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PENNSYLVANIA DEPARTMENT OF AGRICULTURE.

DIVISION OF ZOOLOGY.

THE ZOOLOGICAL QUARTERLY BULLETIN.

VOL. II. No. 1.

THE ECONOMIC VALUE

OF

PENNSYLVANIA ANIMALS

IN RELATION TO AGRICULTURE,

SHOWN IN THE AGRICULTURAL EXHIBIT OF PENNSYLVANIA AT THE ST.  
LOUIS EXPOSITION.

By H. A. SURFACE, M. S., ECONOMIC ZOOLOGIST.

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# THE ZOOLOGICAL QUARTERLY BULLETIN

VOLUME II, No. 1. MAY 15, 1904.

(By H. A. SURFACE, Economic Zoologist)

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## REMARKS ON THE PENNSYLVANIA COLLECTION OF ANIMALS AT THE ST. LOUIS EXPOSITION.

Although this collection was made at the instigation of the present Economic Zoologist of Pennsylvania, it never could have been undertaken had it not been for the intelligent and cordial cooperation of Governor Pennypacker, Secretary N. B. Critchfield, of the Department of Agriculture, Col. James H. Lambert, Pennsylvania Executive Commissioner of the St. Louis Exposition, and Col. John A. Woodward, of Howard, Pa., Officer in Charge of the Preparation of Agricultural Exhibit.

After obtaining the approval and assistance of the persons named above, it was necessary to procure, assemble and arrange all of the specimens within a few short months of the winter time. For this reason it should again be said that nothing could have been done without the aid of collectors in various parts of Pennsylvania, who freely contributed specimens for the purpose of aiding the undertaking. Among those who donated or loaned specimens are the following, with the material contributed:

### CONTRIBUTORS TO THE ZOOLOGICAL EXHIBIT, MADE BY THE DIVISION OF ZOOLOGY OF THE PENNSYLVANIA DEPARTMENT OF AGRICULTURE, AT THE LOUISIANA PURCHASE EXPOSITION, SAINT LOUIS, MO., 1904.

- Aye, W. G., Kelley Station, Pa., one hawk, one opossum; donated.  
Baron, E. A., McKean, Pa., weasel (white); donated.  
Barr, Geo. B., Roulette, Pa., one owl, one skunk; donated.  
Beyer, W. S., Christiana, Pa., one muskrat; donated.  
Bullock, W. H., Honesdale, Pa., loggerhead shrike; donated.  
Bush, A. R. Montrose, Pa., one weasel; donated.  
Campbell, E. W., Pittston, Pa., one opossum, one grosbeak; donated.  
Carpenter, S. S. Bingham Center, Pa., nuthatches, woodpeckers, blue jays, sparrows, squirrels, mice; donated.  
Critchfield, Hon. N. B., Harrisburg, Pa., three hawks; donated.  
Drum, Chas. M., Gettysburg, Pa., one owl, one black snake; donated.

- Eldon, R. M., Aspers, Pa., one redtailed hawk; donated.  
 Engle, E. B., Waynesboro, Pa., one owl; donated.  
 Erisman, Miss Myra, Marietta, Pa., one owl; donated.  
 Fisher, Warren S., Highspire, Pa., chickadees, sparrows, wren, nuthatch, junco, hawk; donated.  
 Friant, Geo. P., Scranton, Pa., voles; donated.  
 Foster, N. H., Bustleton, Pa., three hawks; donated.  
 Fisher, Boyd, Harrisburg, Pa., one mole; donated.  
 Gilmore, L. B. Saegerstown, Pa., duck, red squirrels, rabbits, blue jays, small birds, voles, shrews, whitefooted mice, crawfish, insects; donated.  
 Gipple, Oliver B., Tyrone, Pa., barred owl; donated.  
 Goodenough, L. N. Rileyville, Pa., one owl, two blue jays; donated.  
 Goodyear, Fred C., Daleville, Pa., one grebe; donated.  
 Gould, Mrs. E. V., Effort, Pa., pine grosbeaks, juncos, chipping sparrow, insects; donated.  
 Graves, R., Tompkinsville, Pa., blue jays; donated.  
 Grove, Dr. A. B., New Franklin, Pa., loon; donated.  
 Gundel, John, Columbia, Pa., two sparrow hawks; donated.  
 Harman, Dr. G. G., Huntingdon, Pa., barred owl; donated.  
 Hanel, W. H., Kossuth, Pa., opossum; donated.  
 Hixson, W. L., Ruffsedale, Pa., great horned owl; donated.  
 Hollingsworth, A. S., Derry, Pa., screech owl; donated.  
 Hughes, Wm. Winfield, Fredyffrin, Pa., three hawks; donated.  
 Hurd, W. E., Lajose, Pa., woodchuck, weasel; donated.  
 Jackel, Frederick, Hollidaysburg, Pa., great horned owl; donated.  
 Karns, W. Emerson, Jersey Shore, Pa., Bald Eagle; loaned.  
 Kalbfus, Dr. Joseph, Harrisburg, Pa., screech owl; donated.  
 Keith, Frank, Eagle Foundry, Pa., red tailed hawk; donated.  
 Kelly, G. R., Chrystal, Pa., porcupines, varying hare, pheasant; donated.  
 Kenyon, W. A., New Milford, Pa., loon; donated.  
 King, L. K., Westfield, Pa., voles, gray squirrel, brown rat; donated.  
 Knipe, C. Harry, Marietta, Pa., screech owls, mice, cardinal grosbeak; donated.  
 Leibelsperger, W. S., Fleetwood, Pa., vole, red squirrel, kingfisher; donated.  
 Malloy, Hugh, Freeland, Pa. weasel; donated.  
 Medsgar, O. P., Ruffsedale, Pa., great horned owl; donated.  
 Merrigan, John, Starucca, Pa., porcupine, raccoon, rabbit; donated.  
 Miller, Geo., York, Pa., mink, rabbit, woodchuck, rat, albino mouse, albino sparrow; loaned.

- Moyer, H. C., Mexico, Pa., barred owl; donated.  
 McMillan, J. R., Gettysburg, Pa., killdeer, shorteared owl, voles; donated.  
 McMillan, D. K., Harrisburg, Pa., crow, screech owl; donated.  
 Otmachson Rod and Gun Club, Haneyville, Pa., golden eagle; loaned.  
 Raub, Dr. M. W., Lancaster, Pa., mink, opossum, (albino), English sparrow (albino); loaned. Insects; donated.  
 Robbins, Jesse, Carlisle, Pa., vole; donated.  
 Rothrock, B. P., Williamsport, Pa., three loons, duck, coot, plover, snipe, three quail, gray squirrel (albino); all loaned.  
 Rottler, William, Gettysburg, Pa., marsh hawk, turkey vulture, crows, blue jays, rabbits, voles, screech owls.  
 Ruhl, Jas. P., Vicksburg, Pa., hawk, owl; donated.  
 Russel, W. L., Mila, Virginia, kingfisher; donated.  
 Seebold, A. Foster, North Brook, Pa., screech owl; donated.  
 Sober, C. K., Lewisburg, Pa., weasel; donated. Albino robin; loaned.  
 Snyder, Henry, Duncannon, Pa., opossum; donated.  
 Surface, Prof. H. A., Harrisburg, Pa., 100 mounted birds and mammals; loaned. Gray squirrel, hawks, opossums, rabbits, raccoon, voles, mice, skunk; donated.  
 Templeton, Matthew and John, Scottdale, Pa., two ruffed grouse, quail, yellow leg, owls, duck, sparrow, shrike, skunk; all mounted and donated.  
 The Pennsylvania State College, State College P. O., Pa., many specimens; loaned.  
 Wasbers, Henry, York, Pa., two quail; donated.  
 Weaver, Chas. E., Lanark, Pa., red tailed hawk, two muskrats, skunk, weasel; donated.  
 Wehrle, R. W., Indiana, Pa., woodpeckers, juncos, opossum, owls, oriole, cocoons, jays, nuthatch, weasel, red squirrel; donated. Opossums, minks, muskrats, skunk; purchased.  
 Weiler, John F., Allentown, Pa., frogs, turtles; donated.  
 Weimer, Frederick, Lebanon, Pa., opossum; donated.  
 Wright, C. A., East Canton, Pa., pine grosbeaks; donated.  
 Whitney, S. J., North Springfield, Pa., least weasel; donated.  
 Young, A. P., Millville, Pa., opossum; donated.  
 Zuber, Prof. W. H., Greensburg, Pa., mounted birds and mammals; loaned.  
 On the fifteenth of January there was not a specimen in this office although the entire collection was prepared and the specimens and cases were in their places and ready for shipment by the first of April. This was due greatly to the untiring efforts and intelligence of our expert taxidermist, Mr. Boyd P. Rothrock, of Williams-

port, assisted by Mr. D. K. McMillan, of Gettysburg, and William J. Durborrow, of Harrisburg.

The specimens were arranged in thirty-six cases, each four feet long, three feet high and eighteen inches deep. Each of these is covered with a plate of glass, and they are arranged in the Pennsylvania Agricultural Exhibit in such a way as to form a hollow square with the respective sides of the collection facing outward, with nine cases on each side. The sides are lettered respectively, A, B, C and D, and the cases of each side are numbered in respective order, beginning with No. 1 at the upper left corner and ending with No. 9 at the lower right corner. Thus, "C-2" means the second case on side C, "D-6" designates the sixth case on side D, etc. If all had been equally visible to observers, they should have been arranged in a definite, scientific sequence of relationship. In order to facilitate a close inspection of the smaller specimens, the cases containing these are arranged at the bottom of the series, while those containing the larger specimens which can more readily be seen at a distance, are placed at the top. While this breaks up the scientific order, it facilitates inspection.

Owing to the fact that the collection had to be prepared during the winter when it was impossible to obtain many insects, the important species of insects in relation to agriculture could not be shown, but there is enough in this collection to indicate many facts not generally known. Every case contains a representation that is known to be true to nature.

#### EXPLANATION OF CASES.

In this explanation we follow the true scientific sequence, and the respective cases can be found as desired.

I. (Case C-2). THE LOONS (*Urinatoridae*).—This case contains two fine male loons and two females, the former being known by their white-spotted backs. These are eating fish and frogs and show the biological relationships of the typical fish-eating birds.

II. (Case C-1). DIVERS AND FISH-EATING DUCKS.—This case contains the Grebes, which belong to the Order of Divers (see Zoological Quarterly Bulletin Vol. 1, No. 2, page 10,) and the Merganzers of fish-eating ducks (see Z. Q. B. Vol. 1, No. 2, page 12). The former feed upon vegetation as well as on aquatic animals, insects and fishes, while the latter are fish-eating. Although the merganzers belong to the Duck family, their habits and haunts ally them with the grebes, and there is no great violation of nature in placing them in this case.

