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Effectiveness of Live Traps and Snap Traps in Trapping Small Mammals in Kinmen

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ABSTRACT

Small mammals were trapped at 17 locations with both aluminum live traps and Japanese plastic snap traps between January and May 1993 in Kinmen. Two trap lines, each with 10 trap stations set up at 10-m intervals were established at each location. One live trap and 1 snap trap baited with sweet potato and peanut butter were placed next to each other for 1 night at each trap station. Traps were checked the next morning to record the species caught and their basic measurements. A total of 125 small mammals belonging to 6 species were trapped in 680 trap nights. Live traps caught significantly more small mammals in total, and more *Suncus murinus*. The species caught by these 2 types of traps were also different.

Key words: traps, effectiveness, small mammals, Kinmen

INTRODUCTION

Trap type is a very important variable affecting the results of population studies on small mammals (Wiener and Smith, 1972). Different types of traps are known to have different trapping efficacy on different species of small mammals (Cockrum, 1947; Wiener and Smith, 1972; Hansson and Hoffmeyer, 1973; Boonstra and Rodd, 1982; Williams and Braun, 1983; West, 1985; Alexander *et al*., 1987; Lin and Lin, 1988; Slade *et al*., 1993). Some comparative studies on the same types of traps gave very different results as to which type of trap is more effective. For example, Sealander and James (1958) reported that Sherman live traps were more effective in catching small mammals than the Museum Special, a snap trap. Wiener and Smith (1972) found otherwise, and suggested that there might have been a sampling bias in the former study. However, many studies indicated that the efficacy of traps may also be affected by different localities (Williams and Braun 1983), seasons (Mengak and Guynn 1987), and other factors.

Several types of live traps and kill traps are used in capturing small mammals in Taiwan. However, only a few studies have been conducted to compare the efficiency of these traps. Alexander *et al.* (1987) compared the efficiency of Sherman live traps and Japanese plastic snap traps in trapping 2 sympatric shrew species at Mt. Ali, and found that Sherman traps caught significantly more shrews than snap traps. Lin and Lin (1988) compared 2 sizes of Sherman traps in catching small mammals at Mt. Ali, and found that larger traps (85 x 105 x 294 mm) caught significantly more *Niviventer culturatus* and female *Apodemus semotus*, but not male *A. semotus*. Both studies were conducted in the mountains. The former study used both live and snap traps in catching shrews but not rodents, the latter study tried to capture all small mammal species, but with live traps only. In a recent study conducted on Kinmen (Lee and Lin, 1994), I set up 2 types of traps, aluminum live traps and plastic snap traps, next to each other at 17 locations to compare the

