Supplementary Materials for:

Consumption Performance of Five Detritivore Species Feeding on *Alnus glutinosa* Leaf Litter in a Microcosm Experiment

Masoud M. Ardestani [1,2,*], Vladimír Šustr [2] and Jan Frouz [1,2]

[1] Institute for Environmental Studies, Charles University in Prague, Benátská 2, Prague CZ-12801, Czech Republic

[2] Institute of Soil Biology and SoWa Research Infrastructure, Biology Centre, Czech Academy of Sciences, Na Sádkách 7, České Budějovice CZ-37005, Czech Republic

* Correspondence: mortazavi_m2000@yahoo.com, masoud.ardestani@bc.cas.cz; Tel: +420 387 775 853; Fax: +420 385 310 133

Methods:

Usually energy budgets refer to a complete assessment of the allocation of energy ingested and processed until the molecular level. It includes a complete assessment of all the fluxes, including O_2 consumption and calorimetric measurements of all the elements of the budget (e.g., Elliott and Davison, 1975; Evers and Kooijman, 1989). Since we did not measure other components of these complete processes, we used the term "feeding activity" instead of "energy budget" to avoid misleading interpretation. Regarding calorimetric measurements, we only obtained the values for the test animals, not for the other compartments of energy assessment (see Table S2, Supplementary Materials). For obtaining feeding activity parameters, the following method was used:

a) Leaf litter consumption rate (C, mg dry weight day^{-1} $individual^{-1}$); litter consumption (LC) was calculated from the difference between initial dry weight of litter (LDW_i) added at the start of each interval and final dry weight of the remaining leaf litter (LDW_f) of the same interval/replicate:

$$LC = LDW_i - LDW_f \quad (1)$$

Then, these values were corrected for the microbial degradation. For that, the average of dry weight of leaves measured for control treatments (g) of that leaf litter type at each interval was obtained. Leaf consumption values (LC) were reduced from these average control values. Average of four replicates for each animal species was calculated and changed to mg and divided for 7 days (interval duration) and animal numbers (5 animals) in each experimental box. This resulted in litter consumption rates (C) based on mg dry weight of litter per day per individual.

b) Production rate (or animal growth rate, P, mg dry weight day^{-1} $individual^{-1}$); the fresh weight of animals was recalculated to the dry weight using dry to fresh ratio (index). For that, we first divided dry weight of sampled animals at the start of the experiment (ADW_i) by their fresh weight (AFW_i) to get an initial index (d_i):

$$d_i = ADW_i / AFW_i \quad (2)$$

The same calculation was done to get final index (d_f) by dividing dry weight of sampled animals at the end of the experiment (ADW_e) by their fresh weight (AFW_e):

$$d_f = ADW_e / AFW_e \quad (3)$$

Then, an average value from d_i and d_f was obtained (d_{mean}). The growth rate (production rate) was calculated by multiplying d_{mean} to the difference in fresh weight of animals at the beginning of each interval (AFW_a) and fresh weight of animals at the end of the same interval (AFW_b) as follows:

$$AP = (AFW_b - AFW_a) \times d_{mean} \quad (4)$$

By the above equation, fresh weight of animals was converted to dry weight. From the second interval afterwards, AFW_a was the end fresh weight values of the animals from previous interval. These animal production (AP) values were changed to mg and averaged for each animal species. Then, final growth rates were obtained by dividing them for 7 days (interval duration) and animal numbers (5 animals) in each experimental box. This resulted in animal production rates (P) based on mg dry weight of litter per day per individual.

c) Defecation rate (excrement production rate, D, mg dry weight day^{-1} $individual^{-1}$); for each experimental replicate (box), the average dry weight of compiled excrement at the end each interval was obtained for each animal species. Then, the values were changed to mg and divided for 7 days (interval duration) and animal numbers (5 animals) in each experimental box. This resulted in excrement production rates (D values) based on mg dry weight of litter per day per individual.

d) Assimilation rate parameter (A, mg dry weight day^{-1} $individual^{-1}$); for calculating assimilation rates, all litter consumption rates (C) were reduced from excrement production rates (D) for each animal species:

$$A = C - D \quad (5)$$

e) Assimilation efficiency (%); for calculating assimilation efficiency for each animal species at different intervals, the following equation was used (e.g., Ross, 1978):

$$Ae = (A / C) \times 100 \quad (6)$$

Where Ae is assimilation efficiency in percentage; A is assimilation rate in mg dry weight per day per individual; C is consumption rate in mg dry weight leaf litter per day per individual.

f) Production efficiency; this feeding activity parameter was calculated based on the following equation:

$$Pe = (P / A) \times 100 \quad (7)$$

Where Pe is production efficiency in percentage; P is the growth rate of the animals (production rate) at each interval in mg dry weight per individual per day, and A is assimilation rate.

