Design and field tests of a modified small mammal livetrap

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A PVC (poly-vinyl-chloride) and metal small mammal live-trap has been developed and subjected to field tests. The PVC traps captured greater numbers of very small rodents and shrews but fewer large rodents than did hardboard ones.
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'n PVC-en-metaal vanghok vir klein soogdiere is ontwikkel en is aan toetse in die veld onderwerp. Hierdie PVC-vanghokke is meer doeltreffend wat kleiner knaagdiere en spitsmuise betref; kartonplankvanghokke is egter meer geskik vir die groter knaagdiere.
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The factors influencing trapability of small mammals, including the type of trap used, have been reviewed by Flowerdew (1976). Traps of similar design but different sizes may elicit differential response (Quast & Howard 1953; Wingate & Meester 1977) and even apparently identical traps may yield significantly different numbers of animals due to varying responsiveness of their tripping mechanisms (Grant 1970). Differences in trap efficiency for different species and castes (e.g. males, females, juveniles) necessitate proving in field trials that traps adequately perform the tasks for which they are used (Wiener & Smith 1972). In one of the few trap-response studies that have been done under African conditions Wingate & Meester (1977) established that of six types of livetrap tested, hardboard boxtraps 270 x 90 x 85 mm (Meester 1970) were most effective in capturing *Rhabdomys pumilio* and *Praomys natalensis*, while *Otomys irroratus* was most frequently captured in wire-mesh 'Tomahawk' traps 310 x 135 x 140 mm. Davis (1973) found hardboard traps to be most successful for *O. irroratus*. Although hardboard traps are commonly used in South African small mammal field studies (e.g. Davis 1973; Brooks 1974; Lloyd in prep.) they have a number of major disadvantages. Among these are their weight (approximately 700 g), lack of long-term durability, and the high labour costs involved in their construction. Accordingly a PVC (poly-vinyl-chloride) and metal tunnel trap was developed which appears in some ways to be an improvement on hardboard traps, or at least a useful addition to the range of livetraps available. A modification of the hardboard trap (Meester 1970), it is weatherproof, cheap and simple to construct, and in field trials described below proved to sample very small mammals more effectively than did hardboard traps.

Design and construction of PVC tunnel traps

The trap (Fig. 1) is based on the design of hardboard tunnel traps (Meester 1970). The 216 mm tunnel consists of 2 mm rectangular 54 x 68 mm PVC 'Classic' downpipe (Marley S.A. (Pty) Ltd). cut from 4 m lengths on a circular saw fitted with a perspex-cutting blade. Using a 4 mm tungsten-tipped blade, the tunnel was grooved across the 54 mm top and bottom 6 mm from one end to a depth of 5 mm to hold the sliding door at the back of the trap. Jigs were

