Comparison of Two Methods for Monitoring Population Indices of Small Mammals on Seasonal Islands

PORÓWNANIE DWÓCH METOD OCENY WSKAŹNIKÓW POPULACYJNYCH U MAŁYCH SSAKÓW ZAMIESZKUJĄCYCH SEZONOWE WYSPY

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During summer monsoon rains in Bangladesh, many small villages are surrounded by flood waters and become seasonal islands. As part of a larger study, snap-traps and tracking tiles were compared as means of monitoring small mammal relative abundance in the villages. Traps and tiles were set for two successive nights each week over a 20 week period. The results showed no significant difference between Day 1 and Day 2 data for each technique. The method selected for long-term population monitoring should be based on the objectives of the study and whether a removal or non-removal system should be employed.

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1. INTRODUCTION

Many techniques have been used within the past 30 years to study field rodent numbers. A thorough review was presented by Smith *et al.* (1975). The most common means of obtaining information on animal abundance is through the use of traplines, generally consisting of 10—100 traps set in a straight line (Southern, 1965; Tamarin, 1977; West *et al.*, 1976). The trapline method, known as a removal technique, has been used to estimate population numbers (Hayne, 1949; Zippin, 1958). A variety of trapping configurations have been tested (Smith *et al.*, 1975) but as Stickel (1948) stated, the method may not be fully reliable in estimating numbers, but should be used primarily for convenience (as an index) and is generally one of the least expensive methods.

Apart from the use of traps to assess population levels, techniques involving animal signs such as droppings, footprints, runways, or burrows have been used. Such a nonremoval technique was described by Lord *et al.* (1970) and involved coating plastic floor tiles with ink and examining each the following morning for rat tracks. The results produced an index of rodent activity or relative abundance. Marten (1972) rated the technique superior to traplines.

In Bangladesh deepwater rice is sown in March or April, depending on the initiation of rainfall. During the floods, rats emigrate fields to nearby villages which become small, distinct islands. When the floating rice stems provide enough buoyancy, rats swim out onto the rice to cut and feed on stem hearths.

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As part of a Bangladesh Agricultural Research Institute long-term study of rodents in deepwater rice, an important component of the program was to monitor monthly and annual fluctuations in rodent numbers. Since live-trapping is too time-consuming and expensive, a study similar to the one by West *et al.* (1976) conducted in the Philippines was organized. A field test was designed to (1) compare the use of tracking tiles vs. snap traps on islands in deepwater rice, and (2) determines if only 1 night of trapping or the use of tiles was sufficient to monitor the relative abundance of small mammals.

2. METHODS

The study area was located approximately 10 km WSW of Dacca, Bangladesh in a typical deepwater rice growing delta near the village of Agrakhola. The region floods seasonally from late June to early November.

One island (approximately 2.5 ha in size) was selected and small mammal activity monitored. The study was conducted between 6 September 1979 and 23 February 1980. For 2 consecutive nights each week, over the 20-week period, 50 snap traps (Victor 4-way[1]) and 50, 25×25—cm vinyl tiles were placed on the island shortly after dusk. Twenty tiles and traps each were set in dwellings, 10 between dwellings, and 20 along the island periphery. Coconut was used as bait for the traps.

The total number of traps sprung was also tallied. This included rodent captures, shrew captures, and empty but sprung traps.

One-half of each gray-colored tile was smeared with mimeograph ink and the tile examined on the following day for tracks. Several drops of mustard oil, to prevent drying, were mixed in with about 0.5 cm^3 of ink. The number of tiles with tracks was recorded. After examination of the tiles on the following day, acetone and cotton were used to remove tracks from the uninked portion.

Paired *t*-tests were used to examine for differences between data collected during Day 1 and Day 2 for tiles, traps, and sprung traps. The coefficient of variation was determined for each technique used. The mean data for 2 nights over the 20-week study period for each techniques were compared using analysis of variance.

3. RESULTS AND DISCUSSION

Rodent species collected from the study island included the lesser bandicoot rat *Bandicota bengalensis* Gray, the greater bandicoot rat *B. indica* Bechstein, the roof rat *Rattus rattus* Linnaeus, and the house mouse *Mus musculus* Linnaeus. In addition, an *Insectivora*, the musk shrew *Suncus murinus* Linnaeus was common on the island.

