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SHORT COMMUNICATION

Passive trapping of aquatic caecilians (Amphibia: Gymnophiona: Typhlonectidae)

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Abstract

Due to a paucity of quantitative methods to study caecilian amphibians, knowledge of their biology has lagged far behind that of other neotropical vertebrates. We report the passive trapping of the aquatic *Typhlonectes compressicauda* (Typhlonectidae) from a pond in French Guiana. Four collapsible, nylon-meshed funnel traps (two different manufacturers) were baited with fish and set over a total of five nights in June 2004 and January 2005. A total of 11 *T. compressicauda* were collected across four nights, all in the same single trap. Our results demonstrate the feasibility of passive trapping of aquatic caecilians. This method of capture provides study specimens, but also has the potential to yield quantitative data on the population biology of these poorly known amphibians.

Keywords: Conservation, ecology, freshwater, French Guiana

Introduction

Caecilian amphibians (Gymnophiona) are probably the least understood order of extant vertebrates (Nussbaum & Wilkinson, 1989; Nussbaum & Wilkinson, 1995; Wilkinson & Nussbaum, 2005). Although some caecilians have aquatic larvae (e.g. Kupfer et al., 2005a, 2005b), the adults of most species are terrestrial burrowers in tropical soil and leaf litter (e.g. Taylor, 1968; Himstedt, 1996; Gower & Wilkinson, 2005) and this has contributed to making caecilian ecology a particularly challenging discipline (Himstedt, 1996; Kupfer et al., 2004; Measey et al., 2004; Gower & Wilkinson, 2005). Species of three genera (*Atretochoana* Nussbaum & Wilkinson, 1995, *Potomotyphlus* Taylor, 1968, *Typhlonectes* Peters, 1879) of the South American family Typhlonectidae are believed to be fully aquatic (Wilkinson & Nussbaum, 1999) and viviparous (e.g. Exbrayat, 2000). They live in a variety of habitats including marshes, ponds, streams and rivers, and are known from microhabitats as diverse as mud burrows, under stones, in aquatic vegetation and open water (e.g. Moodie, 1978; McDiarmid, 1994; Wilkinson & Nussbaum, 1999).

Recent studies have made substantial advances in devising and testing field techniques for undertaking quantitative terrestrial caecilian ecology, including randomised surveys (Measey et al., 2003a; Gower et al., 2004; Kupfer et al., 2004) and permanent marking (Measey et al., 2001) for recapture studies (Measey et al., 2003b). An increase in tried and tested techniques for a greater diversity of caecilians will be needed if better ecological data are to improve knowledge of caecilian conservation biology. Most caecilian species are currently of data deficient conservation status, a worrying situation in the face of known declines of some other amphibians (Gower & Wilkinson, 2005).

Few special techniques have been established for sampling caecilians (e.g. McDiarmid, 1994; Pillai & Ravichandran, 1999). For terrestrial species and life history stages, digging is usually required (e.g. Measey et al., 2003a; Gower et al., 2004; Kupfer

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et al., 2004; Gower & Wilkinson, 2005). For aquatic typhlonectids, there are reports of collections made by hand (Moodie, 1978; Verdade et al., 2000), and by using fishing nets (Taylor, 1968). One of the earliest reports (Fuhrmann, 1914, p. 112) of *Typhlonectes natans* (Fisher, 1879) included material collected with fishing lines, and additional museum specimens of *Typhlonectes* and *Potomotyphlus* with fishing hooks in their mouths (DG, MW pers. obs.) demonstrate that this is not unique. Quantitative sampling using funnel traps has been used successfully to study temperate frogs and salamanders and their aquatic larvae (e.g. Adams et al., 1997; Mölle & Kupfer, 1998; Johnson & Barichivich, 2004; Weddeling et al., 2004), but this approach has not been tested for tropical aquatic caecilians. Here we report the passive trapping of the aquatic typhlonectid caecilian *Typhlonectes compressicauda* (Duméril & Bibron, 1841) at a field site in French Guiana.

Materials and methods

The study site is a large (50 000 m^2), permanent pond a few kilometres south of Matoury, French Guiana (N 04°49.324′, W 052°20.579′, 50 m a.s.l.). The pond is artificial and was created some 25–30 years ago (C. LaCoste, pers. comm.). It drains into marshland at its southeastern edge. The site is adjacent to a main road (N2) and low intensity housing, and is 500 m away from the east end of Rochambeau Airport. The pond contains rich marginal vegetation and patches of emergent vegetation including reeds, shrubs and trees. The vertebrate fauna includes freshwater fish, frogs, reptiles such as small crocodilians and freshwater turtles, and several species of water birds. The study site was chosen because an unidentified species of typhlonectid caecilian was known to be present (D. Massemin, pers. comm.).

We employed two very similar types of funnel trap designed for capturing small amphibians and baitfish (see also Adams et al., 1997). Both traps are constructed of nylon webbing (2.5 mm mesh) wrapped around a spring-loaded, collapsible wire frame. Trap dimensions are 24 × 23.5 × 44 cm for red-brown traps manufactured by Balzer GmbH (Lauterbach, Germany) and 26 × 25 × 46 cm for a bright green trap manufactured by Jenzi Fishing GbR (Plüderhausen, Germany; Figure 1). The traps have an open funnel at each end, with circular entrance holes of 6 cm diameter. In an attempt to reduce the likelihood of caecilians escaping from each trap, we used string to close the aperture of one entrance funnel completely, and to narrow the entrance of the other funnel to an oval of approximately 2.5 × 3.5 cm. Each trap has a zippered pouch for bait.