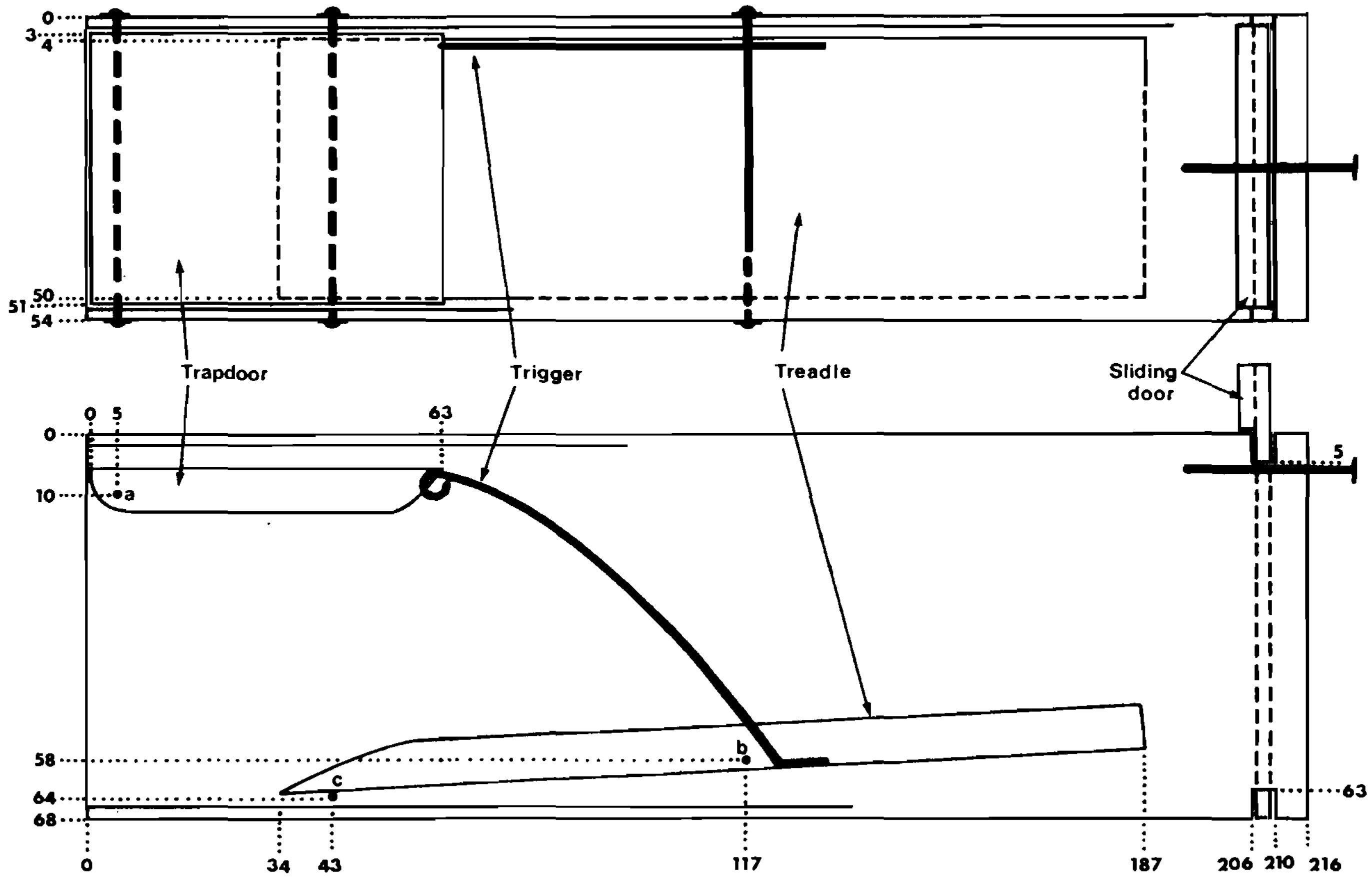

Fig. 1 Design of PVC and metal tunnel traps (after Meester 1970). Figures along both axes represent distances in mm. For construction details, see text.

constructed to facilitate drilling with a drill-press of three pairs of 1,5 mm holes according to the placement of points a, b and c (Fig. 1). The trapdoor was constructed of 0,9 mm aluminium and the treadle of 0,8 mm brass sheeting, and the appropriate holes (a and b) were drilled prior to bending. The trigger was made of 1,5 mm brazing rod soldered into position and bent into the appropriate shape.

The trapdoor and treadle were hinged by means of 56 mm pieces of 1,5 mm brazing rod fixed in position with a 1,5 mm brass washer soldered onto each end. The third cross-member (c, Fig. 1) was added to reduce the minimum distance between the front of the treadle and the bottom of the trapdoor to approximately 2 mm as the door pivotted. This was done in an attempt to ensure that captives attempting to lift the trapdoor to escape would be prevented from doing so by their paws jamming, thus thwarting attempts to open the door. The sliding door was made of 3 mm perspex 49 x 80 mm with a 12 mm perspex strip fixed to one end with 'Tensol 6 cement'. With the door in position, a 2 mm hole was drilled through the perspex immediately below the inner edge of the tunnel to allow locking of the door with a 32 mm nail. With the exception of the nail only non-ferrous metals were used to obviate the possibility of rusting. The final weight of the trap is approximately 250 g and construction cost, excluding labour, was approximately 60 cents per trap in 1976 when they were made.