Results from this study are presented in Tables 1 and 2. The study enabled an examination of a removal *vs.* a nonremoval technique of population index assessment. A *t*-test for each group of data, for trapping, tiles, and total sprung traps, showed no significant differences between Day 1 and Day 2 for each technique.

The coefficient of variation was lowest in the total sprung trap data a possibility speculated by West *et al.* (1976). Most variability was shown in the use of snap traps (Table 3). The ANOVA results indicate significant differences between the three techniques ($P<0.005$, $F=31.8$,

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Significant differences ($P<0.005$) were observed between the tile and trap data. Weather conditions, moonlight, and possible trap shyness over the 20-week period contributed to higher variability in trap success. We assumed that the vinyl tiles did not affect small mammal movements nor activity.

The removal trapping data showed no significant differences ($P<0.05$) between days. Over the duration of the study, the mean trap success for Day 1 was 1.8 rats and 1.75 for the second day, indicating little impact on the local population from the previous night's trapping.

Table

Summary of data collected from an experimental island in which 50 snap trap and 50 tracking tiles were set for two (1, 2) consecutive nights each week over a 20-week period.

Week	Titles tracked		Mammals trapped		Traps sprung	
	1	2	1	2	1	2
1	6	3	2	4	6	9
2	0	0	1	2	5	8
3	6	8	3	2	7	5
4	6	8	3	3	6	6
5	4	3	2	2	7	5
6	3	2	2	2	6	5
7	2	1	1	1	3	4
8	2	2	0	0	2	3
9	4	3	0	0	3	4
10	3	4	2	1	4	4
11	2	4	1	1	4	5
12	4	2	2	1	6	5
13	2	3	4	2	8	6
14	2	3	2	1	7	4
15	4	2	2	0	4	3
16	2	3	1	0	4	3
17	3	4	2	2	6	5
18	4	3	2	2	6	8
19	3	4	2	3	6	4
20	4	3	2	6	2	10

Table 2

Summary data for comparative study of techniques in monitoring small mammal relative abundance over a 20-week period.

Day	Mean	SD	CV. %	Mean for 2 nites	SD for 2 nites	CV for 2 nites %	t-values
			Tiles tracked				
1	3.3	1.559	47	3.275	2.387	48	0.1523^{ns}
2	3.25	1.916	59				
			Mammals trapped				
1	1.8	0.951	53	1.775	1.045	59	0.1649^{ns}
2	1.75	1.482	85				
			Traps sprung				
1	5.35	1.631	30	5.325	1.575	30	0.1209^{ns}
2	5.3	2.003	38				

The greater bandicoot rat, weighing to 1 kg, is common in the area, and was collected from the experiment study area. We speculate that many of the sprung traps were tripped by the large rodent, since it was infrequently captured in the snap traps.

The results of this study indicated that 1 night of trapping or the use of tracking tiles is sufficient in long-term studies to monitor small mammal relative abundance on islands in the deepwater rice zone of Bangladesh. The choice of method depends upon the purpose of the study. If trends in rodent or small mammal numbers are required, as in bait efficacy trial, the use of tracking tiles may be preferred. One drawback in using tiles is that it becomes difficult at times to differentiate between shrew and rodent footprints. The field mouse (*Mus booduga*) was trapped on adjacent islands and discerning between *M. booduga* and *M. musculus* based on tracks may be difficult. The roof rat and lesser bandicoot rat have similar-size hind feet. Therefore, information relative

Table 3

Comparison of snap traps and inked tracking tiles for monitoring small mammal abundance on 2 consecutive nights each week during 20 weeks in 1980 in the deepwater rice zone of Bangladesh.

Method	Night	Mean	SD	CV, %
Tiles tracked	1	3.30	1.56	47
	2	3.25	1.92	59
	Avg	3.28	2.39	48
Mammals trapped	1	1.80	0.95	53
	2	1.75	1.48	85
	Avg	1.80	1.05	59
Traps sprung	1	5.35	1.63	30
	2	5.30	2.00	38
	Avg	5.33	1.58	30

to species composition may be misleading. Tracking tiles may be used for bait efficacy field trials, since there is less variability in monitoring activity trends.

