

USING THE DRIFT FENCE METHOD TO ASSESS THE BREEDING POPULATION SIZE OF NEWTS – A CASE STUDY IN THE EASTERN CARPATHIANS

Introduction

In order to better understand the migration patterns of the common frog (*Rana temporaria*) and the moor frog (*Rana arvalis*) in the Ciuc Basin, within the Eastern Carpathians, in 2011 we set up drift fences around three breeding habitats. During this study, data was collected on two protected newt species as well, the great crested newt (*Triturus cristatus*) and the Transylvanian smooth newt (*Lissotriton vulgaris ampelensis*). In what follows, we present the data on newt numbers and the spatial patterns of the breeding migration, both of these possessing a high relevance for conservation efforts.

Material and Methods

The study area is located North of Miercurea-Ciuc, in the Eastern Carpathians, Romania, on a Pliocene alluvial fan. On the surface of this formation, there are a series of natural ponds that were formed at the end of the last glaciation/during the early Holocene, by massive landslides that resulted in the formation of small lakes and later fens. These are the main amphibian breeding habitats in the Ciuc Basin; their overall number approaches 300. The study area is a short valley with gentle slopes and a length of 1.3 km; the maximum difference in altitude between the valley's floor and the ridges above is roughly 30 m. The slopes of the valley are undulating as a result of late Pleistocene landslides. There are 11 natural ponds in the valley where water is present for at least 3 months a year. All of them are dominated by fen vegetation with *Carex spp.*, and occasional *Typha* and *Phragmites* stands. Three ponds were selected for the purpose of this study, positioned along the main axis of the valley. The distance between them is 300 and 470 m, respectively.

Pond 1 (46.40769°N, 25.80627°E, 697 m a.s.l.) has an approximate area of 1500 m². Its vegetation

is dominated by *Carex acuta*, with few tussocks and a more open structure. It is close to the valley floor and its temporary water course. No significant historical disturbance of the structure was recorded.

Pond 2 (46.41029°N, 25.80709°E, 703 m a.s.l.) has an approximate area of 1700 m². Its vegetation is dominated by *Carex caespitosa* tussocks. Alongside its longitudinal axis there is a ditch dug with the aim of draining the pond in the 1980s. The drainage was not successful and the ditch represents a more open and deeper structure, with *Menyanthes trifoliata*, likely introduced with the creation of the ditch, as this is the only pond where this species is present in the area. Pond 2 also has a few *Salix* bushes and *Typha latifolia*.

Pond 3 (46.4145°N, 25.8075°E, 720 m a.s.l.) has an approximate area of 700 m². It is dominated by *Typha latifolia*.

All three ponds have *Utricularia australis*, indicating a relatively long hydroperiod, with occasional drying in dry summers. Each pond has a pronounced elliptical shape.

The material of the fences used was a plastic net with a 0.5 cm mesh size, 50 cm wide, inserted into the soil to a depth of about 5 cm and completely surrounding the ponds studied. 10 l plastic buckets were dug into the soil at intervals of 10 m around the fence both in the outside and in the inside in relation to the ponds. The length of the fences was as follows: 160 m (15-15 buckets inside-outside) for Pond 1, 190 m (18-18 buckets) for Pond 2, and 120 m (11-11 buckets) for Pond 3.

The fences were up between 19 March and 4 May; afterwards, they were removed. At the moment of setup, the soil was still frozen. After setup, the buckets were regularly checked (3-4 times a day). Amphibians were identified, sexed and moved to the other side of the fence. The position of the capture: inside/outside, bucket number or section between buckets was noted.

Results

Time of arrival

Most newts arrived in the first two weeks of the study period in the case of both species. Numbers of arrival are positively correlated with mean daily temperatures and no correlation is observed with the amount of precipitation.

Newt numbers, sex ratio and age classes

A total number of 127 *T. cristatus* individuals and 468 *L. vulgaris ampelensis* individuals were captured. Sex ratio was female biased for both species: 45 males to 54 females (0.83:1) for *T. cristatus* and 223 males to 244 females (0.91:1) for *L. vulgaris ampelensis*. The number of juveniles was 28 individuals of *T. cristatus* and 1 individual of *L. vulgaris ampelensis*. Number of *L. vulgaris ampelensis* was 3 to 4 times larger than that of *T. cristatus* in the case of all three ponds.

