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Note on the diet of two newt species in Jiului Gorge National Park, Romania

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Abstract. In the spring of 2009 we analysed the feeding of *Lissotriton vulgaris* and *Triturus cristatus* newts from a puddle from Jiului Gorge National Park. The strong water decrease from the habitat registered in one of the study periods due to drought has highly affected the feeding of the newts. Thus, *T. cristatus* consumed numerous individuals of *L. vulgaris* only in that period. *T. cristatus* females fed with larger and less mobile preys than the males. In relation with the previous studies, the massive consumption of microcrustaceans by *T. cristatus* seems to indicate less favourable trophic conditions in the studied habitat.

Key words: newts, precipitation, agglomeration, trophic offer, protection.

Introduction

Newts are rare in Jiului Gorge National Park from southern Romania, due to the scarcity of reproduction habitats, caused by the extremely abrupt slopes from the area (Covaciu-Marcov et al. 2009). The existing populations are generally small, occupying reduced sized habitats (Covaciu-Marcov et al. 2009), with the exception of the habitat from Comanda, which seems to be the only one capable of sustaining larger populations of *Lissotriton vulgaris* and *Triturus cristatus* (Covaciu-Marcov et al. 2009, Dobre et al. 2009). However, the data regarding newts` feeding from Jiului Gorge are not from Comanda, but from a habitat from Meri (Dobre at al. 2007). That population had an intense feeding, but the study aimed only *T. cristatus* species and did not follow the seasonal feeding evolution (Dobre et al. 2007). Thus, we have proposed to observe, during a longer period, how are the newts' trophic requirements satisfied in the puddle from Comanda. Knowing the feeding of newts in their most favourable habitat from the region has a conservative importance, both species being protected in different degrees (O.U.G. 57/2007). It has been recently proved that not only *T. cristatus*, a rarer and conservatively more important species, but also *L. vulgaris* are equally endangered by the habitat deterioration (Denoël et al. 2013). The newts' habitats from Jiului Gorge are anyhow extremely rare, being recommended to realise artificial reproduction habitats (Covaciu-Marcov et al. 2009). Therefore, before they can be realised, it must be seen how the newts feed in the natural habitats from the region.

Material and Methods

The field studies were realised in April and May 2009, when we also investigated the population dynamics of the newts from Comanda (Dobre et al. 2009). The newts were captured in four days (Table 1), with round nets attached on 2 m long handles. The habitat is a quasi-permanent puddle, situated on a small plateau, at approximately 900 m altitude. The water level depends on the precipitation, decreasing a lot during the droughty periods, fact which was obvious in the spring of 2009. The habitat is used by the cattle of the few locals as a watering place (Covaciu-Marcov et al. 2009). We sampled stomach contents from 434 newts from both species and sexes (Table 1). The stomach contents were sampled using the stomach flushing method (e.g. Solé et al. 2005), as well as in the case of other recent studies upon the newts' feeding (e.g. Covaciu-Marcov et al. 2010 a,b, 2012, Bogdan et al. 2011, 2013). The newts were immediately released afterwards. The contents were preserved in test tubes and determined in the laboratory, afterwards calculating the percentage abundance (%A) and frequency of occurrence (%f). The food diversity was calculated using the Shannon-Wiever index (1949), while the overlapping of the trophic niches with the Pianka index (Pianka 1973).

Results

The newts consumed in total 5023 preys (Table 2). *L. vulgaris* ingested much more preys than *T. cristatus* (3789 in comparison to 1234). At *L. vulgaris* the average number of preys / individual was 20.91, while for *T cristatus* it was of 13.56. The preys belonged to 19 prey taxa. Due to the fact that from some taxa, the newts consumed both aquatic as well as terrestrial forms, we separated the 19 prey taxa in 29 categories (Tables 3, 4, 5, 6). The only prey taxon that was consumed by both species in each period was coleoptera. Four prey taxa were consumed by *L. vulgaris* in each of the four study periods (crustacean cladocera, crustacean ostracoda,

Table 1. Total number of studied individuals.
(Lv- *Lissotriton vulgaris*, Tc- *Triturus cristatus*, f- females, m- males)

	01.04.2009				18.04.2009				28.04.2009				22.05.2009			
	Lv		Tc		Lv		Tc		Lv		Tc		Lv		Tc	
	f	m	f	m	f	m	f	m	f	m	f	m	f	m	f	m
individuals	27	30	40	33	31	31	28	29	30	30	16	16	30	29	14	20
Total	57		73		62		57		60		32		59		34	

