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POPULATION DYNAMICS OF THE RED-BELLIED TREE SQUIRREL (*CALLOSCIURUS ERYTHRAEUS*)

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Yao-Sung Lin and Shao-Pin Yo (1981) Population dynamics of the red-bellied tree squirrel (*Callosciurus erythraeus*). *Bull. Inst. Zool., Academia Sinica* **20**(1): 31-41. This study was conducted in Chitou to investigate the population density, home range size and dispersal pattern of the red-bellied tree squirrel, factors that might affect trap response were also discussed. In July 1978 time-area counts were conducted at the Mt. Phoenix plot and in Plantations 168 and 159. Further intensive research employing the mark-recapturing methods was conducted at Plantation 168 from August 1978 to March 1980 to gather informations on monthly change in population density of the squirrels and their home range size.

Based on data obtained by time-area count, the density of squirrels in Plantation 168 was higher than that in Plantation 159. In Plantation 168 the average number of squirrels captured per 100 trap night (CPUE) was 2.34 from August 1978 to February 1979, and the estimated population density was 2.5 squirrels per hectare. The CPUE declined to a mean of only 0.81 from March to the following year. This significant decline in capture of squirrels coincided with the use of warfarin in neighboring Plantations.

The average number of months each squirrel was known to have lived in Plantation 168 was 4.5 months. Adult male exhibited the largest home range size. But no significant difference was observed among the home range size of adult female, immature male and immature female squirrels.

The male to female sex ratio for adult and immature squirrels was 15:10 and 15:15, respectively. Warfarin baiting had no differential effect on either sex.

The frequency that squirrels were trapped did not vary with sex or maturity. The obscuring cover density of the habitat had no effect on capture rate of squirrels, but the topography of the capture site definitely exhibited some effect on capture rate as more squirrels were captured per site on the ridge than the slope in Plantation 168.

During the past 20 years, many areas of virgin forest have been cleared and planted to conifers. However, this large-scale monoculture of these more valuable timber trees has also created some forestry problems. The most serious damage to these conifers is caused by the red-bellied tree squirrels (*Callosciurus erythraeus*)[10]. This kind of squirrel can be found in both woodland and bamboo forests throughout Taiwan, from the low plains to an elevation of 3,000 m.

For reasons not yet clear, these squirrels are very fond of stripping the bark of certain conifers, especially 2 introduced species (*Cryptomeria japonica* and *Cunninghamia lanceolata*). Once bark is torn off by squirrels, even if a tree is not completely girdled, such trees are highly vulnerable to fungus infections, which leads to retardation in growth, a reduced value

of the timber, or eventual death of the tree. Of this fungus, the quality or utilization rate of the logs is reduced about 65 percent within 2 or 3 years[11]. Thus the red-bellied tree squirrel damage is considered serious to the forest industry[2,11,12]. Although the Taiwan Forestry Bureau established a bounty of 5 dollars for each squirrel tail, the situation has not been improved by this control method.

Regardless of the importance of the tree squirrel to forest management, very few biological studies on the squirrel have been conducted in Taiwan. Tang and Alexander[17] showed that pregnant squirrels occur from December till the following August, with peaks in late December and early May, respectively. Chang[2] surveyed the food habits and distribution of nests of the squirrel. More extensive ecological studies are still needed, however, before it will be possible to bring these squirrel populations under effective control.

This study was conducted to investigate factors affecting trap response, population density, home range size, dispersal pattern and other aspects of the population dynamics of the red-bellied tree squirrel.

We believed that this information will provide the type of basic knowledge of the red-bellied tree squirrel that is essential if an effective squirrel-control program is to be developed in the future.

METHODS

Description of the study area

The investigation was conducted from July 1978 to March 1980 in the Experimental Forest of National Taiwan Univesity at Chitou. Chitou is known for its cool, humid climate. The monthly average temperature ranges from 11 to 22°C, and the average annual temperature is 16.9°C. The annual precipitation is 3,000 mm, high precipitation and high relative humidity occurs mainly in spring and summer, and it is dry in autumn and winter.

