

THE UTILIZATION OF NESTING BOXES BY GRAY SQUIRRELS

By VAGN FLYGER AND H. REBECCA COOPER

In order to properly manage gray squirrel populations a knowledge of the nesting period is necessary so that the hunting season can be adjusted to coincide with a time when few if any females have dependent young. Earlier studies (Flyger, 1952) have shown that during September, which is a popular hunting season, about half of the adult females are nursing young. Whenever such a female is shot, her offspring perish in some remote nest.

Discovering the exact details of when squirrels bear their young can be done in two ways: either collecting a large number of specimens every month over a period of years; or by examining squirrel nests and recording the presence or absence of young and the age of the young. This is approximately the same type of information that would be gathered by collecting female specimens to determine presence or absence of milk. Previous studies demonstrated that squirrels use artificial nesting sites erected in trees. Nesting boxes can be placed so that over 100 boxes can be examined within a day thus making it practical to gather management information.

Methods

The squirrel boxes used in this study were surplus ammunition cases acquired from the U. S. Army. These boxes are made of $\frac{3}{4}$ " pine with interior dimensions of 7" x 7" x 14". Each has a hinged lid and a simple lock, making them convenient to open. The boxes were converted to nesting shelters by drilling a three-inch hole in one corner so that when the box was placed on a tree trunk the hole was toward the top of the box and close to the trunk. A loop of wire through the boxes made them easy to hang from a nail on the tree trunk and the boxes could easily be taken to the ground for close examination when necessary and then rehung. Contribution No. 331, Maryland Natural Resources Institute.

Nesting boxes were erected on tree trunks in lines of 100 to 200 in 10 woodlots at approximately 100-yard intervals. They were hung at a height of about 15 feet so that they could be easily examined by the investigator using a 12-foot magnesium ladder. Every month the investigator walked the line with the ladder and examined every other box. The following month the alternate boxes were examined.

The investigator examining squirrel boxes would lean the ladder against the tree trunk, climb to the box, unlatch and open the lid and examine the contents. If it appeared that a squirrel were present, a glove or some other item was stuffed into the entrance hole to prevent escape of the squirrel and the box was lowered to the ground where it could be opened more carefully. The lid was cautiously opened, just enough to permit slipping a gloved hand inside with fingers outstretched, the squirrel was then pressed down against the leaf litter. The hand was so maneuvered that the animal could be grasped around the shoulders and behind the neck and lifted out of the box. Care must be taken to prevent the escape of any other squirrels present. The other hand was free to hold the hind quarters and to manipulate the animal to determine age and sex. If a squirrel were to be weighed, it was simply placed in a cloth bag and hung from a spring scale.

Even though squirrels have sharp incisors and strong jaw muscles, gloves proved adequate protection; the few bites that did occur were moderate. We also found that fingers can be maneuvered inside the glove so that when the squirrel bites, fingers can be simply moved out of the way. A thinner glove was also necessary to protect the left hand from being scratched by the squirrels' hind legs.

The contents of nest boxes were recorded on a simple form. Such information as type of nest, presence or absence of young, number of young, sex of young, and other inhabitants were recorded (Table 1).

TABLE 1—SQUIRREL BOX USAGE—JANUARY 1964-APRIL 1967.

Month	Jan. No.	Feb. No.	Mar. No.	Apr. No.	May No.	June No.	July No.	Aug. No.	Sept. No.
Gray squirrel nests	218	258	432	233	40	50	519	633	125
Gray squirrels	88	103	100	64	5	1	28	57	22
Flying squirrels	9	15	29	14	3	5	22	2	3
Fox squirrels	2	3						2	2
Mice		1	1				4	13	
Opposums							5	4	1
Honeybees		1	5	4	3	1	8	17	3
Bumblebees						3	24	10	3
Wasps			8	6	1	1	22	14	3
Hornets							4		
Lizzards							1	12	
Snakes							1	3	
Screech Owls			1	1					
Other Birds							1	2	
Chipmunks	1								
Total No. Boxes Examined	626	560	646	471	150	159	1024	1003	436

All nest boxes except those containing young were cleaned out and thus, if a nest was present during the next examination two months later, it was certain that it had been constructed during the interval.