Table 2. The number of prey items and the feeding intensity.
(Lv- *Lissotriton vulgaris*, Tc- *Triturus cristatus*, f- females, m- males, o= overall)

	01.04.2009				18.04.2009			
	Lv		Tc		Lv		Tc	
	f	m	f	m	f	m	f	m
No. of prey items	422	770	299	229	712	571	40	34
	O: 1192		O: 528		O: 1283		O: 74	
Average no. of prey items	15.63	25.67	7.48	6.94	22.97	18.42	1.43	1.17
	O: 20.91		O: 7.23		O: 20.69		O: 1.30	
Max.um no. of preys / individual	43.00	33.00	42.00	31.00	47.00	41.00	21.00	13.00
	O: 43.00		O: 42.00		O: 47.00		O: 21.00	

	28.04.2009				22.05.2009			
	Lv		Tc		Lv		Tc	
	f	m	f	m	f	m	f	m
No. of prey items	299	379	32	139	289	347	230	231
	O: 678		O: 171		O: 636		O: 461	
Average no. of prey items	9.97	12.63	2.00	8.69	9.63	11.97	16.43	11.55
	O: 11.30		O: 5.34		O: 10.78		O: 13.56	
Max.um no. of preys / individual	36.00	26.00	6.00	16.00	26.00	28.00	48.00	29.00
	O: 36.00		O: 16.00		O: 28.00		O: 48.00	

diptera nematocera larvae and diptera brachycera). *T. cristatus*, constantly consumed only one prey taxon, trichoptera larvae.

The number of consumed prey taxa differ seasonally, the most being consumed at the end of May. The differences can be observed both between the species, as well as between the males and females from each species. At both species, in almost all of the periods, the highest amounts and frequencies were obtained by

Table 3. The percentage abundance (%A) of the prey items by species. (Lv- *Lissotriton vulgaris*, Tc- *Triturus cristatus*, aq- aquatic, L- larvae)

	01.04.2009		18.04.2009		28.04.2009		22.05.2009	
	Lv	Tc	Lv	Tc	Lv	Tc	Lv	Tc
Oligochaeta	0.42	3.41	-	-	-	-	0.47	0.43
Gastropoda [aq]	-	-	-	-	-	-	-	0.22
Gastropoda	-	-	-	-	-	-	-	0.22
Arachnida	-	-	-	-	-	0.58	0.47	-
Crustacea Copepoda	4.53	-	0.23	-	72.42	56.73	2.67	0.65
Crustacea Cladocera	87.58	94.32	96.41	32.43	-	-	77.67	85.90
Crustacea Ostracoda	4.78	-	0.94	-	20.80	28.65	2.99	1.74
Crustacea Isopoda	-	-	-	-	0.15	-	-	-
Collembola	1.93	-	-	-	-	-	-	-
Ephemeroptera [L.]	-	-	-	-	-	-	0.47	0.22
Odonata [L.]	-	-	-	-	-	0.58	-	0.22
Heteroptera [aq]	-	-	-	2.70	-	-	-	0.22
Heteroptera	0.08	-	-	-	-	-	-	-
Coleoptera Dytiscidae [L.]	0.08	0.76	-	4.05	-	-	1.10	0.22
Coleoptera undet.	0.08	0.38	0.08	1.35	1.18	1.17	3.14	6.72
Coleoptera Carabidae	-	-	-	-	-	0.58	-	-
Coleoptera Curculionidae	-	-	0.08	-	0.44	-	-	-
Coleoptera Staphylinidae	-	0.19	-	-	-	0.58	-	-
Lepidoptera [L.]	-	0.38	-	-	-	-	-	0.43
Lepidoptera	-	-	-	-	-	-	-	0.22
Trichoptera [L.]	-	0.38	-	4.05	-	1.17	-	0.22
Diptera Nematocera [L.]	0.25	-	2.10	12.16	3.39	4.09	10.38	1.30
Diptera Nematocera	-	-	0.08	-	-	-	-	-
Diptera Brahicera [L.] [aq]	-	-	-	-	-	-	-	0.22
Diptera Brahicera	0.25	-	0.08	-	1.33	-	0.16	0.87
Hymenoptera undet.	-	-	-	-	-	0.58	-	-
Hymenoptera Formicidae	-	0.19	-	-	0.29	-	0.31	-
Urodela [*L.vulgaris*]	-	-	-	-	-	4.68	-	-
Anura [L.]	-	-	-	43.24	-	0.58	0.16	-

aquatic microcrustacean (copepods, cladocera or ostracoda). Together with these, high amounts and frequencies were sometimes recorded by diptera nematocera larvae or coleoptera (Tables 5, 6). Concerning the frequency, only at *T. cristatus* did the tadpoles register importance on one occasion. Also, on another case the