III. (Case C-4). THE GULLS (upper shelf) AND THE SHORE BIRDS (lower shelf). These birds belong to two of the orders that were discussed in the second number of the first volume of this Bulletin. The gulls are among our most valuable scavengers, while the shore birds include some of the choice game birds of the State. While these have not such great economic importance as some other birds, they are certainly worthy of a place in such a collection as this.

IV. (Case C-6). THE DUCKS. (Plate I, Fig. 1).—In this case is shown the remarkable Wood Duck, which is one of our most beautiful birds, nesting in a hollow log which has been placed in the fork of a tree for its use. A young duck is beside the parent in the nest. It gives a practical idea of one of the means by which this "Vanishing Game Bird" can be restored to the haunts in which it was once so abundant. By preventing its destruction by gunners and providing nesting sites along streams where the hollow trees have been destroyed, it may be possible to preserve it before it is entirely too late.

Standing beside this tree the tallest duck with the dark head and ring around the neck is a male mallard (*Anas boschas*), which is the ancestor of some of our domesticated ducks. At the observers right, nearest the edge of the case, is the green-winged teal (*Nettion carolinense*), one of our choice game ducks. In the centre of the case, standing just in front of the tree, is a pintail (*Dafila acuta*), also valued as game and for food. In the log and on the ground facing the pintail are specimens of the wood duck (*Aix sponsa*). While between this and the green-winged teal is to be seen the American golden eye (*Clangula clangula americana*). At the left, in front of the mallard, is a male bufflehead (*Charitonetta albeola*), and facing this is a female of the same species. All of these birds are herbivorous, and are prized as game and as food for man.

V. (Case C-5). Contains THE HERONS AND BITTERNS (*Ardeidae*) (on the lower shelf) and the RAILS AND COOTS (*Rallidae*) (on the upper shelf)—These typical swamp birds are discussed on pages 13 to 15 of Vol. I, No. 2, of this Bulletin. The rails and coots are valuable insectivorous birds feeding upon the various species of insects which inhabit the swamps and lowlands. They are also highly valued as game birds.

VI. (Case C-3). THE EAGLES. This case contains an adult bald eagle (*Haliaeetus leucocephalus*) and an adult golden eagle (*Aquila chrysaetos*).—These may be distinguished by the characters given on page 15 of Vol. I, No. 3, of this Bulletin.

VII. (Case D-6). SCAVENGERS, THE TURKEY VULTURE (*Cathartes aura*) (Plate I, Fig. 2) AND THE CROW (*Corvus americanus*). While these birds belong to orders that are widely sep-

arated, the Buzzard or Vulture belonging to Raptores or the Raptorial Birds, and the Crow to the order Passeres or the Perching Birds, their habits are sufficiently similar to justify their being placed together in one case. The Vulture is a valuable bird because it feeds wholly upon carrion and prevents the pollution of the atmosphere and water. It is protected by law in most States and is often seen in the streets of some of the southern villages and cities as well as in the open country and woodland. North of the middle of Pennsylvania it becomes rare.

Three crows are shown in this case, two of which are on the ground eating corn from the ears which were destroyed in the field by this species of bird. Another specimen is shown on the branch, killing and eating a mouse. The food of the crow is known to consist of corn in the fall and for a short time in the spring, of insects during the entire year, when they can be obtained, occasionally of small chickens and mice, and to a very great extent of fragments of waste material, both animal and vegetable. While there is general complaint from many farmers concerning the destructiveness of the crow to corn at the time of planting in the spring and at husking in the fall, the loss can be overcome to a great extent by a knowledge of the proper methods. These consist of treating the grains with some substance to render them distasteful in the spring before planting, and in frightening the birds from the fields containing ripe grain in the fall. There is no doubt of the fact that the crow renders a valuable service in destroying grubs, beetles, cut worms and many other species of obnoxious insects, beside its efficiency as a scavenger. (See the Monthly Bulletin of the Division of Zoology of the Pennsylvania Department of Agriculture, Harrisburg, Pa., for May, 1904).

VIII. (Case D-4). HAWKS. (Plate II, Fig. I).—These are mostly beneficial birds as is shown by their food, which is mounted with them. The light-colored hawk at the right below is a marsh hawk (*Circus hudsonius*). It is carrying a meadow mouse, which is its favorite food, while the one just above it is the same species. The bird at the lower, left corner is a sharp-shinned hawk (*Accipiter velox*) with a young chicken in its talons. This small hawk is one of the most destructive of the birds of prey to very young poultry and to small birds. The two larger specimens above are the red tailed hawks (*Buteo borealis*), and they are shown in the act of eating rats and mice respectively, which are their favorite food. The larger bird at the left side is the duck hawk (*Falco peregrinus anatum*), carrying a shrew, while the long-tailed bird on the floor beneath the light-colored marsh hawk is a pigeon hawk (*Falco columbarius*) with a bird, and the three small hawks near the middle of the picture are

sparrow hawks (*Falco sparverius*). These sparrow hawks are eating English sparrows and mice upon which they feed almost entirely.

IX. (Case D-5). OTHER HAWKS. (Plate II, Fig. 2). The large hawk in the middle of the case is the American goshawk (*Accipiter atricapillus*) with a ruffed grouse or so-called pheasant, which constitutes the chief element of its food. At the right above with its wings spread is the red tailed hawk (*Buteo borealis*), while the three remaining birds in the case are specimens of the red shouldered hawk (*Buteo lineatus*). These three are shown with their most important food, which consists of rats, mice, shrews, etc.

X. (Case D-7). THE LARGE OWLS. (Plate III, Fig. 1). In this interesting case there are three specimens of the great horned owl (*Bubo virginianus*) above and at the right, and two of the barred owl (*Syrnium nebulosum*) at the middle and at the left below. The great horned owl in the upper part of the case carries in his talons a chicken, while the one at the left is eating a rabbit, and the one at the right is in the act of killing and devouring a skunk. This shows the true value of these birds, and the fact that they are both obnoxious and beneficial in their feeding habits. The barred owl in the middle is eating a vole, or short tailed meadow mouse, which is so destructive to young fruit trees during the winter, and the one on the ground at the left is killing and devouring a screech owl, such as has been found many times in the stomachs of this species of bird.

XI. (Case D-8). SMALL OWLS. (Plate III, Fig. 2). This is one of the most important cases to show the habits of valuable birds that have been unjustly persecuted by the persons whom they would benefit. At the left above is a specimen of the barn owl (*Strix pratincola*) holding a shrew. This peculiar bird is a great destroyer of mice, rats and shrews, but does not destroy poultry, game birds or the smaller insectivorous birds. Unfortunately, it, with others of its beneficial relatives, is shot at every possible opportunity by gunners and most farmers, and the result is that mice and rats have increased to an alarming extent during recent years in the State of Pennsylvania. Last winter several thousand dollars worth of trees were destroyed by the species of mice that these small owls and the hawks previously discussed are shown to be eating. In passing a barn recently we saw one of these barn owls dead and nailed to the barn door, while at that instant just beneath it the rats were chasing each other around the barn. This was a striking illustration of the results of acting in ignorance.

At the right, both above and below, are specimens of the short eared owl (*Asio accipitrinus*) eating mice and voles. The six birds of small size in this case are the common and beneficial screech owl

(*Megascops asio*), some in the gray plumage and others in the red, eating mice, voles, shrews, English sparrows, etc.

XII. (Case B-7). THE QUAIL OR "BOB WHITE" (*Colinus virginianus*) (upper shelf), and the RUFFED GROUSE OR SO-CALLED "PHEASANT" (*Bonasa umbellus*) (lower shelf) (Plate IV, Fig. 1).—The quail is variously known in different portions of the country as the "bob white," partridge, quail, Virginia partridge, etc. Under these different names it is familiar to persons living in the country. It lives mostly on the ground, and the characteristic attitudes as well as the differences between the males and females are shown in this case. It feeds to a great extent upon the seeds of weeds and grasses, as well as upon scattered grain, especially buckwheat, and it is particularly desirable as an insectivorous bird. We have records of its having kept potato fields free from the otherwise very destructive potato bug or potato beetle. It is the most important game bird of America, being found over a wider area of country and sought by a greater number of sportsmen than is any other bird that is known in the country. Its greatest enemies are the carnivorous mammals, especially the foxes, wild cats, minks, weasels and skunks as well as some of the medium sized hawks. It is in danger of extermination in those portions of the country where there is prolonged snow through the fact that it starves to death during the winter time, and also, is often covered by deep snow, and may then be unable to make its way through the mantle. It can be propagated, protected and preserved during the winter time by means that have been published in the Bulletins from this office.

The Ruffed Grouse (*Bonasa umbellus*) is a noble game bird in the woodlands of the Eastern United States, and is variously known as grouse, partridge, pheasant, woodshen, ruffed grouse, etc. It does not belong to the same family as the true pheasant. The latter belongs to the same family as the wild turkey and domesticated chickens, the males of which are armed with spurs. The male ruffed grouse never has a spur nor a pointed tail. These birds take their name from the black ruff at the sides of the neck. They are able to subsist better than the quail during winter because they feed upon the buds of trees, and roost in pine trees where they are not covered by snow. Since they can eat the buds of trees, they are not in danger of starvation. Their enemies are numerous, among which are all of the carnivorous and egg-eating birds, mammals and reptiles that are able to capture them or find their nests.

In this case a male is shown upon a log in the act of drumming or booming, while in the grass near him are two females which have come to his call. During the summer these birds feed to a great

extent upon insects of various kinds and upon the seeds of weeds, grasses and various wild berries and other fruits. In the fall they are to be found gleaning in the deserted harvest field. The case contains the grasses which furnish them a portion of their food.

XIII (Case B-9). THE WILD TURKEY (*Meleagris gallopavo*). (Plate IV, Fig 2).—In this case are to be found two specimens of the genuine wild turkey, as fine as can be seen at any place. These are both females, as the collection was made at such time of year that the law did not permit our collecting the male or gobbler—these skins having been preserved since the previous hunting season. Upon the ground by the specimens one can see the chestnuts, acorns and other seeds upon which the wild turkey feeds in the fall of the year. At other times it feeds upon insects, berries and other fruits, vegetation, seeds, grain, etc. It is our most noble game bird, and its increasing scarcity is to be regretted. It is still found more or less abundantly in a few of the wild portions of our country.