Using traps as described above to collect shrews R.M. Baxter (pers. comm.) greatly reduced mortality by providing nesting material, food and water in plastic boxes 155 x 120 x 85 mm cut to fit into the grooves for the sliding door. These traps are probably too small for general purpose trapping, and the design may be adapted to use of PVC '4-square' downpipe 65 x 78 mm (Durapenta). Alternatively, it has been suggested by an anonymous referee of my manuscript that PVC mains conduit 72 x 65 mm, which has a sliding top, be used. This would obviate the need for a movable door at the back as the sliding top would give access to the moving parts and captured specimens. Making such traps 300 mm in length, with the moving parts well forward, would allow nesting material to be provided at the back of the trap.

Relative effectiveness of PVC and hardboard tunnel traps

Materials and Methods

In January 1977 a trapping study in largely undisturbed grassland at Dargle State Forest, Natal (29° 32′ S, 30° 01′ E; ± 1 500 m) provided the opportunity of testing the relative efficiency of PVC and hardboard tunnel traps. The following species were trapped: *Otomys irroratus, Rhabdomys pumilio, Mus minutoides, Crocidura flavescens* and *Myosorex varius*. Traps baited with rolled oats and raisins were set in pairs, one PVC and one hardboard, within 1 m of one another and within 1 m of station markers along two 20-station traplines and on a 10 x 6-station grid with 10 m between stations. Traps were checked morning and evening providing a total of 1 960 trap-checks. Trap preference and mass to the nearest 0,1 g were noted for all captures and animals were released at the point of capture.

Results

A total of 203 captures was made, 104 in PVC and 99 in hardboard traps. This difference is not significant (x^2 = 0,12; ,80 >p>,70) but the difference in mean mass of animals captured in PVC (36,2 g) and hardboard (87,5 g) traps is very highly significant (t_{201} = 8,63; 0,1>p). Numerical breakdown by species and into mass classes are given in Table 1, together with x^2 values, p and levels of significance. The mass classes were selected so that the first (animals under 15,0 g) contained all *Mus minutoides* and *Myosorex varius*, and the last (60,0 g and over) contained only *Otomys irroratus*. Animals under 15,0 g in mass were captured significantly more often in PVC traps while those of 60,0 g and over were most frequently captured in hardboard traps (Table 1). Captures assigned to the three classes between 15,0 g and 59,9 g numerically favoured PVC traps but the differences were not statistically significant. However, captures for the four classes 0 - 59,9 g combined statistically favoured PVC (87 animals) rather than hardboard (35 animals) traps (x^2 = 22,16; ,001>p). *O. irroratus* was most frequently captured in hardboard traps, and *Mus minutoides* and *Myosorex varius* in PVC traps. *Rhabdomys pumilio* and *Crocidura flavescens* had greater capture frequencies in PVC traps but there were no statistical differences in the case of these species.

Discussion

It is apparent that PVC tunnel traps 216 x 54 x 68 mm selectively captured the smaller animals occurring in the Dargle study area, while hardboard traps 270 x 90 x 85 mm were more effective for larger ones, specifically *Otomys irroratus*. This ambivalence is probably explained by the greater sensitivity of the trigger mechanism of the PVC traps. Wingate & Meester (1977) quote C.N.V. Lloyd (pers. comm.) as finding nesting material in hardboard traps together with *Myosorex varius* females, suggesting that they were able to enter and leave the traps a number of times before triggering occurred. Similarly Willan & Meester (1978) found it necessary to use tunnel traps 30 x 40 x 200 mm with extremely sensitive triggering mechanisms in order to consistently trap *Mus minutoides*. However, it is unlikely that trigger sensitivity is the only factor determining trap success, particularly in the case of larger animals, such as *O. irroratus*, which may be inhibited from entering traps of small size. Of the 85 *O. irroratus* captured during the study, 12 weighed over 150 g and it is significant that all of these were taken in hardboard traps (x^2 = 12,0; 001>p). However, of 35 *O. irroratus* weighing under 100 g, 24 were captured in hardboard and 11 in PVC traps. Although this distribution tends more toward randomness than that for animals over 150 g or for the species as a whole (Table 1) the difference is significant (x^2 = 4,83; ,05>p>,02).

