

# Capture effectiveness of terrestrial drift fences and funnel traps for the Great Crested Newt, *Triturus cristatus*

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**Abstract.** We compared the effectiveness of permanent drift fences and submerged funnel traps for capturing Great Crested Newts (*Triturus cristatus*). The average effectiveness of the drift fence amounts to 49.3%, with a high fluctuation from 26 to 74%, with the number of adults captured decreasing from 138 individuals in 2001 to 35 in 2003, at first view indicating a strong decline in population size. The additional application of funnel traps and mark-recapture techniques, however, clearly demonstrated a nearly constant population size over this period. Therefore, the use of funnel traps combines high capturing effectiveness with undisturbed migration behaviour close to the pond.

## Introduction

In the course of a long term study on amphibian populations in an agricultural landscape (see Hachtel et al. 2005) we compared the effectiveness of permanent drift fences and submerged funnel traps for capturing Great Crested Newts (*Triturus cristatus*). In addition to Arntzen et al. (1995) and Baker (1999) both systems were simultaneously used in the same breeding pond during 2002 and 2003. The annual population size was estimated using the Lincoln-Petersen method.

The goal of this analysis was to give recommendations of reliable methods for estimating population size of Great Crested Newts, a fundamental precondition for an appropriate conservation strategy especially in the context of the habitat directive of the European Union (Natura 2000).

## Methods

The study focused on a natural pond surrounded by intensively used agricultural landscape. Using a permanent drift fence encircling the breeding site over three years and submerged funnel traps for two weeks per year, Great Crested Newts (*Triturus cristatus*) were registered by photo identification of the belly patterns. Consequently, we could use the Lincoln-Petersen method, which permits to compute the effectiveness of these two capture methods. Here, the capture probability is defined as the portion of captured animals of the total population size estimated with a capture-recapture model (Arntzen et al., 1995). A detailed description of capture methods and of the locality is given in Ortmann et al. (2005) and Weddeling et al. (2004)

## Results

The number of adults captured at the drift fence decreased continuously from 138 individuals in 2001 to 35 in 2003 (Tab. 1). These numbers could, by uncritical evaluation, be misunderstood as a population decline of more than 70%. In contrast to such an interpretation, the total population size determined by Lincoln-Petersen-method shows clearly overlapping confidence intervals between the years, and no decline can be proved.

The average effectiveness of the drift fence amounts to 49.3%, with a high variability from 26 to 74 %, which is comparable to the findings of Arntzen et al. (1995).

Remarkably, the effectiveness of the drift fence significantly decreased within three years (Spearman correlation,  $p < 0.001$ ), while those of the funnel traps increased in both years (fig. 2).

After 14 days already, the submerged funnel traps proved to be more efficient to determine the population size in comparison to daily drift fence census over eleven months.

## Discussion

The large range of the fence effectiveness for *Triturus cristatus* (already shown by Arntzen et al., 1995 and Baker, 1999) shows the necessity to examine the accuracy of the method for each locality and to quantify the measurement error, if quantitative statements are to be met. Only in this way the comparability of results (e. g. between single water bodies, investigation years or especially different projects) can be assessed and further estimation of population parameters e.g. survival rates are reliable.

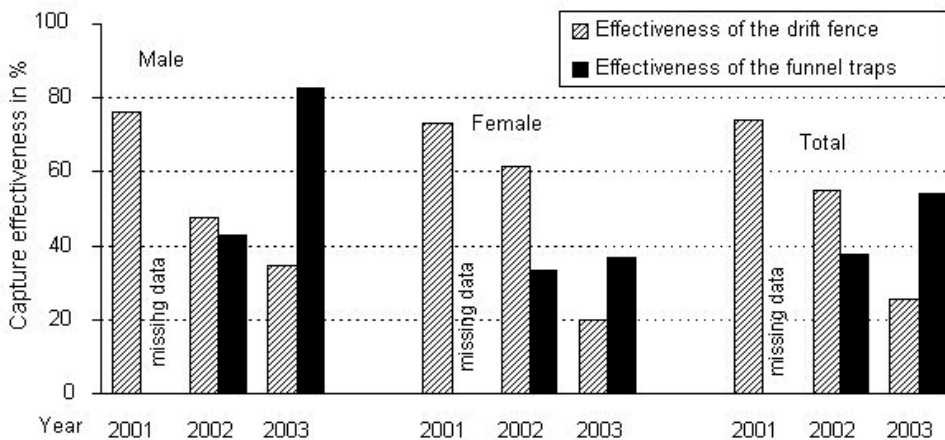
In agreement with Baker (1999) our data furthermore strongly suggest that drift fences considerably influence the migration behaviour of *T. cristatus*, leading to

**Table 1.** Effectiveness of drift fence with pitfall traps, and funnel traps in the study area from 2001-2003 for adult males and females of the Great Crested Newt (*Triturus cristatus*).