Table 4/A. The percentage abundance (%A) of the prey items by sexes.
(Lv- *Lissotriton vulgaris*, Tc- *Triturus cristatus*,
f- females, m- males, aq- aquatic, L- larvae)

	01.04.2009				18.04.2009			
	Lv		Tc		Lv		Tc	
	f	m	f	m	f	m	f	m
Oligochaeta	-	0.65	2.68	4.37	-	-	-	-
Gastropoda [aq]	-	-	-	-	-	-	-	-
Gastropoda	-	-	-	-	-	-	-	-
Arachnida	-	-	-	-	-	-	-	-
Crustacea Copepoda	-	7.01	-	-	-	0.53	-	-
Crustacea Cladocera	98.10	81.82	94.65	93.89	95.93	97.02	52.50	8.82
Crustacea Ostracoda	-	7.40	-	-	0.42	1.58	-	-
Crustacea Isopoda	-	-	-	-	-	-	-	-
Collembola	-	2.99	-	-	-	-	-	-
Ephemeroptera [L.]	-	-	-	-	-	-	-	-
Odonata [L.]	-	-	-	-	-	-	-	-
Heteroptera [aq]	-	-	-	-	-	-	2.50	2.94
Heteroptera	0.24	-	-	-	-	-	-	-
Coleoptera Dytiscidae [L.]	0.24	-	1.34	-	-	-	-	8.82
Coleoptera undet.	-	0.13	-	0.87	-	0.18	2.50	-
Coleoptera Carabidae	-	-	-	-	-	-	-	-
Coleoptera Curculionidae	-	-	-	-	0.14	-	-	-
Coleoptera Staphylinidae	-	-	-	0.44	-	-	-	-
Lepidoptera [L.]	-	-	0.67	-	-	-	-	-
Lepidoptera	-	-	-	-	-	-	-	-
Trichoptera [L.]	-	-	0.33	0.44	-	-	-	8.82
Diptera Nematocera [L.]	0.71	-	-	-	3.23	0.70	12.50	11.76
Diptera Nematocera	-	-	-	-	0.14	-	-	-
Diptera Brahicera [L.] [aq]	-	-	-	-	-	-	-	-
Diptera Brahicera	0.71	-	-	-	0.14	-	-	-
Hymenoptera undet.	-	-	-	-	-	-	-	-
Hymenoptera Formicidae	-	-	0.33	-	-	-	-	-
Urodela [*L.vulgaris*]	-	-	-	-	-	-	-	-
Anura [L.]	-	-	-	-	-	-	30.00	58.82

Table 4/B. The percentage abundance (%A) of the prey items by sexes.
(Lv- *Lissotriton vulgaris*, Tc- *Triturus cristatus*,
f- females, m- males, aq- aquatic, L- larvae)

	28.04.2009				22.05.2009			
	Lv		Tc		Lv		Tc	
	f	m	f	m	f	m	f	m
Oligochaeta	-	-	-	-	-	0.86	0.87	-
Gastropoda [aq]	-	-	-	-	-	-	-	0.43
Gastropoda	-	-	-	-	-	-	-	0.43
Arachnida	-	-	-	0.72	0.35	0.58	-	-
Crustacea Copepoda	65.89	77.57	25.00	64.03	5.88	-	-	1.30
Crustacea Cladocera	-	-	-	-	70.24	83.86	82.17	89.61
Crustacea Ostracoda	24.75	17.68	28.13	28.78	1.73	4.03	3.48	-
Crustacea Isopoda	0.33	-	-	-	-	-	-	-
Collembola	-	-	-	-	-	-	-	-
Ephemeroptera [L.]	-	-	-	-	0.69	0.29	0.43	-
Odonata [L.]	-	-	-	0.72	-	-	-	0.43
Heteroptera [aq]	-	-	-	-	-	-	0.43	-
Heteroptera	-	-	-	-	-	-	-	-
Coleoptera Dytiscidae [L.]	-	-	-	-	1.73	0.58	-	0.43
Coleoptera undet.	0.33	1.85	-	1.44	3.11	3.17	8.70	4.76
Coleoptera Carabidae	-	-	-	0.72	-	-	-	-
Coleoptera Curculionidae	1.00	-	-	-	-	-	-	-
Coleoptera Staphylinidae	-	-	-	0.72	-	-	-	-
Lepidoptera [L.]	-	-	-	-	-	-	0.87	-
Lepidoptera	-	-	-	-	-	-	0.43	-
Trichoptera [L.]	-	-	3.13	0.72	-	-	-	0.43
Diptera Nematocera [L.]	4.68	2.37	21.88	-	15.57	6.05	0.43	2.16
Diptera Nematocera	-	-	-	-	-	-	-	-
Diptera Brahicera [L.] [aq]	-	-	-	-	-	-	0.43	-
Diptera Brahicera	2.68	0.26	-	-	0.35	-	1.74	-
Hymenoptera undet.	-	-	-	0.72	-	-	-	-
Hymenoptera Formicidae	0.33	0.26	-	-	-	0.58	-	-
Urodela [*L.vulgaris*]	-	-	21.88*	0.72	-	-	-	-
Anura [L.]	-	-	-	0.72	0.35	-	-	-