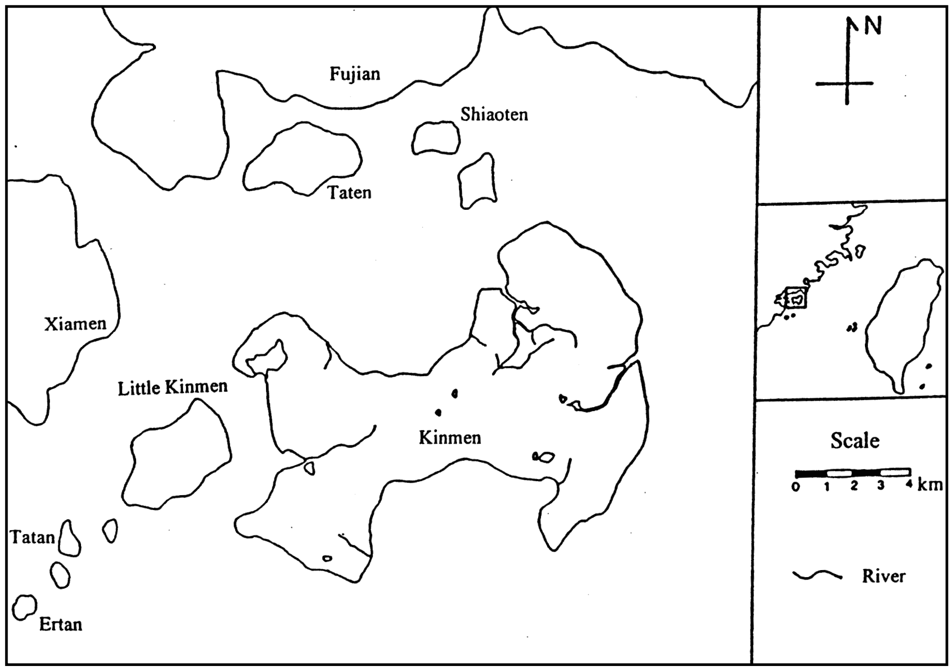

Figure 1. Location of Kinmen.

effectiveness of these traps in capturing both insectivores and rodents in the lowland area.

STUDY SITE

Kinmen is an island about 10 km to the east of Xiamen, Fujian Province, China (Fig. 1). The land area of this island is about 134.25 km^2. Its shape is like a bone, wide on both the east and the west ends, and narrow in the middle. The highest point of the island, Mt. Taiwu, is 253 m in elevation. The topography is generally flat with some mounds. The island has a subtropical monsoon climate, with more fog and rain between April and September, and strong northeast winds the rest of the year. Typhoons bring in more rain in summer and fall. Mean annual temperature is 21.1°C (12.8~28.8°C), and annual precipitation is about 986.9 mm.

The vegetation on the island is mostly *Acacia* sp. and *Casuarina* sp., and cropland. Agriculture is not intensive. Less disturbed areas are covered by thorny bushes of *Scolopia oldhamii, Maytenus diversifolia, Sageretia thea,* and *Litsea glutinosa*. There is little industry, and residential construction is in general localized. Therefore, a considerable amount of wild land remains.

MATERIALS AND METHODS

Trapping was conducted between January and May 1993. I divided the land area of Kinmen into 76 one-square-kilometer grids, and set traps at the center of 37 grids which covered the longest axes across and along the east and west sides of the island, excluding military restricted zones (Fig. 2). However, due to the number of traps available, only 17 of the locations were set with 2 types of traps. The 2 types of traps used in this study were aluminum box live traps (26 x 9 x 9 cm) (San-Kuan Co., Taiwan) and Japanese plastic snap traps (16 x 6 cm) (Easy trap, Japan Trap Co., Japan). Two trap lines, each with 10 trap stations set at 10-m intervals, were established 10 m apart at each location. At each trap station,

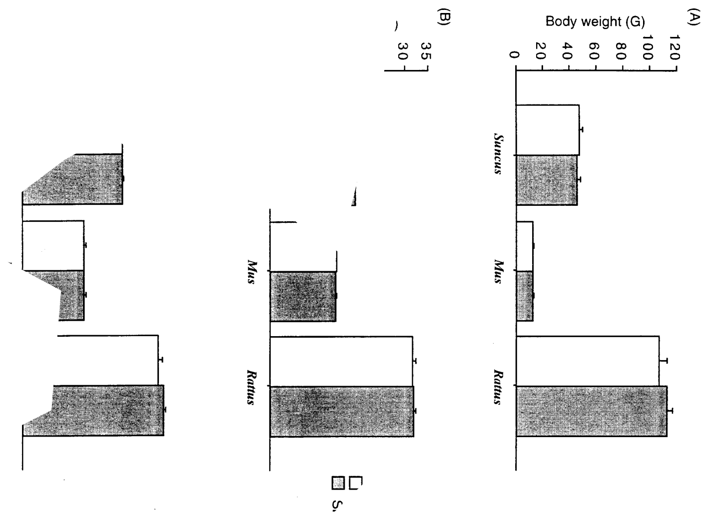

Figure 2. Small mammal trapping grids. In hatched grids, both live traps and snap traps were used; shaded grids were restricted areas.

1 live trap and 1 snap trap baited with sweet potato and peanut butter were placed next to each other for 1 night. Traps were checked the following morning, and the small mammals caught and their basic measurements were recorded.