Results

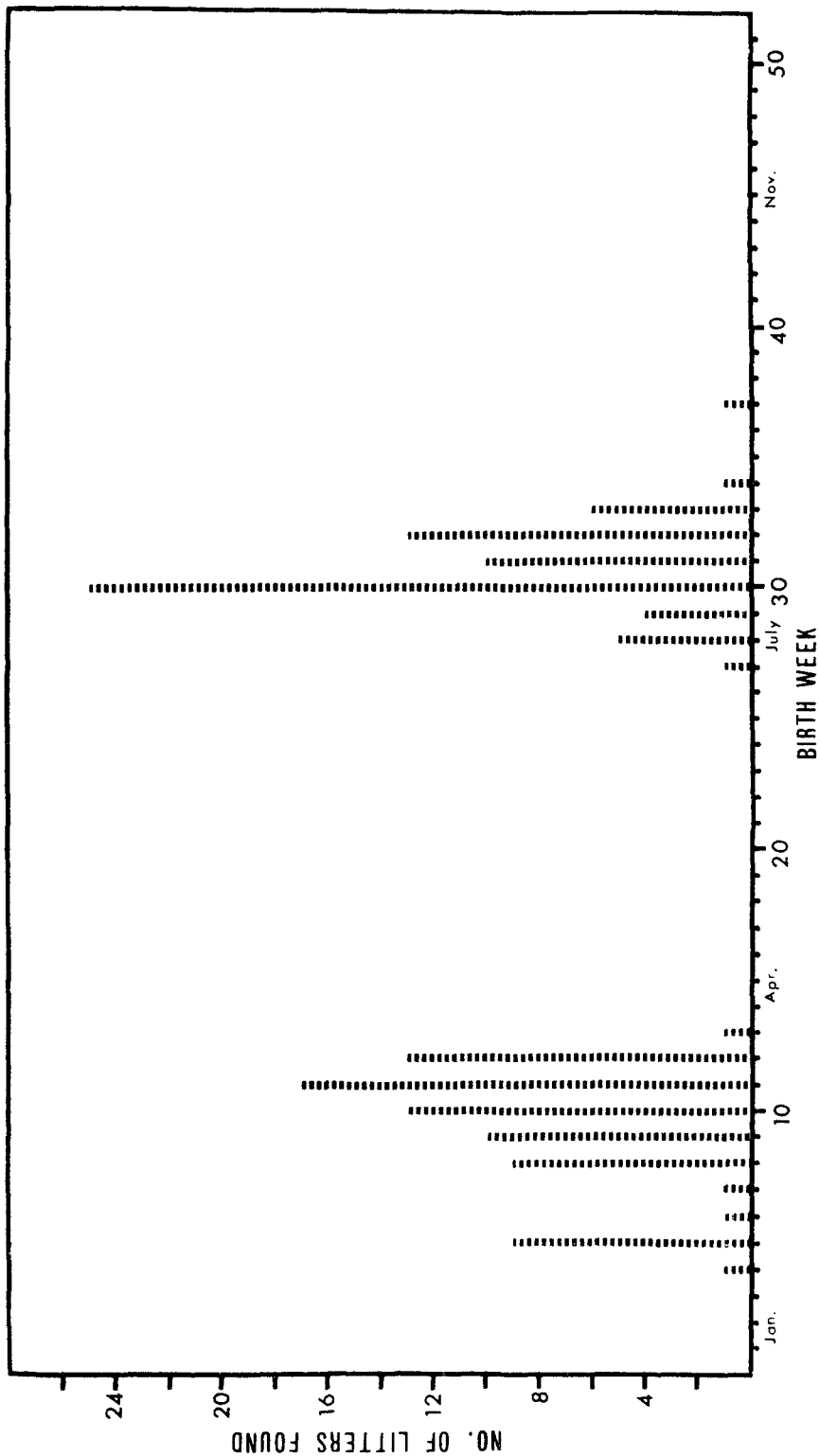
Based upon 5075 nest box examinations on Maryland's eastern shore, we discovered (not unexpectedly) that the gray squirrel has two very distinct breeding seasons. Young gray squirrels are born in either February-March or July-August (Fig. 1) and no squirrel litters were found at any time other than at these two seasons. The size of the litters varied from one to six, with two being the most frequent. One hundred forty-three litters had a mean size of 2.69 young (Fig. 2). There was a significant difference between summer litters (3.29) and the winter litters (2.15). Shorten (1954) believes this difference is due to seasonal differences in availability of food.

