CALVERT CLIFFS
Chesapeake Bay, Maryland

Photographed by
John Calder

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MARYLAND NATURALIST

Knowledge never learned of schools,
Of the wild bee's morning chase,
Of the wild flower's time and place,
Flight of fowl and habitude
Of the tenants of the wood;
How the tortoise bears his shell,
How the woodchuck digs his cell,
And the ground-mole sinks his well.

-John Greenleaf Whittier

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Delmarva Fox Squirrel
Sciurus niger neglectus

COMMENTS ON THE FOX SQUIRRELS OF MARYLAND

by Romeo Mansueti

Introduction

Fox squirrels are among the most spectacular of rodents in Maryland. Their large size, plainly evident when compared to the gray squirrel, has made them eagerly-sought prey of squirrel hunters during the autumn hunting season. Aside from their heavier bodies - males may weigh more than three pounds (Dozier and Hall, 1944) - the habits and distribution of fox squirrels should be of special interest to Maryland naturalists and outdoorsmen. Their apparent scarcity in Maryland and in other states on the Atlantic Coast has prompted G. M. Allen (1942) to place them on his list of species that are on the verge of being extirpated.

Few people have recorded observations of fox squirrels in Maryland during recent years, but apparently hunters have bagged comparatively substantial numbers of them. Compared to the gray squirrel, which is abundantly represented throughout the State in mature forests of hardwoods and mixed hardwoods and conifers in which mast-producing trees such as oaks, hickories, and pines are present, fox squirrels exist roughly in a ratio of one to every 40 grays, according to a preliminary game kill census calculated from figures taken for the 1950-51 Maryland hunting season by Longwell (1951). Such a ratio when compared to reports from Game Wardens and residents living or working in the large woodlands of the State, seems somewhat high. Here the human failing for misidentification of closely related animals is probably the major cause, with the local custom of applying individualistic vernacular names a close second. For example, the fox squirrel *(Sciurus niger)* of the Eastern Shore possessing the book names of "Bryant fox squirrel" and "Peninsula fox squirrel" was known as the "gray," "big gray," "cat," and "stumped-eared" squirrel, while the much smaller gray squirrel *(S. carolinensis,)* is known in some sections as "fox" squirrel! (Dozier and Hall, 1944; and Handley and Patton, 1947).

Races of Fox Squirrels in Maryland

Two races, possibly three, of fox squirrels have found habitats to their liking in Maryland's varied physiography, which possesses conditions and ecological elements all out of proportion to its size. The three races are:

1. Delmarva Fox Squirrel
   Sciurus niger neglectus (Gray)

2. Allegheny Fox Squirrel
   Sciurus niger vicinus (Bangs)

3. Western Fox Squirrel
   Sciurus niger rufiventer (Geoffroy)

The status and relationships of the latter two subspecies in Maryland are imperfectly known, but the comments below represent a resumé of all the available information for each race.

DELMARVA FOX SQUIRREL

Sciurus niger neglectus (Gray)

Name and status: This race was formerly known as the Bryant Fox Squirrel, *Sciurus n. bryanti* H. H. Bailey, originally described in 1920 from Dorchester County (Bailey, 1920). Poole (1944) re-examined the early descriptions and types, and discovered that the name *bryanti* was preoccupied by *neglectus*, the name that was formerly applied to the Allegheny fox squirrel. Consequently, the name "Bryant fox squirrel" and *bryanti* are no longer valid. Common names for this species have been given above, although Dozier and Hall (1944) state, "Why the Southern gray squirrel, *Sciurus c. caroleninsis* Gmelin is called 'fox squirrel locally is rather difficult to understand and leads to much confusion."
General Distribution; Formerly occurred from Virginia to Southeastern Pennsylvania, but now extinct excepting the eastern shore region of Delaware, Maryland, and Virginia. However, Handley and Patten (1947) stated that it ranged to Western Connecticut and Dr. Earl L. Poole, director, the Reading Public Museum and Art Gallery, informed me that "so far as I am aware the most northerly specimen of typical *neglectus* was taken in Dauphin County, Pa., near Harrisburg, in 1892."

Distribution in Maryland: Dozier and Hall (1944) state that, "Although it occurs in limited numbers in Queen Anne, Talbot, Wicomico, Somerset, and Worcester Counties, the center of population appears to be in Dorchester County. In former times a large population occurred there from the vicinity of Church Creek to Big Gum Swamp and through to Kentuck and Greenbriar Swamps, where there was an abundance of old-growth pine, oak and gum. Much of this has been cut over or burned through extensive forest fires but squirrels still persist in fairly plentiful numbers. At the present time the heaviest concentration appears to be in the Drawbridge District of Dorchester County."

Localities -

1. Near Church Hill, four miles below Chestertown, Queen Anne County, January 7, 1933 caught in muskrat snare at edge of marsh by T. L. Lowman, January 7, 1943. (Dozier and Hall, *op. cit.*)

2. Big Swamp, two miles east of Kings Creek, Somerset Co., E. A. Vaughn 1922, (Dozier and Hall, *op. cit.*)

3. Pocomoke City, (near), Worcester Co., (Dozier and Hall, *op. cit.*)

4. West of Westover, Somerset County, 1940. (Dozier and Hall, *op. cit.*)

5. Dr. Tull's Swamp. Loretto, Somerset County. (Dozier and Hall *op. cit.*)

6. Lonie Slacum farm, off Maple Dam Road, near Cambridge, Dorchester County, 1941, by J. Tyder. (Dozier and Hall *op. cit.*)

7. Salem Woods, 14 miles from Cambridge on Road to Salisbury, Dorchester County, 1933 by G. Hurley. (Dozier and Hall, *op. cit.*)

8. Big Blackwater Section, Dorchester County, 1932, (Dozier and Hall, *op. cit*)

9. Cambridge, Dorchester County, U.S.N.M. (Hamilton, 1943)

10. Three miles East of Trappe, Talbot County, October 6 1951, mature male two lb. Shot by R. D. Van Deusen on ground.

11. Near Trappe, Talbot County, September 27 1948, shot by Phil Barski.

12. Gibbs Marsh, between Golden Hill and Church Creek, nr. Blackwater River, Dorchester County, and observed by Dr. R. V. Truitt.

13. Newark, Worcester County, October 13, 1951. Fred Seiling.

14. Newark, Worcester County, October, 1951. 2-1/2 pound silvery-white squirrel shot by son of Newell Stagg.

Habits: Dozier and Hall (1944) and LeCompte (1942), in part, have recorded some interesting observations regarding the behavior of this species when compared to the smaller gray squirrel. They note that it spends much time on the ground and stays close to home, and that it lies close to the body of a tree or limb, while the gray jumps from tree to tree. The fox squirrel does not as readily jump from tree to tree, but rather descends to the ground and then ascends another tree. Many fox squirrels are shot on the ground. Vagn F. Flyger observed a fox squirrel two miles east of Trappe jump from tree to tree between three trees.

Dozier and Hall (1942) have presented an impressive amount of information on habitat, behavior, nest-building activities, food and parasites of the Delmarva fox squirrel. They stated, "Scattered breeding may occur throughout most of the year but mating usually takes place during the latter part of February or early in March. The litters are found mostly during April. Breeding has also been noted late in summer and in fall in a number of cases. From limited observations the size of the litter is usually four."
Subspecific Status: The only conceivable point of intergradation in Maryland between *S. n. neglectus* and *S. n. vicinus* would be in Cecil and Harford Counties. Presumably, fox squirrels have been completely extirpated in this region, so no objective evidence is available. Longwell (1951) has received answered questionnaires from region #4, which includes Cecil and Harford Counties, from which calculations indicated that a number of fox squirrels are reported. These records do not necessarily mean that they were killed within these counties. Pelts and skulls would be particularly desirable from this region.

Numerical Status - Dozier and Hall (1944) stated that ". . . this squirrel has become greatly reduced in numbers and has already disappeared entirely from many of its former haunts. This radical reduction has been brought about not only through intensive hunting but through the cutting over of the large tracts of virgin and old-growth timber with the consequent destruction of the feeding grounds of the squirrels." G. M. Allen (1942) has provided a discussion of its occurrence and probable impending extermination.
Longwell (1951) has calculated a very rough estimate of the fox squirrel harvest (in which the small gray squirrel probably was largely represented in the census returns for regions #5 and #6, all Eastern Shore Counties.)

