Energetic mismatch induced by warming decreases leaf litter decomposition by aquatic detritivores

Theme08 - Introduction to Systems Biology
Reproducing a Research Article

Figure 1: Gammarus fossarum

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Abstract

Max 150-250 words. CHANGE LAYOUT/STYLING ENTIRELY

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Statistical Analysis Equations

The following equations were used to express the mass (M in mg) and temperature (T in Kelvin) dependence of individual RMR and IR:

$$I = \alpha M^b e^{Ea\left(\frac{T-T_0}{k_B T_0 T}\right)} \tag{1a}$$

$$I = \alpha M^b e^{p\left(\frac{T-T_0}{k_B T_0 T}\right) - q\left(\frac{T-T_0}{k_B T_0 T}\right)^2} \tag{1b}$$

Table 1: Definitions/explanations MTE equations

Parameter	Explanation
α	metabolic or ingestion expression level at reference temperature (T_0)
b	the mass-scaling exponent
M	dry body mass (mg)
Ea	activation energy (eV)
k_B	Boltzmann's constant ($8.62 * 10^{-5}$ eV K^{-1})

The standard MTE formulation (1a) is simply a particular case of the quadratic formulation (1b) where $q = 0$ and the equation is reduced to the MTE model where p can thus be interpreted as the activation energy.

Energetic efficiency was also calculated as follows: $E = (IR/RMR) * A_T$, where the ratio of IR to RMR is the ingestion to metabolism efficiency and A_T is the assimilation efficiency at temperature T. The temperature (T in Kelvin) dependence of assimilation efficiency was expressed, using empirical equations and values for detritivores Assimilation efficiency was following a logistic equation with the MTE equation both at the numerator and the denominator With the following formulation, assimilation efficiency is confined between 0 and 1 (no or complete assimilation):

$$A_T = \frac{\alpha e^{Ea\left(\frac{T-T_0}{k_B T_0 T}\right)}}{1 + \alpha e^{Ea\left(\frac{T-T_0}{k_B T_0 T}\right)}} \tag{2}$$

Consumer-Resource Dynamics Model

Below are the ordinary differential equations describing temporal change in leaf litter standing stocks (L) and Gammarus population biomass (G) (Equation 3a and 3b).

$$\frac{dL}{dt} = I - f(L)_{\mathrm{T}} G - k_{\mathrm{T}} L \tag{3a}$$

$$\frac{dG}{dt} = G\left[f(L)_{\mathrm{T}} A - RMR_{\mathrm{T}}\right] \tag{3b}$$

3 Results

4 Discussion and Conclusion

4.1 Discussion

4.2 General conclusion and perspective