Direction of arrival

In the case of Pond 1, the main direction of arrival was N and NE for *L. vulgaris ampelensis* and E for *T. cristatus* (Fig. 4). In the case of Pond 2, the main arrival direction was NW, NE and E for *L. vulgaris ampelensis* and NE for *T. cristatus* (Fig. 5). In the case of Pond 3, the main arrival direction was NE for *L. vulgaris ampelensis* and E for *T. cristatus* (Fig. 6). In the case of Pond 1 and Pond 3, arrival directions were more concentrated than in Pond 2, where they were more dispersed.

Relationship between pond size and newt numbers

The number of newts per pond was not positively correlated with pond size. The largest pond had the smallest number of newts for both species. However, the second largest pond had by far the largest number of newts of both species.

Discussion

The ponds studied and the surrounding landscape host a locally very important newt population. In the three studied ponds, adult newt numbers are close to 500 in *L. vulgaris ampelensis* and close to 150 in *T. cristatus*. The available data suggests that the total newt population in this landscape fragment is several times larger than the numbers found in the three ponds, i.e. more than 1000 *L. vulgaris ampelensis* and around 500 *T. cristatus*. There are at least 5 other ponds with long hydroperiods suitable for newts within 500 m and other 2 ponds within 1

km of the ponds studied. Sex ratio is slightly female biased in the case of both species. The low captured number of *L. vulgaris ampelensis* juveniles is the consequence of the mesh size of the material used for fencing that allows crossing of juvenile *L. vulgaris* through the net. Also, small newts could climb over the net. No obvious difference in habitat preferences was found between the two species. The main arrival directions suggest that hibernation and terrestrial habitats are mostly located in grassland habitats, in other words, both species prefer grassland habitats to arable ones. All three ponds are surrounded by agricultural land: arable fields and hay meadows. The main arrival directions coincide with the position of hay meadows in relation to the pond. In the case of Pond 1, arable land is dominant to the S and W of the pond. Main direction of arrival was from the east. Similar configuration is found in Pond 3. Pond 2 is surrounded mostly by hay meadows. Arrival directions were more even in this case but also dominated by the E direction. In this case, humidity gradients could be involved, with preference towards lower humidity hibernation grounds. In a German study, it was found that newts prefer forest habitats, and *Triturus cristatus* avoids grassland habitats. In our case, forest habitats are not available in the surroundings of the breeding habitats. This might explain the relative abundance of the two species in this area. *L. vulgaris ampelensis* population size is almost four times as large as *Triturus cristatus*.

Data on the population size of protected species is essential for conservation. In the context of an upscaled European network of protected areas that at present covers 26% of the territory of Romania, large amount of information is generated to assure the baseline for effective conservation measures. Estimating newt population size is particularly challenging, as they are mostly nocturnal and do not aggregate or have egg masses like some frog species. In Romania, capturing the total number of individuals was used in several cases for estimating newt population size. However, in medium and large size breeding habitats with plenty of underwater structures like tussocks this approach is not applicable.

Conclusion

The drift fence method, although much more time consuming than other methods used so far in Romania, provides data on the time and direction of arrival to the breeding pond for the whole amphibian community in addition to population size and

sex ratio. Also, size and structure of the breeding habitat may limit the applicability of methods that involve netting and capturing the entire population. Another aspect to consider is disturbance to the habitat structure that may be very large in the case of direct netting. The data collected in this study shows main directions of arrival, indicating the position of hibernation and terrestrial habitats. It highlights

the importance of the surrounding landscape and land use, in particular the presence of unimproved grassland (in open agricultural landscapes). The method greatly improves the precision of data on population size in the cases when capturing or visual observation method is not applicable because of the size and structure of breeding habitats.

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**Gőtepopulációk felmérése terelőkerítések segítségével –
Esettanulmány a Keleti-Kárpátokból**

(Kivonat)

Jelen tanulmány egy, a Csíki-medencében 2011-ben végzett adatgyűjtés eredményeit összegzi, amelynek célja a tarajos göte (*Triturus cristatus*) és az erdély pettyes göte (*Lissotriton vulgaris ampelensis*) populációméretének vizsgálata volt 3 szaporodási élőhelyen. A vándorlás térbeli mintázata mellett értékelésre kerül az alkalmazott módszer hatékonysága is.