XIV. (Case C-8). THE WOODPECKERS (ORDER PICI), AND OTHER INSECTIVOROUS BIRDS. (Plate V, Fig. 2).—This case should be one of the most instructive in the entire exhibit, as it contains a number of birds that are decidedly beneficial in their feeding habits, and yet but comparatively little known for the good they do in the regions where they abound. The large log in this case is a section of a trunk of an old apple tree which has been drilled full of holes by the so-called sap-sucker or yellow-bellied woodpecker (*Sphyrapicus varius*), which is the only woodpecker that ever injured trees or attacks living trees for any other purpose than to capture and eat the insects which are to be found damaging them. This bird is rare in Pennsylvania, and is not sufficiently common or injurious to justify its extermination. Specimens of this species are shown at each side of the base of the larger stump, and also on the stump just above the lower bird at the right. In addition to its habit of drilling the rows of holes that are here shown, it eats many of the most injurious species of insects. It is unfortunate that our more common species of small woodpeckers are commonly called sapsuckers, and are killed in orchards because they are the ones that are erroneously supposed to do this mischievous work of the more rare migrant.

The smallest, most abundant and doubtless most beneficial of the various species of woodpeckers found in Pennsylvania is the little bird known to bird students by the common name of the downy woodpecker (*Dryobates pubescens*). This is represented by the two small specimens toward the base of the old limb occupying the middle of this case, showing a side view of each. These birds remain in the orchards of our State all winter, and are among the most bene-

ficial friends of the horticulturist in taking the larvae of the codlin moth from beneath the scales of bark on the trunk of the apple, pear and quince trees, and thus destroying this greatest pest of the apple grower. They are generally stoned and shot as "sapsuckers," and it is important that all fruit growers and farmers should become familiar with this most beneficial and least abnoxious of birds. It has no feeding habits whatever that would justify its persecution or extermination.

Similar to the Downy Woodpecker is the one commonly known as the hairy woodpecker (*Dryobates villosus*), which differs from the former chiefly in size, being nine inches in total length, while the Downy is but six and one-half inches long. The habits and economic results of the Hairy Woodpecker are very closely similar to those of the Downy. The former, however, is more of a resident of the woods or forests, not being so frequently seen in the orchard. The color of the two is so nearly alike that they can be distinguished in color only by the fact that the Hairy or larger species has the outer tail feathers wholly white, while the Downy or smaller species has black bars on the otherwise white outer tail feathers. These birds nest in holes which they make for themselves in dead trees, branches and posts, and one means of encouraging them and securing their presence on the premises is to erect posts in which they can nest, or permit dead branches or stumps to remain for their use. We have seen this done successfully, especially in the dooryard and orchard of Prof. John Hamilton, ex-Secretary of Agriculture of Pennsylvania, at State College, Pa.

On the top of the larger log is perched a pileated woodpecker (*Ceophloeus pileatus*), which is very commonly but erroneously known in this State as the Woodcock. This may come from the fact that one of its common names is the Logcock. This is the largest woodpecker found in our State, being eighteen inches in length, and having a wing nine and one-half inches from the angle to the tip. It is found in the wilder portions of mountainous regions of Pennsylvania, and owing to its shy and retiring habits it does not often come to cultivated trees to feed, hence it does not destroy the insects that attack our fruit trees to a great extent, although it is one of the most valuable birds of the forest in aiding to hold in check the various kinds of pests that destroy the forest trees. We have seen their holes, which have penetrated trees to the depth of four inches for the purpose of extracting wood-boring beetle larvae, and have taken scores of such larvae from their stomach. It is to be regretted that in these days when forestry preservation is being so urgently placed before the public, every gunner should find it his privilege and even duty to make a special effort to destroy the

now rapidly disappearing examples of this valuable forest tree preserver.

The common Red-headed woodpecker (*Melanerpes erythrocephalus*) is represented by the four specimens on the upper portion of the dead limb in the middle of this case. The one at the right of the limb is a female and has no red upon its head. The other three specimens are males and are distinguished by their striking red, black and white colors. When the destruction of old forest trees commenced to render it difficult for these birds to find nesting sites in the woods they were able to adapt themselves to changed conditions and make use of the modern inventions of science by nesting in telegraph and telephone poles. The slight injury which they thus effect to the pole is more than compensated by their great destruction of insects injurious to forests and fruits. The red headed woodpecker is undoubtedly to be classed among our most beneficial birds, although it is true that in the spring time when other food is scarce and the young are in the nest, they often take cherries from the trees. At that time if there be but a few trees bearing, and especially if these be near a woods, a great deal of loss may occur from this source. This is to be avoided by planting along the fences, and in the woods and gardens a few specimens of the shrubby tree or bush variously known as shad berry, shad flower, service berry, sarvis berry, June berry, corinthabaum, corinthian currant, corinthian cherry, June cherry, Amelanchier, and known to scientists as the *Amelanchier canadensis*. All kinds of fruit-eating birds prefer the berries of this tree to cherries, but if in the so-called march of civilization the native fruits be destroyed, there can be no other course for the birds than to turn to the cultivated fruits during periods of scarcity, and especially at the time of year when Nature is making the most urgent demands for food for their young. One can also avoid loss from such birds by planting early sweet varieties of cherries, such as the Governor Wood, and permitting them to remain upon the trees especially for the birds; as well as by planting mulberries in the vicinity, and the fruit-eating birds will make use of these in preference to the cultivated varieties which are of use to man.

Upon the ground at the lower, left corner is shown a flicker (*Colaptes auratus*), which is also known as the yellow-hammer, golden-winged woodpecker, high-holer, yarrup, yellow-shafter woodpecker, etc. This bird feeds upon the ground more than does any other species of the woodpecker family, and as a consequence it destroys a great number of the ground-inhabiting insects, especially ants. In its destruction of ants it is accomplishing a valuable service to mankind, because the ants, especially the species living in the

ground, take care of the Plant lice or Aphids that feed on the roots of plants, and are thus the indirect cause of considerable injury to the roots of various cultivated plants.

In these specimens the observer can see the characteristic structures of the order and family to which the woodpeckers belong. Among these are to be noted (1) the structure of the feet, having two toes in front and two behind, insuring a firm grasp upon the bark, as they climb around in search of their food, (2) the flat and pointed, hard, chisel-shaped bill for cutting into wood and bark to obtain their prey and to make holes for their nests; (3) their stiff-pointed tail feathers upon which they rest as upon a third leg, when perched against the trunk of a tree, and (4) their attitudes, which are consequent upon these characteristic structures. It will be noted that when a woodpecker is at rest upon the side of a tree, it clings with its feet and rests upon its stiff-pointed tail feathers, which are closely pressed against the object to which it clings, as is shown in the attitude of the three specimens of red-headed woodpeckers near the centre of this case.

The many other small birds in this case that are not woodpeckers were not placed here on account of zoological or structural affinities, but rather for convenience in caring for the present collection, and to some extent to emphasize their beneficial feeding habits. They do not belong to the same order as those previously discussed, but to the order Passeres or Perching Birds—being distinguished by having three toes in front and one behind, the latter toe being provided with a particularly large claw, and the feet not adapted to swimming, wading or grasping. Among these are the wrens, the brown creeper, the nuthatches, the tufted titmouse and the chickadee. All these are of very great value in their feeding habits, because they destroy insects, and many of the creatures that they take as their food are among our greatest pests of fruit trees, ornamental shrubs, shade trees and woodlands.

A fine example of the white-breasted nuthatch (*Sitta carolinensis*) is to be seen at the left side of the upper end of the larger stump. This shows the characteristic attitude of this bird as we see it so often in orchards and elsewhere, clinging with its head downward to the trunk of a tree. Its long straight bill is admirably adapted for inserting into cracks and crevices of the bark to extract the various insects that may be found in such places during the winter time. It is one of the very effective enemies of the codlin moth, and has been known to preserve an entire pear orchard by remaining during the winter in flocks in the orchard and feeding upon the adult or winged individuals of the Pear-tree *Psylla*—that worst of recently-introduced pear pests, which winters in its adult stage in

places of partial concealment on the trunks of the trees. The four specimens in a vertical row at the left side of the larger stump are all representatives of the white-bellied nuthatch, which is unfortunately also called a sapsucker, and is too often killed under the decidedly erroneous notion that it punctures the bark of trees and sucks sap. It is one of the birds that the fruit grower should make a special effort to study in order to be able to recognize his best friends and preserve them when they come to his premises.

The tufted titmouse (*Parus bicolor*) is shown on the upper diagonal branch at the left of the red-headed woodpecker, and its cousin, the chickadee (*Parus atricapillus*) is shown on the horizontal branch at the extreme left of the case. The titmice and chickadees eat very small insects, and, especially, insect eggs. The chickadee is the smallest bird that remains in the State of Pennsylvania during the winter. It spends its time searching the twigs and smaller branches of trees for the various kinds of small insects, especially, plant lice eggs, that may be found there. It is our most efficient enemy of the eggs of the apple plant louse and other species of aphids, and will subsist all winter upon the eggs of these very injurious insects, where it can find them in sufficient abundance, and remains in an orchard until it greatly reduces the number of such pests.

XV. (Case C-7.) THE CUCKOOS (Family *Cuculidae*), AND THE KINGFISHERS (Family *Alcedinidae*). (Plate V, Fig. 1.) The reason that these birds are placed together in this case is that the zoologists have found it advisable to group the two families in the same zoological order, which is named *Coccyges* or the Cuckoo-like Birds. Their most striking differences, separating them from the woodpeckers, are their soft tail feathers and the bill not chisel-like. As far as biological habits are concerned the birds of these two families are widely separated. The Black-billed Cuckoo (*Coccyzus erythrophthalmus*) is our most effective destroyer of the hairy caterpillars. This bird is shown at each side of the upright portion of the brush just at the left of the center of the case. In this brush is the nest of the apple-tree ten-caterpillar, one of our most conspicuous and at times destructive of hairy larvæ. One cuckoo is facing the tent and eating larvæ from the same, while another has a larva of this pest in its bill. They feed very extensively upon these insects as is shown by the fact that in the stomach of one which had killed itself by flying against a wire and was opened by the writer, when at Cornell University, there were found fifty-two specimens of full-grown larvæ of the tent caterpillar. The stomachs of these birds are often found to be so coated by the hairs or spines of the caterpillars sticking into them that they look as though they were lined with fine fur. The cuckoos are often called "Rain Crows" from the sup-

position that their peculiar, hollow call foretells a rain. We know of these beneficial birds having been killed and their heads taken to the township clerk for the fifty cent bounty upon the heads of hawks and owls, which was offered in Ohio some years ago. The clerk paid the bounty and thus rewarded the destruction of one of the most beneficial birds known in America.

At the left of the case is a Baltimore oriole (*Icterus galbula*), also taking the hairy caterpillars from the tent which they have constructed. This represents a well known fact in nature, such as all these Exhibts are intended to depict. (For the list of known avian enemies of the tent-caterpillars, see our discussion of these pests in the Monthly Bulletin of the Division of Zoology for April and May, 1904.)

