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Research Article

Effect of bait in funnel-trapping for great crested and smooth newts *Triturus cristatus* and *Lissotriton vulgaris*

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ABSTRACT – Aquatic funnel traps (collapsible, mesh construction) set for newts were baited with beef and compared with non-baited traps. Baited traps captured great crested newts *Triturus cristatus* more than twice as frequently as traps with no bait, yielding more than three times as many newts. Females were more frequently attracted to baited traps than were male great crested newts. The addition of bait to traps did not significantly affect their efficiency in trapping smooth newts *Lissotriton vulgaris*. Baiting traps is worthy of further consideration in great crested newt survey and/or surveillance work. Nevertheless, the trapping methodology described here is suitable only for specific conditions and is best regarded as an option within a range of survey techniques.

INTRODUCTION

Aquatic funnel-trapping has long been used in the study of newt ecology (e.g. Bell, 1977; Dolmen, 1983a; Griffths, 1987; Griffiths & Mylotte, 1987; Baker, 1999). In the UK bottle traps have been the most commonly used design and are recommended for survey work (Griffiths et al., 1996; English Nature, 2001; Sewell et al., 2013). Nevertheless, other types of funnel trap have also been used in newt research and monitoring work, including specially constructed box traps (e.g. Dolmen, 1983a; Baker, 1999), and more recently a 'Dewsbury' trap has been designed (Dewsbury, 2011). Mesh fish traps have been recommended and used in North America (e.g. Olson et al., 1997) and specifically for newt surveys in continental Europe (Bock et al., 2009; Kröpfli et al., 2010). Illuminating traps has improved trapping efficiency for some amphibians (e.g. Grayson & Roe, 2007) but has had mixed results for great crested newts; glow sticks were ineffective in one study (Kröpfli et al., 2010) but light emitting diodes improved trap efficiency in another (Beckmann & Göcking, 2012). In most cases, however, traps set for amphibians, including newts, rely on the animals' tendency to enter spontaneously – that is without the use of bait.

The current study tested the effectiveness of traps baited with small pieces of beef in capturing great crested and smooth newts.

MATERIALS AND METHODS

The traps used (BO traps supplied by Interex International Ltd.) are constructed of plastic mesh supported by a frame which is collapsible for storage. They measure 46 cm long x 25 cm x 25 cm and have funnel entrances at both ends. The trapping trials were carried out in natural ponds (pingos) in Norfolk, eastern England. Ten traps were set during each trial. Five traps in each trial were baited with small cubes of stewing steak (approximately 3 g) held in a zippered pocket set in the roof of the traps. Traps were set along the pond edges in pairs, each comprising a baited and non-baited trap, with at least two metres between traps.

Twenty-five trapping trials (125 pairs of traps) were carried out over six years, in seven ponds known to support both great crested and smooth newts. The traps were set during the daytime on dates ranging from 11 March to 20 July. Water temperatures, taken at the pond

	Great crested newt		Smooth newt	
	Bait	No Bait	Bait	No Bait
Traps capturing newts	49	21	17	13
Traps not capturing newts	76	104	108	112

Table 1. Numbers of traps with and without bait capturing/not capturing newts.

surface, ranged from 9 to 27°C. Each trap was set approximately 1.5-2.0 m from the shoreline, and attached to the pond bank by rope tied to a stake. Traps were thrown into open water, allowing them to sink to the pond bottom (depths of approximately 0.3-1.0 m). Each trial lasted for three to four hours after which the traps were removed from the water and inspected for newts.

RESULTS

Baited traps captured great crested newts more frequently than did traps with no bait (χ^2 = 15.56, 1 d.f., $p < 0.01$); there was no such effect for smooth newts (χ^2 = 0.61, 1 d.f., $p = 0.44$) (Table 1).

Baiting traps captured more than three times as many great crested newts (all stages) as using traps with no bait (Fig. 1). This effect of baiting was most marked among females – more than seven times as many were captured in baited traps.

Great crested newt larvae were captured only in low numbers making it difficult to determine whether they were attracted to baited traps. No smooth newt larvae were captured.

DISCUSSION

For great crested newts baiting mesh funnel traps with small pieces of beef increased trapping efficiency, more than doubling the number of traps capturing newts and more than trebling the number of newts captured. Hence the use of bait in funnel traps is worthy of further consideration.