If accurate data on species composition, sex ratio, and reproductive parameters are required, the use of snap traps would be most effective. Selecting live or kill traps for a study depends on the objectives. If no trap mortality on the rodent fauna (nonremoval method) is desired, live traps may be preferable.

Most of the island villages in southern Bangladesh are similar in size. We, therefore, feel the data obtained in this study are reliable and reflect approaches to consider in monitoring rodent populations in this unique agrosystem. Ideally, it would have been better had the experiment been conducted on more than one island. Access and transport of equipment through the deepwater rice and between islands, with water to 4 m deep, was difficult. The lengthy time required to set traps and tiles on one island, then to move to another, limited our activity, since the equipment was set out after sunset to avoid human and domestic animal interference. We felt that although replicate islands would have enhanced the study, the subsequet bias of our later evening activity in setting tiles and traps would inject much bias by possibly affecting rodent and shrew movement patterns.

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Relative Capture Efficiency of Large and Small Sherman Live Traps

WZGLĘDNA EFEKTYWNOŚĆ MAŁYCH I DUŻYCH ŻYWOŁÓWEK SHERMANA

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In a study of small mammal populations on Assateague Island, Virginia, U.S.A., two species (*Microtus pennsylvanicus, Oryzomys palustris*) exhibited a significant preference for large rather than small Sherman live traps. Three smaller species (*Cryptotis parva, Mus musculus, Peromyscus leucopus*) did not show a significant bias with respect to trap size. Differential effectiveness of large and small traps appeared to be related to size-specific behavioral responses and not to differences in trap sensitivity.

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INTRODUCTION

Numerous authors have reported on the relative efficiency of different types of small mammal traps (e.g., Rose *et al.*, 1977, Mihok *et al.*, 1982, Williams & Braun, 1983). However, only two studies have compared different sizes of the Sherman live trap, the type most commonly used by American researchers. Quast & Howard (1953) found large (254×76×76 mm) Sherman-type traps to be much more effective than small (164×64×51 mm) traps in capturing *Peromyscus* species in the San Joaquin Experimental Range, O'Neals, California. In contrast, Dalby & Straney (1976) found small Sherman live traps to greatly exceed large traps in numbers of white-footed mice (*Peromyscus leucopus*) captured in woodlands near Blacksburg, Virginia. In this report, we document the relative efficiency of large and small Sherman live traps in capturing five species of small mammals (including white-footed mice) on Assateague Island, Virginia, U.S.A.

Table 1

Captures of small mammals in small and large Sherman live traps

Species	Number of indiv.	Mean wt., g	Captures: Large traps	Captures: Small traps	χ^2	*P*-value
Least shrew	30	4.1	15	18	0.27	NS
House mouse	67	12.4	47	55	0.63	NS
Meadow vole	85	40.0	117	88	4.10	<.05
Rice rat	80	46.6	97	62	7.70	<.01
White-footed mouse	15	17.7	15	16	0.13	NS
Meadow jumping mouse	4	12.3	2	2	0.00	—

METHODS

As part of a study on small mammal competition and resource utilization, trapping was conducted at biomonthly intervals from August 1983 to January 1984. During each trapping period, one large (279×89×76 mm) folding and one small (165×64×51 mm) nonfolding Sherman live trap were placed at each of 243 trap stations located in three 9 station by 9 station permanent trapping grids. These grids encompassed dune grassland, freshwater marsh, pine woodland, shrub, and salt marsh habitats (Higgins *et al.*, 1971) on Chincoteague National Wildlife Refuge, Assateague Island, Virginia, U.S.A. Traps were baited with rolled oats and checked twice daily for five days during each trapping period. Both traps at a trap station were located in similar microhabitats and near evidence of small mammal activity (e.g., runways, plant clippings) whenever possible. A total of 9720 trap nights were completed during the study.

RESULTS

We captured six species of small mammals for a total of 535 captures (281 individuals). Three species, least shrews (*Cryptotis parva*), house

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mice (*Mus musculus*)
showed no significan
(Table 1). Rice rats (
pennsylvanicus) were
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mammals did not dif
(χ=4.15, *P*>0.20).

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