A live-trap and trapping technique for fossorial mammals

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An effective live-trap was designed for *Cryptomys hottentotus* (Bathyergidae) and *Amblysomus hottentotus* (Chrysochloridae). Factors involved in the design and adaptability of this trap for use in various field conditions and live capture of other fossorial mammals are discussed.
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'n Doeltreffende val is ontwerp om *Cryptomys hottentotus* (Bathyergidae) en *Amblysomus hottentotus* (Chrysochloridae) lewend te vang. Faktore betrokke by die ontwerp en aanpasbaarheid van hierdie val vir gebruik onder 'n verskeidenheid van veldomstandighede, en om ander fossoriale soogdiere lewend te vang, word bespreek.
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The paucity of investigations on bathyergids, chrysochlorids and other fossorial mammals is directly related to the difficulty of obtaining specimens. For instance, despite the fact that *Cryptomys hottentotus* is widely distributed (de Graaff 1971), is detrimental to both horticulture and agriculture (Bishop 1947), and may greatly modify habitat (Eloff 1953), few studies have been conducted on the common mole-rat and methods of capture are glaringly absent in the literature. Mole-rats can be shot, poisoned by bait, or gassed (Bishop 1948), but none of these methods provide specimens for study.

It is even more difficult to capture live, uninjured specimens. One time-consuming method is to look for surface activity, jab a spade through the burrow behind the burrowing mole, and then lift and fling the mole onto the surface. Genelly (1965: 649) remarked on his study of *Cryptomys*, "Live-trapping would have been desirable but could not be reliably accomplished with snares, although an occasional mole-rat was still alive and in good condition when removed from a snare". Aside from any apparent injuries, the trauma involved in such capture does not promote acclimatization to captive conditions. Here, a design for an effective live-trap for *Cryptomys hottentotus* and *Amblysomus hottentotus* is described, and factors involved in the evolution of trap design for use in various field conditions and live capture of other fossorial mammals are discussed.

Materials and Methods

Constructing the trap

Major components of the live-trap are shown in Fig. 1. A 300 mm length of PVC plastic piping with an inside diameter of 59 mm and an outside diameter of 63 mm forms the body of the trap. A 50 mm long slit, 50 mm from one end of the trap, is cut for a length of 50 mm through the top of the plastic pipe to accommodate the sliding door.

The door housing is formed from a 6 mm thick, 116 mm long, and 75 mm wide section of PVC sheeting. A 63 mm diameter hole is drilled in the centre, and rectangles measuring 58 mm by 8 mm are cut from each end. The PVC sheet is then cut into two equal pieces. Two 65 mm

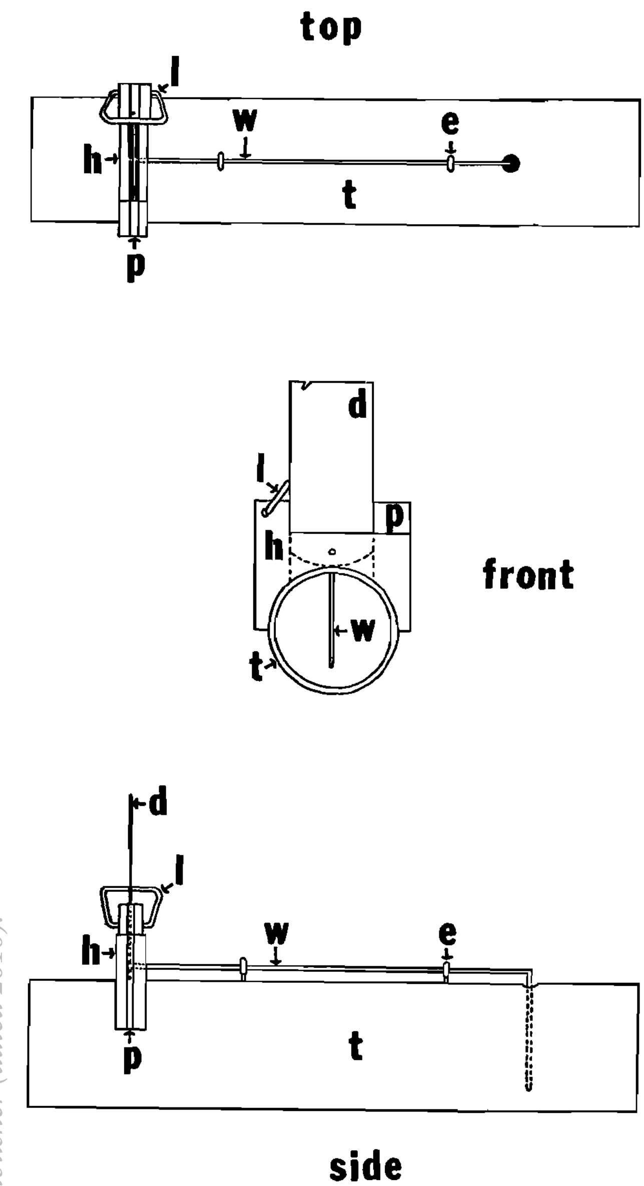

Fig. 1 Top, front, and side views of a trap in set position. d, door; e, eyescrew; h, door housing; l, lock; p, door post; t, tube; w, trigger-wire.