**Evaluarea populației de tritoni folosind garduri în derivă
– Un studiu de caz din Carpații Orientali**

(Rezumat)

Acest studiu cuprinde rezultatele unei culegeri de date din 2011, desfășurată în Bazinul Ciucului, privind populația locală reproductivă a tritonului cu creastă (*Triturus cristatus*) și a tritonului comun transilvănean (*Lissotriton vulgaris ampelensis*). Accentul se pune în primul rând pe stabilirea mărimii populațiilor și distribuția traiectoriilor parcurse de amfibieni, însă se evaluează și eficacitatea metodei alese de către cercetători.



Figure 1. Landscape in the study area, with the fenced Pond 1, on 20 March 2011, facing West. Note land use in the surroundings of the pond: arable land to the South and West, seminatural grassland (hay meadows) to the North and East



Figure 2. Partial view of Pond 3, to the Southwest, along the longitudinal axis of the pond. Note a bucket in the foreground, on the inside of the fence, and the vegetation with *Carex acuta* and *Typha latifolia* in the pond

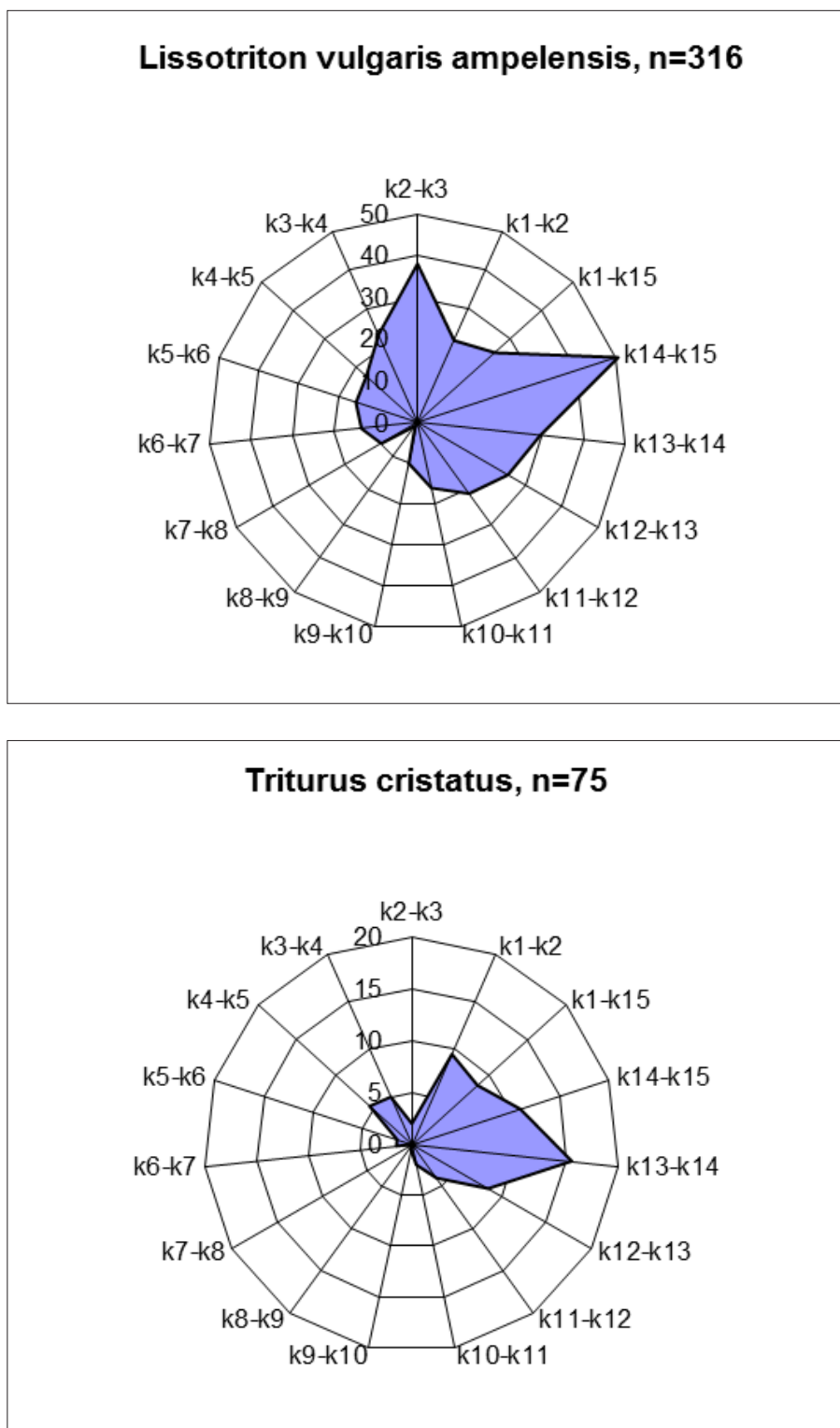


Figure 3. Number of newts and direction of approach in Pond 1.

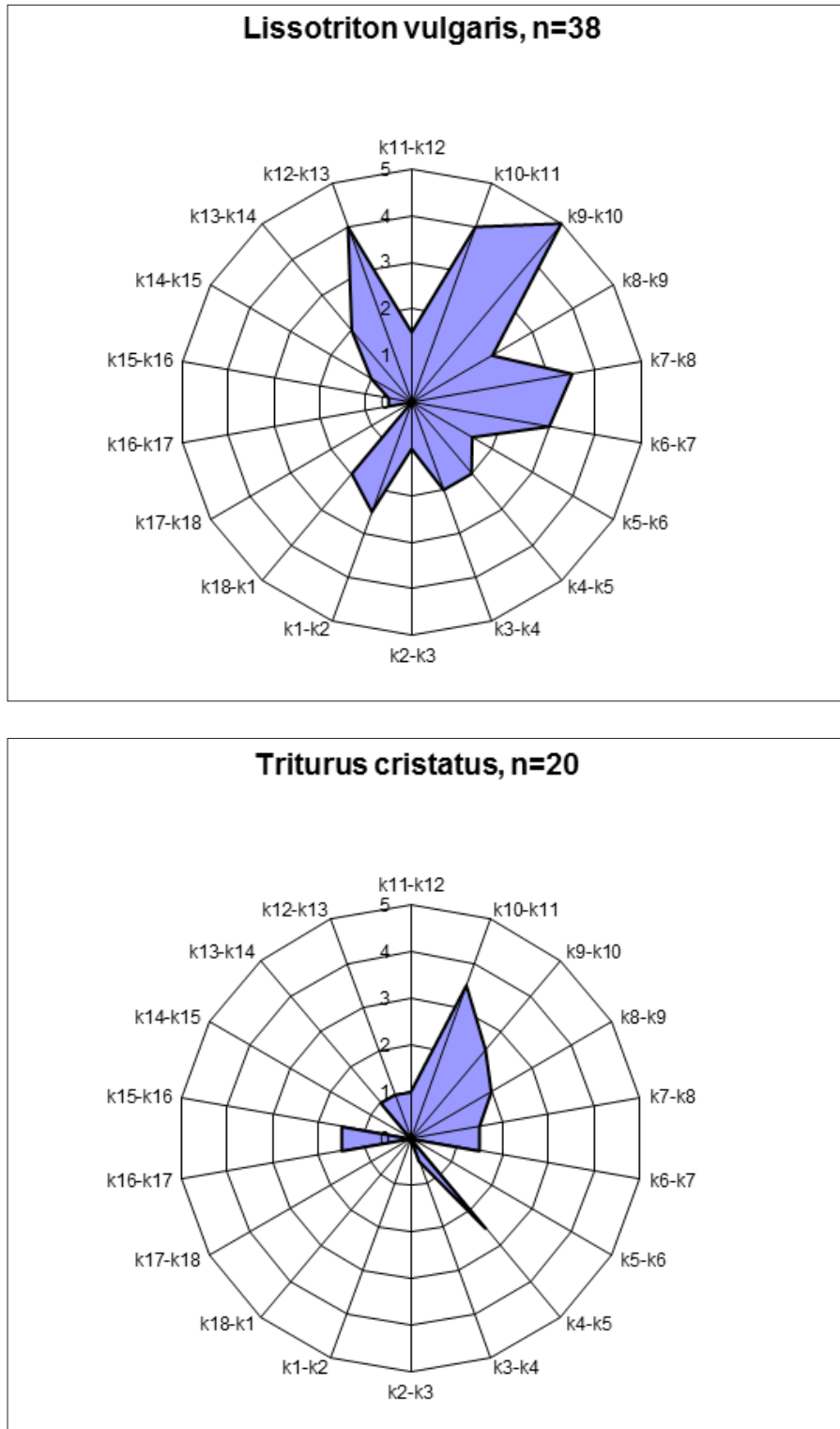


Figure 4. Number of newts and direction of approach in Pond 2.