Field trials of mesh funnel traps, similar to those used in the current study, indicate that they are more effective than bottle traps (Madden & Jehle, in press). An additional advantage of these traps is that they can be set on the pond bottom in deeper water than is practical for bottle traps. Bottle traps are confined to relatively shallow water, often close to the shoreline of larger ponds. Great crested newts (although not their larvae) tend to live on the pond bottom and for much of the aquatic season spend the daytime in deeper parts of the pond (Steward, 1969; Dolmen, 1983b; Griffiths

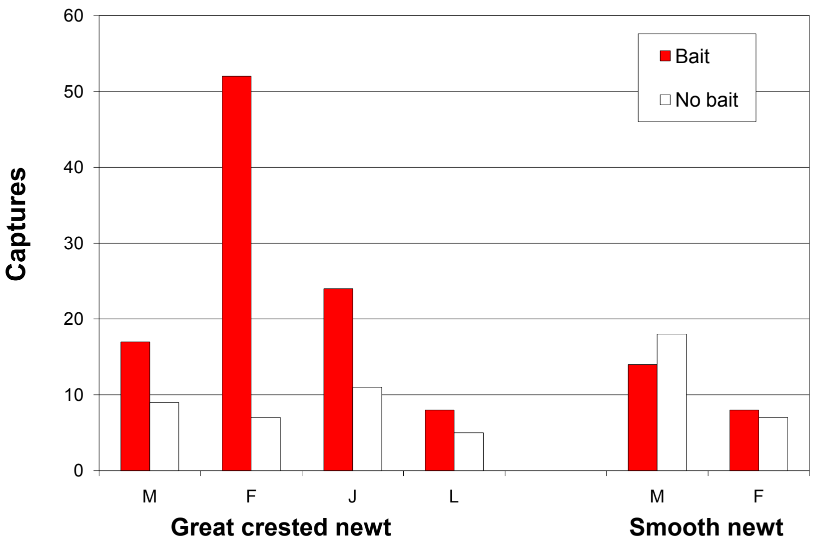

Figure 1. Numbers of great crested and smooth newts captured in 125 pairs of traps with and without bait. M = male, F = female, J = juvenile, L = larva.

& Mylotte, 1987) so trapping here is likely to be productive (e.g. Kröpfli et al., 2010).

Use of traps in the current study differed from convention. Great crested newts are primarily nocturnal (Dolmen, 1983a; Dolmen, 1983b) and consequently funnel traps are more effective at night (Bock et al., 2009) whereas in the current study trapping was carried out during the daytime. This was because fully immersed funnel traps risk killing newts which are prevented from reaching the water surface. Hence traps were deployed for only three to four hours rather than leaving for a longer period typical of overnight trapping. The short trapping period also permitted the use of traps at water temperatures higher than regarded as safe for prolonged submersion. It should be noted that the ponds in the current trial were relatively deep and supported plentiful submerged aquatic vegetation. Trapping in other conditions should be undertaken with caution to determine whether the water is sufficiently oxygenated to hold newts in submerged traps without asphyxiation.

Additionally, some of the trapping trials were carried out relatively late in the year. This did not seem to reduce trapping efficiency. Trapping rates (proportion of traps capturing newts) were 0.57 for the 35 baited traps which were set in June and July, compared with 0.32 for baited traps set from March to May. The success of late season trapping may be in part a geographic effect (seasonal amphibian activity being later in eastern England than in southern or western areas) but it would be worthwhile investigating whether traps that capture from the pond bottom in deep water (e.g. fish traps and Dewsbury traps) extend the period over which great crested newts can be trapped beyond the newts' breeding season.

Baited mesh funnel traps used in the current study would certainly not be suitable for all situations. It would be difficult or impossible to use these traps in ponds packed with dense beds of aquatic vegetation, for example. Taking a wider perspective, the future use of traps in amphibian survey work will likely be dependent on developments in the field of environmental DNA, which has been used to detect great crested newts and may even be able to quantify population density (Thomsen et al., 2012). Less reliance on traps should be welcomed given the risks to wildlife entailed (Denton, 2002; Klemish et al., 2013). The effectiveness of any particular trap type is likely to vary according to survey conditions. Baited mesh traps should be regarded as an option within a range of techniques considered by the surveyor, who should choose according to the pond conditions in hand, survey objectives and financial constraints.

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