Table 5. The frequency of occurrence (%f) of the prey items by species. (Lv- *Lissotriton vulgaris*, Tc- *Triturus cristatus*, aq- aquatic, L- larvae)

	01.04.2009		18.04.2009		28.04.2009		22.05.2009	
	Lv	Tc	Lv	Tc	Lv	Tc	Lv	Tc
Oligochaeta	7.02	17.81	-	-	-	-	3.39	5.88
Gastropoda [aq]	-	-	-	-	-	-	-	2.94
Gastropoda	-	-	-	-	-	-	-	2.94
Arachnida	-	-	-	-	-	3.13	5.08	-
Crustacea Copepoda	8.77	-	1.61	-	60.00	31.25	3.39	2.94
Crustacea Cladocera	94.74	46.58	88.71	3.51	-	-	61.02	61.76
Crustacea Ostracoda	7.02	-	3.23	-	31.67	18.75	6.78	5.88
Crustacea Isopoda	-	-	-	-	1.67	-	-	-
Collembola	3.51	-	-	-	-	-	-	-
Ephemeroptera [L.]	-	-	-	-	-	-	5.08	2.94
Odonata [L.]	-	-	-	-	-	3.13	-	2.94
Heteroptera [aq]	-	-	-	3.51	-	-	-	2.94
Heteroptera	1.75	-	-	-	-	-	-	-
Coleoptera Dytiscidae [L.]	1.75	5.48	-	5.26	-	-	8.47	2.94
Coleoptera undet.	1.75	2.74	1.61	1.75	11.67	6.25	30.51	41.18
Coleoptera Carabidae	-	-	-	-	-	3.13	-	-
Coleoptera Curculionidae	-	-	1.61	-	5.00	-	-	-
Coleoptera Staphylinidae	-	1.37	-	-	-	3.13	-	-
Lepidoptera [L.]	-	2.74	-	-	-	-	-	5.88
Lepidoptera	-	-	-	-	-	-	-	2.94
Trichoptera [L.]	-	2.74	-	5.26	-	6.25	-	2.94
Diptera Nematocera [L.]	5.26	-	25.81	10.53	15.00	9.38	45.76	8.82
Diptera Nematocera	-	-	1.61	-	-	-	-	-
Diptera Brahicera [L.] [aq]	-	-	-	-	-	-	-	2.94
Diptera Brahicera	3.51	-	1.61	-	11.67	-	1.69	5.88
Hymenoptera undet.	-	-	-	-	-	3.13	-	-
Hymenoptera Formicidae	-	1.37	-	-	3.33	-	3.39	-
Urodela [*L.vulgaris*]	-	-	-	-	-	25.00	-	-
Anura [L.]	-	-	-	21.05	-	3.13	1.69	-

urodela, represented by *L. vulgaris* individuals was important prey taxa. Thus, in 28 IV, the 16 analysed *T. cristatus* females captured 7 *L. vulgaris* individuals (one female and six males). Unlike the females, only one *T. cristatus* male ingested a *L. vulgaris* male. In the other three periods, neither of the analysed *T. cristatus*

Table 6/A. The frequency of occurrence (%f) of the prey items by sexes. (Lv- *Lissotriton vulgaris*, Tc- *Triturus cristatus*, f- females, m- males, aq- aquatic, L- larvae)