The kingfisher (*Ceryle alcyon*) is a strict inhabitant of regions where there is water and it can obtain aquatic creatures, especially fish, for its food. Two of these birds are shown carrying fish, which they have presumably taken from the water represented beneath them, and another is in an attitude of diving for a fish. These birds are expert divers and fishermen, and although they are very attractive along streams, they are especially objectionable in the vicinity of fish hatcheries.

XVI. (Case C-9.) NIGHT-HAWKS, ETC. (Plate VI, Fig. 1.) In this case are represented many species of birds that belong to the orders of *Macrochires* or Goat Suckers, Swifts, and Humming Birds, as well as many representatives of the Order Passeres, or the Perching Birds. Upon the floor on small logs one will see the Whip-poor-will at the right, and the Night Hawk at the left, perching lengthwise upon small logs. These birds perch in this peculiar manner, rather than resting, as do other birds, across the objects upon which they alight. In the middle of the case one will see a beautiful pair of humming birds together with the nest of the same, while at the middle of the right side of the case is shown a pair of Chimney Swifts (*Chatura pelagica*). The Night Hawk and Whip-poor-will are valuable insectivorous birds of the twilight and night time, flying through the air with their large, sticky mouths, wide open and catching insects in their flight, while the Chimney Swift, also feeds entirely while on the wing, capturing insects that fly in the air. These birds have no obnoxious features, excepting the fact that occasionally a beneficial insect may be taken, and it has been proven that the food of the insectivorous birds is not to a great extent composed of insects that rank as beneficial to mankind. The details of the feeding habits of such birds will be issued in a subsequent Bulletin, which will be published from this office.

XVII. (Case D-9.) SOME PERCHING BIRDS. (Plate VI, Fig. 2.)

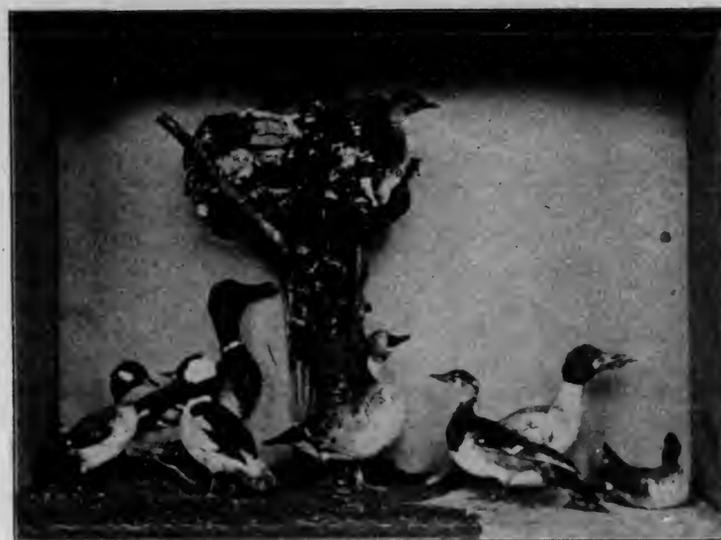


Fig. 1. Edible Ducks.



Fig. 2. Crows and Vulture.

PLATE I.

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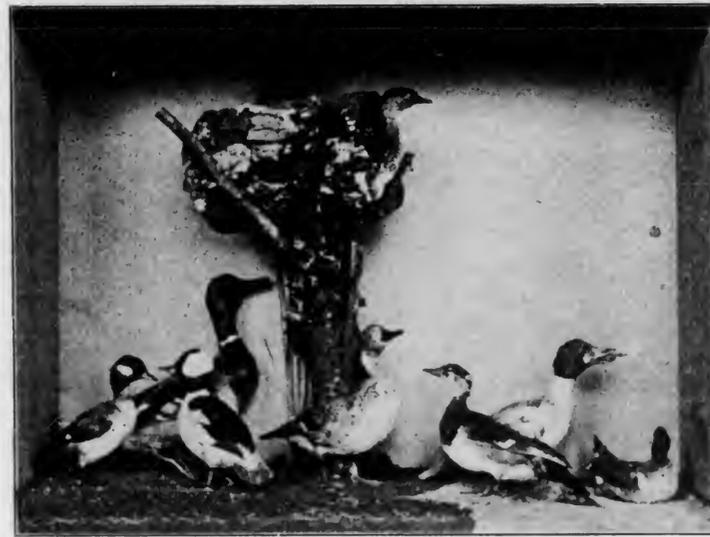


Fig. 1. Edible Ducks.



Fig. 2. Crows and Vulture.

PLATE I.



Fig. 1. Large and Small Hawks.



Fig. 2. Large Hawks.

PLATE II.



Fig. 1. Large Owls.



Fig. 2. Small Owls.

PLATE III.



Fig. 1. Quail or "Bobwhite" (upper shelf). Ruffed Grouse (lower shelf).



Fig. 2. Wild Turkeys.

PLATE IV.

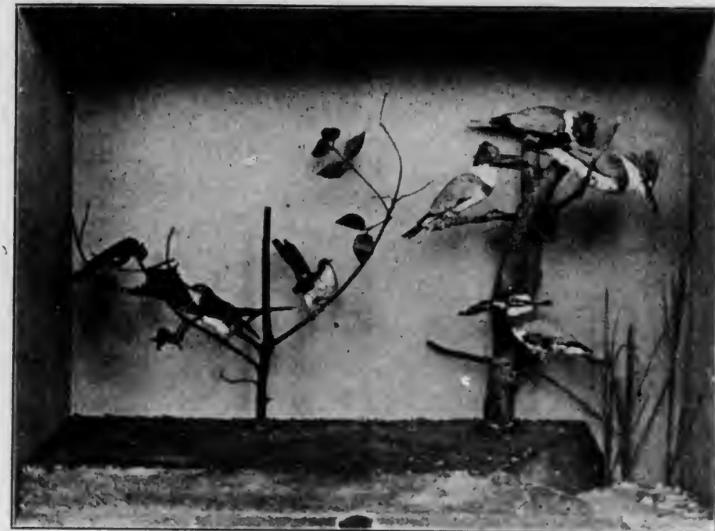


Fig. 1. Cuckoos and Kingfishers.



Fig. 2. Woodpeckers and Other Insectivorous Birds.

PLATE V.



Fig. 1. Night Hawks, Hummingbirds, etc.



Fig. 2. Shrikes, Jays, Meadow Larks, Robins, etc.

PLATE VI.



Fig. 1. Opossums.



Fig. 2. Rabbits (upper shelf) and Hares (lower shelf).

PLATE VII.



Fig. 1. Porcupines.



Fig. 2. Muskrats.

PLATE VIII.



Fig. 1. Rats, Mice, Moles and Shrews.

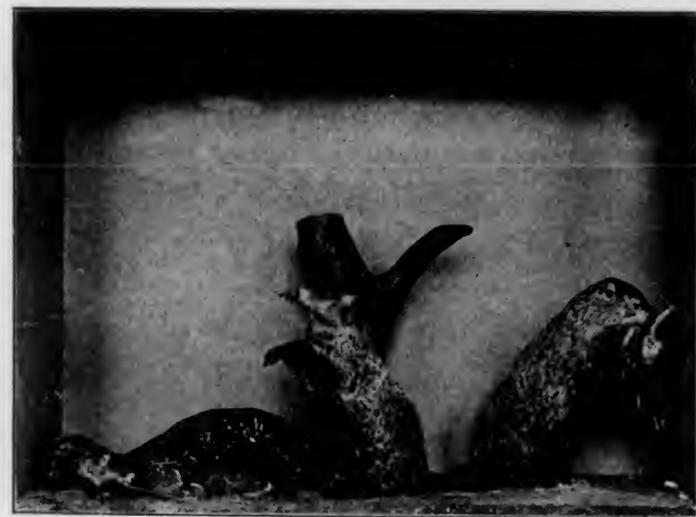


Fig. 2. Woodchucks or Groundhogs.

PLATE IX.



Fig. 1. Squirrels and Chipmunks.



Fig. 2. Deer.

PLATE X.

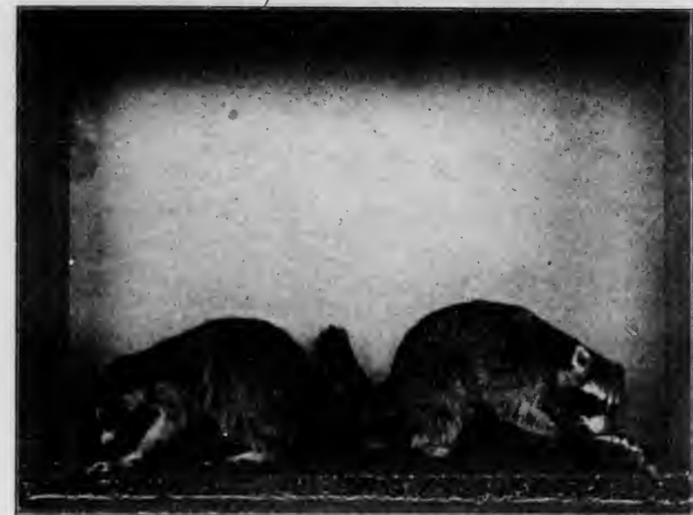


Fig. 1. Raccoons.

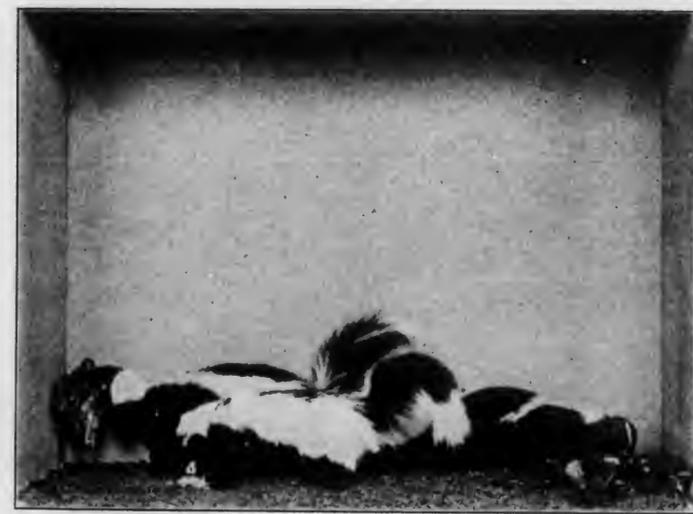


Fig. 2. Skunks.

PLATE XI.



Fig. 1. Seed-eating Birds (upper shelf), and Weasels (lower shelf).



Fig. 2. Gray Foxes and Cross Fox.

PLATE XII.

