

Using simple funnel traps for surveying the Great Crested Newt (*Triturus cristatus*) – a cost/time analysis

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0. Abstract

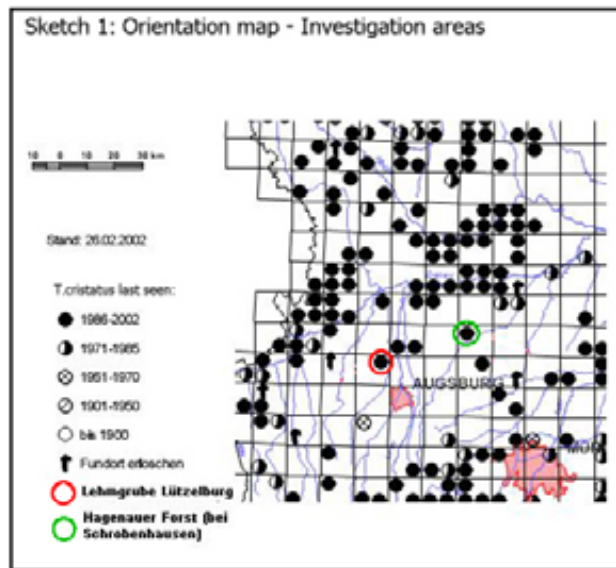
In summer 2005 the Faculty of Physische Geographie und quantitative Methoden of the University of Augsburg conducted a field study on the surveying-method for the crested newt (*Triturus cristatus*) with simple funnel traps. During the project a total of eight waterbodies in Bavaria (Landkreise Augsburg and Neuburg-Schrobenhausen) at two different sites were investigated. In each waterbody several simple funnel traps (based on the model suggested by GRIFFITHS, 1985) were installed for three (at the site Lützelburg) and one (at the site Hagenauer Forst) nights. The results of the study were used to estimate the time and cost requirements of this method and to discuss its suitability for monitoring the crested newt.

1. Introduction

Since amphibians moved into the focus of both scientist and conservationists, the problem of monitoring this group in its different habitats was one of the mayor tasks to be solved. Especially on the crested newt, which has its center of distribution in central Europe and which finds itself under legal protection according to the EU-directive 92/43/EEC as well as national regulations, a multitude of studies has been carried out during the last years (eg. BEEBEE 1990, KRONE 2001, KUPFER & THIESMEIER 2000). But what is the price for monitoring – or even tracking - the species in the field? This question was addressed during a research project at the University of Augsburg, Faculty for Physische Geographie und quantitative Methoden. The tested and evaluated item was the mark-recapture method with funnel-traps. In the following, a short summary of the results and a detailed calculation for the surveying method with funnel traps will be presented.

2. Investigation area

Two sites were visited. Both of them are situated in the Bundesland Bavaria, Germany (see sketch 1). The Investigation site “Lützelburg” belongs to the Landkreis Augsburg, the site “Hagenauer Forst” to the Landkreis Neuburg-Schrobenhausen.



The investigation site “Lützelburg” is situated appr. 10 km northwest of the city of Augsburg. Within an area of 7,5 ha about 40 ponds of various size are to be found. The ponds are of artificial origin and were created when the area was used as a claypit until 1973. At present the area is under legal protection (being also a NATURA 2000 site); in regular intervals conservation measures are carried out in order to maintain an early successional stage at the site.

The investigation site “Hagenauer Forst” with two natural ponds is situated inside the northern part of the forest “Hagenauer Forst”, appr. 7 km west of the town Schrobenhausen. Unlike the ponds in Lützelburg, these two are forest ponds, overshadowed by trees for more than 50 percent. The whole area is likewise a NATURA 2000 site and according to the Arten- und Biotopschutzprogramm Bayern (ABSP) of considerable importance.

3. Methods

The studies were carried out from the 17.07.2005 until the 20.07.2005 in Lützelburg and the 28.07.2005 in the Hagenauer Forst. Due to heavy thunderstorms the 29th and 30th of July, the investigation at the Hagenauer Forst was ended after one night.

In every waterbody a certain number of funnel traps - according to size and volumina of the pond – were installed. The traps were built according to suggestions given by GRIFFITHS (see sketch 2 below). The funnel traps were fixed to a metal stick, which was pushed into the floor of the pond. The inlets of the traps formed an angle of appr. 45° with the bottom. An air-bubble for breathing was left within the traps.

The traps in the ponds were surveyed and emptied during the night at four-hour intervals, from 22:00 p.m. until 6:00 a.m. All individuals of *Triturus cristatus* (all lifestages) were measured (length, weight).