	01.04.2009				18.04.2009			
	Lv		Tc		Lv		Tc	
	f	m	f	m	f	m	f	m
Oligochaeta	-	13.33	17.50	18.18	-	-	-	-
Gastropoda [aq]	-	-	-	-	-	-	-	-
Gastropoda	-	-	-	-	-	-	-	-
Arachnida	-	-	-	-	-	-	-	-
Crustacea Copepoda	-	16.67	-	-	-	3.23	-	-
Crustacea Cladocera	88.89	100.00	45.00	48.48	90.32	87.10	3.57	3.45
Crustacea Ostracoda	-	13.33	-	-	3.23	3.23	-	-
Crustacea Isopoda	-	-	-	-	-	-	-	-
Collembola	-	6.67	-	-	-	-	-	-
Ephemeroptera [L.]	-	-	-	-	-	-	-	-
Odonata [L.]	-	-	-	-	-	-	-	-
Heteroptera [aq]	-	-	-	-	-	-	3.57	3.45
Heteroptera	3.70	-	-	-	-	-	-	-
Coleoptera Dytiscidae [L.]	3.70	-	10.00	-	-	-	-	10.34
Coleoptera undet.	-	3.33	-	6.06	-	3.23	3.57	-
Coleoptera Carabidae	-	-	-	-	-	-	-	-
Coleoptera Curculionidae	-	-	-	-	3.23	-	-	-
Coleoptera Staphylinidae	-	-	-	3.03	-	-	-	-
Lepidoptera [L.]	-	-	5.00	-	-	-	-	-
Lepidoptera	-	-	-	-	-	-	-	-
Trichoptera [L.]	-	-	2.50	3.03	-	-	-	10.34
Diptera Nematocera [L.]	11.11	-	-	-	41.94	9.68	10.71	10.34
Diptera Nematocera	-	-	-	-	3.23	-	-	-
Diptera Brahicera [L.] [aq]	-	-	-	-	-	-	-	-
Diptera Brahicera	7.41	-	-	-	3.23	-	-	-
Hymenoptera undet.	-	-	-	-	-	-	-	-
Hymenoptera Formicidae	-	-	2.50	-	-	-	-	-
Urodela [*L.vulgaris*]	-	-	-	-	-	-	-	-
Anura [L.]	-	-	-	-	-	-	21.43	20.69

Table 6/B. The frequency of occurrence (%f) of the prey items by sexes. (Lv- *Lissotriton vulgaris*, Tc- *Triturus cristatus*, f- females, m- males, aq- aquatic, L- larvae)

	28.04.2009				22.05.2009			
	Lv		Tc		Lv		Tc	
	f	m	f	m	f	m	f	m
Oligochaeta	-	-	-	-	-	6.90	14.29	-
Gastropoda [aq]	-	-	-	-	-	-	-	5.00
Gastropoda	-	-	-	-	-	-	-	5.00
Arachnida	-	-	-	6.25	3.33	6.90	-	-
Crustacea Copepoda	53.33	66.67	12.50	50.00	6.67	-	-	5.00
Crustacea Cladocera	-	-	-	-	46.67	75.86	57.14	65.00
Crustacea Ostracoda	40.00	23.33	12.50	25.00	3.33	10.34	14.29	-
Crustacea Isopoda	3.33	-	-	-	-	-	-	-
Collembola	-	-	-	-	-	-	-	-
Ephemeroptera [L.]	-	-	-	-	6.67	3.45	7.14	-
Odonata [L.]	-	-	-	6.25	-	-	-	5.00
Heteroptera [aq]	-	-	-	-	-	-	7.14	-
Heteroptera	-	-	-	-	-	-	-	-
Coleoptera Dytiscidae [L.]	-	-	-	-	10.00	6.90	-	5.00
Coleoptera undet.	3.33	20.00	-	12.50	30.00	31.03	42.86	40.00
Coleoptera Carabidae	-	-	-	6.25	-	-	-	-
Coleoptera Curculionidae	10.00	-	-	-	-	-	-	-
Coleoptera Staphylinidae	-	-	-	6.25	-	-	-	-
Lepidoptera [L.]	-	-	-	-	-	-	14.29	-
Lepidoptera	-	-	-	-	-	-	7.14	-
Trichoptera [L.]	-	-	6.25	6.25	-	-	-	5.00
Diptera Nematocera [L.]	16.67	13.33	18.75	-	53.33	37.93	7.14	10.00
Diptera Nematocera	-	-	-	-	-	-	-	-
Diptera Brahicera [L.] [aq]	-	-	-	-	-	-	7.14	-
Diptera Brahicera	20.00	3.33	-	-	3.33	-	14.29	-
Hymenoptera undet.	-	-	-	6.25	-	-	-	-
Hymenoptera Formicidae	3.33	3.33	-	-	-	6.90	-	-
Urodela [*L.vulgaris*]	-	-	43.75	6.25	-	-	-	-
Anura [L.]	-	-	-	6.25	3.33	-	-	-

individuals fed with *L. vulgaris*.