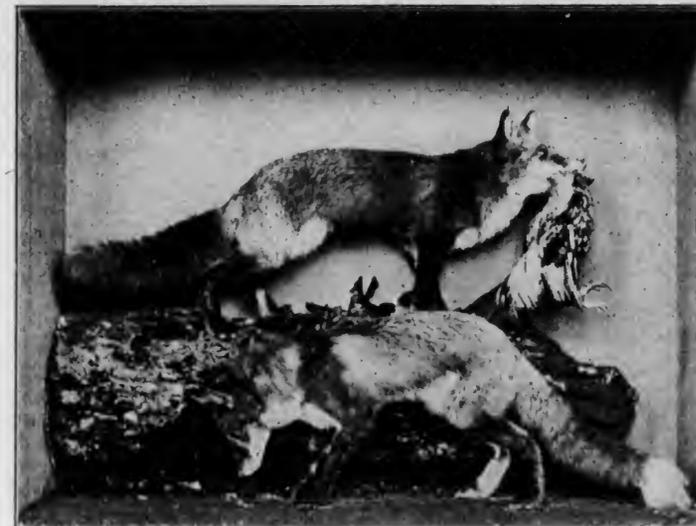


Fig. 1. Red Foxes, Eating Mouse and Chicken.



Fig. 2. Red Fox, Carrying Ruffed Grouse.

PLATE XIII.



Fig. 1. Wild Cats, Killing Rabbit and Catching Bird.

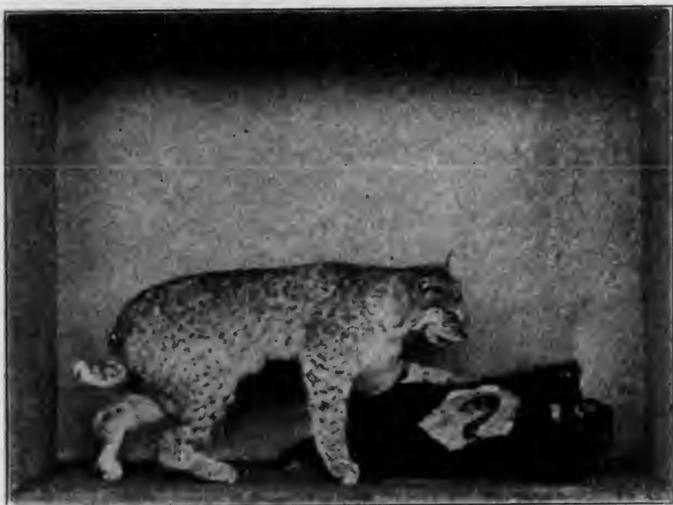


Fig. 2. Wild Cat, Killing Porcupine.

PLATE XIV.

In this case there is but one bird that does not belong to the order Passeres or Perching Birds. This is the dove (*Zenaidura macroura*) also known as the mourning dove, or turtle dove, and represented by the specimen in the upper, right-hand corner. It is unfortunate that the dove is regarded as a game bird in most States, and in Pennsylvania is not at present protected by law. It is known both as mourning dove and turtle dove. The former name referring to its mournful, cooing sound. It is a valuable bird as a destroyer.

At the middle of the case are shown three Blue Jays (*Cyanocitta cristata*), one of which is taking an egg from a robin's nest and the other is eating an insect. These birds are objectionable through the fact that they eat birds' eggs and young birds, but are also beneficial in their insectivorous habits. They also eat nuts and acorns in the woods to a great extent and feed at times on wild fruits.

At the left of the centre of the case are shown two specimens of the Logger-head shrike (*Lanius ludovicianus*), the lower of which is pinning a June-bug on a spiny branch, while the other has just fastened an English sparrow into a fork of the brush, and has broken its skull and eaten away its brain. This is a southern species which is not commonly represented in Pennsylvania, excepting in the warmer portions. It nests in thorn trees or spiny bushes where it has an opportunity to pin its prey to the spines, and around its nests one can often see various kinds of insects, such as grasshoppers, June-bugs, large water bugs, katydids, and others of the larger species of insects, as well as frogs, small birds, especially the English sparrow, mice, voles, shrews, etc., attached to the spines where it has fixed them in store as food for itself and its young. The obnoxious features of the feeding habits of this bird are far exceeded by its beneficial qualities.

Just above the two logger-head shrikes, and also, at the left of the centre of the case, is to be seen a specimen of the northern shrike (*Lanius borealis*). This bird is just in the act of breaking away the skull of a Pennsylvania meadow mouse or vole (*Microtus pennsylvanicus*), which it has killed and attached to a spine of the bush. This bird is one of the important enemies of mice, voles and the English sparrow, as well as a destroyer of many of the larger insects. The shrikes are raptorial in their nature and habits, although being classified with the Perching Birds on account of their small feet and other structural characters. The northern shrike is found in Pennsylvania during winter time, while the southern species is with us during the summer only.

Toward the lower right corner of this case are two specimens of the red-winged blackbird (*Agelaius phoeniceus*), also erroneously called the American starling. This beautiful bird nests in swamps,

and feeds its young almost wholly upon insects. In the fall when it gathers in flocks shortly before migration, it may prove destructive to corn in the field, but its value as a seed-eater and destroyer of obnoxious species of insects is so great that it undoubtedly deserves to be preserved.

On the ground in the lower left corner is shown a meadow lark (*Sturnella magna*) eating a grass-hopper. The common meadow lark is very abundant throughout the fields and pastures during the summer, and is, unfortunately, occasionally sought as game or food. It is one of the most valuable insectivorous birds in this State, and also at times destroys weed seeds, without proving very destructive at any time to any of the property of man. As a means of suppressing the many obnoxious pests of the grass and grain field, there is perhaps no other bird or mammal that is as valuable as the meadow lark.

The other birds in this case are specimens of the familiar American Robin (*Merula migratoria*), or the American Red-breast. At the left side, on the ground in front of the meadow lark, is shown a robin eating an earthworm, which is one of the most common elements of food of this bird. At the rear of the case on the ground is a fine male robin, facing the observer, while toward the centre of the case from this, perched on a lower branch is a robin showing the back view. These birds have been maligned, especially during certain seasons, for their fruit-eating propensities, but we know where this has been avoided by the method for preserving fruits from the attack of woodpeckers and other fruit-eating birds. The insectivorous habits of the robin are such that all persons are justified in preserving it about the premises by every possible means. It is only during seasons of scarcity, especially while its young are in the nest, that this bird is particularly destructive to cultivated fruits or to any other interests of man. However, if by any cause such birds or other creatures should increase upon one's premises to such an extent as to be forced to become destructive to the property which he wishes to preserve, there is no reason why he should not defend his own possessions, and the law of this State permits the killing of any kind of wild animal or bird when engaged in the act of destroying the property of any individual.

We have many records of the valuable qualities of the robin, such as a letter from a friend in Tyrone, Pa., saying that these birds cleaned the grub worms from his lawn. Fortunately, sentiment also aids in the protection of this favorite American bird.

## THE MAMMALS.

VXIII. (Case D-1.) THE OPOSSUMS. (Didelphidæ.) Plate VII, Fig. 1.) The Virginia Opossum or Common Opossum (*Didelphis virginiana*) is the only representative of its order and family found in North America. It belongs to the Marsupials or Pouched Animals, so called because there is a ventral pouch in which the young are carried until they reach a greater stage of maturity than at the time when they are first born. These animals are southern in origin, as is shown by their thin fur, thin uncovered ears, and exposed tail and feet. They are found rather common in the warmer portions of Pennsylvania, but at the higher altitudes, especially at the northern part of the State, they become quite rare.

The opossum is the lowest of our native mammals in point of structure, and its generalized habits are in keeping with its low or general structure. It eats almost any food that is taken by other mammals, excepting the bark of trees and hard nuts. It readily devours fruits in season, insects, fishes, frogs, birds' eggs, young or older birds, mice, reptiles, carrion, roots and any other edible material which it may find.

In the opossum case one sees an adult female hanging by its tail from a limb, and in the ventral pouch of this specimen is to be seen a young opossum safely protected. On the ground is an adult opossum eating a dead crow, which is mounted to represent carrion, and on the limb is another opossum climbing to the nest of a bird for the purpose of taking its eggs. At the farther end of this limb is shown a young opossum in the attitude of eating fruit, while at the right side of the case is the skin of one of these animals, intimating the fact that it has commercial value.

### Order GLIRES, the RODENTS OR GNAWERS.

To the Order of Rodents belong many species of mammals that are of decided economic importance to man. Some of these are almost wholly beneficial, such as the squirrel. Others are almost entirely obnoxious, such as the mice. Others are either obnoxious or beneficial according to circumstances, such as the rabbits, muskrats and porcupines. There are a great many species of this large and important order found in the State of Pennsylvania, but we here discuss only those that are shown in this Collection.

XIX. (Case A-5.) THE HARES AND RABBITS (Family Leporidae). (Plate VII, Fig. 2.) On the upper shelf of this case are shown

two specimens of the common Gray Rabbit or Cotton-tail (*Lepus nuttalli mallurus*) gnawing fruit trees. The trees are specimens that had been damaged in the orchard, showing exactly the characteristic effects of this rodent when snow covers the ground and forces it to feed upon the green bark of the living trees. There are two or three varieties of rabbits known in this State, yet they differ so slightly from one another as to be almost indistinguishable. Their habits and effects are similar. They are strictly herbivorous or plant-eating, and multiply so rapidly as to become destructive to the interests of the gardener or fruit-grower where they are not held in check.

It is true that the rabbit is the chief game animal of Pennsylvania, being more sought by gunners, especially by young hunters, than is any other mammal or bird. It prefers to live in or near regions that are more or less cultivated, and may often become so accustomed to man as to reside around his buildings and even become injurious to vegetation in gardens. Many complaints have reached us of the destruction of trees by rabbits during the winter time while the snow covered the ground, while other persons have written of damages from these rodents, especially to cabbage and similar garden plants during the summer time.

One method by which trees can be protected from rabbits is to rub them with tallow or some other form of grease or with blood. This, however, does not protect the trees from mice, and, consequently, the best means of saving a young orchard during prolonged snow is to wrap the trees in the fall with wire netting or tarred paper. Where rabbits are especially obnoxious they can be killed with poison on apples or on bunches of clover, and they are commonly caught in "dead falls" and ordinary traps. The law in this State permits any man to protect his property from injury by wild animals or birds, although there is a protective law upon the rabbit during the greater portion of the year, this does not interfere with the rights of any man to save his property from their ravages by killing them at any time they are found destructive.