A digital picture of the ventral pattern of the adult animals was made in order to enable of funnel traps individual recognition.

To estimate the population size of the crested newt in each pond, the following formula can be applied (SINSCH 2005):

$$N = \frac{m * c}{r}$$

with: N= Population size
c= Individuals caught at the last day
m= Total number of marked individuals
r= number of recaptures

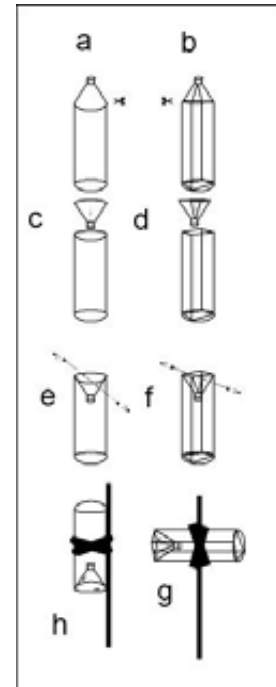
The standard error for this method is:

$$SE(N) = \sqrt{\frac{(m + 1) * (c + 1) * (m - r) * (c - r)}{(r + 1) * (r + 1) * (r + 2)}}$$

The standard deviation is:

$$s = \sqrt{\sum_{i=1}^n \frac{1}{n-1} * (x_i - N)^2}$$

with: x_i = measured values
N = mean value
n = total measurements



Prerequisite for this method is that in between the emptying-intervals, the population has enough time to completely mix itself anew. In Lützelburg, where the tested waterbodies were small, this was assumed to be the case.

4. Results

As a preliminary remark it seems necessary to point out that the goal of this study was not to make a valid assessment of the local *Triturus cristatus* population. The aim was rather to test the method theoretically as well as under the viewpoints of practicability and efficiency. The numbers given below do certainly not represent the actual situation of the newt at the site.

A total of eight waterbodies (six in Lützelburg, two in the Hagenauer Forst) was surveyed during the study. While in Lützelburg ten adult newts could be caught and marked, none were found in the Hagenauer Forst.

In one pond (surface 22 m², depth appr. 1 m, three funnel traps installed) in Lützelburg recaptures were possible. The following was found and theoretically estimated (Table 1):

Adults caught and marked (recaptured) in one pond in Lützelburg from 17.07 until 20.07.2005			Population size $N = \frac{m * c}{r}$
17.07/18.07	18.07/19.07	19.07/20.07	10 (± 1)
3	2 (1)	0	
Total captures m=5 Last captures c=2 Last recaptures r=1			Surface: 22 m ² Depth: appr. 1m Traps: 3

In the other five ponds in Lützelburg no recaptures were made, thus no population size estimations could be made.

A total of 35 larvae of *Triturus cristatus* was caught from the 17th until the 20th of July in all funnel traps (total=22).

5. Time-cost analysis

One of the mayor goals of the undertaken study was a time-cost analysis of the surveying of crested newts with funnel traps. Deduced from our investigation, we reach the following conclusions:

5.1. Material cost

Basically, material costs for the construction of simple funnel traps are very low. Required are plastic bottles (1,5 – 2 litres), strong tapes, water-proof markers and sticks for fixing the traps to the ground. For the construction and maintenance of one funnel trap we estimate the cost of 1 Euro. Further, one larger plastic container in which to empty the contents of the traps is needed (5 Euro).

Should the aim of a study be the estimation of the population size of *Triturus cristatus*, a digital camera is needed, as well as a small container in which the caught adults can be immobilized for taking pictures of their individual ventral pattern. While for the cameras a number of models at any range of prices are available, the price for the container (eg. a wooden box filled with foam rubber and covered with a glass lid) should be calculated with 10 Euro material cost.

5.2. Cost/time requirements

The required time naturally strongly depends on the dimension of the planned study. To give an example, a calculation will be made for one easy accessible pond with ten traps (construcion time appr. 1h) and one emptying check, all undertaken by one person. The traps are considered to be set up before dusk and emptied after dawn. In the case that funnel traps without internal air-bubbles or in very warm water are used, additional checks during the night must be taken into consideration in order to keep caught animals from suffocating. Of course, the time required emptying also strongly depends on the number of caught animals. Therefore the numbers given in table 2 should be regarded as rough guidelines .