Elliott, J.M., Davison, W., 1975. Energy equivalents of oxygen consumption in animal energetics. Oecologia 19: 195-201.

Evers, E.G., Kooijman, S.A.L.M., 1989. Feeding, digestion, and oxygen consumption in Daphnia magna: a study in energy budgets. Netherlands Journal of Zoology 39: 56-78.

Ross, S.E., 1978. The relationship of age, sex, and reproductive state to assimilation efficiency in the adult milkweed bug *Oncopeltus fasciatus*. Journal of Insect Physiology 24: 305-308.

Figure S1. The animal species used in the feeding experiment: *Telodeinopus aoutii* (TA), *Epibolus pulchripes* (EP), *Cylindroiulus caeruleocinctus* (CC), *Glomeris hexasticha* (GH), and *Porcellio scaber* (PS).

The average animal's length was approximately 6.5, 6, 3, 2, and 1.5 cm, respectively (n=10). The average animal's weight at the beginning of the test was approximately 1.1, 2.3, 0.14, 0.10, 0.03 g, respectively (n=10).

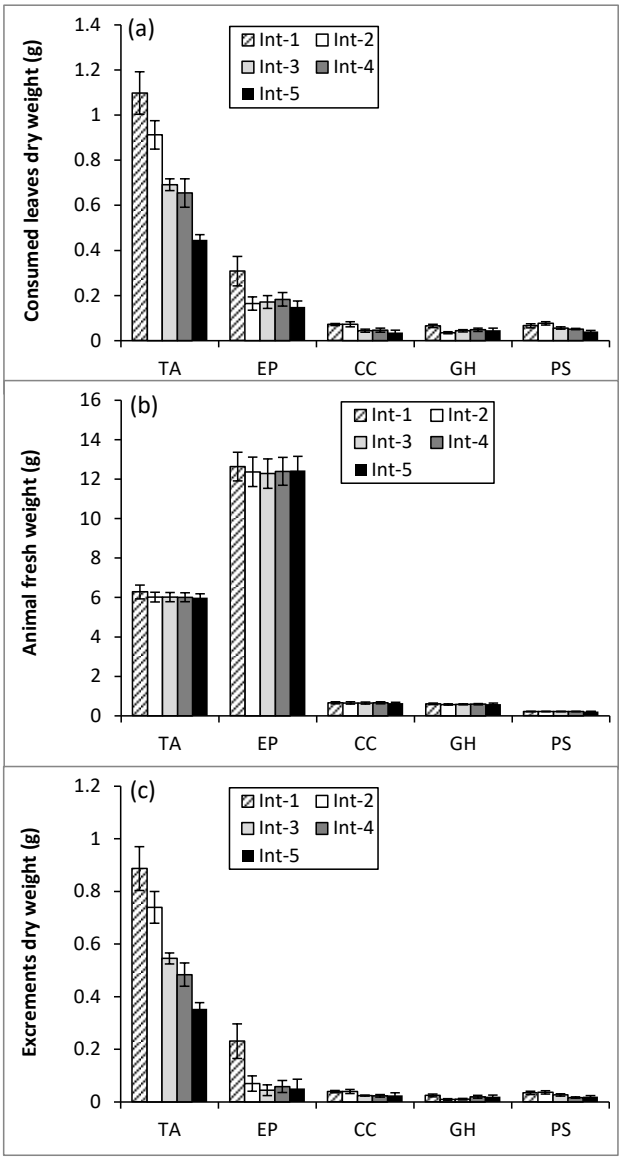

Figure S2. The consumed leaf litter (a), animals' fresh weight (b), and produced excrements (c) for five detritivore species feeding on *Alnus glutinosa* in a five-interval test.