On the lower shelf of this case are to be seen three unusually interesting specimens of the White Rabbit or Varying Hare (*Lepus americanus*). This mammal is remarkable for the fact that it is gray or brown in summer and changes to white in winter. At the left is a gray specimen in the summer pelage, while at the centre is one in its autumnal coat, changing from the summer to the winter conditions, and shown as partially white and partially gray. At the right is a white specimen characteristic of the winter time, showing the protective coloration with which nature endows this peculiar mammal. The Varying Hare is thus named because of its

variation in color from one season to another. In habits it differs considerable from the common Cotton-tail, as it lives in the wilds of the woodlands and mountains, especially in the high mountainous swamps, far from the abode of man. It does not enter holes in the ground to escape its enemies or for protection from cold, as does the Cotton-tail; and its feet are very large and covered with long hairs, which spread in such a way as to support it on the snow, and thus prove an additional adaptation to its life in the snowy regions. This hare is not sufficiently abundant in our State to be considered of great economic importance, although it is often hunted for food for man and for sport, and frequently may be seen for sale in the markets during the appropriate season.

XX. (Case B-3.) THE PORCUPINE (*Erethizon dorsatus*). (Plate VIII, Fig. 1). The porcupine is a strictly northern mammal which has usually been considered very rare in Pennsylvania, but during recent years it has been increasing in the forestry preserves of this State to such an extent as to become very destructive to the forest trees. It feeds upon all kinds of material, but is especially fond of pine needles and the bark of pine and other coniferous trees. It climbs the trees and eats the bark for distances of many feet, cutting into the wood and destroying the life of the tree. The limb at the right side of this case is from a tree that has been peeled in the manner described, and it may be seen covered with the marks of the porcupine's teeth. These two specimens are mounted in their characteristic attitude, eating a young pine tree.

The porcupine is effectively protected from most mammals by its very sharp, barbed spines, which are so jointed that they readily break off at the base, and then work deeply into the flesh of any animal that would strike their owner. It is not true that this animal is able to shoot its spines at intruders, although it does strike very swiftly with its tail. The porcupine is a sluggish animal, and is readily overtaken in the woods, during both day and night, and since its flesh is edible, it is preserved in the forest regions of some of the northern States in order to provide food for persons who might be lost and find no other means of subsistence. The natural enemies of the porcupine are the foxes and wild cats. In the heads of these mammals we have found embedded the spines from the bodies of the porcupines. The method of attack upon porcupine by a fox or a wild cat is shown in another case.

XXI. (Case A-4.) THE MUSKRAT (*Fiber zibethicus*). (Plate VIII, Fig. 2.) This is one of the most common mammals of North America, and belongs to the Mouse Family (*Muridae*). It is generally regarded as being strictly herbivorous in its feeding habits, although we have known it to be carnivorous, as is shown by the one eating

the fish in the middle of this case. The muskrat lives in swamps and near water, and is an expert diver and swimmer. If it can find a suitable tussock that is not easily reached by man on account of the surrounding swamp, it will there build a platform above the water line, and over this will construct a dome similar in shape and size to a bushel basket such as is commonly used upon the farm. This dome is composed of rubbish, sticks, mud, cornstocks, grass, etc., and is built in the fall for the purpose of affording a dry and warm winter retreat for the muskrat's family. The southern side slopes more gradually than does the northern, and is composed of lighter material through which the sun's rays more readily penetrate. The case on exhibition shows one of these domes that has been opened by a vertical cut through the centre, exposing the platform within. Coming up to this platform from the water is a muskrat carrying in its mouth some vegetation, and on the platform is another of these rodents, devouring a freshly-killed fish. This shows exactly what we found upon opening one of these domes near Ithaca, New York. The water line is represented at about one-half the height of the platform, and shows how the residents of the dome can plunge into water and escape by their hidden paths when they realize the approach of danger.

The muskrat is not only injurious to farm crops, but also to trees in swamps. At the right of the dome is shown the trunk of a tree that was peeled by these animals for food last winter. It is, also, very destructive to dikes and dams, as it makes holes through which the water flows, causing breaks, overflows, and sometimes considerable damage. The pelt at the left side of the case shows how the skins of these animals is to be encased with the fur turned to the inside, in preparing them for market. The muskrat is very prolific, producing two or three broods per year. It may be killed by trapping, shooting, poisoning, and fumigating with carbon bisulphide or hydrocyanic acid gas when found in holes where these gases can be applied.

XXII. (Case D-3.) THE WOODCHUCK OR GROUND HOG (*Arctomys monax*). (Plate IX, Fig. 2.) The woodchuck is a familiar resident of many hillsides adjoining cultivated fields in this State, and effects considerable damage to crops without much evidence of direct compensation for the loss. It may be that it eats weed seeds to a great extent, and, also, lives upon obnoxious insects of the field, but these suppositions remain to be proven. In the case at the left is shown a young woodchuck, while at the center is an adult sitting upright, and holding in its mouth some heads of grain, while at the right is another eating an ear of corn. These destructive rodents live in borrows in the ground as is shown in this case, and may be

killed without difficulty by putting into their holes a quantity of carbon bisulphide or even a sufficient amount of benzine or gasolene, and then stopping the holes tightly with damp earth. One can also kill them by hydrocyanic acid gas, which is generated by diluting sulphuric acid with water, placing this in the hole in a vessel and dropping in a lump of cyanide of potassium as large as a walnut. Close the hole at once with moist earth, well packed in, and the wood chuck or ground hog will never open it. The hide of this animal is unusually strong or tough, and is consequently often used for thongs, although its skin is not used as fur.

XXIII. (Case A-6.) THE SQUIRRELS (*Sciuridae*). Plate X, Fig. 1.)—All of the species of squirrels found in Pennsylvania, excepting the common flying squirrel, and the Fox Squirrel, are represented in this case. The grey squirrel or black squirrel (*Sciurus carolinensis*) is shown by the two black specimens near the centre of the case, as well as by the gray one at the foot of the limb, and the two grays at the left. The black squirrel is not a distinct species or variety, but is simply a black form of the common gray squirrel. The red squirrel of chickaree is shown at the top of the branch, as well as at the front of the middle of the floor, and a chipmunk (*Tamias striatus*) is to be seen going down the base of the branch, and also on a small stump at the right. The chipmunk is regarded as a general feeder, living mostly upon seeds, nuts and acorns, but we know it also as an important destroyer of insects. It devours such insects as June bugs very freely, when these pests are to be obtained, and we have seen piles of the elytra or wing cases of the June bugs at the sides of the entrance to the burrow in which the chipmunk makes its home. This is the one member of our squirrel family which has cheek pouches, and one of these specimens is mounted with these pouches filled with acorns in order to show how it carries its stores.

The Little Red Squirrel or Chickaree (*Sciurus hudsonicus*) is shown by the specimen at the top of the branch, as well as by two or three others in this case. This common and interesting little squirrel is so generally believed to attack and drive away the gray squirrel that we can not doubt this statement without further evidence disproving it. There is no doubt of the fact that where birds' nests are so situated that it can find them, and take their eggs, or even young birds, the Little Red Squirrel is very destructive to such bird life as can thus come under its attacks. It can be prevented from destroying the eggs or young of birds by placing a band of tin, a foot or more wide, about the trunk of the tree or all trees whose branches meet, which it would have to climb in order to find the nest. It can not pass up over this barrier, but if it can get into the trees by some other means, as by intertwining branches, of course this band would not prove an effective protector.

Squirrels are decidedly beneficial in carrying nuts, acorns and other seeds, and burying them in places where they will grow, thus aiding in the extension and production of forests, notwithstanding the fact that they eat the seeds or nuts of the kinds of trees that are thus planted. They are also of great value as food for man, and as objects of sport for hunters, giving mankind an incentive to take health-giving exercise. They are very prolific, and may become so numerous as to be destructive in certain places. Where they attack and destroy grain, they may be held in check by the gun, trap or poison.

The beaver, which has been supposed to be extinct in Pennsylvania, has lately been found on the premises of Judge Ettinger near Strasburg, Monroe county, Pa., where they have selected their own site, built their own dam, and are thriving. At the angles of the cases containing this Collection are shown trees gnawed off by this colony of beavers, and also, photographs of beavers and their work. Judge Ettinger deserves great credit for having had a special law passed by the State Legislature of Pennsylvania for the protection of this rare colony.

XXIV. (Case A-7.) THE MICE AND RATS, VOLES, SHEWS AND MOLES.—(Plate IX, Fig. 1.) In order to show certain biological facts, and different animals in their relation to one another, it was necessary to place in this case mammals belonging to no less than three Families and two of the Great Orders. On the small log at the middle of the case is seen a White-footed Mouse or Deer Mouse (*Peromyscus leucopus*), while another specimen of the same species is seen gnawing the little tree near the end of the log. This mouse lives mostly in the woods and fields and eats seeds, roots, insects, and the bark of trees when driven to it by hunger. It is very common throughout the State and is one of the important elements of food of the hawks, owls, shrikes and mice-eating mammals.

The Meadow Mouse or Vole (*Microtus pennsylvanicus*) is shown at the base of each of the larger trees, and is mounted in the act of gnawing these trees, which are specimens taken from orchards that had been destroyed by this very injurious rodent. The height at which the trees had been peeled beneath the snow is plainly shown, and the fine marks of the incisors or gnawing-teeth of this pest can be plainly seen in the wood from which it has removed the bark. This is the mouse that is commonly called the Vole, and lives in meadows and the more open portions of the country, making conspicuous runways in the grass and clover where it lives. It is exceedingly destructive to vegetation, as we have seen it destroy over seventy-five per cent. of the clover plants in a fine clover field by eating away the crowns and the tops of the roots. Its beneficial

effects are so few in comparison with its obnoxious qualities that there is little to be said in its behalf. Throughout the greater portion of Pennsylvania, it is undoubtedly the greatest pest of all the vertebrate animals that are known to man. Fortunately, it is eaten by snakes, hawks, owls, shrikes, weasels, minks, shrews, foxes, wild cats, and, in fact, all carnivorous reptiles, bird and mammals, and yet it is so prolific as to be increasing instead of decreasing in this State. One of the great causes of the increase of this pest is the decrease of its natural enemies. The best means of preserving property from its attacks is to protect the hawks and owls, concerning which we published in Nos. 3 and 4 of Vol I of this Bulletin. It can be killed both by poisoned food and poisonous gases, and an effort to do this would be justified in every young orchard.

On the ground at the right side of the case are two specimens of the brown rat, wharf rat or Norway rat (*Mus decumanus*), which was introduced into this country about 1775 and has now become the very familiar and destructive rodent that is commonly known throughout this State by the common name "The rat." About barns, garnaries and mills it is the most serious pest. It not only destroys grain and other stored products, but is very objectionable from the fact that it is a carrier of disease germs. It has many enemies among which the owls are to be considered the most important. It has been recently reported from France that a disease-causing germ, which will kill rats and mice only, has been cultivated artificially and used with satisfactory results. It is to be hoped that this will soon prove one of the great achievements of modern science in helping to free mankind from some of the pests that afflict him.