The sex ratio of 377 young from 143 litters was 195 males to 182 females. This ratio is essentially equal as compared to that of the adult squirrels, which strongly favors males. For example 109 adult squirrels captured in box traps in a woodlot north of Baltimore, Maryland had 61% males (67 males and 42 females) and 67 adult gray squirrels found dead on Maryland roads throughout the state had 64% males (43 males and 24 females). Chi-square tests of these samples showed that the ratio differed significantly from a 50-50 ratio ($X^2=5.29$ for trapped squirrels and $X^2=14.50$ for road kills).

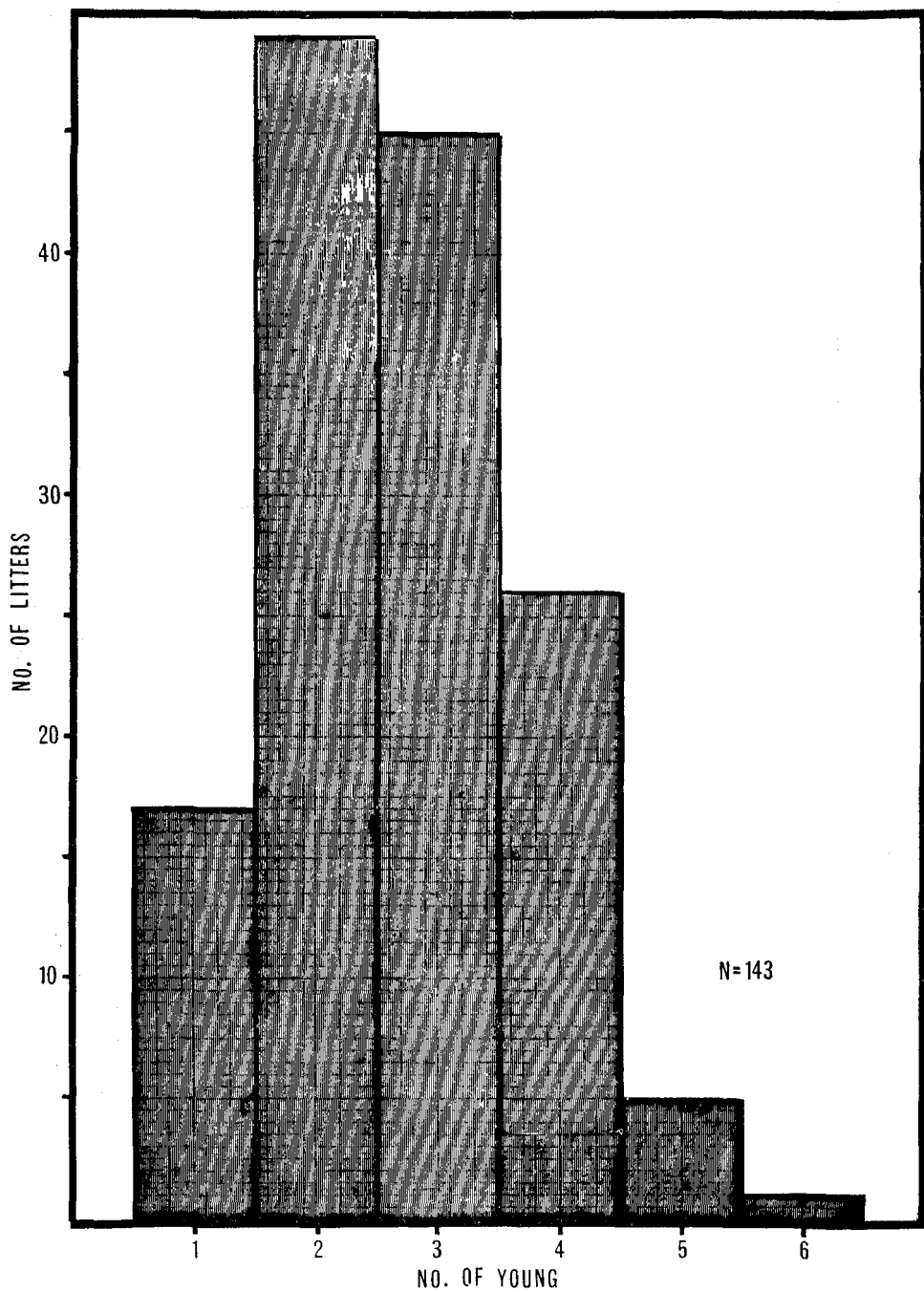
The difference in sex ratio between adults and nestling squirrels can be accounted for either by differential mortality favoring males or by differences in activity or a combination of these factors. Males are probably more active than females since males search for mates and are not burdened with family duties. Therefore, males are more likely to be seen by hunters, run over by cars, or captured in traps.