and 17 mm wide door posts are then cut from 1,5 mm thick PVC sheeting, positioned, and glued on either side of the door with PVC adhesive (such as Penta Dura Cement). The portion of door post extending into the semicircular region of the door housing may be removed by emery wheel. The slit in the door housing may now be aligned and glued into position over the slit in the plastic pipe.

The door is fashioned from 93 mm long, 40 mm wide, and 0,7 mm thick brass sheeting. Both corners of one end are rounded to conform to the inner circumference of the pipe. An angled slit is made at one of the two corners. A wire bent into rectangular shape is positioned through a hole drilled in the right door post and housing. When the door slides shut, this locking loop of wire falls over the corner of the door and prevents reopening by sliding into the slit at the top of the door.

A hole is drilled through the back of the door housing unit and the door to accommodate an L-shaped wire (bent bicycle spoke) measuring 185 mm along the top of the trap, and a 60 mm portion which extends down into the interior of the trap (through a 5 mm diameter hole drilled 60 mm from the rear of the trap). Two eyescrews dorsally positioned at 10 and 20 cm intervals from the front of the trap support, and allow sliding of, the trigger-wire (bent aluminium brazing rod obviates the need for eyescrews). Pushing the trigger-wire backwards causes the trigger-wire to slip out of the hole in the door, allows the door to slide shut, and the lock to fall over the door into a locked position.

A 24 cm section of 50 mm piping cut lengthways forms a semicircular canopy over the trigger-wire. A thick rubber band holds the canopy firmly in position, yet allows the sliding of the canopy backwards and permits the trigger-wire to be positioned.

A hinged door at the back of the trap involved more expense, but was more serviceable than a piece of plastic taped into position. Many materials may be obtained from industries as scrap, or inexpensive materials such as galvanized iron may be substituted for brass.

Locating the tunnel

Traps should be placed at or near fresh mounds to ensure that there is an animal in the burrow system, and to lessen the likelihood of the tunnel being plugged. Probes, described by Crouch (1942) and Storer (1953) for locating pocket gopher tunnels, may be used to find tunnels leading into the mound.

Two traps are normally required for setting in each direction of the intersected burrow. Since the traps are 30 cm long and cannot be set within the burrow itself, excavation of a long trench for trap placement may be troublesome in areas where extensive digging is required. In most cases, the number of trap sets may be doubled and the work of setting traps halved by placing only one trap instead of the usual two traps per setting by noting the position of the surface mounds. Fresh mounds often radiate in linear fashion from a clump of older mounds where the established portion of the burrow system (including the nest) is located. Choose a fresh mound which appears the furthest away from the old clump of mounds and locate the main runway, and place a single trap with the front of the trap facing the old clump of mounds. This situation is often found along roadsides where the freshest mounds are usually closest to the road. Trapping in the middle of mound clusters may warrant the use of two traps; otherwise, if the runway is not located immediately and if time permits, wait a few days until a more favourable mound pattern develops.

Setting the trap

Once the tunnel to a fresh mound is located, excavation of the trap site should be accomplished as soon as possible since the first response of mole-rats to any disturbance is to investigate, and if any opening is present, to plug the burrow back away from the disturbance. However, it must be emphasized that proper placement of trap is as vital to success as proper and precise construction of the trap.

The lateral tunnel to the mound is excavated to a level portion of the main tunnelway, which usually occurs in the first 12 cm or so of digging. The trap may then be put in a level position snug against the burrow opening and in the same linear axis of the portion of tunnelway which was excavated to position the trap. The trap is removed, and also the dirt in the tunnelway loosened by the positioning of the trap. Loose dirt is spread along the floor of the trap, and again the trap is set into position. Dirt may then be packed around the trap-burrow juncture. To set the trigger, the door is raised, the canopy slipped back, the trigger-wire inserted through the door, and the lock is propped into ready position against the edge of the door. The canopy is repositioned forward, and the trap buried (except for the upraised door which is covered by a plastic flower pot 11 cm in diameter which obstructs light, draughts, noise and other disturbances).