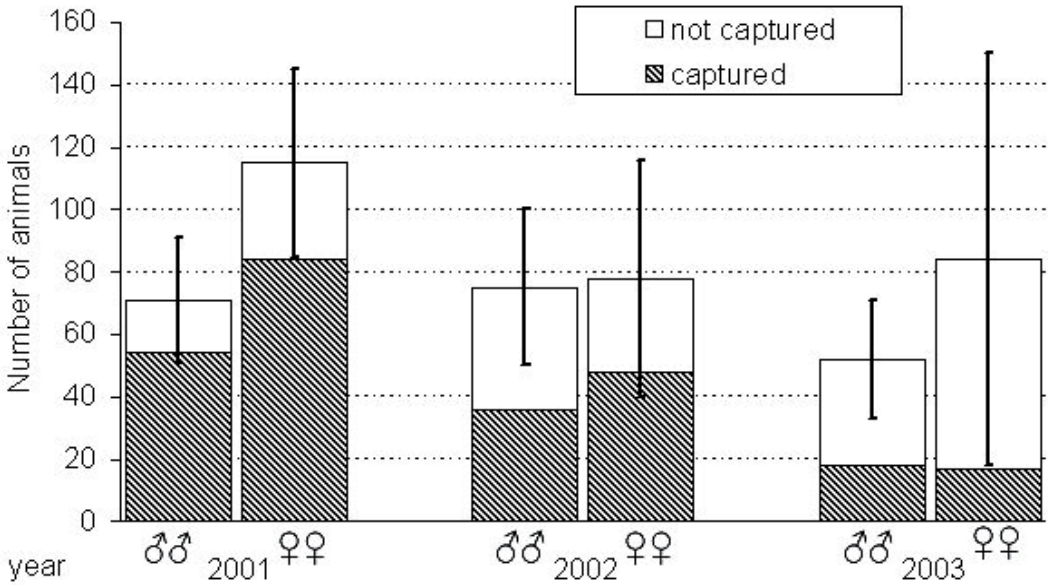
Year / Sex	2001		2002		2003	
	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀
Individuals in pitfall traps	54	84	36	48	18	17
Individuals in funnel traps	-	-	32	26	43	31
Lincoln-Petersen estimation	71 ± 20	115 ± 30	75 ± 25	78 ± 38	52 ± 19	84 ± 66
<b>Effectiveness of pitfall traps %</b>	<b>76.1</b>	<b>73.1</b>	<b>48</b>	<b>61.5</b>	<b>34.6</b>	<b>20.2</b>
<b>Effectiveness of funnel traps %</b>	-	-	<b>42.7</b>	<b>33.3</b>	<b>82.7</b>	<b>36.9</b>

an accumulation of newts inside the enclosure. For the closely related *T. dobrogicus*, Jehle *et al.* (1997) stated as well that the proportion of the registered individuals at the drift fence was reduced considerably in the course of several years, while the numbers of new catches in underwater funnel traps had been “relatively large”. For a number of North American amphibians and reptiles, Crosswhite *et al.* (1999) observed that the capture efficiency of drift fences over two years decreased. Trusting the drift fence data

alone, one would have assumed a strong decline in population size. The additional application of funnel traps and mark-recapture analysis, however, clearly demonstrated a nearly constant population size over this period. Therefore, the use of funnel traps combines high capturing effectiveness with undisturbed migration behaviour close to the pond. Thereby the question arises whether the fluctuations of the population size found in comparable studies are due to fluctuations in the capture effectiveness rather than in the real population size.

**Figure 1.** Effectiveness of drift fence and funnel traps (in %) for the Great Crested Newt (*Triturus cristatus*) from 2001-2003, for males and females. 100 % = population estimated with Lincoln-Petersen-Method.

**Figure 2.** Population trend of the Great Crested Newt (*Triturus cristatus*) in the study area from 2001-2003 based on drift fence data (dark bars) and corrected for mark-recapture-data (Lincoln-Petersen estimation based on recapture data by inner circle of pitfall traps (2001, emigrating individuals in autumn), and by submerged funnel traps (2002-2003, during breeding season), bars incl. 95 % confidence interval).



If the measuring error is not quantified, population size estimation and resulting trends often are strongly biased. These effects are relevant regarding the current discussion on the evaluation and conservation of populations in the EU habitat directive, in which *T. cristatus* earns special attention as a species in the appendices II and IV.

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