Approximately 10,000 fox squirrels were determined from data submitted, a figure which is unfortunately exaggerated through misapplication of the common name. Conversely, this is borne out by the comparatively low harvest of gray squirrels, when compared to the production for the whole State, i.e., a little over 35,000 for the whole Eastern Shore.

ALLEGHENY FOX SQUIRREL

Sciurus niger vicinus (Bangs)

Name - This subspecies was known for many years as *neglectus*, until Poole (1944) resurrected the old name originally given by Bangs (1896). It has also been known as the Northern fox squirrel, and it is generally known as fox squirrel to game wardens and residents in the counties where it occurs. Haley (1861) called it the "cat" squirrel, and G. M. Allen (1942) calls it "Eastern" and "Northern" fox squirrel. *General Distribution* - Formerly occurred in the Appalachian Highlands from western North Carolina and Virginia north to central or northern New York, but now limited to western Virginia, eastern West Virginia, western Maryland, and south central Pennsylvania. (Handley and Patton, 1947).

Distribution in Maryland - Bailey (1923) has summarized the known localities from which the fox squirrel has been taken. In general this race is found only in the heavily forested regions on the Western Shore of Maryland, the entire Piedmont Plateau, and the entire mountainous regions. In many sections it has been extirpated where farm lands have superseded wooded areas. Even in wooded areas where the gray squirrel is still abundant, the fox squirrel has been long since decimated (see G. M. Allen, 1942). *Localities:* principally from Bailey (1923):

1. Near Plummer Island, Montgomery County, on Virginia side 1905, Vernon Bailey
2. Great Falls, Montgomery County, Oct. 22, 1916, Francis Harper.
3. Laurel, Prince Georges County, U.S.N.M.
4. Priest Bridge, along Patuxent River, Anne Arundel County, U.S.N.M.
5. North Chesapeake Beach, Calvert County, U.S.N.M.
6. Governors Run, Calvert County, seven killed few years ago (1948?), according to Warden Fielder Crawford.
7. College Park, near site of Glenn L. Martin Aeronautical School, Prince Georges County, April, 1948, R. Mansueti.
8. One-half mile East of intersection Highway 214 and 301, Prince Georges County, 1940, Phil Lyons reports.
9. Green Ridge State Forest, two miles East of CCC camp on Mertons Avenue, Allegany County, Nov. 1935, Ralph Hammer.
10. Along Chesapeake and Ohio Canal and Potomac River, at Fort Frederick State Park, Washington Co., 1950. Reported as common enough to be seen regularly by Superintendent.
11. Accident, Garrett County, 1945. James Beal.
12. Bittinger, Garrett County, 1948. Lloyd Cook.
13. Accident, Garrett Co., Jan. 15, 1951. John Reckner
14. Meadow Mountain, Garrett Co., Sept. 1947, Francis H. Ruge.
15. Near Bladensburg, Prince Georges Co., 1949? Report from Warden A. D. Jones.
16. Martin site 1/2 mile N. Md. line, Fayette Co., Pennsylvania. Gilmore (1946).

Habits: No one has made extensive observations on this subspecies, but Bailey (1923) has published a few notes, saying, "But for their great intelligence and skill in hiding and keeping out of sight they would long since have vanished from our remnants of forest." Two hunters report that they have observed three juveniles in a nest in Garrett County. According to Handley and Patton (1947) and Grimm and Roberts (1950), they prefer open deciduous woodlands, woods borders, and orchards.

Subspecific Status: Although this subspecies is the most widely distributed race in the State, museum specimens are poorly represented in collections. Consequently, its relationship to the other subspecies in the State is not clear. The area of intergradation of *S. n. vicinus* with *S. n. neglectus* and *S. n. rufiventer* can only be surmised; the latter subspecies probably intergrades with *vicinus* on the western edge of the Allegheny Plateau, but material is not available to support this premise.

Numerical Status: Apparently, this subspecies has been considerably decimated in recent years. The remaining fox squirrels are strictly local in nature and are more or less relic populations where they occur. Some indication of their actual numbers may be gleaned from the provisional statistics given by Longwell (1951). In regions #1, #2, #3, and #4, comprising all Western Shore Counties, a little over 5,000 fox squirrels were calculated from answers supplied by hunters during the 1950-51 Maryland hunting season. What percentage of error is involved in this seemingly high figure is open to conjecture.

WESTERN FOX SQUIRREL

Sciumus niger rufiventer (Geoffroy)

Name and Status: This subspecies has never been recorded in the State before, and is discussed here purely on a provisional basis. It is not abundant enough to be considered any different from the Allegheny fox squirrel.

General Distribution: Occurs in extreme western New York (Chautauqua County), western Pennsylvania (reintroduced in much of Pennsylvania), all of Ohio through central Michigan and Wisconsin south to western Kentucky. This is the form which occurs west of the Allegheny Mountains. (Hamilton, 1943).

Distribution in Maryland: During 1950, Vagn F. Flyger, formerly game biologist with the Maryland Department of Research and Education, and the author examined the tail from a fox squirrel shot on a hill near Storey's Landing, Deep Creek Lake, Garrett County, by Matt Storey several years ago. Mr. Flyger later called my attention to the color of tail which is characteristic of *rufiventer,* a race with which he was quite familiar. Unfortunately, no further information or specimens are available to shed further light on its occurrence. Grimm and Roberts (1950) collected two specimens of this subspecies from Somerset County, Pennsylvania, which is directly north of Garrett County, but they state that it is "Most common in the extreme southwestern portion of the (Southwestern Pennsylvania) region (Washington and Greene counties), where it is probably native. Rather rare and local east of the Allegheny and Monongahela rivers, where the species has apparently been introduced." They state further that, "in Southwestern Pennsylvania the

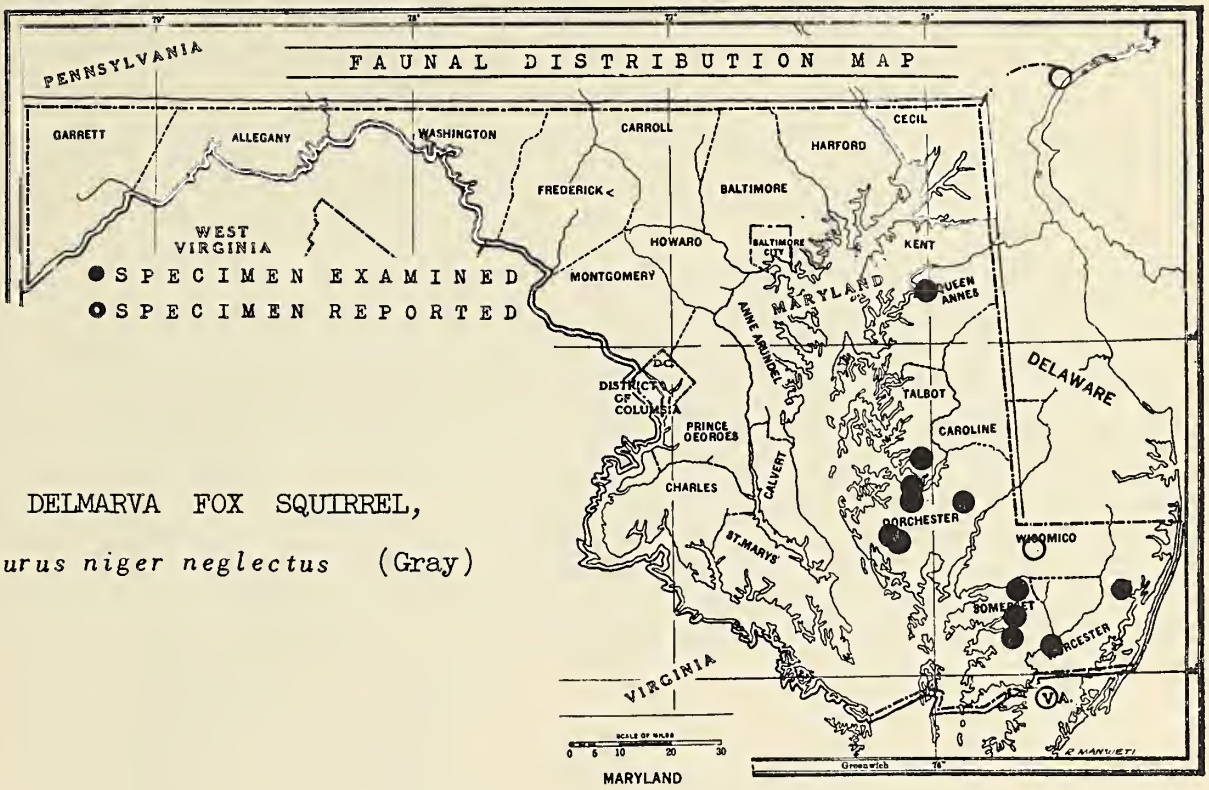
fox squirrel prefers open or park-like upland woods to extensive and heavily forested sections. It not uncommonly occurs in pasture fields where there are only scattered large trees, or along fencerows between cultivated fields if some large trees have been left standing." These conditions accurately describe those found in many parts of Garrett County, particularly around Deep Creek Lake.

