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Analyis of eliminaton products of some gastropod species.

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Abstract
This work presents results on the daily average leaf consumption of six gastropod species fed in laboratory conditions as well as the average consumption of specimens living in a 1 m^2 area examined via quadrate sampling. Furthermore, the quantities of total elimination products (mucus and dejecta) have been calculated in relation to the food consumed in percentage of the elimination products for 1 m^2 (table 1). Regarding the consumption *Limax cinereoniger* proved to be the most agile. *Helix* had the highest rates of daily consumption and elimination along with those calculated for 1 m^2. Furthermore, high daily leaf consumption rates have been observed for the species *Pomatias* along with high elimination percentage for the species *Bradybaena*.
Keywords: consumption, mucus, dejecta per 1 m^2

Introduction

There are hardly any studies dealing with the eliminatory analysis of terrestrial gastropods. Such studies have been carried out by GERE (1956-1978) in Hungary for slaters and diplopods. The productivity analyses of BLESS (1978) were focusing on the detailed examination of the energy content of organic materials consumed by animals including molluscs as well.

In this work gastropod specimens were collected from different forest habitats via quadrate sampling and examined in laboratory conditions with regard to their daily consumption and elimination (mucus and dejecta). The results gained have been used for calculating the average consumption and elimination rates and quantities for larger populations (1 m^2) of the species under examination via extrapolation based on specimen numbers from quadrate sampling.

Material and method

In the days following field collections 1-3 specimens of the species collected were placed into bowls with a glass cover in the laboratory along with a piece of weighed fresh leaf. Consumption as well as the production of mucus and dejecta has been analysed for 5-10 days. Data gained have been averaged on the basis of specimen number in the quadrates and extrapolated to 1 m^2 (multiplied with 1.6).

The species examined were collected at the following habitats:
Pomatias rivulare (EICHWALD 1829): Bátorliget 24.07.1975., Fraxino-Ulmetum hungaricum SOÓ 1963 (24 specimen in 10 quadrates).
Limax cinereoniger WOLF 1803: Síkfőkút 1975 x 5, Quercetum petreae cerris pannonicum SOÓ 1962 (5 specimen in 10 quadrates, 3 specimen were fed with *Lamium maculatum* L. and *Euonimus europaeus* L. leaves.
Bradybaena fruticum (O.F. MÜLLER 1774): Kiskőrős-Szücsi 09.04.1995. Fraxino Ulmetum hungaricum SOÓ 1963 (from 10 quadrates 3 species fed with *Urtica dioica* L. leaves).

Perforatella vicina (ROSSMÄSSLER 1838): Bagiszeg 22.07.1975. Fraxino-Ulmetum hungaricum SOÓ & KOMLÓDI 1960. (21 specimen from 10 quadrates, 2 specimen fed with *Sambucus ebulus* L., and decaying twigs and oak leaves, average rates were calculated separately for the 21 specimen).
Chilostoma banaticum (ROSSMÄSSLER 1838): Bagiszeg 22.07.1975. Fraxino-Ulmetum hungaricum SOÓ & KOMLÓDI 1960. (6 specimen from 10 quadrates, 2 specimen fed with *Sambucus ebulus* L. leaves).
Helix pomatia (LINNÉ 1758): Síkfőkút 1975x5 Quercetum petreae cerris pannonicum SOÓ 1962 (3 specimen from 10 quadrates, 1 specimen fed with *Euonimus europaeus* L. leaves).

Average weight of the specimens fed along with those of the leaves consumed and the mucus and dejecta produced daily were measured and calculated. The gained data have been multiplied with the number of specimens found in the 10 quadrates and extrapolated to 1 m^2. In order to differentiate between the elimination products of specimens kept on different diets in case of the species Perforatella, averaging and calculations for extrapolated to 1 m^2 were made separately for the specimens examined regarding their diets. The temperature in the lab was between 22-27 degrees C°, corresponding to the prevailing climatic conditions experienced in the forest habitats under examination.

Percentages of mucus and dejecta productions were calculated on the basis of the total consumption of the species examined and were compared to the similar data of GERE for diplopods and isopods.

Results
Data regarding the daily average leaf consumption as well as mucus and dejecta production of the species examined along with those calculated for specimens on a 1 m^2 habitat are presented in table 1.

The species *Helix pomatia* had the highest rates of daily consumption. The species *Perforatella vicina* (ROSSMÄSSLER 1838) preferred the decaying twigs and elder to the oak leaves regarding consumption. The daily mucus and dejecta production of this latter species was the lowest in case of the decaying twig diet as well. Furthermore, rates of elimination (mucus and dejecta) were quite low for the species *Pomatias* and *Chilostoma*.

