**Appendix B: Model Parameterisation**

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*Taxon-specific normalisation constant, B­0­*

Regression analysis of earthworm data (N=28) by Meehan (2006, p. 881) yielded:

In (*maintenance*) = 5.70 + 0.71 In(*M*) – 0.25/*𝜅T*

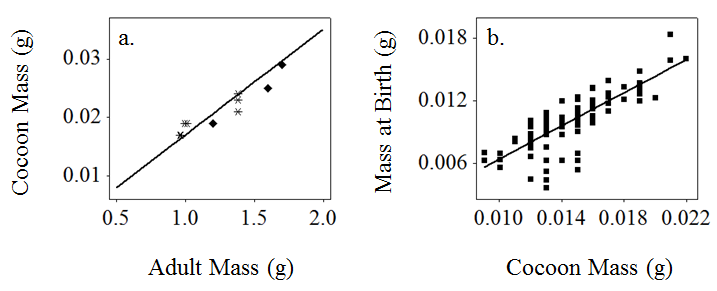
in the notation of Fig. 1, where *maintenance* is measured in J/hour and *M* in mg. Evaluated at *M* = 1g and *T* = 288.15 K (15 °C) gives *maintenance* = 0.04102 kJ/day. From the equation in Figure 1, *B0* = 0.04102 *e* 0.25/*κT* = 968 kJ/day.

*Maximum ingestion rate, IGmax*

In the most comprehensive study of *A. caliginosa* soil egestion rates Taylor and Taylor (2014) recorded individual gut transit times and gut contents. Gut transit times ranged from 8 to 11.5 hours for individuals weighing 0.21 – 0.708 g. Taking the maximum gut transit time to correspond with the largest individual gives 16.24 hours per g earthworm and thus 1.5 feeding events per day. In the same study *A. caliginosa* gut contents was recorded by weighing the dry weight of faeces produced during starvation. A mean value of 0.165 g dw faeces was recorded for a mean individual weight of 0.338 g. Using the above values and assuming a dry:wet weight conversion for soil of 1:1.10 the maximum ingestion rate (*IGmax*) is estimated as 0.805 g/day/g. This value is within the range of *A. caliginosa* ingestion rates reported in the literature, ranging from 0.04 to 1.68 g dry mass g/day (Guild, 1955; Barley, 1959; Curry et al., 1995).

*Mass of Cocoon, Mc & Mass at Birth, Mb*

Boström and Lofs-Holmin (1986) and Boström (1987) observed a strong correlation between adult and cocoon mass (Fig. B.1a) and Pedersen and Bjerre (1991) between cocoon mass and hatchling mass at birth (Fig. B.1b) in *A. caliginosa.* The linear regressions in Fig. B.1a & b are used within the model to predict the parameters mass of cocoon (*Mc*) and mass at birth (*Mb*) from the mass of the reproducing adult.

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**Fig B.1.** Linear regressions (lines) used to model relationships between cocoon mass, *Mc*, mass at birth, *Mb*, and adult mass, with data from a) Boström and Lofs-Holmin (1986) (diamond) and Boström (1987) (asterisk) and b) Pedersen and Bjerre (1991) (square).

*Growth constant, rB*

Sibly et al. (2014) show that the von Bertalanffy growth constant (*rB*) can be estimated by following:

where *Mb* is mass at birth, *Mm*is maximum mass, *Mp* is mass at puberty and *tp* is time at puberty. Lofs-Holmin (1983) record values for *Mb*, *Mp*, *Mm* and *tp* for *A. caliginosa* of 0.025 g, 0.50 g, 2 g and 45 days. These values are used to yield a growth constant value (*rB*) of 0.049.

*Maximum rate of energy allocation to reproduction, rm*

Spurgeon et al. (2000) (Table 2, p. 1803) recorded a cocoon production rate of 1.84 per week for *A. caliginosa* individuals with an average biomass of 0.84 g at 15 °C. This gives a reproduction rate of 0.263 hatchlings individual-1 day-1. The energy costs of producing one cocoon are *Mc* (*Ec* + *Es*) = 0.174 kJ, where *Mc* is calculated as 0.0164 g from the regression equation in Fig. A1a using an adult mass of 0.84 g. These values give a rate of energy allocation to reproduction of 0.046 kJ/day, and corrected for a 1 g individual gives a *rm* value of 0.054 kJ/g day-1 (Table 1).

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