Some idea of how this race has emigrated from the prairie region to cut over areas of essentially wooded regions may be gleaned from the following.

D. L. Allen (1943) pointed out that the Western fox squirrel does not favor deep woodland, originally being a creature of the prairie edge. "Its range was the transition zone between the eastern deciduous forests and the prairies. Oak-covered ridges, which represented the western outposts of forest in Illinois prairies, and 'oak openings' which were the eastern vestiges of prairie in the woodlands of northern Indiana, Wisconsin, and southwestern Michigan, were its favorite habitat . . . Thus it is easy to understand why the fox squirrel was uncommon or absent from most of southern Michigan where heavy forest cover predominated. *** By cutting dense forests the settlers eliminated the home of the gray squirrel. But in the new environment, farm woodlots interspersed with open fields, fox squirrels found conditions similar in many ways to their primitive habitat on the prairie margins. In less than thirty years they spread over the entire lower half of the southern peninsula." Allen suggests that some of the fox squirrels strayed out from the prairie region and became established where extensive clearings were maintained by the Indians. As the forests were cleared in Michigan, the Western fox squirrel continued to spread northward and by 1870 occupied the lower half of the peninsula. In some localities in the northeastern counties the species did not appear until 1930, but there were a few in every county by 1925. The speed of its distribution was determined by the speed with which early farmers and lumbermen made conditions livable for it.

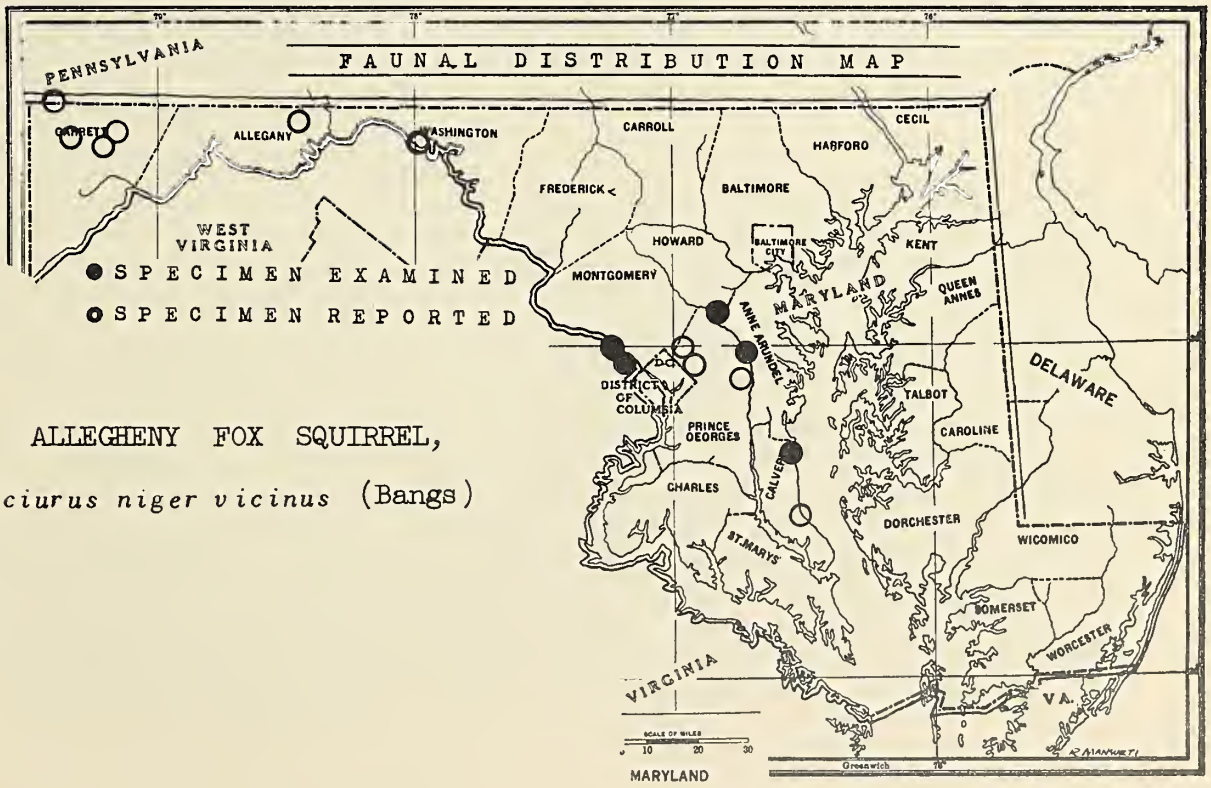
Whitesell (1951) stated, "The western fox squirrel *(Sciurus niger rufiventer)* was unknown in Ohio prior to 1830 and was not common until after 1910. This is easily understood since the fox squirrel is a prairie species and Ohio, at that time, was mostly forest. With the advent of land clearing the habitat became more suited to the (Western) fox squirrel."

The above explanation may shed some light on the possible eastward invasion of the western fox squirrels in the mountain sections of Maryland that have been cleared. Browning (1928) reported during his last years of active hunting in 1839 that the herding of foreign cattle in unbounded pasture areas in the Glades of Allegany and Garrett Counties had considerably cleared the understory and shrub-like vegetation. Grimm and Roberts (1950) stated, "Much apparently optimum habitat for this squirrel occurs in Greene and Washington counties where the oak and hickory woods have been extensively grazed by large herds of sheep. It is entirely possible that the fox squirrel originally migrated into this region following the large scale introduction of sheep. We have never seen it anywhere in the extensively forested sections, nor is it very often found in the bottomland