Together with the animal prey, the newts also consumed vegetal remains, shed skin, inorganic elements and amphibian eggs. The shed skin generally belonged to some newts, but the *T. cristatus* females also swallowed *Bombina variegata* shed skin in May. The eggs were permanently consumed by both species, but with a very high frequency by the *T. cristatus* females on the first two dates (Table 7). According to the Pianka index, there are greater differences between the feeding of the newts between different periods regarding both species, than between the two species concerning the same period. The feeding of the two species from 28 IV was very similar, but meanwhile very different from the rest of the periods. The

Table 7. The frequency of occurrence (%f) of the non-prey items.
(Lv- *Lissotriton vulgaris*, Tc- *Triturus cristatus*, f- females, m- males, O- overall)

	01.04.2009				18.04.2009			
	Lv		Tc		Lv		Tc	
	f	m	f	m	f	m	f	m
% vegetal remains	44.44	46.67	57.50	54.55	90.32	80.65	85.71	75.86
	O: 45.61		O: 56.16		O: 85.48		O: 80.70	
% of shed skin	51.85	60.00	27.50	36.36	25.81	22.58	21.43	20.69
	O: 56.14		O: 31.51		O: 24.19		O: 21.05	
% of minerals	-	-	-	-	-	-	-	-
	-		-		-		-	
% amphibian eggs	18.52	-	77.50	81.82	54.84	41.94	89.29	96.55
	O: 8.77		O: 79.45		O: 48.39		O: 92.98	

	28.04.2009				22.05.2009			
	Lv		Tc		Lv		Tc	
	f	m	f	m	f	m	f	m
% vegetal remains	76.67	90.00	75.00	81.25	76.67	72.41	85.71	70.00
	O: 83.33		O: 78.13		O: 74.58		O: 76.47	
% of shed skin	36.67	40.00	37.50	43.75	30.00	17.24	35.71*	45.00
	O: 38.33		O: 40.63		O: 23.73		O: 41.18	
% of minerals	-	6.67	-	-	-	6.90	-	5.00
	O: 3.33		-		O: 3.39		O: 2.94	
% amphibian eggs	3.33	-	-	12.50	43.33	3.45	-	10.00
	O: 1.67		O: 6.25		O: 23.73		O: 5.88	

Table 8. The feeding diversity according to Shannon-Weaver index.
(Lv- *Lissotriton vulgaris*, Tc- *Triturus cristatus*, f- females, m- males, O- overall)

01.04.2009				18.04.2009			
Lv		Tc		Lv		Tc	
f	m	f	m	f	m	f	m
0.1178	0.6895	0.2783	0.2848	0.2015	0.1682	1.1439	1.3103
O: 0.5488		O: 0.2945		O: 0.1966		O: 1.3996	

28.04.2009				22.05.2009			
Lv		Tc		Lv		Tc	
f	m	f	m	f	m	f	m
0.9641	0.6972	1.4766	0.9889	1.046	0.7034	0.7617	0.5005
0.8356		1.2383		0.9057		0.6798	

differences between the feeding of the two species, or the one between the same species from different periods were not significant in all of the cases. These differences also remained not significant when we took into consideration the eggs and shed skin as well as when we considered only the prey taxa. Only in the case of *L vulgaris* the comparison between the feeding from different periods, without amphibian eggs and shed skin, lead to closer values to the significant ones (*Kruskal-Wallis test:* $H\ (3, N= 39) = 7.038917$ $p = .0707$).

Discussions

In three of the four study periods, the feeding of the two newt species was similar (Fig. 1). However, in April 28 the feeding of both species proved to be very different from the other periods. On that date the feeding of the two species comes closer to one another than that of their own species from other periods. This is the only period in which *T. cristatus* fed with individuals from the syntopic species *L. vulgaris*. Although *T. cristatus* sometimes consumes *L. vulgaris* individuals (e.g. Cicort-Lucaciu et al. 2005, Bogdan et al. 2013), the frequency of the phenomenon has very high values at Comanda. Moreover, although the two species were also present in the other periods in the same habitat, the fact was never repeated, although *L. vulgaris* is much more numerous than *T. cristatus* in the pond from Comanda (Dobre et al. 2009).