Rats can be killed in traps, but they soon become accustomed to one kind of trap, and then another must be used for a time. In this case one rat is shown caught in "Stop-thief Trap" made by the Animal Trap Company, Abington, Ill. As prevention is better than cure, it is best to avoid attracting them as much as possible by guarding carefully against permitting any food substance to remain where they can find it, fill holes with clay and pounded glass, place granaries upon supports protected by metal sheets over which they can not climb, and otherwise provide against such places where these pests can find living quarters. When rats are in holes in walls or the ground they can be killed by fumigation with the poisonous gases above mentioned, and they can also be poisoned by the use of a little white arsenic with their food.

At the left of this case are shown two specimens of the black rat or the so-called "old-fashioned rat" (*Mus rattus*). This has a tail longer than head and body, and is a sooty black to lead color. It

was introduced into this country about 1544, and became the common rat in many places, but it was later driven away or exterminated by the brown rat just discussed. It is still common in a few portions of this State. These specimens were sent from Maplewood, Wayne county, where it is common and the brown rat is not known.

The shrews are small, mole-like mammals, which in size and form resemble mice, but in color and appearance of the fur and shape of the head, they resemble moles. They differ from the moles in the fact that their forefeet are not broad and enlarged for digging, their external ear is developed, and they have well-developed, although very small eyes. Specimens of the mole shrew (*Blarina brevicauda*) are shown in the upper horizontal runway of this case, at the centre and toward the left. The one at the centre is eating a beetle, which shows the common insectivorous habit of this beneficial mammal, while the one at the left of it, is eating a meadow mouse, which shows another remarkable and desirable feature of its habits. The shrew is strictly carnivorous, being to a great extent insectivorous. Its sharp, sword-like under teeth enable it to kill a mouse and it will devour almost the entire body of a mouse as large as itself at a single meal. It is a mammal that is little understood, and is undoubtedly of great benefit.

The moles (*Talpidae*) are also shown in this case. The vertical section represented in the face of the case is to show a mound and the runways made by the mole. The nest with its hidden path is shown at the centre of the lower portion of the case, and is occupied by a large specimen. There are two species of moles found in this State, the Common Mole or Silver Mole (*Scalops aquaticus*) and the Star-nosed Mole (*Condylura cristata*). The latter can be known by the fringe of fleshy projections like a circle of tentacles around its snout, and also, by its very large and long tail. It is shown at the right side of the case, one specimen being in the upper runway and another in the lower. The Common Mole or Silver Mole is represented by the specimens in the nest, and in the lower runway at the left of the centre. These animals feed mostly upon earth worms, but to a great extent upon grubs and other larvæ of insects, as well as upon all ground-inhabiting insects which they are able to capture.

The biological relationship of this colony or group of animals is of great interest and importance. The mole makes the runways or large ridges which are so conspicuous in the region where it is found and which are shown on the surface of the ground at each side of this case. At the left rear corner of the case is the mole trap, of the Animal Trap Company, set in one of these ridges. The moles

are generally killed where found under the supposition that they destroy vegetation. They themselves are not the destroyers, excepting inasmuch as they loosen the ground and may thus incidentally kill some shallow-growing plants; but they also thus form tunnels in which the mice, especially voles, run and find food. While the moles seek earth-worms and insects, the mice follow in their tunnels and eat the roots of plants, tubers, etc., causing great damage. However, the shrew also lies in wait in these tunnels, and by a sudden lunge pierces the skull of the mouse with its projecting lower teeth, and devours its victim, as is shown in the enactment of the tragedy in the upper runway at the left of the centre. This sets forth the peculiar life-habits and effects of those animals which commonly live underground around us.

Owing to the preparation of the Collection at a time of year when the bats could not be obtained, these very beneficial insectivorous mammals are not exhibited in this Collection.

XXV. (Case B-8.) THE VIRGINIA DEER OR RED DEER (*Odocoileus americanus*). (Plate X, Fig. 2.)—We have in this State but one species of deer, which was formerly known to scientists as the *Cervus virginianus* until it was shown that the scientific name given above should apply to this animal through the application of the law of priority. This deer is our only native, living representative of the family *Cervidae*, or the Deer family, and of the order *Ungulata* or the Hoofed Animals.

In this very remarkable and attractive case are only very young specimens of the deer. The larger one at the left is a fawn, probably not two weeks old, while the two smaller specimens are fawns whose mother was drowned at the time of their birth. They are kindly loaned for this exhibition by Dr. L. Banks, of Mifflintown. They indicate a spotted ancestry of our common red deer, but the conspicuous spots on these young individuals will gradually disappear as the animal becomes older, until in a short time no evidences of them will remain. The deer is found abundantly in certain of our forest reserves, and where it is properly protected and is recently known to be increasing instead of decreasing. It is our most noble game mammal, and its habits are too well known to need detailed description here. It is not sufficiently common to be called injurious to the interests of man at any time.

XXVI. (Case B-4.) THE RACCOON (*Procyon lotor*). (Plate XI, Fig. 1.)—The Raccoon is commonly found along streams and in wooded districts of this State. It belongs to the great order *Feræ*, or the Flesh-eaters, named *Carnivora* by many authors, but to a distinct family (*Procyonidae*), which is characterized by the flat feet, well-developed tail, sharp snout and rather slender body. Its

food is of such a general nature that it can almost be called omnivorous. It eats fish or fresh-water crabs, mollusks, birds and birds' eggs, mice and other mammals, fruit, grain, corn, berries, and other kinds of material. The specimen at the right is eating an ear of corn which was taken from a field where the racoons had bitten off the husk and had left it in just the way that this is shown. One can distinguish an ear of corn in the field that has been attacked by a "coon" from one that has been eaten by a squirrel by the fact that the former bites away the ends of the husk, while the latter tears it down in strips. The specimen at the left is fishing in a pool of water and capturing a cray fish or fresh-water crab, which is among its favorite food. These mammals are experts at fishing, as they feel under stones and logs and catch the members of finny tribe in retreats from which there is no escape. They are great enemies of trout, and sometimes poultry. They are hunted extensively by dogs, especially at night, for their fur and flesh, being used to some extent as food for man. A common method of catching them is tracking them in the snow, and cutting down the trees in which they find concealment. However, this results in exterminating and driving them away, as it destroys their breeding places. They are also readily trapped and are frequently tamed as pets. They become very gentle, and are quite interesting and attractive.

XXVII. (Case A-1.) THE BLACK BEAR (*Ursus americanus*).—In this case we have a specimen of a young black bear feeding upon berries. This belongs to the same order as the racoons, but to a different family (*Ursidae*) being distinguished by the rudimentary tail, heavy body and short snout, and having the flat feet, as with the racoon only. In the more cultivated portions of our State the bear is not known, but in the mountainous regions, from the centre northward, it is rather abundant.

It feeds upon berries, fruits, wild animals and live stock, but is not sufficiently abundant to be considered among our important economic animals. It is hunted for sport, for its pelt, and as food for man.

XXVIII. (Case B-5.) THE SKUNK (*Mephitis mephitis*). (Plate XI, Fig. 2.)—This common mammal belongs to the weasel family (*Mustelidae*) and to the great order of *Ferae* or flesh-eating mammals, which includes the racoon, the bear, and those to be subsequently discussed in this Bulletin. It is one of the most common animals of the State, living near the abode of man as well as in the woodland, prowling around stealthily at night, and feeding upon a wide variety of material. It eats insects to a very great extent, and in cultivated regions is undoubtedly to be preserved as one of the greatest destroyers of those insects which live in and on the ground.

During the early spring time one can often see along stony hill sides where something has turned over hundreds of stones about the size of a man's hand or somewhat larger, and in many cases has made funnel-shaped pits under these stones or in the soil near them. This has been done by the skunk in its search for insects, and indicates how decidedly beneficial is this animal, which is but slightly appreciated for its desirable qualities. The specimen at the centre of the case is digging in the ground for insects, which are its food during the greater portion of the year. Many times have we found their stomachs filled with nothing but the remains of insects, mostly beetles.

It is well known, however, that the skunk is at times an enemy of poultry and eggs, and it also destroys the eggs and young of those birds which nest on the ground, and will kill and eat old birds when possible. The specimen at the right in this case is taking eggs from the nest of a quail, while the one at the left has captured and is carrying away the parent bird. Since the quail and the ruffed grouse nest commonly upon the ground, it is to be seen that the skunk is one of the important enemies of these game birds. Therefore, in weighing it in the balance of Economic Effects, we can only say that in cultivated regions the skunk would prove a most valuable insectivorous animal, especially if screened away from the poultry yard; while in game preserves and those portions of the country where one wishes to maintain the game birds, the skunk is likely to prove so destructive as to justify its extermination.

It should be remembered that the skunk is one of our most valuable fur bearing animals, and a great many persons in this State make considerable money each year by trapping. While there are several animals that are sought by trappers, the skunk must stand first in importance because of its abundance, wide distribution, and average high price for its fur. A few skunk farms have been started for the purpose of propagating this animal for financial returns, but they have not proven successful, owing to the fact that the promoters of such enterprises have not been equipped with the fundamental biological knowledge necessary for best results.

XXIX. (Case A.8.) THE MINK (*Lutreola vison*).—This animal also belongs to the Weasel Family (*Mustelidae*), and has been one of the very important fur-bearing animals of this State. It is now so reduced in numbers that it is not common, excepting in the wilder portions of the country. In the forests of the mountains it may be considered abundant. It lives on fish, mollusks, birds' eggs, young birds, fully grown birds, mammals and poultry. It may prove very destructive to a poultry yard, as it has been known to kill over two dozen young chickens or ducks in a single night. It is

to be caught by carefully placing traps in its runways, especially by baiting these with fresh meat or freshly killed birds.

In the Collection we have shown a mink coming from the water, and carrying a fish in its mouth, while another is carrying a young duck, and another is eating a mouse. In this case is a stretched skin, showing how they are encased for sale.

XXX. (Case A-9.) SEED-EATING BIRDS (Upper shelf) AND THE WEASELS (Lower shelf). (Plate XII, Fig. 1).—In order to find room for the shelf of Seed-eating birds it was necessary to place them in this case, which was incongruous from the zoological standpoint, but made necessary by the requirements of the occasion. The value of birds as destroyers of weed seed has not been fully emphasized, and in the Exhibit here shown one will see much that is worthy of careful study. Birds are mounted with the weeds, the seeds of which they have been known to destroy in a very effective manner. (See the publications from the U. S. Department of Agriculture, Division of Biological Survey, on the subject of "The Native Sparrows as Destroyers of Weed Seed").