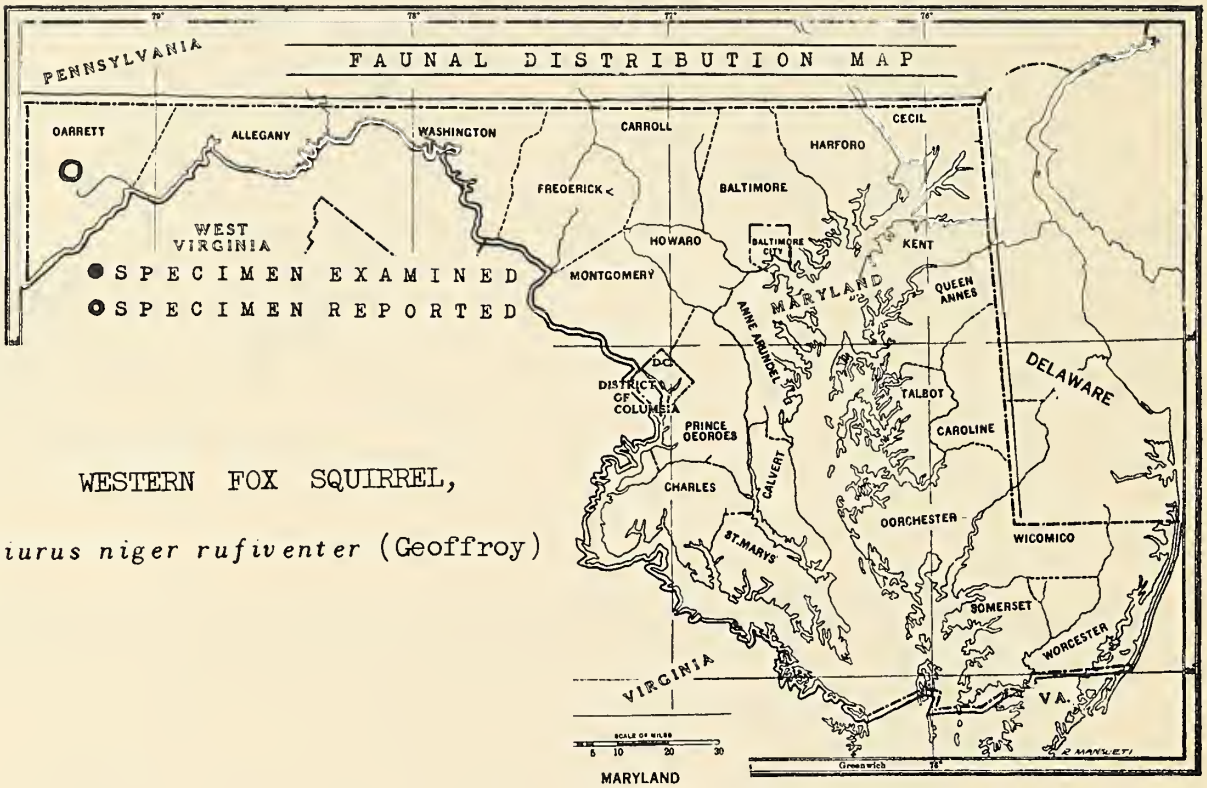
DELMARVA FOX SQUIRREL,

Sciurus niger neglectus (Gray)



ALLEGHENY FOX SQUIRREL,

Sciurus niger vicinus (Bangs)



WESTERN FOX SQUIRREL,

Sciurus niger rufiventer (Geoffroy)

forests of Greene and Washington counties, where the groundcover is usually rather dense." In conclusion, it is predicted that the Western fox squirrel may increase in numbers in Maryland as the forested habitat conditions become altered into cleared land areas. In a sense, it is invading the areas that have been vacated by its precursor, the Allegheny fox squirrel.

Breeding Habits: Whitesell (1951) states that the Western fox squirrel has two breeding seasons, the first occurring from late December until early April, and the second from late May until middle October in Ohio.

Subspecific Status: *S. n. rufiventer* may intergrade with *S. n. vicinus* somewhere in the vicinity of the confluence of western Maryland, southwestern Pennsylvania, eastern Ohio, and northeastern West Virginia. The fact that the habitat preferences of these two subspecies are dissimilar may preclude the intergradation of the two subspecies in areas where *rufiventer* has recently invaded. On the other hand, hybridization may occur by the artificial introduction of one subspecies into the domain of another. Thus, Grimm and Roberts (1950) writing about Southwestern Pennsylvania, stated, "In past years small number of Western fox squirrels, ranging up to two dozen individuals, have been introduced into every county within this region. In a few localities they seem to have persisted, but most of the introductions have not been too successful." Some of these may have migrated south into Maryland.

Numerical Status: No data available.

Introduced Fox Squirrels

To augment declining stocks of certain game animals, efforts are often made to replenish numbers by introducing animals from distant locations where they are easily captured. This measure, often carried out unmindful of environmental requirements of certain races, occasionally is unsuccessful. Grimm and Roberts (1950) have indicated that this is somewhat so in Southwestern Pennsylvania for *S. n. rufiventer* although further plantings, considered from a purely management viewpoint, may be more successful as more land is cleared.

Bailey (1923) stated that, "Fox squirrels, some of which may be of southern forms, have been liberated at various times in the Zoological Park [at Rock Creek Park, District of Columbia], and have been observed from time to time during the past few years in Cleveland Park and adjoining wooded sections. Mr. N. Hollister, superintendent of the Park, reports importations of seven [*S. n. rufiventer*] from Wichita, Kansas, in 1899; of one [*S. n. niger*] from South Carolina, in 1902; of eight (*S. n. rufiventer*) from Arion, Iowa, of one [*S. n. neglectus*] from Richmond, Virginia in 1904; and one [*S. n. bachmani*] from Columbia, Tennessee, in 1916." Although consideration was given by game authorities to trapping and transporting the Delmarva fox squirrels from the Eastern Shore to the Western Shore, the plan never materialized. Former Chief Game Warden E. Lee Le Compte was very interested in conserving this species, and as a result of his interest the LeCompte Bryant Fox Squirrel Refuge, four miles southwest of Vienna, in Dorchester County was set aside within the last few years as a sanctuary especially for fox squirrels. The establishment in 1933 of the Blackwater

National Wildlife Refuge in Dorchester County also provided a haven of safety. However, Dozier and Hall (1944) stated that the timbered land on this Refuge considered to be suitable habitat for this squirrel, "is less than 500 acres," with an estimated present population of approximately 150 fox squirrels.

One of the difficulties presented by the introduction of different races of fox squirrels in the District of Columbia area is identification. Recently, during January, 1952, Mr. Jack Christian, graduate student, Johns Hopkins School of Public Health and Hygiene, observed a large squirrel struck by an automobile just north of the U. S. Naval Hospital on Route 240, Montgomery County, in a suburban area that was generally wooded. The animal was not killed, and before it escaped a short time later, Mr. Christian noted the following characteristics: (1) it was a large heavy squirrel, somewhat larger than the gray squirrel; (2) it was a predominantly black color dorsally, and a rich rufous color ventrally; (3) no white on the nose, ears, or limbs; (4) limbs black on the outside and rufous on inside of the body; (5) tail black dorsally; (6) ventral area deep rufous with no white color. Mr. Christian was familiar with both gray and fox squirrels having collected both species on the Pennsylvania Mammal Survey, and he remarked that the individual was difficult to place with any race of fox squirrel with which he was acquainted.

TABLE I

Differences in three races of fox squirrels based on descriptions of Hamilton (1943), Handley and Patton (1947), Anthony (1928), Dozier and Hall (1944), and D. L. Allen (1943):

	Delmarva Fox Squirrel *Sciurus niger neglectus*	Allegheny Fox Squirrel *S. n. vicinus*	Western Fox Squirrel *S. n. rufiventer*
Overall Color	Steel-blue cast with whitish underparts	Buffy brown with whitish underparts	Tawny brown grizzled with gray above and pale rufous or yellow-brown below.
Tail Color	A pronounced black stripe on outer edges with a narrow but distinct border of white. Three narrow stripes of black very noticeable on ventral view present on median portion.	Grayish white above and rufous below.	Mixed black and tawny rufous.
Color of Nose	White	Sometimes white	Never white
Ear Color	White	Rusty	Bright orange brown, slightly tufted in winter.
Feet Color	White	Rusty	Orange-brown.
Pattern	Melanistic phases occur, but very little varation occurs in overall color.	Varies somewhat in cream and rufous color.	Individual color very variable, some being very dark, almost black
Total Length (Average) etc.	T.L. 591 mm. Tail 284 mm. Hind foot 75 mm.	578 mm. 279 mm. 75 mm.	535 mm. 244 mm. 74 mm.
Weight	Average 2 lb. Maximum 3 lb.	- -	1 lb. 14 oz. 2 lb. 11.5 oz.