Elevation of the study areas ranges from 1,050 to 1,500 m. Most of the virgin forest on the mild slope was cut down and reforested with conifers and bamboo. *Cryptomeria japonica* constitutes the main cultured conifer. On Mt. Phoenix, however, a considerable area of well-preserved virgin forest still remains.

The 3 study plots, Plantations 168 and 159 and a virgin forest in Mt. Phoenix area, which is close to Plantation 61-2 were chosen. The monocultural *Cryptomeria japonica* trees in Plantations 168 and 159 were 30 and 36 years of age, respectively, and the density of trees in both areas is 2,000 per hectare. *Polygonum* spp., *Alocasis macrorrhiza* and *Strobilanthes flaccdifolius* constitute the major ground-cover herbs, while *Ficus beecheyana* and *Villebrunea pedunculata* are the dominant shrubs. Mt. Phoenix is covered by virgin forest, which is mainly composed of 3 plant associations[14]: *Rhododendron formosanum-Yushania niitakayamensis, Cyclobalanopsis longinux-castanopsis carlesii* and *Pasania kawakamii-Phocbe formosana.*

Time area count

To compare the density of squirrels in different forests, direct counts were conducted at the Mt. Phoenix plot and in Plantation 168 and 159, in July 1978.

Since this squirrel is most active around 7:00 a. m.[2], counting was performed from 6:00 to 8:30 a. m. The observer would sit for 30 minutes at radomly-chosen counting station along one of the existing trails in the experimental forest. At each counting station, the estimated distance between the observer and each squirrel spotted was recorded. The distance was judged by comparing with known distances to marks sprayed on some of the trees. The density of squirrel was then calculated as: $P=AZ/0.6\pi Y^2$. where A is the total area of the woods (in this study, we used 10 hectares), Z is the number of squirrels seen and Y is the average of all distances from the observer to spotted squirrels[5]. The results do not represent the actual population size[1,5,20], but the data can be used as indices of the relative abundance of the squirrel populations.

Mark-recapture method

This method was employed for the squirrel population in Plantation 168. Red-bellied tree

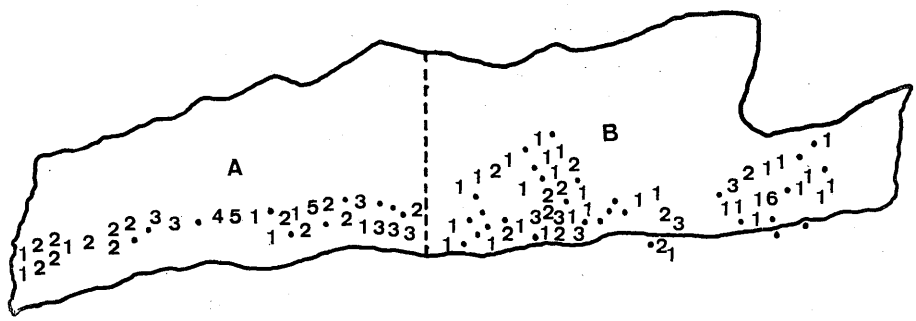

Fig. 1. Number of squirrels captured at each trap station in Plantation 168. The dots represent zero capture and the numerical numbers indicate the number of captures at the correspondary stations. A indicate the ridge and B the slope.

squirrels were live-trapped monthly for a total of 102 nights (afternoon until the following day), from August 1978 to March 1980. A grid with 114 trap stations, 39 on the ridge and 75 on the slope (Fig. 1), was established. The distance between stations was about 20 m. The total area of Plantation 168 is 10.76 hectares. A squirrel livetrap (24×15×11 cm), with banana bait, was set on the trunk of a tree, or a limb between 2 trees. During the trapping periods, the traps were checked every morning and fresh bait added.

Captured squirrels were individually marked by punching 1 to 3 holes in their ears[7]. The following characteristics were recorded for each captured squirrel: body weight, body length, tail length, sex and the status of maturation. The squirrels were categorized as to sexual maturity according to the proposal of Giles[7] and Tang[17]: mature male — testis fully developed, scrotum 3-4 cm long and heavily pigmented; immature male — testis miniature, scrotum less than 2 cm long with little pigmentation; mature female—nipples large and heavily pigmented; immature female — less pigmentation of nipples. Sometimes body weight was also used as a reference parameter for maturity. The body weight of immatures was usually less than 250 gm, while adults weighed more than 300 gm.

