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A Funnel Trap Modification for Surface Collection of Aquatic Amphibians and Reptiles

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Funnel traps originally described by Imler (1945) and simplified by Fitch (1951) have been used in many terrestrial (Fitch 1951, 1963; Greenberg et al. 1994; Imler 1945; Vogt and Hine 1982), arboreal (Fritts et al. 1989; Rodda and Fritts 1992; Savidge 1987) and aquatic (Adams et al. 1998; Calef 1973; Carpenter 1953; Fraker 1970; Richter 1995; Riley and Bookhout 1990) field studies. Some aquatic studies (Calef 1973; Richter 1995) have used modified funnel traps with air chambers to prevent suffocation. Traps in these studies have been attached to buoys and placed on the surface, or attached to rods in the ground and placed at varying levels in the water column. However, typical methods for aquatic captures have involved placing unmodified traps half-submerged (without any flotation aid) along the shoreline (Fraker 1970; Keck 1994) or fully submerged (Adams et al. 1998; Carpenter 1953) on the water bottom. Two similar, significant problems exist when using these placements. Any reptile or adult amphibian (with the exception of paedomorphic salamanders) will drown in an underwater trap if not tended to often enough. Depending on changes in water level, animals captured in traps half-submerged run the risk of drowning, desiccating, or over-heating. Here we describe a safe and easy funnel trap modification for humane use in the field.

Eelpots (Cuba Special Manufacturing, Fillmore, New York, USA) measured 60.5 cm long and 22.5 cm in diameter (terminal funnel openings measured 4 cm in diameter), and were made from 0.5 cm gauge hardware-cloth (Fig. 1). Two pieces of Styrofoam measuring 30 cm x 6 cm x 5 cm (L x W x H) were attached with locking, 22.7 kg tensile strength nylon ties (Thomas and Betts Corporation, Memphis, Tennessee, USA) to the middle, opposing sides of each eelpot. A third nylon tie was attached in the middle for easy manipulation of the traps. The Styrofoam blocks were attached so the traps floated half-way out of the water. Two pieces of nylon rope, 1.5–2 m in length, were also attached to opposite sides of each eelpot. Traps were placed in the water and were aligned to facilitate entry of animals following along edges of the shoreline or of vegetation (Fig. 2). Each trap was tied to nearby vegetation or to stakes in the ground with enough play in the rope to compensate for fluctuating water levels. Traps were left out continuously for at least 10 days and were checked daily. During periods of non-trapping, plastic cups were used to close funnel openings and prevent captures. Diameter of funnel openings, dimensions of Styrofoam, placement of Styrofoam on traps, and length of rope can be easily altered as needed. Under normal conditions, the Styrofoam will support the weight of any captured animal and will last at least one year without need for replacement. Eelpots were the greatest expense (US $15/trap), but the additional materials were of negligible cost (~ US $1.50/trap). Funnel traps can be built from aluminum window screen (Greenberg et al. 1994) as a less expensive, but more labor-intensive alternative.

Fraker (1970) described his unmodified, aquatic funnel traps as "relatively inefficient," reporting a 2.3% success rate (2.3 snakes caught per 100 trapping-days) in 79 days of trapping northern water snakes (*Nerodia sipedon sipedon*) in a fish hatchery and the surrounding ponds and streams. Our modified traps are currently being used in the fifth year of an ongoing study of giant garter snakes (*Thamnophis gigas*) in deep and shallow water central California ponds, sloughs, and irrigation canals. During the first 79 days of trapping in 1997, we report a 3.7% rate of trap success. Although trap efficiency is relatively low in both studies, it is important to note that trap success was not negatively affected—and was actually greater—when using this modified design. Trap success may be improved if the traps are baited (Keck 1998) or when used in combination with other methods (Adams et al. 1997) such as drift fencing (modified from Lutterschmidt and Schaeffer 1996).

According to Adams et al. (1998), funnel traps detected the most species of all sampling methods compared, required the least effort to use, and was the only technique to detect presence of small populations. In a review of various aquatic sampling methods, Adams et al. (1997) felt the strongest reason for using funnel traps was that the skill and experience of the user has very little influence on results. Drawbacks noted by those two papers were that funnel traps capture few adult amphibians, potential trap locations are not maximized, and the problem of trap mortality. During the