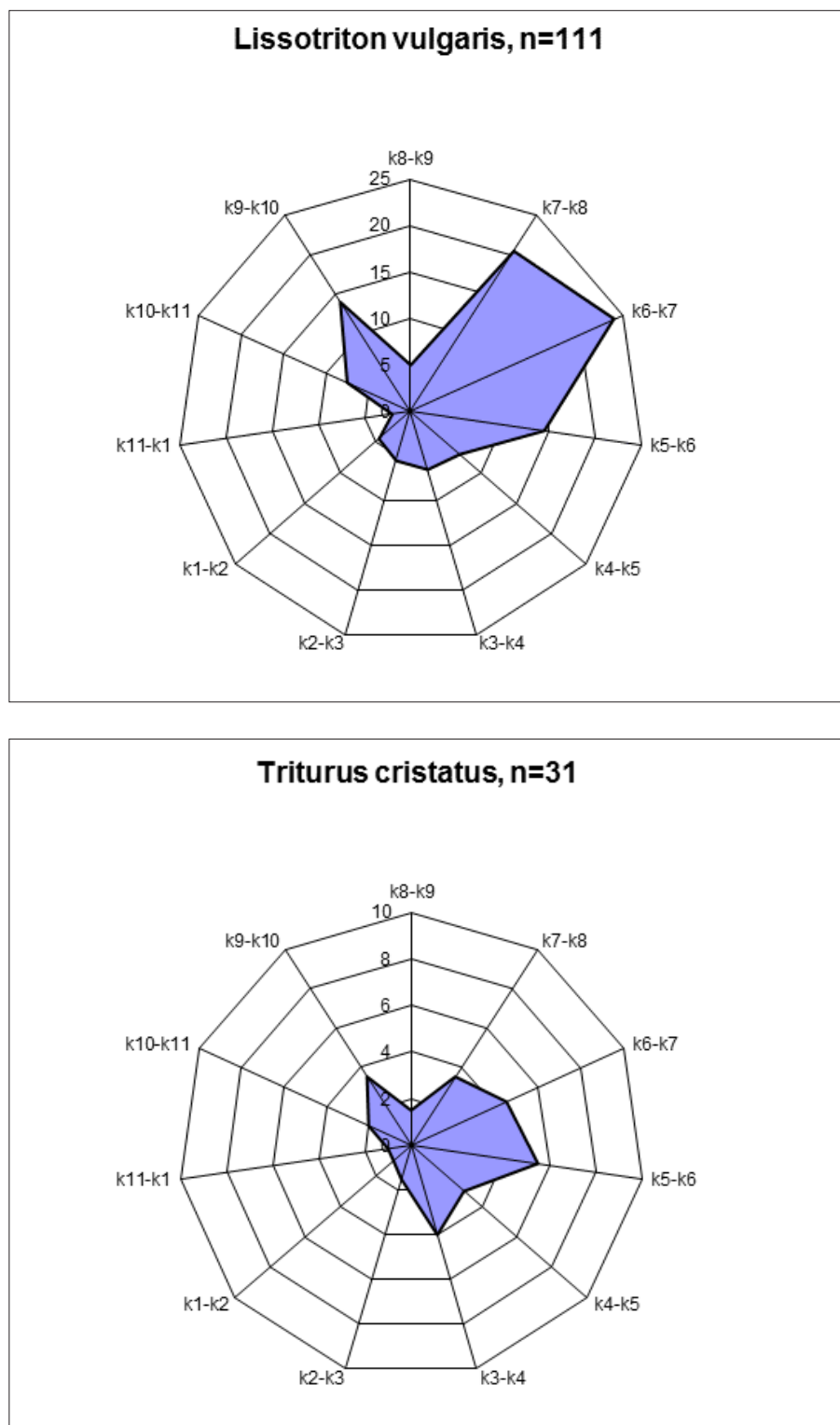


Figure 5. Number of newts and direction of approach in Pond 3.