When a squirrel was caught at more than 3 different sites, the locations were plotted on a grid map, and the area enclosed by these trap stations was calculated as the minimal home range of the squirrel. However, the method was subjected to the effect of irregular spacing of the traps[6]. Since many squirrels undoubtedly ranged outside the trapping area in Plantation 168, as the plot consisted of a long strip, the maximum distance between any 2 capture sites for each squirrel that was caught at more than 3 sites, was also used as an index for home-range analysis[6,19].

Cover density

In order to evaluate the effect of cover density on the distribution of squirrels, a density board[7] was used to measure density of the cover adjacent to each trap. The board was 6 foot tall, with each foot (30.5 cm) marked off and numbered from 1 to 6. It was used in the following manner: the density board was placed in the cover at each trap site and from a distance of 20 m an observer read those figures which were not obscured by the cover. If there was no cover, the reading would be 21 (the sum of numbers 1, 2, 3, 4, 5 and 6). If the board was completely obscured, the reading would be zero. The reading obtained by 3 observers, from different directions, were averaged. This figure was then divided by 21 and used as the obscuring cover density index of that site.

RESULTS

Mark-recapture

A complete picture of the mark-recapture data during the 20-month study period is presented in Table 1. The horizontal column shows

TABLE 1.

The number of red-bellied tree squirrel captured by mark-recapture methods on each month for adult male (M), adult female (F), immature male (IM) and immature female (IF) in Plantation 168 from August 1978 to March 1980

Serial No.	Sex & Maturity	Time																		
		1978					1979											1980		
		A	S	O	N	D	J	F	M	A	M	J	J.	A	S	O	N	D	J	F	M
1	M	1																			
2	M	1			1																
3	M	1				1															
4	M	1		1				1							2						
5	F	1																			
6	F	2												1							
7	IF	1	4																		
8	IF	1			2																
9	M		1																		
10	M		2																		
11	M		1	1	2	1	1														
12	M		1			1		1													
13	M		1	1	1														1		
14	F		1																		
15	F		1		1		1														
16-17	IM		1																		
18-19	IM		2	1																	
20	IM		1		2	2	4														
21	IM		2		1	1	2		2												
22	IF		1		1																
23	IF		1					1													
24	IF		1		1	1								1						1	
25	M			1																	
26	F			3																	
27	F			1				1		1											
28	F				1																
29	IM				1	2		1													
30	IF				1																
31	IM					2															
32	M						1	1													
33	M										1										
34	M										1			2							
35	IF										1		1	1	1	1					
36	IM											2	1	2	1						
37	IM											1						1	1		
38	IM												1								
39	IM													1							
40	F														1						
41	IM														1						
42-43	IF														1						
44	IM														1	1					
45	IF														1						
46	IM																2	2			
47-48	IF																	1			
49	IF																	1			
50	IF																			1	2
51-52	M																				1
53	F																				2
54	F																				1
55	IF																				1

the minimum estimation of time that each squirrel was known to be present on Plantation 168, and the number of times each individual was captured. Vertical column shows the total population and the number of each sex and age class that was captured each month.

In order to have a reasonable estimation of the average number of months each squirrel have stayed or lived in one area, the observation period must be long enough to have the squirrels recaptured later in the study period. Consequently, the squirrels first captured after March 1979 could not be used to examine the time of squirrel stayed in Plantation 168. Of those squirrels first captured before March 1979, the length of time each squirrel to have stayed in Plantation 168 ranged from less than 1 month to a maximum of 18 months, with an average of 4.5 months. The average length of time for adult male, adult female, immature male and immature female to have stayed in Plantation 168 were 5.2, 4.1, 2.9 and 5.7 months, respectively, but there is no significant difference among these means.