Chi-square test was applied to compare the efficacy of the 2 types of traps, and Mann-Whitney U test was applied to compare the measurements of animals caught by the 2 types of trap.

RESULTS

A total of 125 small mammals, belonging to 6 species, were caught in 680 trap nights. *Suncus murinus* was the species most often caught (n = 57), followed by *Rattus r. flavipectus* (44), and *Mus caroli* (19). The numbers of *M. musculus* (3), *R. norvegicus* (1), and *Bandicota indica* (1) caught were too low for further analysis.

Among the total of small mammals caught, 77 were caught by live traps and 48 by snap traps. The total number of animals trapped was significantly higher with live traps than snap traps (X^2 = 6.73, d.f. = 1, $P < 0.01$). However, different traps were more effective in capturing different species. More *S. murinus* were caught by live traps (n = 47) than by snap traps (n = 10) (X^2 = 24.02, d.f. = 1, $P < 0.005$). Snap traps caught more *R. r. flavipectus* (n = 28) than live traps (n = 16), but the difference was not statistically significant (X^2 = 3.27, d.f. = 1, $0.1 < P < 0.05$). The number of *M. caroli* caught by the 2 types of traps was about equal (n = 11 for live traps, and n = 8 for snap traps, X^2 = 0.47, d.f. = 1, $P < 0.1$).

The species caught by the 2 types of traps were different. Both traps caught the more abundant species, such as *S. murinus, R. r. flavipectus,* and *M. caroli.* However, only live traps caught *M. musculus*, which made the total number of species caught by this trap 4. Snap traps caught *R. norvegicus* and *B. indica*, but not *M. musculus*, giving the number of species caught by snap traps as 5.

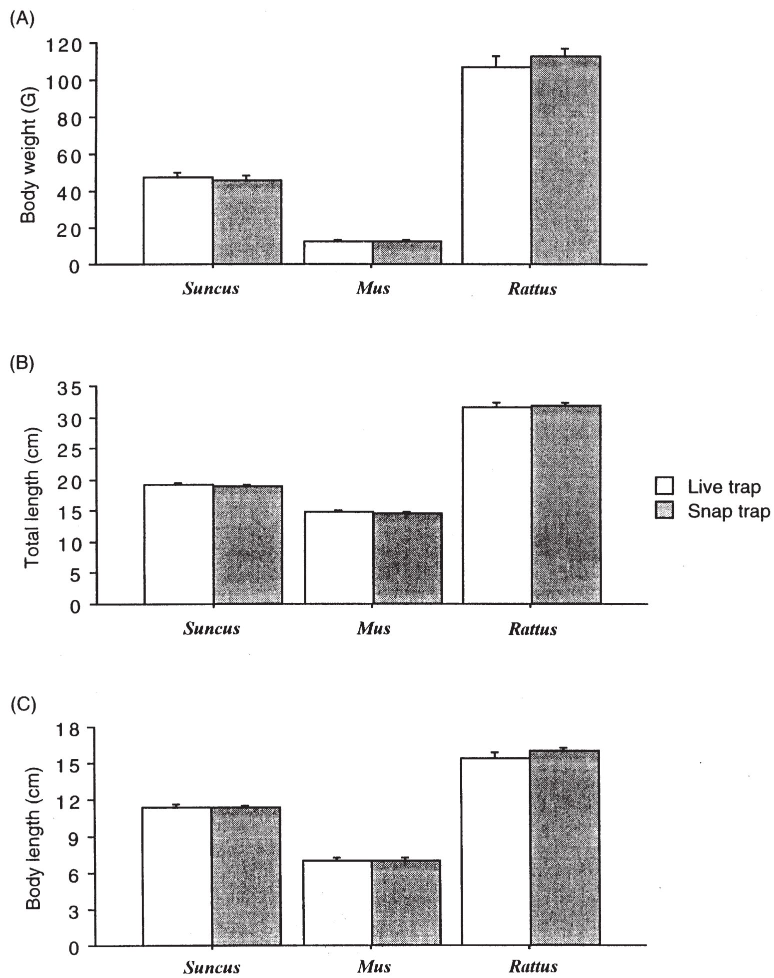

Figure 3. The mean (A) body weight, (B) total length, and (C) body length of 3 small mammal species caught by live traps versus snap traps. Vertical lines indicate standard errors.