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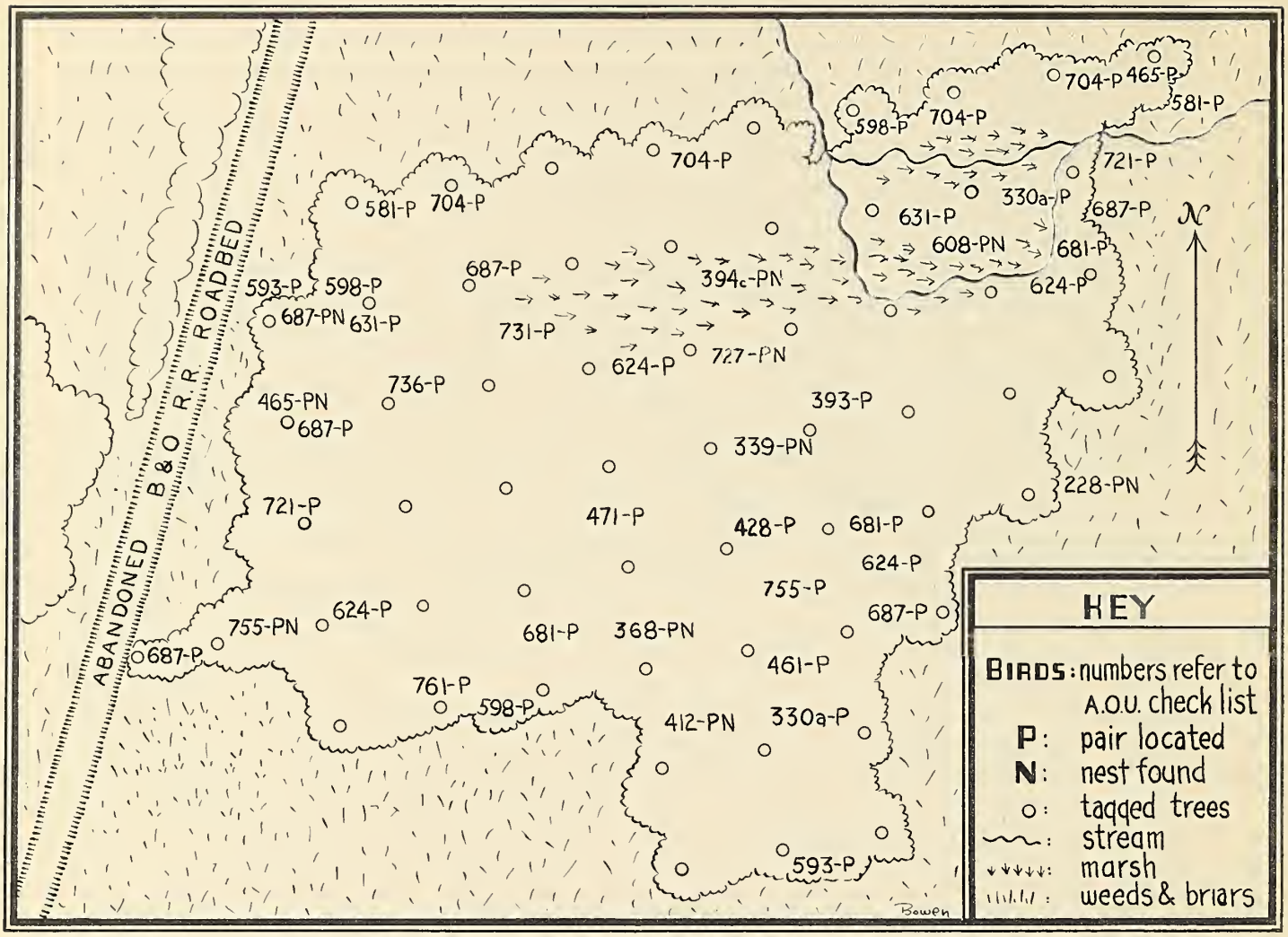


RELAY CENSUS AREA

American Ornithologists' Union (A.O.U.)

Check list numbers as listed below locate territories on the map.

A.O.U.	Name	A.O.U.	Name
339	Red-shouldered hawk	721	House wren
228	Woodcock	727	White-breasted nuthatch
368	Barred owl	704	Catbird
428	Ruby-throated hummingbird	761	Robin
412	Flicker	755	Wood thrush
393	Hairy woodpecker	631	White-eyed vireo
394c	Downy woodpecker	624	Red-eyed vireo
330a	Crested flycatcher	681	Maryland yellow-throat
461	Wood pewee	687	American redstart
465	Acadian flycatcher	608	Scarlet tanager
471	Blue jay	593	Cardinal
736	Carolina chickadee	598	Indigo bunting
731	Tufted titmouse	581	Song sparrow

A BREEDING BIRD CENSUS IN THE RELAY AREA

by

Robert M. Bowen

The primary purpose of a breeding bird census is to count the number of pairs of breeding birds in a designated area. Each year numbers of individuals, bird club members, and Federal Wildlife workers conduct censuses in various parts of the United States. By publishing these results in magazines, such as *Audubon Field Notes,* and natural history journals this information can prove valuable in a number of ways.

Information received from the bird club members and other individuals can add much to the work performed by the Federal Wildlife workers. With the limited manpower and resources of these agencies it is not always possible to make detailed coverages of every section of the country. Many valuable contributions to ornithological studies have been supplied by amateur bird watchers.

By comparing census results over a period of years the rise or decline in population levels of birds in general or of a species in particular can be determined. If there is detailed and accurate information available, the extension or contraction of the range of a species, the effect on birds of exploitation of natural resources by private and government enterprise and the results of conservation practices in game bird management can be analyzed.

Besides the value the census may have to others, the observer profits by the many observations made on bird ecology, territory, mating, nests, eggs and incubation, young, their development, and parental care. Each of these sequences in the cycle of individual nesting species is a study in itself and can furnish information that is all too scarce in published works.

In undertaking a census a number of factors must be taken into consideration. First, an area should be selected showing plant development from water through marsh, to forest or grassland. This type of area is recommended because of the large number and interesting varieties of birds it would attract, and because of the openness of such an area it would make observation easy and nests accessible.

After the area has been selected a topographical map should be made. If the observer has access to or help from botanical sources, dominant plant growth should be indicated on the map. A number of prints should be made of the map and on each trip to the area a fresh copy should be used. The location of each bird, singing perch, territory and nest should be noted. Time, weather conditions, birds feeding or flying over the area, and special notes should be recorded also.

The area selected for our 1948 census was in Relay, Baltimore County, Maryland. In the spring of 1947, an area of approximately sixty-six acres in the same vicinity was censused by Irving E. Hampe, Gorman M. Bond, and the writer. Experience proved that the area was too large to cover properly, so the lower portion was selected for the 1948 census. This tract consisted

of typical flood plain deciduous forest and was approximately three hundred yards long and one hundred and fifty yards wide. As the area showed a succession of developmental plant growth from marsh to forest it seemed the most suitable part of the sixty-six acre tract to census.

Observation trips through January and February were very spasmodic and were mainly for the purpose of checking winter residents. The early part of the year was unseasonably cold with little snowfall. Early March was also cold, followed by unseasonably warm weather. April was slightly warmer than usual and many winter residents departed early. Migrants began arriving in mid-April with a succession of warm spells. Cold, rainy weather early in May slowed migration slightly, but as it grew warmer in mid-May waves of migrants passed through. In June and July precipitation was very heavy locally, and caused the census area to remain in a semi-flooded condition throughout the census period. This factor proved a great hindrance in observing and in searching for nesting birds.

Of the earlier nesting birds, nests of the red-shouldered hawk, the barred owl, and the woodcock were found. The red-shouldered hawk nest was located in the crotch of a tall sycamore tree and was approximately thirty feet from the ground. By the time the nest was examined the four young were several weeks old. They were photographed and banded by Irving E. Hampe on the twenty-third of May, 1948. Many observations were made of the parents carrying such food as snakes, rats, and other small mammals to the nest. A number of small mammal bones were found in the nest and on the ground under the nest. These were predominantly of Norway rats.

The barred owl nest was inaccessible by climbing and no such attempt was made. In the spring of 1947, when the nest was located in a different tree about one hundred yards from the present nest, two young were found. A number of photographs were made of the young at that time. Late in July, 1948, a pair of young were seen in the area, presumably from the located nest.

The woodcock eggs were being incubated by the time the nest was found and very little data on them was obtained. The four eggs were hatched several days after the nest was located and on the following trip the young were gone from the nest. No more was seen of parents or young.

Among the other nests found were those of the flicker, downy woodpecker, Acadian flycatcher, white-breasted nuthatch, wood thrush, yellowthroat, redstart, and scarlet tanager.

Time limitations made it impossible to search the area thoroughly enough to locate nests which were in denser vegetation. Most of the time spent censusing the area was in early morning or late afternoon. Two trips were made at night in search of nocturnal residents.

