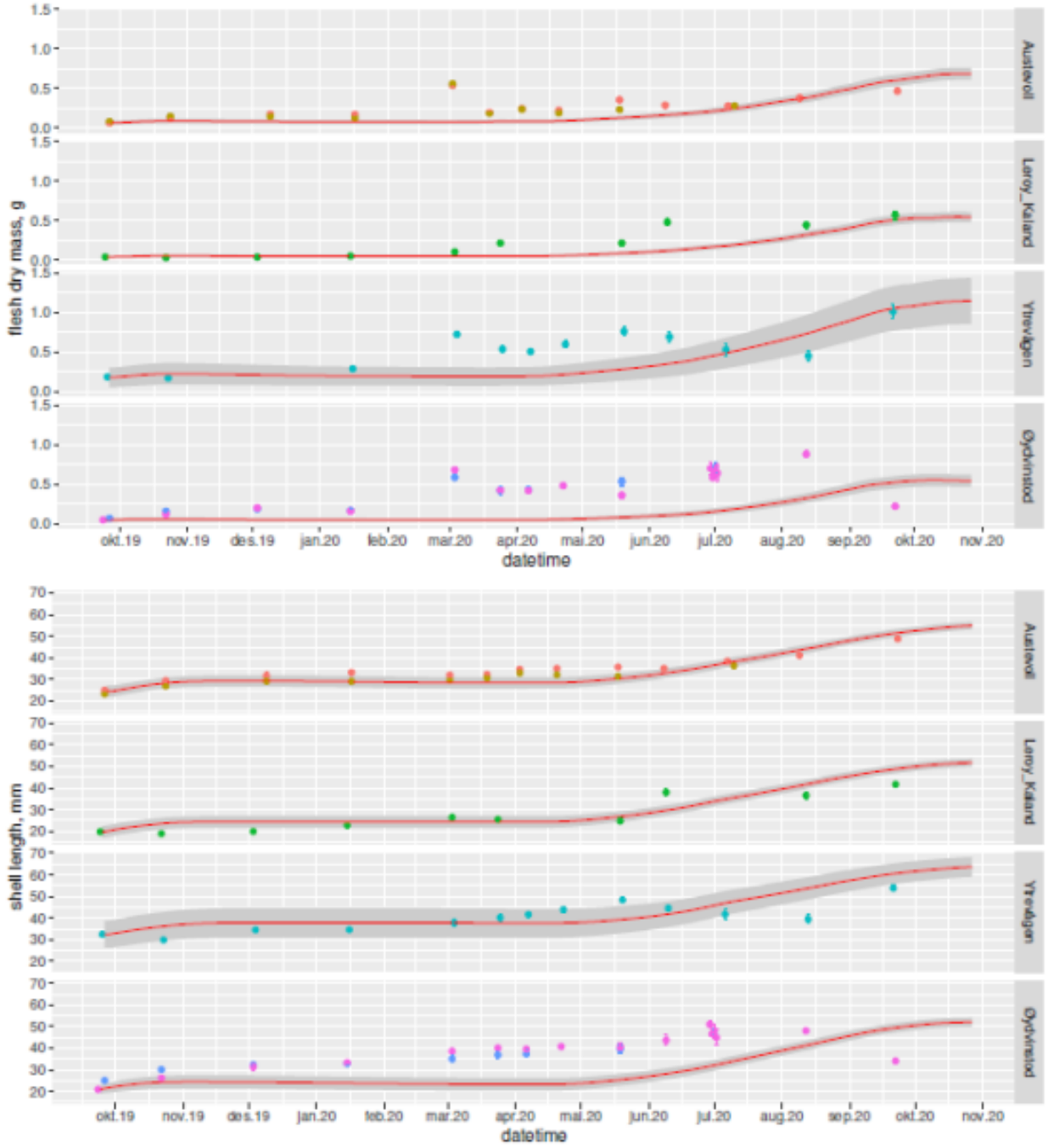

Figure S1: Mussel's growth at four locations along the Hardangerfjord gradient: Øydvinstod the inner one and Austevoll the more coastal. Line and shaded area are the DEB model output for the growth of 100 individuals with the same length and dry mass distribution of the initial mussels set to grow in the locations, dots and bars are measurements of shell length and dry mass of samples of 20 individuals of these populations