Many fossorial traps including the present type do not require bait, operating on the principle that the animal will attempt to plug all openings to the surface in the burrow system with earth. However, bait may increase captures, and in the case of live trapping, prevent animals from dying of starvation (Howard 1951). Further study is needed to determine whether baiting increases trapping success, and what types of bait are most effective.

When to trap

Trapping after a rainfall is convenient because fresh mounds are easier to locate, the soil is easier to dig, placing and insulating the traps is easier than in hard soil, and animals appear to be more active in mound-building (perhaps because of repairing damage to tunnels or because the soil is easier to excavate). Trapping can, however, be very successful in dry soils as well.

Minimally, traps should be checked in the morning and evening. It is good procedure to recheck all traps which have been positioned before leaving. In the case of colonial animals such as *Cryptomys,* it is advisable to reset traps after a capture since most trapping time is spent in finding areas suitable for trapping and exposing runways.

Results

Of 100 traps set, 39 were inactive for various reasons: ants aggregated in great numbers in some traps; monkeys *Cercopithicus aethiops,* dogs, and trucks prematurely triggered some traps; the absence of mounds or plugging response from some systems after several days of trapping suggested that all the occupants of some burrow systems had been trapped; and heavy rain sometimes necessitated picking up traps prematurely (not because of possible damage to the traps, but because captive animals tended to become wet and more likely to die). Of 61 active sets, 46 captures (three golden moles *Amblysomus hottentotus* and 43 *Cryptomys hottentotus*) and 15 misses were recorded for 75% trapping success. For both active and inactive sets, success ranged from five captures for seven traps, to no capture for six traps (during heavy rain). There were no injuries and the only mortality occurred when a trapped individual drowned in a trap during an overnight rain.

Discussion

Numerous trap types have been employed for capturing fossorial mammals (see reviews by Godfrey & Crowcroft 1960, Hickman 1969, Mellanby 1971, Bateman 1973, Twigg 1975). Pitfall traps, in use since prehistoric times, have been used. Many snare type traps are now produced commercially with springs and metal loops replacing bent saplings and vines. Modifications of deadfall type traps use spring mechanisms which force spikes through the roof of surface runs (typical of insectivores) to impale the victim; other variations allow a door to drop behind the animal (Rudge 1963). Clutch-action traps such as iron foot traps can capture moles (Bishop 1948). Kennerly (1964) blunted the pointed steel jaws of the reliable Victor Macabee death-trap with adhesive tape for use in live trapping. The direct method of flipping the animals out of the burrow with a spade (Bishop 1948, Hill *et al.* 1957) requires a considerable amount of time and patience. Unmodified surface treadle-box Longworth traps were used by Weir (1971) for trapping tuco-tucos *Ctenomys talarum* from burrows. Trap designs for fossorial mammals are quite varied, but new designs appear regularly (see review of geomyid traps by Hickman 1969).

Even when traps prove equally effective, there are several features making some fossorial live-traps more desirable than others. What constitutes a desirable feature in the design and construction of a trap varies, of course, with different investigators: funds available for trap construction, type habitat and weather conditions, and biological, anatomical and behavioural peculiarities of the species sought. The perfect fossorial trap may be paradoxical: development of one desirable feature such as low cost may inhibit development of another desirable feature such as durability. The best that can be achieved is a compromise coming the closest to fitting the needs imposed by existing circumstances.

Desirable mechanical features of trap design revolve around the primary principles such as simplicity, availability and low cost of materials, ease of construction, durability, ease of setting, and prevention of injuries to captives or other animals (such as dogs or children) which may come into contact with traps. Critical biological factors influencing trap design are temperature and humidity inside the trap, thigmotaxis, auditory clues, orientation, olfaction, and sight. The influence each of these mechanical and biological variables has on successful trapping of fossorial mammals is largely unknown. The effect each variable has on other variables, under different habitats and weather conditions, and when applied to different orders, families, genera, or even species, is an open field for investigation (see similar studies on surface traps by Cockrum 1947, Smith *et al.* 1971, and others). Comparative studies of trap effectiveness would be aided by the fact that fossorial mammals are widely distributed, and occur commonly throughout the world (Ellerman 1956). Perhaps only minor differences in trap design, such as size, would be required to adapt a trap design to broad use, because anatomical differences between a wide diversity of taxonomic groups are diminished by fossorial adaptations (Shimer 1903).

Encouragement is given to scrutinize the literature beyond taxonomic boundaries for solutions to the special problems presented by fossorial mammals, and to promote not only studies on the development of new traps, but also the further testing and modification of existing trap types. Not only is it important to have a trap that works, but it is also most desirable to understand the factors contributing to its effectiveness.

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