Grateful acknowledgment is made to Irving E. Hampe, Curator of Ornithology, Natural History Society of Maryland, whose guidance was a great help in performing the census.

The results of the census work in 1948 may be summarized as follows:

Location: Relay, Baltimore County, Maryland. Size: 12 acres (approximately). Description: Deciduous forest on river floodplain about 12 feet above sea level. Coverage: Frequent morning and afternoon trips in May and June. Infrequent trips in February, March, April, and July. Total hours of observation, 58. Census: American redstart, 6 (50); catbird, 4 (33); red-eyed vireo, 4 (33); Maryland yellowthroat, 4 (33); indigo bunting, 3 (25); crested flycatcher, 2 (17); Acadian flycatcher, 2 (17); house wren, 2 (17); wood thrush, 2 (17); white-eyed vireo, 2 (17); cardinal, 2 (17); red-shouldered hawk, 1 (8); woodcock, 1 (8); barred owl, 1 (8); ruby-throated hummingbird, 1 (8); flicker, 1 (8); hairy woodpecker, 1 (8); downy woodpecker, 1 (8); wood pewee, 1 (8); blue jay, 1 (8); Carolina chickadee, 1 (8); tufted titmouse, 1 (8); white-breasted nuthatch, 1 (8); American robin, 1 (8); scarlet tanager, 1 (8); song sparrow, 1 (8). Total, 48 pairs, 396 pairs per hundred acres. Remarks: Figures in the above list show the number of pairs found on the area and in parentheses the corresponding calculated density per one hundred acres. In the course of the study twelve nests were found. The following species were noted feeding or flying over the area but not settled in it: green heron, turkey vulture, osprey, wood duck, bob-white, spotted sandpiper, chimney swift, barn swallow, rough-winged swallow, Carolina wren, mockingbird, brown thrasher, kingbird, American crow, starling, red-eyed towhee, purple grackle, goldfinch, and field sparrow.

A NEW COUNTY RECORD FOR JEFFERSON'S SALAMANDER IN MARYLAND

by

Charles J. Stine and Robert S. Simmons

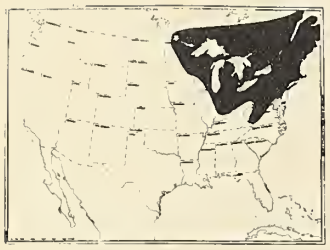
Photographs by Charles J. Stine

Ambystoma jeffersonianum (Green) has been previously known by preserved specimens from only Allegany County in Maryland.

The report of *jeffersonianum* from Plummer's Island, Montgomery County by Brady (1937, Proc. Biol. Soc. Washington, 50:137) must be considered hypothetical due to lack of preserved specimens.

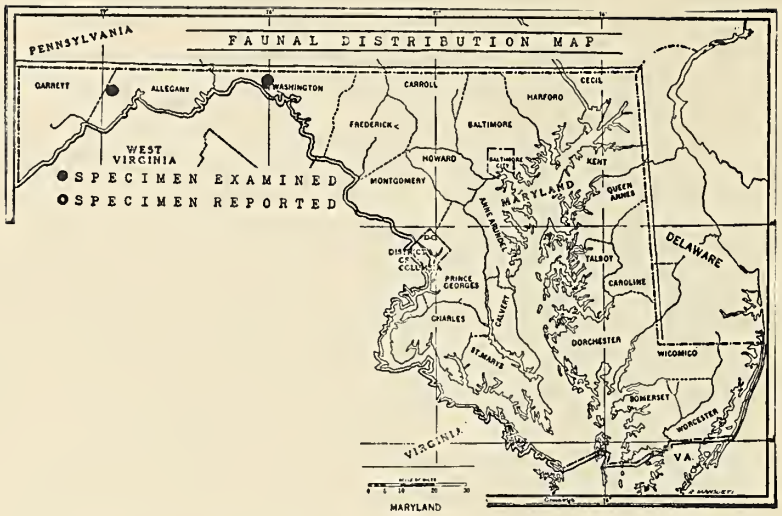
Dr. M. Graham Netting reported in the July 1946 issue of *Maryland*, adult specimens of this species secured by Mr. Leonard Llewellyn on April 3, 1937 and March 12 and 19, 1938 at Carlos, situated near the western extremity of Allegany County.

On April 19, 1952, Mr. James A. Fowler collected a series of larvae in a pond 0.4 mile south of Route 40 on the Ernstville Rd. 15.3 miles west of Hagerstown in Washington County. The larvae were those of *Ambystoma opacum* and an unidentified species. Egg masses of *Ambystoma maculatium* were also present. Mr. Fowler preserved all the smaller unidentified larvae and expressed the opinion they might be larvae of *Ambystoma jeffersonianum*.



General range

of species



Locality records for A. jeffersonianum
in Maryland

On May 17, 1952, the senior author and Howard W. Campbell collected a series of larvae from the same pond. The larger larvae transformed to juvenile *A. opacum* as anticipated and one of the smaller group transformed to a juvenile A. *jeffersonianum* when forced by laboratory induced anhydrous conditions.

On June 17, 1952, the authors and Howard W. Campbell obtained a fine series of Jefferson's larvae from the same pond. The pond which previously occupied an area of approximately 48' x 48' had dehydrated to an area of approximately 15' x 15' facilitating collecting.

The Jefferson's larvae were in various stages of development with most of the specimens obtained mature, and many transforming. No. *A. opacum* larvae were observed and those of *A. maculatium* were moderately advanced but small enough to distinguish them from the larger Jefferson's.

The immediately adjacent deciduous woods were investigated thoroughly for adults but none was observed. This, however, is not surprising when one considers the burrowing habits of this species and the temperature of 88° F prevailing in the area searched at this time. Adults of this species will undoubtedly be taken at this locale in the future, during the breeding time, barring destruction of the pond.

Now that this species has been found off the Allegheny plateau in the physiographic area of the Allegheny ridges, diligent search should reveal its presence in the provinces of the Cumberland Valley, Blue Ridge and the Piedmont Plateau. Since, however, it is primarily a mountainous form it is not to be expected east of the Fall line.

The photographs of the species illustrate very well the long toes on the distal extremities which are a specific character often used to differentiate this species from other *Ambystoma*.

1. Adult *A. jeffersonianum* 120 mm. Kansas

2. Mature *A. jeffersonianum* larva 50 mm. Washington Co., Maryland, June 17, 1952

3. Recently transformed *A. jeffersonianum* 54 mm.

4. Breeding Pond, Washington Co., Looking east. June 17, 1952

MICA

by

Earl S. Arrington

Mica was known to the Ayrans in ancient India long before the birth of modern civilization, and appears to have been used in Greece and Rome before the Christian era.

In Russia where white muscovite mica was mined and used from about the fifteenth century or earlier, it was called "Muscovy glass," as translated from the Latin word "vitrum muscovitum." Muscovy was the ancient name of the central part of Russia, the Grand Duchy of Muscovy, where this class of mica was used and traded in chiefly for glazing and decorative purposes. Muscovy was the first country in Europe to produce marketable muscovite mica. Today, however, India and the United States are the two largest muscovite mica producing countries.

New Hampshire and North Carolina are the two largest mica producers in the United States. New Hampshire normally produces about one-half and North Carolina more than one-third of the total domestic output of mica. North Carolina leads in the production of scrap and New Hampshire generally in the production of sheet mica. Together they produce more than 90% of the country's total output of mica.

In Maryland phlogophite brown mica has been found at Cockeysville, Baltimore County. Fuchsite (emerald green mica) has been found in Montgomery County and at Cockeysville, Baltimore County. Muscovite (white mica) has been found at Simpsonville, Howard County, at the Kensington Mica mine, Montgomery County and at a number of other localities.

Mica is one of the commonest and most widely distributed constituents of schists, granites and allied rocks of metamorphic or igneous origin. It occurs in commercial quantities and marketable sheets only in the coarser forms of pegmatites of a few restricted areas and is presumed to have originated at considerable depths in the earth's crust.

Conditions of extreme geological stability seem to be quite essential to preserve the crystals of mica undamaged, inasmuch as even the slightest earth movement during or after crystallization might seriously disturb the consolidation or spoil the usefulness of the crystals. In the United States mica of the best quality is found in the Appalachian region.