Out of 102 trapping nights for a total of 10951 trap nights, 55 squirrels were captured 136 times, for a low trapping success of only 1 squirrel per 80 trap nights. During the study period (August 1978 to March 1980), 31 of the 55 squirrels were caught more than once, and 22 of them were captured more than twice. Two immature males seemed to have had a proneness to be trapped; one was caught 8 times, and the other 9 times.

The frequency squirrels were trapped did not vary with sex or maturity. A adult males, adult females, immature males and immature females were captured 2.3, 1.9, 3.2 and 2.2 times in average, respectively.

Population size

The frequency that different number of squirrels were spotted in July 1978 during different countings in Plantations 159, 168 and the Mt. Phoenix plot were listed in Table 2. For the most part, the number of squirrels spotted was between 0 and 2. An average of 0.92, 0.94 and 1.16 squirrels were spotted per counting in Plantations 159, 168 and Mt. Phoenix, respectively. No significant difference was shown among these means ($F=0.471$, $p>0.05$). Using Flyger's index for Plantations 168 and 159, there was an average of 1 and 0.5 squirrels per hectare, respectively. In the virgin Mt. Phonix plot the vegetation is so complex and the topography of the mountain is so steep that it was difficult to make reliable estimate of the distance between a squirrel and the observer. Hence Flyger's time-area formula could not be used.

In the mark-recapture study, the ratio of unmarked squirrels to total number of captured squirrels were very high in the first 2 months, then it declined gradually to a low level and fluctuated only slightly until February 1979 (Fig. 2). In February 1979, all 6 squirrels captured were already marked. By then, a total of 32 squirrels had been marked in Plantation 168 (Table 1). It is interesting to note that only 2 and 1 marked squirrel was captured in March and April 1979, respectively. From May 1979 to March 1980, only 4 out of the 27

TABLE 2.
The number of squirrels seen by direct counting for 30 minutes in Plantations 159, 168 and the Mt. Phoenix, in July 1978. Population size was estimated from time-area count by Flyger's formula

Location	No. of counting stations	Frequency which 0 to 4 squirrels were spotted					Ave. No.	Mean observer squirrel distance (m)	Estimated population size (No./10 ha.)
		0	1	2	3	4			
Plantation No. 159	12	5	4	2	1	0	0.92	31	5
Plantation No. 168	16	7	5	3	0	1	0.94	18	10
Mt. Phoenix Plot	19	5	6	8	0	0	1.16	—	—

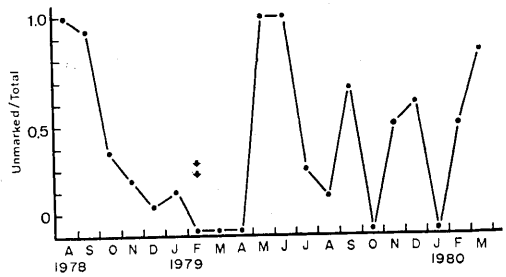

Fig. 2. Monthly change in ratios of unmarked squirrels to total number of squirrels captured during the period from August 1978 to March 1980 in Plantation 168. The arrow indicates the time warfarin program started.

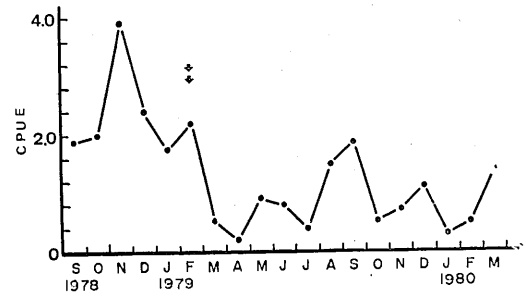

Fig. 3. Seasonal variation of CPUE (number of squirrels captured per 100 trap nights) during the period from September 1978 to March 1980 in Plantation 168. The arrow indicates the time warfarin program started.

squirrels captured had been marked prior to March 1979 (Table 1). Apparently most of the old residents had been replaced by a new population. The transition period probably occurred between April to May, when only 1 squirrel of the old population was captured and new individuals started to appear in Plantation 168.