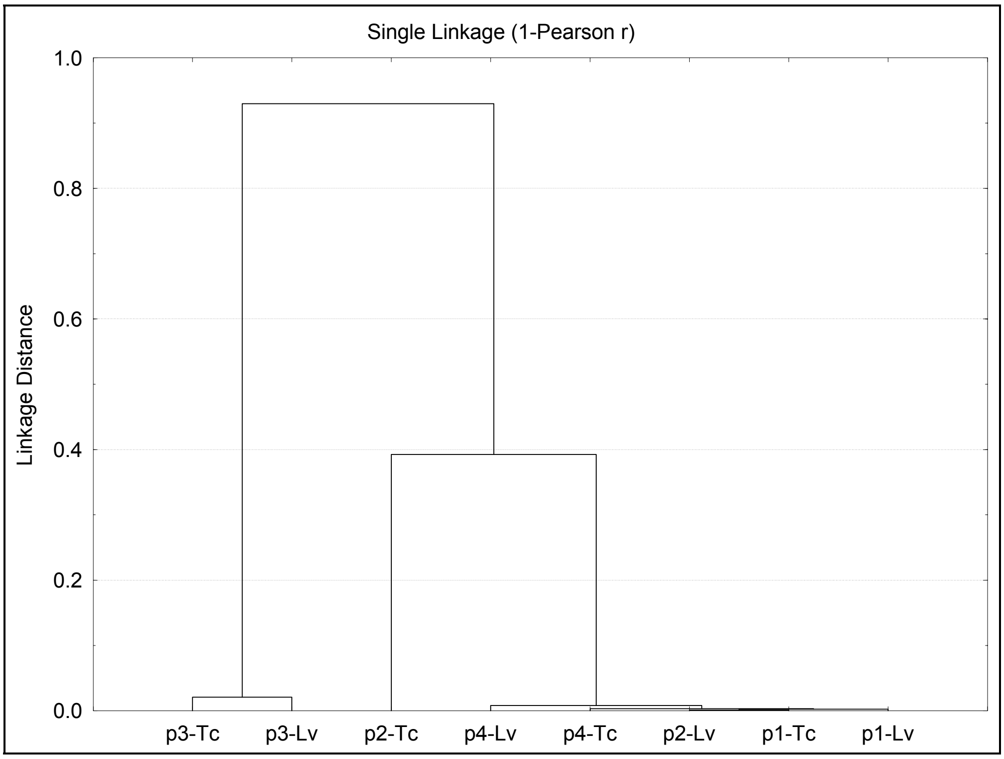

Figure 1. The feeding similarity after Pianka's index.
(Lv- *Lissotriton vulgaris*, Tc- *Triturus cristatus*, p- study periods,
p1- 01.04.2009, p2- 18.04.2009, p3- 28.04.2009, p4- 22.05.2009)

The frequent consumption of *L. vulgaris* by *T. cristatus* on April 28 was caused by a very strong decrease of the water level due to the extremely dry period. In April 28 the water level was reduced to less than a third of the normal one. Thus, the contact between the numerous individuals from the two newt species from the pond (Dobre et al. 2009) became easier, fact which had negative consequences for *L. vulgaris*, a smaller species (Fuhn 1960). Normally, the two species act in different sectors of the pond (Covaciu-Marcov et al. 2010a), fact which was annulled by the water decrease. Similar situations, due to overcrowding and little food which resulted in cannibalism were recorded in the case of some amphibian larvae (e.g. Griffiths 1997, Wildy et al. 2001). Probably not only the easier contact determined the consumption of *L. vulgaris* by *T. cristatus*, but also the poverty of the trophic offer due to the reduction of the aquatic habitat, *T. cristatus*, being more dependant of the water depth and aquatic vegetation (Denoël et al. 2013). In that period some newts only consumed vegetal, shed skin, amphibian egg and one *L. vulgaris* individual alongside them. Consequently, the high consumption recorded by a newt species of the individuals of the other species is only a side of the feeding disturbance caused by the reduction of the aquatic habitat due to drought. Thus, the importance of the habitat's diversity is confirmed, in order to avoid competition and the decline of some amphibians (e.g. Guidali et al. 2000). Afterwards, in May the precipitation restored the water level from the pond from Comanda and the anomalies stopped from the newts` feeding.

Although at Comanda the consumption of some individuals from an amphibian species by the larger species was determined by an exterior factor, the phenomenon is also relatively frequent for other amphibians (e.g. Wang et al. 2008, Sas et al. 2009, Mollov et al. 2010, Çiçek 2011) and cannot always be explained as in the case of Comanda. Including *T. cristatus* was observed feeding with other larger preys, such as fish corpses, fact considered to be an indicator of its behaviour plasticity (Iftime & Iftime 2011).