Associated Rocks and Minerals

Mica schist - a laminated metamorphic rock consisting of mica, generally muscovite or biotite (black mica) in small flakes, together with quartz and other minerals.

Chlorite schist - is usually green in color and very brittle.

Feldspar - consists of several anhydrous silicates of aluminum containing the bases potash, soda or lime. There are two kinds: potash feldspar and lime soda feldspar.

Apatite - is of many colors and occurs as an associate of phlogophite mica; it is principally composed of phosphoric acid (39.7) and lime (47.9).

Tourmaline - frequently an associate of muscovite mica is a complex silicate of aluminum and boron with magnesium, iron, or the alkalies prominently in its composition. Usually brownish or bluish black, it is also bluish green.

Mica is a good insulator - a non-conductor of electricity. It is a comparatively light material, elastic in nature and is practically unaffected by acids or alkalies. Organic solvents have no action on it, yet it bonds with plastic materials.

Notes from Field and Study

Pileated Woodpecker near Shawan

In their "Preliminary List of the Birds of Maryland" (1947:34) Hampe and Kolb say of the Pileated Woodpecker: "We know of no place near Baltimore where they may be found today."

On February 18, 1951, at 4:30 P.M., while driving along the Falls Road about one mile south of Shawan, I saw what I am certain is a bird of this species. It was flying parallel to the road about 100 yards away, then crossed in front of the car, and flew out of sight. It was crow sized, black, with large white patches on the wings. I have seen several Pileateds in Pennsylvania (2 since then, on March 26, in Pa.) and am quite certain of the identification. It is unfortunate the bird got out of sight before I had time to stop and get a good look at it through the glasses, but the size, shape, and coloring make me feel this was unnecessary.

Jack Kaufmann

Robin Attacking Gray Squirrel

On May 16, 1952, Mr. Phillip Thornhill and I saw a robin *(Turdus migratorius)* attack a gray squirrel *(Sciurus carolinensis)* at the McMillan Reservoir, Washington, D. C.

When first observed, the squirrel had taken refuge momentarily under a set of stairs at a loading platform but soon made a break for it, darting out, skirting the platform to a fence close by, squeezing quickly under the fence and disappearing around the corner of the building. As the squirrel got underway, the robin swooped down at him from a nearby tree but missed its mark and flew up again to perch briefly on top of the fence and then descended to the lawn where it began searching for food. The squirrel did not reappear.

Mr. Thornhill told me that the robin had previously made five or six passes at the squirrel when the latter was climbing on the trunk of

a tree and that the squirrel had successfully dodged every attack.

Robins and squirrels daily forage for food on the lawns around our office, and the above is the first such incident noted.

Donald Lamore

THE LADY-BUGS OR LADY-BIRDS

(Family *Coccinellidae*)

These little beetles, which are predaceous, both in the larval and adult stages, are well known to most people in this country and in Europe.

Frank Cowan recorded some interesting historical notes regarding them, some of which may strike a familiar tune, in his unique "Curious Facts of the History of Insects", published by J. B. Lippincott & Co., back in 1865:

In England, the children are accustomed to throw the Lady-bird into the air,* singing at the same time,-

Lady-bird, lady-bird, fly away home;
Your house is on fire, your children's at home,
All but one that ligs under the stone,-
Ply thee home, lady-bird, ere it be gone.

***

Or, as most commonly with us in America,-

Lady-bird, lady-bird, fly away home,
Your house is on fire, and your children all burn.

The meaning of this familiar, though very curious couplet, seems to be this: the larvae, or young, of the Lady-bird feed principally upon the aphides, or plant-lice, of the vines of the hop; and fire is the usual means employed in destroying the aphides; so that in killing the latter, the former, which had come for the same purpose, are likewise destroyed.

Immense swarms of Lady-birds are sometimes observed in England, especially on the southeastern coast. They have been described as extending in dense masses for miles, and consisting of several species intermixed. In 1807, these flights in Kent and Sussex caused no small alarm to the superstitious, who thought them the forerunners of some direful evil. They were, however, but emigrants from the neighboring hop-grounds, where, in their larva state, they had been feasting upon the aphides.

***

Hurdis, who has frequently, in his Poems, availed himself of the modern discoveries in Natural History, has drawn the following accurate and beautiful picture of the Lady-bird in his tragedy of Sir Thomas More:

Sir John.
What d'ye look at?

Cecilia.
A little animal, that round my glove,
And up and down to every finger's tip,
Has traveled merrily, and travels still,
Tho' it has wings to fly: what its name is
With learned men I known not; simple folk
Call it the Lady-bird.

Sir John.
Poor harmless thing!
Save it.

Cecilia.
I would not hurt it for the world;
Its prettiness says, Spare me; and it bears
Armor so beautiful upon its back,
I could not injure it to be a queen:
Look, sir, its coat is scarlet dropp'd with jet,
Its eyes pure ivory.

Sir John.
Child, I'm not blind
To objects so minute: I know it well;
'Tis the companion of the waning year,
And lives among the blossoms of the hop;
It has fine silken wings enfolded close
Under that coat of mail.

Cecilia.
I see them, sir,
For it unfurls them now - 'tis up and gone.

(A.1, sc.iii)

ADDITIONAL NOTES ON THE HARVESTER BUTTERFLY - *Feniseca Tarquinius* (Fabricius)

by Bryant Mather*

The article by Simmons and Stine (1) suggested the desirability of recording a few other observations and records of this interesting species in Maryland. Clark (2) has summarised the information for the District of Columbia and the adjacent portions of Maryland up to 1932. His records include specimens taken in June 1909 and as late as September 1931. He reports it to have been common at Silver Spring in 1928, 1929, and 1931. The 1931 occurrence was associated with wooly aphids (*Prociphilus imbricata*) infesting beeches rather than alders. The writer noted an infestation of wooly aphids on a beech in the Johns Hopkins University portion of Wyman Park in Baltimore City in the summer of 1932 and has in his collection a specimen of *F. tarquinius* taken at that locality on June 15, 1932. Klots (3) gives the range of this species as Maritime Provinces west to Ontario, south to Florida, Gulf States, and central Texas. Clark and Clark (4) record it from 13 counties of Virginia; indicate its period of flight as from April to October, and report that it may have from one to eight broods. Macy and Shepard (5) found it in Minnesota from May to July in 1930 to 1936. There are no published records from Mississippi but the writer has a specimen from Clinton, Hinds Co., taken on July 23, 1950, probably associated with aphid infestation of hawthorn (*Crategus*).

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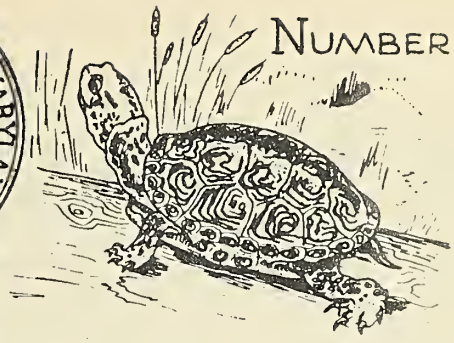
*Mr. Mather who has been a member of the staff of The Natural History Society for many years, is now living in Mississippi.

NUMBER 13



MARYLAND NATURE LEAFLET

THE PERIODIC CICADA*
Or "Seventeen Year Locust"

In the spring of 1936 great hordes of strange insects appeared in the state of Maryland. For a few weeks the air was filled with the sound of their songs, and then they were gone. In the month of May, 1953, the offspring of the visitors of 1936 will appear amongst us. This leaflet is a revision of a Special Bulletin published by the Natural History Society of Maryland in 1936. It was originally written by the late Elmo Masters, at that time Curator of the Department of Entomology.

Periodic Cicada Adult

One summer, before some readers of this leaflet were born, the leaves on the tips of many forest trees wilted and died at the end of June. Tree owners, examining the affected branches found in the twigs parallel rows of punctures, like two long slits. With a hand-lens they could see ten to eighteen small insect eggs in each such affected twig. And if anyone had been interested enough to have watched those eggs he would have found near the end of July tiny immature insects (called nymphs) emerging from them. They dropped to the ground and burrowed into the soil.