Of the first population of squirrels, 5 marked squirrels died in the traps. Two died in September 1978, 2 in October 1978 and 1 in March 1979, due to heavey rain or other causes. Two of the marked squirrels were known to have dispersed in April 1979 from Plantation 168 to Plantation 52-2 (Mr. Wan-Fu Chang, personal communication). Consequently, the population of squirrels marked before February 1979 in Plantation 168 may have declined to less than 26 squirrels by April 1979, for a mean density of 2.5 squirrels per hectare.

Seasonal variation of squirrel population

To show the seasonal variation of squirrel populations, the catch per unit of effort (CPUE), which is the number of squirrels captured per 100 trap nights, were calculated for each month. It is believed that the relative abundance of squirrels can be reliably reflected by the value of CPUE.

The seasonal variation of CPUE (Fig. 3) suggests that the population size of squirrels in Plantation 168 declined after March 1979. This decline coincided with the start of a warfarin control program. Under that program 6 kg of warfarin per hectare was placed on trees in the forest adjacent to Plantation 168 during February and March 1979. Before the control program started, the mean CPUE from August 1978 to February 1979 had been 2.34, but it declined after the warfarin application. After March 1979, the monthly value of CPUE fluctuated around a mean of only 0.81. The population size of squirrels was consistantly low from March to the following year, and it seemed likely that this significant decline in capture of squirrels was due to the warfarin program.

Population structure

To investigate the sex ratio and the ratio of the number of adult to immature squirrels in Plantation 168, the sex and maturity of the squirrels when first captured were recorded (Table 1). The sex ratio varied slightly with age. For the 55 squirrels caught during the 20-month study period, the male to female sex ratio for adult and immature squirrels were 15:10 and 15:15, respectively. Both values, however, showed no significant difference from 1:1 ratio by the χ^2 test ($p>0.05$).

To determine whether the warfarin control program affected the sex ratio of squirrels, the value was calculated twice. Before the warfarin program started in February 1979, the sex ratio for adults and immatures were 11:7 and 8:6, respectively. After the warfarin baiting the ratio was 6:4 for adults and 7:10 for immatures. These ratios also showed no significant

TABLE 3.
The maximum-distance (m) between repeated captures and the area (m^2) of the home range for adult male, adult female, immature male and immature female squirrels, from August, 1978 to March 1980, and the number of points (capture sites) on the map used to compute these ranges

No.	Home range											
	adult male			adult female			Immature male			Immature female		
	Area	Distance	No. Capture sites	Area	Distance	No. Capture sites	Area	Distance	No. Capture sites	Area	Distance	No. Capture sites
1	1635	608	3	217	43	3	128	61	3	1361	240	3
2	8584	613	3	534	46	3	3337	110	3	1897	114	4
3	2808	234	4	2443	326	3	915	145	3	1565	71	5
4	12018	437	5				630	38	4	9914	484	5
5	12177	427	6				616	46	4			
6							5153	322	6			
7							3822	233	8			
8							4535	291	9			
Mean	7444	464		1065	138		2392	156		3684	227	
S. D.	4996	156		1204	163		2026	113		4159	186	

difference from the 1:1 ratio. This indicates that warfarin baiting had no differential effect on either sex of squirrels.

The warfarin baiting, however, probably have a differential effect with regard to the maturity of squirrels. The proportion of immatures to total number of squirrels captured was 0.44 before the application of warfarin, it incresed to 0.70 for the 23 squirrels first captured after April 1979. Although the χ^2 test showed no significant difference ($p>0.05$) between these two values, the slight increase in proportion of the immatures may suggest that the mortality rate caused by the application of warfarin in the adjacent area was higher for adults than for immatures.

Home range

Twenty squirrels captured 3 or more times had an average greatest distance of movement of 244 m (Table 3). The average distance was 464 m for 5 adult males, 138 m for 3 adult females, 156 m for 8 immature males, and 227 m for 4 immature females. An analysis of variance showed a significantly larger movement for adult males than for adult females, immature males and females. For the latter 3 groups, there is no significant difference in their distance of linear movement. For the same 20 squirrels, the average home range was 3714 m^2. The average home range for adult males, adult females, immature males and immature females were 7444, 1065, 2392 and 3684 m^2, respectively. These results also indicate that adult males have a larger home range than the other 3 groups.

