SHORT COMMUNICATION

Home Range Size of the Formosan Squirrel, *Callosciurus erythraeus thaiwanensis*, Estimated by Radio Tracking

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The Formosan squirrel, *Callosciurus erythraeus thaiwanensis*, is an exotic species in Japan. Although there are several reports on its general ecology including its food habits in Japan (Asahi, 1967; Ozaki, 1986; Udagawa, 1954), the home range size and the utilization of home range have not yet been precisely studied. In this paper, we describe the home range of this squirrel estimated by radio tracking and its aspects found in the study.

The study was conducted in the woods of Kamakura City (35°19'N, 139°33'E), Kanagawa Prefecture, Japan; one of the places where Formosan squirrels had become successfully established. The history of their introduction and establishment to this region was described by Shibata (1980). The topographical feature of the study area was somewhat complicated in elevation which varied from 50 to 120 m above sea level. The vegetation consisted of mainly broad-leaved evergreen trees, such as, *Castanopsis cuspidata* and *Machilus thunbergii*.

The squirrels were captured by live traps baited with peanuts and bananas. All the individuals captured were weighed and sexed, and their sexual maturity was examined by the method of Tang & Alexander (1979). Then a collar with a transmitter was attached to eight adult individuals.

We adjusted the transmitter to oscillate on the 50 MHz band. The collar size was 35 mm in diameter and 12 mm in width. The silver oxide battery with the life of 30–50 days was used. The entire weight of this collar including a transmitting antenna of 100 mm in length ranged from 7.6 to 9.3 g, which was 2.0–2.6% of the body weight. A receiver was FT–690 (YAESU MUSEN CO. Ltd), and a receiving antenna was hand-made two-element phased arrays. In open fields, this antenna was well functional at least within the range of 300 m.

Location of a radio tagged squirrel was determined by triangulation at 2–7 points at a time. The squirrel was tracked at 2 hrs intervals from dawn to dusk of the day. We repeated such trackings of each individual for one or two days per week during one of two periods, either from October to December 1984 or from April to June 1985. In order to minimize the error caused by topography,
Table 1. Home range size and the greatest linear dimension of three females and five males.

<table>
<thead>
<tr>
<th></th>
<th>F1</th>
<th>F2</th>
<th>Name codes of radio tagged individuals</th>
<th>F3</th>
<th>M1</th>
<th>M2</th>
<th>M3</th>
<th>M4</th>
<th>M5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>Female</td>
<td>Female</td>
<td>Female</td>
<td>Male</td>
<td>Male</td>
<td>Male</td>
<td>Male</td>
<td>Male</td>
<td>Male</td>
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<tr>
<td>Body weight (g)</td>
<td>326</td>
<td>388</td>
<td>331</td>
<td>380</td>
<td>370</td>
<td>328</td>
<td>376</td>
<td>384</td>
<td></td>
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<tr>
<td>Tracking period</td>
<td>Oct.29</td>
<td>Nov.29</td>
<td>May 4</td>
<td>Oct.29</td>
<td>Apr.8</td>
<td>Apr.8</td>
<td>Apr.27</td>
<td>May 4</td>
<td></td>
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<tr>
<td></td>
<td>Nov.10</td>
<td>Dec.21</td>
<td>May 19</td>
<td>Nov.18</td>
<td>Apr.20</td>
<td>May 4</td>
<td>Jun.8</td>
<td>Jun.8</td>
<td></td>
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<tr>
<td>No. of days tracked</td>
<td>5</td>
<td>9</td>
<td>4</td>
<td>8</td>
<td>6</td>
<td>9</td>
<td>7</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>No. of fixed points</td>
<td>26</td>
<td>33</td>
<td>19</td>
<td>29</td>
<td>15</td>
<td>37</td>
<td>43</td>
<td>27</td>
<td></td>
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<tr>
<td>Home range size (ha)</td>
<td>1.00</td>
<td>0.50</td>
<td>0.67</td>
<td>3.50</td>
<td>5.50</td>
<td>4.33</td>
<td>3.17</td>
<td>2.67</td>
<td></td>
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<tr>
<td>The greatest linear dimension (m)</td>
<td>162.5</td>
<td>117.5</td>
<td>115.0</td>
<td>475.0</td>
<td>435.0</td>
<td>392.5</td>
<td>407.5</td>
<td>462.5</td>
<td></td>
</tr>
</tbody>
</table>

locations were collected by approaching to the radio tagged squirrels as close as possible.

Table 1 shows home range sizes determined by the minimum area method and the greatest linear dimensions in three females and five males. The average home range size was 0.72 ha (±0.25 SD) for females, and 3.83 ha (±1.11 SD) for males. The average greatest linear dimension was 131.7 m (±26.7 SD) for females, and 434.5 m (±35.1 SD) for males. Home range sizes and the greatest linear dimensions were significantly greater in males than in females (U =0, p<0.05 in both cases). In males, there was no correlation between the body weights and the home range sizes (τ =0.60, p>0.05). According to Asahi (1964), the average home range size of this species by the mark and recapture method was 0.21 ha for females and 0.23 ha for males in Tomogashima Island, Wakayama Prefecture, Japan. These values were considerably small as
compared with those obtained by the present study, and this disagreement might probably result from the differences in the methods applied and in the habitats of the animal.

Figure 1 shows the overlap of home ranges for the eight radio tagged squirrels. The home ranges of the three females exclusively located for each other, though there were several other females as residents. On the contrary, male home ranges extensively overlapped each other as well as with females.

The female generally owned 1–2 sleeping sites in the home range, and utilized them continuously (Fig. 2). Female F2 used one of her two sites successively for several days and then changed to the other. On the other hand, the male owned 3–6 sleeping sites but frequently changed one after another, and the reciprocal distances among these sleeping sites used by the same male varied from 25 to 370 m (Fig. 2). Abe (1967) reported that the Hokkaido squirrel, Sciurus vulgaris orientis, also owned more than one sleeping site within the
The activities of the respective males were generally limited within their daily home ranges even when they were attending mating bouts (Fig. 2): the male did not participate in the mating bouts which occurred at the places where he had not visited previously. In the red squirrel, Tamiasciurus hudsonicus, and the tassel-eared squirrel, S. aberti, the male went out of his home range for mating bouts which occurred in neighboring places (Farentinos, 1972; Smith, 1968).

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References