That was the summer of 1936, seventeen years ago. All these years the nymphs have been growing underground and now, in the spring of 1953, they are ready to come up once again into the light and air above ground. They are the "Seventeen Year Locusts" known more correctly as the Periodic Cicadas. While many insects have a life of but a few weeks and few survive more than a year, these cicadas and their close relatives are most extraordinary in the long period of their development from egg to maturity.

Early students of the cicada were greatly confused by the apparently irregular appearance of these insects, until it was discovered that there were really two distinct kinds — a southern race with a thirteen year life cycle and a northern with a seventeen year cycle. It was also found that for each of these races there were a number of definite broods that emerged at different times in certain localities. Today we have records of thirty of

*Magicicada septendecim

these broods, seventeen broods of the northern and thirteen of the southern race. The broods differ greatly in number of individuals and in distribution. Several are very small and appear in only a few limited localities, for example, Brood XI (1920) appeared in only a few sections of Massachusetts and Connecticut. Those that are to appear in Maryland this year are members of Brood X (1919), one of the largest broods, which will also occur in Ohio, Indiana and southeastern Pennsylvania in immense hordes. This brood has been recorded from fourteen states.

To trace the life history, let us go back to the year 1936. During June of that year each female punctured the under side of twigs. Two punctures were made side by side and in these she laid eggs. The finished egg nest then appeared as two more or less parallel rows of eggs, separated by a narrow partition of wood. When she had filled one twig she selected another, and so on until she had laid a total of from two to six hundred eggs. The leaves on the damaged twigs turned brown and died and often the twigs died; at times this damage was so great that the trees appeared to have been swept by fire. In about six weeks the eggs hatched and the young cicadas, or nymphs, dropped to the ground.

The nymphs, after entering the soil, located the root of a tree where they constructed a chamber, and fed on the sap of the root. Year after year these nymphs grew by a series of molts; when one shell became too small for the increased size it was cast or molted and a new and larger shell took its place, rather like moving into a new and larger house.

The nymphs molted five times and so had six stages in their immature life. Naturally these stages lasted a long time, as the growth of the Periodic Cicada is very slow. At the time of the fourth molt the nymph was about twelve years old. At the end of the sixth stage it was fully grown and measured about one and one-quarter inches in length. The life history of our cicada has now entered the year 1953, and the nymph, feeling the approach of maturity, has burrowed upward through the soil, where it has lived all these years at a depth of eight to twenty-four inches, until it is less than half an inch from the surface. Here it has constructed a chamber where it lies in wait for the time for all cicadas to emerge.


Cicada splitting its nymphal shell.

This will occur about the middle of May. During the first few days cicadas will emerge as early as five o'clock, but after that none will emerge before dusk.

When at last the nymph appears above ground it is still a wingless creature. Before full adult form with strong, clear wings can be reached, a final molt must occur.

If you would witness this transformation, and it is one of the most wonderful sights in nature, you must attend an evening performance. Take your flashlight and go to some wooded area (except pine growth). Here a short search will reveal a cicada nymph about to emerge from its imprisoning nymphal shell and enter into the world of winged insects. You may be so fortunate as to see the nymph in the actual act of breaking through and leaving the soil. At once the nymph will proceed to its choice transformation spot — a tree. Most of the nymphs climb out on the

leaves and branches, but some appear to be in such a hurry that they just barely reach the tree. Of course, where trees are not available the cicada will use telephone or fence poles, blades of grass or whatever chance may offer.

Once settled upon the tree, the preliminaries are begun. These consist of a thorough clean-up. The front claws are passed through the brushes on the face and the hind feet are brushed against the sides of the abdomen. These acts are repeated until the cicada is apparently satisfied that all loose particles of soil have been removed. It is interesting to note that while the front and hind feet are so thoroughly cleaned, the middle feet of the three pairs which all insects have are always overlooked. This clean-up may require as long as thirty-five minutes. Then taking firm hold on the tree, the insect rests for about ten minutes.

Now has come the time for the actual transformation: suddenly the creature arches itself, and a split appears along the middle line of the back extending from the first segment of the abdomen forward over the top of the head. A creamy white insect bearing two large black spots bulges out of this slit. Now appears a head with two brilliantly red eyes. Then the soft, crumpled wings and legs appear. We can see what seem to be four white threads pulling out from the body of the cicada as though they would hold it to the shell that has contained it all these years. These are the linings of the thoracic air tubes and they are being shed with the nymphal shell.

The cicada now leans far back out of the shell, and all of the legs come free, leaving it attached by only the hind parts of the body. Sagging weakly out of the shell the wings hang down, and as we watch we can see them lengthen. Here is the reason the claws and feet were so carefully cleaned; a particle of loose soil might disengage the grip and a fall at this stage would be fatal. The insect may remain in this helpless condition for as long as twenty-five minutes.

Abruptly, it reaches out its legs and grasping the cast shell, pulls itself entirely free. The body now hangs down outside the shell. The wings fill out and the cicada is now complete in structure but still white and soft. At about this time it usually leaves the shell and moves several inches to another spot. The color now begins to darken, and the wings are folded against the back. The period from the splitting of the shell to the folding of the wings will vary from forty-five minutes to over an hour. In the several following hours the colors become deeper until the cicada assumes the appearance of the adult. It is completely mature and early the next morning it is flying about intent on the business of its kind.

In appearance the adult Periodic Cicada is quite a distinguished looking insect: large with a thick, heavy-set body, a bulging head, and a short strong beak extending from its under surface. The body is black, the beak and legs have a reddish tinge and there are markings of orange on the abdomen; the eyes are prominent and a bright red in color; the wings of a transparent amber with orange-red veins, and the front wings are each marked with a dark brown "W". It may be easily distinguished from the common annual cicadas, which are found in Maryland each year, for these are green in color, sprinkled underneath with white.

The annual cicadas are also sometimes called locusts in our region but none of the cicadas are closely related to the true locusts which are close relatives of our grasshoppers (Class Orthoptera). The locusts are chewing insects but the cicadas, like all of their class (Hemiptera), have a sucking beak. There are 113 species of cicadas in America north of Mexico. It was formerly thought that the cicadas did not feed in the adult state and that they were deaf. Modern observations have proven, however, that they feed on

the saps of trees. It has also been proven that they can hear, although it is probable that their sense of hearing is keyed to particular high notes, such as the cries of their own kind.

All cicadas are famous for their singing and the Periodic Cicada has its own particular songs, four types of which may be easily distinguished. In the early part of June the " grand chorus" will be a familiar sound; this is created by the adult males, all high in the trees, each singing the particular bu-r-r-r song of the Periodic Cicada, until the individual notes are lost in the mighty volume of the singing multitudes. Only the males are capable of uttering any sound, for the females are entirely mute. It is probable that the male uses the song to attract the female.

The sound apparatus of the cicadas is different from that of other insects, and it is very highly specialized. It consists, principally, of a pair of large oval membranes, which may be called the drumheads. These are set firmly in the body walls at the base of the hind wings, and may be seen by lifting the wings. The drumheads are operated by large muscles, the largest in the body. The contraction of these muscles and consequent drawing in of the drumhead and its release create the actual sound. Practically all of the abdomen is taken up with a large air-chamber that serves as a sound-box. On the under side of the abdomen are situated two smaller drumheads called "mirrors." These are protected by flaps which project out from the thorax. By lifting the abdomen these "mirrors" are exposed and in this way the sound is given volume. When the cicada sings it may be seen to lift the abdomen and set the large drumheads in rapid motion.

Cicada clear of shell with wings still soft and crumpled.

About the middle of June the mating season comes to an end. The eggs have been laid, and all of the cicadas seem to weaken. They then fall easy prey to birds and their other natural enemies, or fall to the ground weak and battered. For a few days the ground is strewn with the dead and dying, and soon the Periodic Cicada is gone.

Six weeks later, the eggs hatch and the young, minute soft bodied creatures about one-twelfth of an inch long, drop to the ground, and immediately enter the soil through crevices, to be lost to the outside world until 1970. All that will remain to remind us of our late visitors will be the scarred twigs on which they laid their eggs, and the brownish patches of dead leaves on the trees.

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