The *T. cristatus* females consumed more individuals of *L. vulgaris* than the males. The *T. cristatus* males hunted in the same period more terrestrial preys. The preference of the *T. cristatus* females for larger and less mobile preys has also been previously recorded, being explained through the mobility differences between the two sexes (e.g. Dobre et al. 2007). Also in the case of other amphibian species, the females did consume larger preys (e.g. Juncá & Eterovick 2007). It is however more difficult to explain why almost all of the consumed *L. vulgaris* individuals were males. Probably because of their dorsal crest they are more dynamic than females and in the reduced habitat with a poor trophic offer they were forced to swim and look for preys, thus becoming easy to observe and attack by *T. cristatus*. As in other cases (e.g. Covaciu-Marcov et al. 2010a, Bogdan et al. 2013), *T. cristatus* frequently consumed amphibian eggs and larvae, when they were present in the habitat. Together with these, the newts frequently consumed shed skin. *T. cristatus* was not limited only to consuming newt shed skin, but also ingested *Bombina variegata* shed skin, which is much more rare (Cicort-Lucaciu et al. 2005). Newts consume shed skin in a more frequent manner when other preys are absent (Kovacs et al. 2010); these come across *B. variegata* shed skin much rarer, the species coming out from hibernation later than newts (Fuhn 1960). Due to the fact that the newts feed poorly at the end of April at Comanda, these could also consume *B. variegata* shed skin.

The newts from Comanda consumed the prey taxa that they generally consume (e.g. Fasola & Canova 1992, Cicort-Lucaciu et al. 2005, Kovacs et al. 2010, Covaciu-Marcov et al. 2010a, Bogdan et al. 2013), except for the high consumption frequency of *L. vulgaris* registered by *T. cristatus*. The very high consumption frequency of microcrustaceans registered by *L. vulgaris* was often mentioned (e.g. Griffiths & Mylotte 1987, Covaciu-Marcov et al. 2010a, Bogdan et al. 2013). It seems that due to the size, the species favourite food is microcrustacean, but, in other cases, *T. cristatus* avoided these preys and consumed larger preys (Bogdan et al. 2013). This fact seems to denote that at Comanda, *T. cristatus* did not have sufficient large preys available and was constrained, as well as *L. vulgaris*, to consume microcrustaceans. Including in the previous study from Jiu Gorge, *T. cristatus* mostly consumed nematocera larvae and not microcrustaceans (Dobre et al. 2007). Consequently, comparing the newts' feeding from Comanda with the scientific literature (e.g. Covaciu-Marcov et al. 2010a, Bogdan et al. 2013), it seems that at least *T. cristatus* has an improper feeding.

In the conditions of the rarity of newts from Jiului Gorge National Park (Covaciu-Marcov et al. 2009), the poor feeding from Comanda, combined with the negative effects of the drought, it is alarming. In case of drought, *T. cristatus*, a larger and more protected species (O.U.G. 57/2007), concentrates towards consuming individuals from the smaller and less protected species. The solution is useful for *T. cristatus* and, considering the size of the *L. vulgaris* population from Comanda (Dobre et al. 2009), it does not probably have real negative consequences for the common newts. Still, from a conservative aspect this is not a solution, because, considering that in the past years drought has been very common, the effects of the phenomenon are probably continuously increasing.

The two newt species react to the water decrease because of drought, not only through food competition, but also through relations such as prey – predator, probably because of the different size. Although, in the case of the sintopic amphibians the food competition is reduced or absent (e.g. Cogălniceanu et al. 2001, Juncá & Eterovick 2007, Ferenţi & Covaciu-Marcov 2011, Jiménez & Bolaños 2012, Bogdan et al. 2013), it seems that the profound modification of the environmental conditions also changes this reality. The food richness from the habitats and the generalist trophic regime allow the newts to coexist (Vignoli et al. 2009), but the drought reduces the trophic offer and brings the two newt species in direct competition. This seems to be one of the situations in which overlapping the trophic niches between the two species can lead to competition (Roşca et al. 2013).

Except for drought, the less optimal feeding of the newts is probably a consequence of the position and the aspect of the habitat from Comanda. It is isolated on a plateau and is not connected with any water course. The fact makes it extremely vulnerable to drought, but it also limits its contact with another aquatic fauna, which could represent prey for the newts. In other habitats, not necessarily bigger, but supplied by springs or streams, the newts do not necessarily eat more preys or more intensely, but especially more diverse and larger preys (e.g. Bogdan et al. 2013). The data from Comanda confirm the vital importance of the aquatic habitat for the newts' feeding (e.g. Bogdan et al. 2013). Probably if artificial reproduction habitats would be made for the newts from Jiu Gorge, these data should be taken into consideration. Thus, the artificial habitats should be connected to springs or streams, in order to be able to maintain both the water level as well as to assure a flow of aquatic fauna that could represent potential prey for newts.

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