Squirrel nesting boxes were also attractive to other animals and some of these — the bees and wasps — were quite unpleasant and undesirable. Flying squirrels were frequently encountered and are not so sound sleepers as gray squirrels: they usually left the nest box as soon as the ladder was laid against the tree. To capture flying squirrels, one had to place the ladder quietly against the trunk and climb as silently as possible. Gray squirrels on the other hand, if present in the box, were often sound asleep when the investigator opened the box and could sometimes be captured before they awakened. Flying squirrel nests would be recognized by the presence of a mass of fecal pellets in one corner of the nest.

SEASONAL DISTRIBUTION OF LITTERS



GRAY SQUIRREL LITTER SIZES



Conclusion

Examination of nesting boxes to study gray squirrel reproduction is an efficient and rapid method for gathering data. Adults as well as nestlings are easily captured and examined.

Gray squirrels have two nesting seasons on the eastern shore of Maryland. The late summer season extends from the 27th to the 34th week, with one stray litter on the 37th week. Assuming that the last litters are born on the 34th week and that the young are dependent upon their mother for approximately 10 weeks the squirrel season should begin no earlier than the 44th week or November first if no females with dependent young are to be shot.

LITERATURE CITED

- Flyger, Vagn. 1952. A study of the nest box habits and the breeding season of the gray squirrel (*Sciurus carolinensis leucotis*) in Maryland and Pennsylvania. Unpub. M.S. Thesis 59 p. Penn State University.
- Shorten, Monica. 1954. Squirrels, Collins, London 212 p.

NOTES ON THE LIFE HISTORY OF THE SWAMP RABBIT IN ALABAMA ¹

By EDWARD P. HILL III

A B S T R A C T

A swamp rabbit life history study was conducted in Alabama during 1960-1967. Of 438 swamp rabbits taken by hunters on Wheeler National Waterfowl Refuge in northern Alabama during February, 205 (46 percent) were males. In a sample of 64 others collected statewide throughout the year, 29 (45.3 percent) were males. Late winter weights are presented for 322 swamp rabbits examined in north Alabama. Based on implantation sites or corpora lutea counts, the mean size of 95 first swamp rabbit litters of the season was 2.863. The mean size of 17 second litters of the year was 3.176. No significant differences were found between the size of litters from different latitudes or within different litter sequences.

The onset of the swamp rabbit breeding season is well defined in northern Alabama, usually starting in mid-February, and slightly preceding the onset of the cottontail breeding season. The infrequent occurrence of young animals in late winter collections of swamp rabbits from northern Alabama indicates there is little or no fall or early winter breeding by swamp rabbits in that area. A lens weight histogram representative of February age distributions is presented. Based on ages determined by lens weights, a February sample of swamp rabbits contained 58 per cent juvenile which is less than is normally found in cottontail populations, perhaps suggesting greater life expectancy in swamp rabbits.

¹ Presented at Technical Game Sessions of 21st Annual Conference of Southeastern Association of Game and Fish Commissioners, September 1967.