Although the mean body weight, total length, and body length of small mammals caught by these 2 types of traps were different ($P < 0.005$, Mann-Whitney U test), such differences disappeared when data of each species were calculated separately ($P > 0.1$) (Fig. 3), which means that the differences were due to the fact that the trapping efficiency of *S. murinus* and *R. r. flavipectus* were different with different traps.

DISCUSSION

Previous studies on the efficacy of live traps versus snap traps gave very different results. Cockrum (1947) reported that live traps (8" × 3" × 3") caught 2 to 3 times more small mammals than snap traps (Museum Specials). Sealander and James (1958) also reported that Sherman live traps were more effective than Museum Specials. Hansson and Hoffmeyer (1973) reported that live traps caught more *Apodemus flavicollis*, *A. sylvaticus*, and *Sorex araneus*, but not *Microtus agrestis* or *Cleithrionomys glareolus*. Alexander *et al.* (1987) reported that Sherman live traps caught more shrews than Japanese plastic snap traps. In this study, live traps also caught more small mammals in total than snap traps. However, live traps caught more *S. murinus*, an insectivore, but fewer *R. r. flavipedtus*, a rodent, than did snap traps. Weiner and Smith (1972), on the other hand, suggested that Museum Specials were much more effective in catching small rodents than were Sherman live traps. Faust *et al.* (1971) pointed out, in particular, that Sherman live traps were inferior to Museum Specials in catching *Blarina brevicauda*, an insectivore.

Few hypotheses were proposed in these studies to explain the differences in the results. Here, a few possible factors need to be examined and discussed. First, the types of live traps and snap traps used in these studies were similar in function but differed in size and design. The snap traps used in these studies included Museum specials, Japanese plastic snap traps, and a few other types of snap traps used in Europe (Hansson and Hoffmeyer, 1973). The live traps used in these studies were also different in their design or size. Second, the small mammals captured in these studies were different in species, sizes, and responses to traps. Third, research design and sampling bias were also different in these studies. Some studies removed all animals caught for several consecutive days (Hansson and Hoffmeyer, 1973), some studies marked-and-released animals caught in live traps (Alexander *et al.*, 1987). In the present study, traps were set for only 1 night per site to avoid bias due to mortality of the animals caused by snap traps and by cold and wet weather, especially *S. murinus*. Therefore, it is difficult to draw any general conclusion from these studies before these factors are standardized or fully examined.

The effectiveness of traps may also be affected by factors such as the body mass of the animal. Boonstra and Rodd (1982) found that larger animals were harder to catch with a standard longworth trap, because larger animals might get their back, hind feet, or tail caught under the door when the traps spring, and thus can back out to avoid being trapped. Although individuals of each species caught by live traps were not significantly smaller or lighter than those of snap traps in this study, all animals caught by snap traps were on average larger and heavier than those caught in live traps, if they were not broken down into different species, because more *R. r. flavipectus* individuals, which are larger and heavier than *S. murinus*, were caught by snap traps than by live traps. Therefore, we could not completely rule out the possibility that animals larger than a certain size are less trappable with live traps.

Bait may be another factor affecting the capture rates of the 2 traps. With the snap traps, animals need to bite off or move a certain portion of the bait (a small sweet potato cube) to trigger the traps. If too small a piece of bait is eaten or moved, animals will not be caught. *S. murinus* may be attracted to the smell of peanut butter, but may be less likely to eat or remove a significant portion of this bait than are rodents, and is therefore less likely to be caught by snap traps. However, if entering a live trap, it is more likely to be caught whether it eats the bait or not, as long as it steps on the treadles.

There are at least 20 species of small terrestrial mammals resident in Taiwan (Chen and Yu 1984), and at least 3 types of live traps and 3 types of snap traps commonly used in small mammal studies. How effective these traps are in capturing different species under different environmental conditions is very important for future work, and should be examined further.

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