It may be concluded that although the PVC traps sampled *O. irroratus* less efficiently than did the larger hardboard ones, they were superior in respect of smaller species and may prove useful used in conjunction with larger traps in order to obtain unbiased field estimates (Sealander & James 1958). Alternatively, adaptation of the design presented here to PVC tunnels of larger dimensions should result in a more versatile, durable and efficient trap suited to efficiently sampling animals of a wider range of sizes.

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Table 1 Capture analysis according to species and mass in PVC (P) and hardboard (H), tunnel traps (NS = not significant; ** = highly significant; *** = very highly significant)

Species	Mass classes										Total captures		x^2		Signi-ficance
	Under 15,0 g		15,0 g - 29,9 g		30,0 g - 44,9 g		45,0 g - 59,9 g		60,0 g and over						
	P	H	P	H	P	H	P	H	P	H	P	H			
Otomys irroratus	-	-	-	1	-	-	1	2	17	64	18	67	28,25	,001>p	***
Phabdomys pumilio	5	2	16	10	11	9	5	2	-	-	37	23	3,27	,10>p>,05	NS
Mus minutoides	8	-	-	-	-	-	-	-	-	-	8	0	8,0	,01>p>,001	**
Crocidura flavescens	-	-	4	4	7	2	-	-	-	-	11	6	1,47	,30>p>,20	NS
Myosorex varius	30	3	-	-	-	-	-	-	-	-	30	3	22,09	,001>p	***
Total captures	43	5	20	15	18	11	6	4	17	64	104	99	0,12	,80>p>,70	NS
x^2	30,08		0,71		1,69		0,40		27,27						
p	,001>p		,50>p>,30		,20>p>,10		.70>p>,50		,001>p						
Significance	***		NS		NS		NS		***						

References

BROOKS, P.M. 1974. The ecology of the four-striped field mouse, *Rhabdomys pumilio* (Sparrman, 1784), with particular reference to a population on the Van Riebeeck Nature Reserve, Pretoria. Unpubl. D.Sc. thesis, Univ. of Pretoria.

DAVIS, R.M. 1973. The ecology and life history of the vlei rat, *Otomys irroratus* (Brants, 1827), on the Van Riebeeck Nature Reserve, Pretoria. Unpubl. D.Sc. thesis, Univ. of Pretoria.

FLOWERDEW, J.R. 1976. Ecological methods. *Mamm. Rev.* 6 123-159.

GRANT, P.R. 1970. A potential trapping bias in the use of Longworth traps. *J. Mammal.* 51: 831-835.

LLOYD, C.N.V. in prep. The ecology of *Rhabdomys pumilio* (Sparrman, 1784) at Midmar Dam Nature Reserve. Ph.D. thesis, Univ. of Natal.

MEESTER, J. 1970. Collecting small mammals. *Spectrum* 8 403-408.

QUAST, J.C. & HOWARD, W.E. 1953. Comparison of catch of two sizes of small mammal live traps. *J. Mammal.* 34: 514-515.

SEALANDER, J.A. & JAMES, D. 1958. Relative efficiency of different small mammal traps. *J. Mammal.* 39: 215-223.

WIENER, J.G. & SMITH, M.H. 1972. Relative efficiencies of four small mammal traps. *J. Mammal.* 53: 868-873.

WILLAN, K. & MEESTER, J. 1978. Breeding and postnatal development of the African dwarf mouse. *Acta Theriol.* 23 55-73.

WINGATE, L.R. & MEESTER, J. 1977. A field test of six types of live-trap for African rodents. *Zool. Afr.* 12: 215-223.