Preparational activity		Time required
Constuctin of ten traps		1 h 30 min
Daily activity		
Setting up and marking of the traps		30 min
Emptying of the traps	no marking of individuals	45 min
	marking and taking biometrical data of individuals	1 h 30 min
Dismantling of the traps		15 min
Total (daily activity)		1 h 30 min – 2 h 15 min
Total (including preparations)		3 h – 3 h 45 min

No comments can be given on the time requirements for the processing of the gathered data, as this is very much depending on the scientific goal of the study.

In table 3, the cost and time requirement for the field work for a monitoring program on *Triturus cristatus* for five days in one pond and ten funnel-traps is calculated. Biometrical

data as well as pictures of the individual ventral pattern are taken. As a referential value for the wages, the usual reimbursement for a scientist in Germany (20,28 € / h, BATIIa) is taken.

Item	Time required	Cost per item (€)	Number of items	Total (€)
Material cost traps	-	1	10	10
Other material cost	-	15	1	15
Construction of the traps	1,5 h	20,28	1	30,42
Setting up and marking of the traps	0,5 h		5	50,7
Emptying of the traps	1,5 h		5	152,1
Dismantling of the traps	0,25 h		1	5,07
Total cost				

The calculation in table 3 does not include items like the way to and from the pond, neither preliminary site investigations nor the time needed for the acquaintance of the material.

6. Evaluation of the funnel-traps for surveying the crested newt

There may be several reasons for using funnel traps in a waterbody, where *Triturus cristatus* is present or suspected to be. One reason might be the need to estimate the local population size, another one to simply verify the presence of the species. These two aspects shall be discussed in the following.

6.1 Using funnel traps for estimating populations

It is possible to estimate the population size at a certain site with the mark-recapture method. For this reason, individuals have to be caught and permanently marked. Installing simple funnel traps like suggested by GRIFFITHS (1985) or KÜHNEL & RIECK (1988) is, in comparison with other methods like the complete fencing in of a pond for a long period or nightcounts, rather cheap and efficient. COOKE (1995) estimates that with underwater-traps 6 to 10 percent of the whole population can be caught; given a long enough exposure of the traps at the site.

However, any such data will have to be treated very carefully, as it is well known that newt-populations can be subject to considerable changes over the years (eg. ARNTZEN & TEUNIS 1993, BAKER 1999). Further, the time of the year chosen for the investigation seems to be vital. In our case it was already rather late in the year, therefore it seemed highly probable that many adult newts had already left the pond. The use of underwater-traps seems to be most promising during the mating-period, when most adults are active inside the pond. KUPFER and THIESMEIER (2000) suggest to combine setting up underwater-traps and the offering the newts artificial daytime hiding places around the pond (eg. boards), thus enhancing the chance of catching animals.

6.2 Verifying the presence of *Triturus cristatus* with funnel-traps

According to our study it seems to be a good option to install underwater-traps in order to determine the presence or absence of *Triturus cristatus*. In Lützelburg, a total of 22 traps was installed in 6 ponds. With one of the ponds being very unlikely to be inhabited by the crested newt (intensive searching merely produced a lot of recently hatched fish), 16 traps remained for 5 ponds, where the presence of the newt was secure. Their surfaces ranged from appr. 5 m² to 25 m². The traps were emptied 9 times in 3 nights. 33 three times the traps had caught one or more individuals of *Triturus cristatus*. In our case this meant a chance of 22 percent for

catching a newt with a trap in the ponds at every check. This rate of success is likely to be influenced besides other factors mainly by the size of the pond, the denseness of the vegetation, the daily activity pattern of the animals as well as the size of the population itself.

A long exposition of the traps given, it seems likely to get good results to catch both adults, juveniles and larvae of the crested newt with funnel-traps. According to the findings of our study, a theoretical trap would after three nights (emptying at 22:00, 02:00, 06:00) have caught at least one individual with a probability of 90 %.

7. Summary

Installing simple funnel traps in ponds for surveying purposes concerning the crested newt seems to be a reasonable and cheap option and/or addition to other herpetological standard methods (fencing in, nightcounts). In a field-study, conducted by the Lehrstuhl für Physische Geographie und quantitative Methoden (Universität Augsburg) several ponds inhabited by *Triturus cristatus* were furnished with underwater-traps as suggested by GRIFFITHS. The results of the study show that the exposition of one trap for three nights in a small waterbody (appr. 5 to 25 m²) would have proven the presence of the Great Crested Newt with a 90 % probability.

In order to estimate the costs for comparable studies, the time and material requirements for a hypothetical surveying setup at one pond with ten funnel traps and an exposition time of five nights were analysed, adding up to 263,29 €.

8. References

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