The animal species were: *Telodeinopus aoutii* (TA), *Epibolus pulchripes* (EP), *Cylindroiulus caeruleocinctus* (CC), *Glomeris hexasticha* (GH), and *Porcellio scaber* (PS). The first two big-size species (*T. aoutii* and *E. pulchripes*) were kept at 25 °C, similar to their natural tropical habitats and the last three small-size species were kept at 15 °C. The duration of each interval (Int) was one week. Four replicates for each interval/animal were used. All values are based on total dry weight (g) measured at the end of each interval. Data represent mean ± standard error (SE).

Table S1. The consumption rate, animal growth rate, excrement production rate, and assimilation rate (mg dry weight day^{-1} $g_{fresh\ body\ weight}^{-1}$) for five detritivore species feeding on *Alnus glutinosa* leaf litter in a five-interval test.

Animal species	Time	*Telodeinopus aoutii*	*Epibolus pulchripes*	*Cylindroiulus caeruleocinctus*	*Glomeris hexasticha*	*Porcellio scaber*
Litter consumption rate	Interval 1	21.8	3.18	11.6	10.9	32.0
	Interval 2	20.3	1.68	11.8	3.81	39.4
	Interval 3	16.1	1.79	5.59	6.36	24.2
	Interval 4	15.2	1.93	5.92	6.99	21.4
	Interval 5	10.3	1.54	3.14	6.58	14.3
Animal growth rate	Interval 1	0.00	0.00	0.00	0.00	0.43
	Interval 2	0.00	0.00	0.00	0.00	0.00
	Interval 3	0.06	0.00	0.00	0.60	0.35
	Interval 4	0.00	0.35	1.43	0.57	0.62
	Interval 5	0.00	0.13	0.00	0.27	0.00
Excrement production rate	Interval 1	17.8	2.56	8.75	5.92	23.4
	Interval 2	16.8	0.83	8.66	2.17	25.0
	Interval 3	13.0	0.52	5.35	2.88	17.9
	Interval 4	11.5	0.69	5.17	4.70	11.1
	Interval 5	8.47	0.62	5.06	4.82	13.6
Assimilation rate	Interval 1	3.93	0.63	2.88	5.01	8.59
	Interval 2	3.58	0.85	3.15	1.65	14.3
	Interval 3	3.06	1.28	0.24	3.48	6.24
	Interval 4	3.65	1.24	0.75	2.30	10.3
	Interval 5	1.83	0.92	0.00	1.76	0.78

The animal species were: *Telodeinopus aoutii*, *Epibolus pulchripes*, *Cylindroiulus caeruleocinctus*, *Glomeris hexasticha*, and *Porcellio scaber*. The first two big-size species (*T. aoutii* and *E. pulchripes*) were kept at 25 °C, similar to their natural tropical habitats and the last three small-size species were kept at 15 °C. The duration of each interval was one week. Four replicates for each interval/animal were used. The feeding activity parameters were calculated based on the method described in the Supplementary Materials.

Table S2. The calorimetric values for five detritivore species feeding on *Alnus glutinosa* leaf litter in a five-interval test.

Animal species	***Telodeinopus aoutii***	***Epibolus pulchripes***	***Cylindroiulus caeruleocinctus***	***Glomeris hexasticha***	***Porcellio scaber***
With ash	19.2	19.4	19.2	19.9	19.6
Without ash	20.7	20.8	20.7	20.9	21.2

The animal species were: *Telodeinopus aoutii*, *Epibolus pulchripes*, *Cylindroiulus caeruleocinctus*, *Glomeris hexasticha*, and *Porcellio scaber*. The first two big-size species (*T. aoutii* and *E. pulchripes*) were kept at 25 °C, similar to their natural tropical habitats and the last three small-size species were kept at 15 °C. The duration of each interval was one week. Four replicates for each interval/animal were used. The feeding activity parameters were calculated based on the method described in the Supplementary Materials. The energetic content the animals at the start and at the end of experiment was established by burning of the dry materials in a micro-calorimeter (Ika-Calorimeter C700T, Hamburg, Germany). At the start and end of the test, two replicates for each test animal were measured. Data represent the average measurements of start and end sampled animals. All values are in KJ g^{-1} dry weight of samples.