It would be expected that the calculated home range of a squirrel would become larger the more times the squirrel is captured. However, the correlation coefficients between the number of times captured and the log distance of movement and log area of the home range were 0.14 and 0.39, respectively. Neither value is significant at the 5 percent level. However, as would be expected, the correlation coefficient between the greatest distance of movement and the calculated home range area for the 20 squirrels (Table 3) was 0.816 which is significant at 0.001 probability level.

Capture rate

Plantation 168 was divided into areas A and B according to topography (Fig. 1). Area A is on the ridge and B is on the slope. In areas A and B, the number of sites where

TABLE 4.
The mean and standard deviation of the obscuring cover density for the number of times squirrel was captured at different sites

	number of captures						
	0	1	2	3	4	5	6
No. of trap sites	39	37	23	11	1	2	1
Mean	0.54	0.50	0.55	0.47	0.78	0.51	0.56
S.D.	0.16	0.12	0.15	0.17		0.00	

squirrels were captured are 39 and 75, respectively. The mean number of squirrels captured per site in area A was 1.67, which is significantly higher than that of 0.95 for area B ($F=9.46$, $p<0.01$). This shows that more squirrels were captured per site on the ridge than on the slope.

The obscuring cover density of the habitat, however, has no effect on the rate of capture of squirrels. The mean and standard deviation of the obscuring cover density for the number of squirrels captured at different catch sites are presented in Table 4. The mean obscuring cover density are 0.51 and 0.56 for those sites where squirrels were capture five and six times, respectively. These values are relatively the same as that where squirrels were only captured from 0 to 3 times. The correlation coefficient between the number of times of captures and the obscuring cover density on all 114 trap sites was only 0.002, which is not significant at 5 percent probability level.

DISCUSSION

The population density of squirrels in Plantation 168, estimated by the mark-recapture method, was about 2.5 times that calculated by Flyger's formula based on the time area count. This would be expected since it is believed that mark-recapture method is more reliable than time area count, although it requires more labor and time. As pointed out by Hicks[8], many ecological factors could cause biased estimation of population size based on the time area counts. Bouffard and Hein[1] further indicated that time area count would underestimate the population size. The steep topography and dense underground cover caused some difficulty in estimating the distance to squirrels spotted. Hence time area count is not a very satisfactory method for estimating population size in Chitou.

In spite of the low population density of squirrels in Chitou, they cause serious damage to *Cryptomeria japonica*. The population density was about 2.5 per hectare in Plantation 168. The density may be even lower in Plantation 159, where 80 percent of the planted trees were injured by squirrels[2]. Mr. Wan-Fu Chang (personal communication) observed that 90 percent of the stomach contents of squirrels were the inner bark of *C. japonica* from February through April, when the damage to trees was most serious. In addition, the squirrels waste a great amount of food materials during their bark feeding process. Therefore, it is not surprising that just a few squirrels can cause serious damage to a forest.

Ideally, the study of home range of a given animal should be done in a large area with square or rectangular grids of trapping sites[4,13]. But such a perfect study area is hard to find in Chitou due to steep topography and the continuous surge of great number of tourists. Plantation 168 was chosen because of the ease to reach it on foot and it had little interference by tourists. Although all the trapping sites were arranged on one side of the Plantation to avoid disturbance by tourists, and the steep slopes prevented us from spreading the traps in square or rectangular grids, we still believe that the data obtained by our intensive mark-recapture research does provide some idea about the relative home range for squirrels of different sex and maturity. Our observation indicate that

the adult male tree squirrel has a greater home range than the adult female. Similar phenomenon has also been observed in gray squirrels and red squirrels[15,16,18]. This is probably because females have to take care of the young, hence only forage near their nest. Flyger[6] and Cordes and Barkalow[3] found that immature male squirrels had a tendency to disperse, and have larger home range due to the influence of hormones. However, the present data showed no difference in the home range size between immature male and female squirrels.