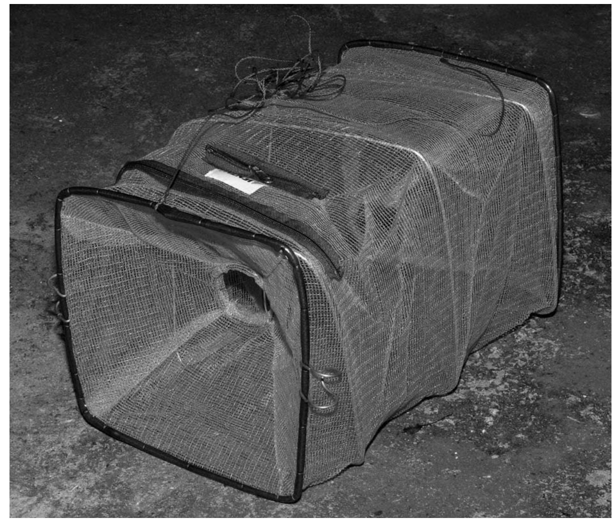

Figure 1. The collapsible Jenzi baitfish trap used to collect *Typhlonectes compressicauda*.

Trapping was carried out (1) for four consecutive nights between 2 June and 7 June 2004, and (2) overnight between 8 and 9 of January 2005. The traps were set each afternoon/early evening and checked the next day, between 11.5 and 24 hours (mean interval of 19 h) after being set.

Typhlonectid caecilians appear to be generalist carnivores (e.g. Gudynas et al., 1988; Verdade et al., 2000). Observations in captivity of *Typhlonectes* (e.g. Hofer, 1998; DG, AK, Hofer, 2000; MW, pers. obs.) and sightings and collections of these caecilians in places where fishermen clean their catch and discard waste (MW, pers. obs.) suggests that *Typhlonectes* feed readily on carrion and probably locate food using chemosensory clues, as do their terrestrial relatives (Himstedt, 1996). We thus used roughly chopped tinned (3 June) and freshly caught local pond fish (4–6 June and 8 January) to bait the traps.

We used four traps for this study, three manufactured by Balzer and one by Jenzi. All traps were placed in shallow water (depth range 45–100 cm, pH 6.0) at a distance of up to 7 m from the edge of the pond. During the first trapping night (3 June), two traps were positioned at the eastern end of the pond close to its exit stream leading to the marsh. On this and subsequent occasions, all other traps were set along the pond's southwestern margin. Traps were prevented from floating away by tying them to wooden stakes and/or emergent vegetation. The top of each trap was precisely positioned to break the water surface, in order to prevent air-breathing typhlonectids from drowning. Two methods were used to maintain the position of each trap at the water surface—by introducing small ballast stones into traps tied tightly to poles so as to maintain the open funnel at a level slightly below the closed end (June 2004), or by inserting polystyrene blocks in the traps to maintain buoyancy (January 2005). Bait was placed in the zippered pouch (June), or directly inside the main trap compartment (January).

Results

During the four trapping nights between 3 and 7 June 2004, we captured six *Typhlonectes compressicauda*, one female of 336 mm total length (31.8 g), three males (one of which is shown in Figure 2) ranging from 300 to 370 mm (25.2 – 39.9 g), and two subadults of 190 (10.4 g) and 173 mm (7.3 g). On the night of 8 January 2005, five *T. compressicauda* were collected ranging from 205 to 320 mm (14 – 37 g). All 11 specimens were trapped in the green Jenzi trap along the pond's southwestern margin using fresh fish bait. Each trapping night yielded from zero (3 June) to five (8 January) caecilians. One specimen was found dead (7 June), probably drowned after the trap drifted loose from its mooring. Several small holes were often found in the less robustly meshed, red-brown Balzer traps. These were repaired before resetting traps on each occasion, but no caecilians were collected in them. Other than caecilians, traps occasionally collected an assortment of fish, freshwater snails and small crayfish.

Discussion

As far as we are aware, this is the first demonstration of passive trapping of aquatic caecilians. The results show that fresh fish is a viable bait, that traps need to be of robust construction and probably to have small entrances, and they emphasise that it is essential that set traps allow access to air. Our study was preliminary and there remain many unknowns to be investigated, including where and when it is best to set and check traps, whether specimens are able to escape, optimum mesh size, optimum entrance size, requirements for the presence and type of baits, and demographic trapping biases. We predict that similar traps will also work for other aquatic and semiaquatic typhlonectids and perhaps for larvae of some terrestrial caecilians. Although we used nylon mesh traps, other baited containers may also work.

Although *T. compressicauda* has been studied in the laboratory (see Exbrayat, 2000) quantitative studies of especially the field ecology of *Typhlonectes* are lacking, and the biology of their aquatic relatives *Potomotyphlus* and *Atretochoana* is largely unknown. Passive trapping opens up many new possibilities for quantitative studies of aquatic caecilians, including quantitative monitoring for conservation assessments.

Figure 2. A male *Typhlonectes compressicauda* (total length 300 mm; mass 25.2 g) trapped in June 2004.

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