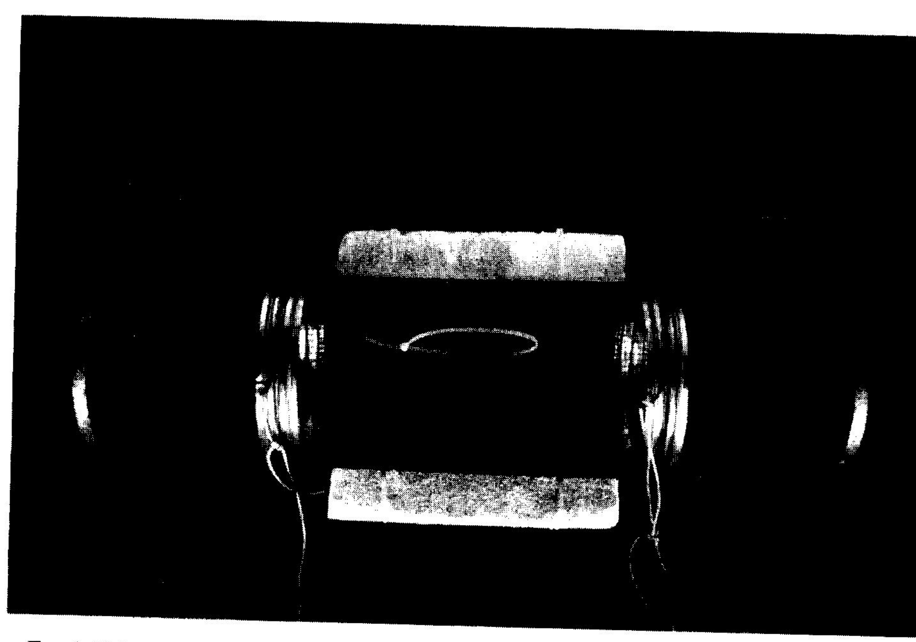

FIG. 1. Eelpot modified for placement on water surface.

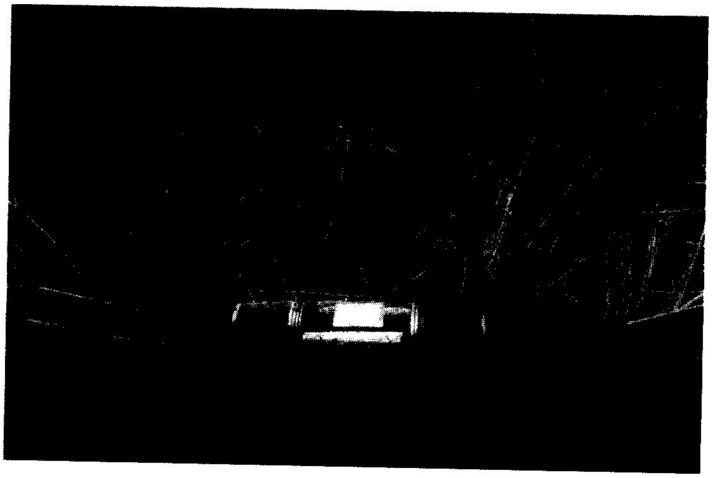

FIG. 2. Modified trap in a marsh along edge of vegetation.

second year of our *T. gigas* study (the only year amphibian captures were recorded), our traps caught twice as many adult bullfrogs (*Rana catesbeiana*, N = 160) as larval bullfrogs (N = 81). Furthermore, our design allows for sampling an increased range of aquatic habitats. Future conservation work will depend on the quality of sampling done now. Being able to survey additional areas will provide a more accurate documentation of species presence and distribution. Finally, trap mortality is avoidable. No amphibian or reptile has died in our traps due to drowning, desiccation, or other trap-related causes (several bullfrogs have been partially consumed by crayfish, *Procambarus* and *Pacifastacus* spp.). Our trap design is appropriate for use in studies where animal safety is important or where habitats (i.e., stream banks with steep slopes) preclude deployment of unmodified funnel traps.

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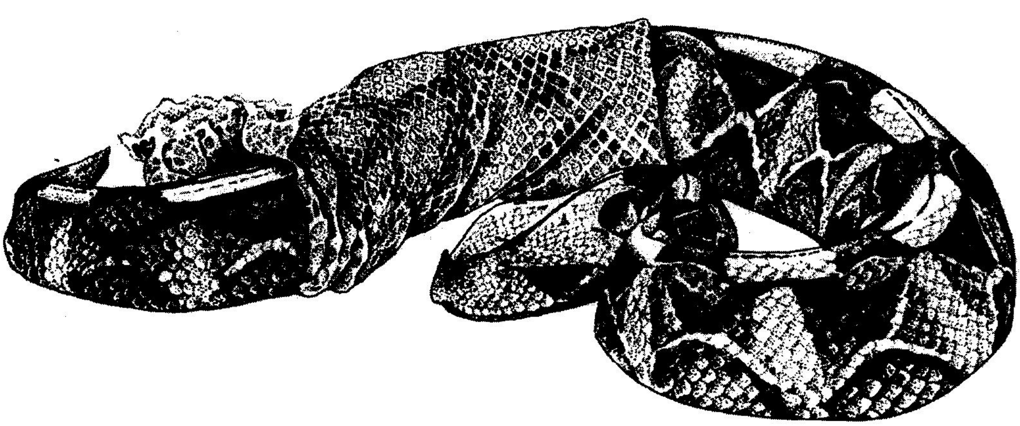

Bitis arietans (Puff Adder). Illustration by P. A. Benson.