In case of data extrapolated to 1 m^2 the highest values of leaf consumption were those of *Pomatias* and *Chilostoma.* Elimination (mucus and dejecta) was high for *Pomatias* and *Limax cinereoniger* and quite low for the rest of the species examined.

The percentage values of elimination in relation to leaf consumption give a totally different picture as it is seen in table 1. : the species *Limax, Helix* and *Bradybaena* bear very high percentages in all likelyhood indicating their larger agilities. Their rates of mucus elimination - utilized for movement - contributes significantly to the percentages of total elimination (BÁBA 2000).

In case of the diplopods and isopods daily dejecta elimination was 3.29-3.94 mg for *Glomeris*, 0.82-3.87 mg for *Chromatojulus* and 0.25-0.97 mg for *Protracheoniscus* (GERE 1956) in case of the consumption of oak leaves. Percentages of dejecta elimination in relation to consumption (oak leaf litter and oak leaves) for the diplopod *Chromatojulus*, *Ophyiulus*, *Cylindroiulus* and *Plydesmus* were between 74.33 and 106.5 %, significantly higher than those gained for gastropods (GERE 1962).

Summary
Consumption and elimination of mucus and dejecta of six gastropod species fed in laboratory conditions were analyzed in details. Data gained regarding the daily average leaf consumption and that extrapolated to 1 m^2 along with the percentages of mucus and dejecta eliminated in relation to the food consumed in an area of 1 m^2 are presented in table 1. The species *Pomatias rivulare, Limax cinereoniger* and *Helix pomatia* bore the highest averages of daily leaf consumption. Daily mucus and dejecta elimination was the lowest for *Pomatias* and *Chilostoma*. In case of the specimens of the species *Perforatella vicina* kept on different diets elimination was lower for those feeding on decaying twigs.

Average leaf consumption was the highest for *Pomatias* and *Chilostoma* in case of the specimens living in 1 m^2. Elimination rates extrapolated to 1 m^2 were the highest for *Pomatias* and *Limax cinereoniger*. Percentages of mucus and dejecta eliminated in relation to the food consumed in an area of 1 m^2 were the highest in case of the more agile *Limax, Helix* and *Bradybaena*. Percentages of dejecta eliminated were significantly higher in case of the diplopods examined by GERE 1962 compared to our gastropods.

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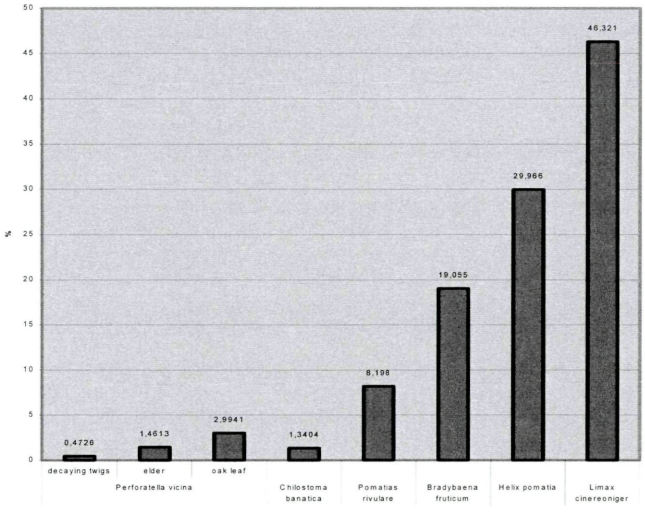
Table 1: The average leaf consumption (daily and extrapolated to 1 m^2) along with the percentages of mucus and dejecta eliminated in relation to the food consumed in an area of 1 m^2 for the species examined.



Species	Daily average production		Production for 1 m2		%
	Leaf consumption gr	Mucus+dejecta mg	Leaf consumption gr	Mucus+dejecta mg	
Pomatias rivulare (Eichwald 1828)	7,006	0,0098	70,256	12,972	8,198
Limax cinereoniger Wolf 1803)	0,7931	0,4467	4,7591	5,842	46,32
Bradybaena fruticum (O.F. Müller 1774)	0,1907	0,1098	6,6771	1,2725	19,06
Perforatella vicina (Rossmässler 1842)					
decaying twigs	1,988	0,0128	37,7839	0,1786	0,473
oak leaf	0,4731	0,0241	5,677	0,17	2,994
elder	0,5611	0,00955	14,5889	0,2132	1,461
Chilostoma banatica (Rossmässler 1838)	0,44	0,0589	70,404	0,9437	1,34
Helix pomatia (Linné 1758)	0,66	0,1116	2,1808	0,6535	29,97