The average distance of movement and home range for each squirrel were 244 m and 3714 m^2, respectively. Both values were probably underestimations because the trapping sites were distributed on grids in a relatively narrow stripe. This was further supported by the fact that two squirrels have dispersed with a distance of over 1 km from Plantation 168 to 52-2. With such large home range, the squirrels could have moved away from the trapping sites easily and not being recaptured later. This may explain why the estimated average length of time each squirrel to have stayed in Plantation 168 was only 4.5 months, and also the replacement of squirrel population during the study period.

The capture rate of squirrels was higher on the ridge than on the slope of Plantation 168. This was probably related to the different vegetation habitat in these 2 areas. There are many different kinds of hardwoods growing among *C. japonica* on the ridge, but not on the slope areas. Hwang *et al.*[9] also indicated that the damage of *C. japonica* occurred more frequently near the edge of virgin hardwood forest. It implies that squirrels are most active in areas with hardwood nearby. However, the relationship between the number of squirrels captured on the catch sites and the corresponding density of the lower vegetation cover was not significant. This suggests that environmental conditions other than cover density, such as availability of food or nesting sites, might be the main factor that influence the distribution of the squirrels.

In Chitou, a 2-month warfarin control program was initiated in February 1979 in all the Plantations except Plantation 168 and a few others. Evidently, some of the squirrels foraged in the neighboring plantations and got poisoned. The CPUE dropped from an average of 2.34 before February 1979 to 0.81 for the following year. A slight increase in the proportion of immatures in the squirrel population was also noted. As mentioned earlier this was probably due to adults having a larger home range than the immatures. The other possible reason is that adults may be more apt to take artificial baits than immatures which usually feed on certain nature foods (Dr. Walter E. Howard, personal communication).

Since the red-bellied tree squirrels have become a serious problem to the forest industry, methods have been tried to control the population of these squirrels. According to Ms. Ying Sze-Ling (personal communication), from 1955 the Forest Bureau and other forest owners in Taiwan have used warfarin to kill the squirrels in many forest areas. Because the squirrels decay in the forest after they were killed, it is hard to estimate the effectiveness of this method. Hence a bounty system sponsored by the Forest Bureau has also been in operation since 1965, and over 500,000 squirrels have been harvested. Apparently the control methods have not been very successful because it has not prevented damage by the squirrels. Due to the high cost of labor for repeated application of rodenticide on a large scale, warfarin baits have been placed for short periods in plantations where the damage was most serious, then the operation moved to another plantation the next year. Thus as bus, this only resulted in a temporary reduction of the squirrel population in the treated area. But the population will soon be built up again in the following years. This probably is the reason why damage to cultivated tree continued even with the bounty system and warfarin program. Therefore, permanent bait stations that require low labor to operate should be set in plantation areas to control squirrel populations.

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赤腹松鼠之族羣動態

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本研究之目的在調查溪頭赤腹松鼠之族羣大小，活動範圍與分佈狀況，並探討影響松鼠捕獲率之因素。民國67年7月間利用定時定點觀察法，在鳳凰山原始林，及168, 159號人造林內進行研究。民國67年8月至69年3月，更進一步利用標放法收集168林地內松鼠密度月變化及其活動範圍之資料。

根據定時定點觀察法之資料，168林地內松鼠密度較159林地爲高。67年8月至68年2月168林地內，每百個籠子捕獲之松鼠平均數目爲2.34，估計松鼠密度每公頃爲2.5隻。自68年3月後一年，平均捕獲率降爲0.81。此種顯著的下降與周圍林區內進行殺鼠靈毒殺時期相吻合。

168林地內，松鼠平均停留期間爲4.5個月。成體雄鼠之活動範圍最大，但成體雌鼠，未成熟雄鼠及未成熟雌鼠之活動範圍並無顯著差異。成熟松鼠與未成熟松鼠之雌雄比分別爲15：10及15：15，殺鼠靈毒殺並不影響性比。

松鼠之捕獲率不因性別、成熟度而異，且捕獲率與鼠籠附近遮蔽度無關。但與鼠籠架設的地形有關，擺設於稜線上者比山坡上之捕獲率爲高。