The weasels (Genus *Putorius*) are shown on the lower shelf of this case. These mammals are brown in summer and become entirely white in winter, excepting the tip of the tail, which remains black during the entire year. An interesting specimen shown on the stump near the middle of the shelf was killed in February, in Monroe county, Pa., but had retained the summer color of its pelage during the entire winter. On the bank at the left is shown a common Weasel, Ermine or Stoat (*Putorius noveboracensis*) killing a vole or meadow mouse, while on the ground in front of it is another of this species carrying a young duck. The smallest white specimen near the middle of this shelf is the rare Alleghenian Least Weasel (*Putorius allegheniensis*), of which there are but few specimens in existence. This was sent to us by a correspondent in West Springfield, Erie county.

If persons would provide against weasels entering the poultry yard these small animals would be of very great value around the premises, as there is no more important enemy of rats and mice. They destroy great numbers of these obnoxious rodents, and thus help to preserve the property of man.

XXXI (Case D-2). THE RED FOX (*Vulpes pennsylvanicus*). (Plate XIII, Fig. 1).—In this case is to be seen two specimens of the Red Fox, one of which is carrying a chicken and the other is just ready to take a mouse that is looking up at him from a hole in the ground. This shows the dual nature of the economic features of the fox. It can be said that it is of very great value as a destroyer of the smaller obnoxious rodents, but, unfortunately, it also kills game birds and attacks poultry. It is an object of the chase, and is

also hunted and shot for its fur. The Red Fox is becoming rare in Pennsylvania, although in the wilder, unsettled portions, it is yet to be considered common, especially in the forest preserves.

XXXII (Case A-2). THE RED FOX CARRYING A RUFFED GROUSE. (Plate XIII, Fig. 2).—This is one of the most spirited and attractive representations of a true episode in nature that is to be seen in the entire collection, and as it is so simple as to tell its own story it needs no further description.

XXXIII (Case A-3). THE CROSS FOX (*Vulpes pennsylvanicus decussatus*) AND THE GRAY FOX (*Urocyon cinereoargenteus*). (Plate XII, Fig. 2).—On the rock at the left in this case is a specimen of the rare Cross Fox, which is dark in color and receives its common name from the dark cross on the back. This was shot in Wayne county, in March, 1904. In its mouth it carries a young opossum. It is regarded as a variety of the Red Fox, as the above scientific name shows. It is too rare to be of great economic importance in our State.

On the ground at the front of the case is a gray fox carrying in its mouth a meadow lark, and coming down the sloping ledge at the back, is another gray fox whose mouth is fringed with mice, which it is carrying to its den. This shows the true habits of the foxes, as they are known to carry many mice at a time to their young ones. While the red fox is regarded as a more northern animal, the gray fox is a southern species, which is smaller and more dog-like in habit and appearance, and finds its northern limit in Pennsylvania. It is the animal that is the chief object of sport in the fox chase, and is, also, killed for its pelt. There is no doubt of the fact that in the poultry yard and game preserve the fox is very disastrous, but in the meadows, woodlands and cultivated fields, it has its part to play in suppressing the obnoxious smaller creatures.

XXXIV (Case B-1). THE AMERICAN WILD CAT (*Lynx rufus*). (Plate XIV, Fig. 1).—This animal is variously called the Lynx, Wild Cat and Catamount. While the true Lynx, which is larger but with shorter tail, is found in the northern part of this State, it is rare. This is our native representative of the cat family (*Felidae*), and has many of the habits that are shown by the domesticated cat. It hunts mostly by night, and kill its prey on the ground as well as in trees. This is shown remarkably well in this interesting case, as the specimen at the right is represented as having just killed a rabbit for its food, while the one at the left is climbing a tree in order to capture the sleeping Jay perched on a branch above it. There have been many remarkable and absurd stories told concerning the attacks of wild cats and others of our native animals upon man, and these are mostly either entirely without foundation or greatly exaggerated. No one need fear to enter or reside in the forests of

Pennsylvania on account of ferocious beasts. These animals do not attack man, and, indeed, would be much more afraid of him than he would be of them.

XXXV (Case B-2). WILD CAT KILLING PORCUPINE. (Plate XIV, Fig. 2).—In this case is shown a remarkable occurrence true to nature, illustrating the manner in which the wild cat and fox attack the porcupine in order to obtain it as food. They rip it open on the ventral side, which is the only part of the animal that is not protected by severe spines. It is said by the foresters that the porcupine has these two important enemies, and this supposition and report is confirmed by the fact that we have found the spines of the porcupine embedded in the muscles of the head of the wild cat and of the fox. Both species of foxes are known to attack this spiny enemy of the forest trees.

XXXVI (Case B-6). ALBINO BIRDS AND MAMMALS.—This case of albinos is prepared for the purpose of showing the wide range of animals in which the freak or condition known as albinism may occur. Some of these specimens are pure white, others are cream-colored and others mottled. Among the birds here showing this unusual condition are the common crow, English sparrow, native sparrows and American robin; while among the mammals is the opossum, red squirrel, gray squirrel, rat, mouse and skunk. It is interesting to see that this pure white condition occurs in species that are normally the types of darkness or night time, such as the crow and the skunk.

#### MORE SPECIMENS WANTED.

If our friends have enjoyed seeing these few specimens and reading this publication they can imagine how much more interesting the study of Economic Zoology could be made if we had at hand a sufficient amount and variety of material to enable us to pursue the subject to its proper extent. Therefore, we append this article, inviting all persons living in or near the State of Pennsylvania to send us specimens for preservation in the State Museum for making larger and better collections of this kind and for study. We prefer them alive or freshly killed, but not opened. They should be shipped either by express or mail directly to the writer, who will immediately make an examination of their stomach contents, and see that all specimens are properly preserved and all contributions acknowledged. We especially wish to publish a Bulletin on the reptiles of Pennsylvania which will be sent free to contributors, but which can not be issued until after we receive and study reptiles from all parts of the State.

Address all communications to H. A. Surface, Economic Zoologist, Harrisburg, Pa.

PENNSYLVANIA DEPARTMENT OF AGRICULTURE.

DIVISION OF ZOOLOGY.

THE ZOOLOGICAL QUARTERLY BULLETIN.

VOL. II, No. 2.

THE ECONOMIC VALUE

OF

# OUR NATIVE BIRDS.

DISCUSSED BY ORDERS AND FAMILIES.

ORDER XI. COCCYGES, CUCKOOS, ETC.

FAMILY 17. CUCULIDÆ. THE CUCKOOS.

(To be Continued.)

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## CLASSIFICATION AND NAMES OF THE BIRDS TREATED IN THIS BULLETIN.

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## EXPLANATIONS.

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The Quarterly Bulletins and Monthly Bulletins of this Office are entirely distinct and do not belong to the same series, although the mailing list is the same for both. The former deal exclusively with Vertebrates, or the higher animals, while the Monthly series is intended to treat those subjects (chiefly enemies of vegetation or destroyers of man's property) that must be met at certain times of the year, such as are indicated in those Bulletins. Both are sent free to all who apply for them, but our mailing list is now full, and the names of applicants are kept on file until provision is made by the next Legislature to permit an increase in the number of these Bulletins above twenty-five thousand, which is now the legal limit. Copies of back numbers are kept in stock at the office of the Economic Zoologist, and will be sent free to all persons who apply for them, until each respective issue is exhausted.

The subject treated in this Bulletin is a continuation of the discussion of The Economic Value of Our Native Birds, commenced in the Zoological Quarterly Bulletin for August, 1903, and continued in the November and February issues of the same series. This subject was interrupted by the May Quarterly, which was devoted to the Economic Collection of Birds and Mammals of Pennsylvania exhibited at St. Louis.

In the August Quarterly Bulletin for 1903 was published the Analytic Key and List of Orders and Families of our Native Birds. The Orders and Families are there numbered in regular scientific arrangement, and we here continue that plan and those numbers. The next Quarterly Bulletin devoted to this subject will begin where this ends, and the subject will be treated in subsequent Bulletins until all of the Orders, Families and important species of our native birds shall have been discussed.

The relationship of classes, orders, families, genera and species should be well understood, but for this knowledge we refer readers to elementary books on classification in natural history. The specific numbers given with the respective kinds of birds agree with the Check List of the American Ornithologists' Union.

This Bulletin contains the results of our own field and laboratory researches and extracts from the best and most practical printed articles that could be found upon these subjects.

In the course of time we hope to publish Bulletins upon the Reptiles and Mammals of Pennsylvania, and we are now giving attention to the collection of specimens and notes for such future publications. Correspondence and contributions of notes and specimens are therefore invited, now and at any time in the future, in order that material may be at hand for use in future Bulletins when the time comes for them to appear. It is impossible for one man to see and learn everything that occurs in nature among the undomesticated animals of a great State like Pennsylvania, but with thousands of observers ready to co-operate with us in sending specimens and notes upon what they see, it is possible to supplement our observations and studies in such a way as to obtain many facts worthy of record, and to make these Bulletins more valuable than would be possible by any other means.

It has been suggested that the various local organizations,—granges, alliances, and schools,—can give needed help to this office, and thus to the State, by sending us desired specimens, notes, records of observations, etc.

Acting upon this suggestion, we hereby ask the Secretaries of granges, alliances, clubs, etc., to announce at their respective local meetings that we desire specimens of unusual kinds of mammals, birds, reptiles, insects, etc., as well as duplicate specimens of the more common kinds. All such material will be acknowledged at once, used in investigations and publications, and preserved in the State Museum with proper credit to the sender.

Send Pennsylvania specimens (at our expense) and notes on observations to H. A. Surface, Economic Zoologist, Harrisburg, Pa.

#### ORDER XI. COCCYGES. THE CUCKOOS, KINGFISHERS, ROAD-RUNNERS, ETC.

This Order is represented in the United States by birds belonging to three families, but only two are represented in Pennsylvania. The birds belonging to this Order are distinguished by having soft tail-feathers, the bill not strongly hooked, and the toes either two in front and two behind or the outer and middle toes united. The birds belonging to this order are mostly tropical and sub-tropical.

##### Family 17. Cuculidæ. The Cuckoos, Anis and Road-runners.

The birds of this Family agree in having the toes two in front and two behind; the bill as long as the head, compressed, with cutting edges smooth, nostrils exposed or not covered, no distinct bristles at corner or angle of mouth; tarsus nearly or quite as long as the longest front toe, and unfeathered for the greater part of its length; front toes separated to extreme base, and feathers without bright or metallic colors.

There are three Genera of this family found in North America, and to these, respectively, belong the Anis (*Crotophaga*) and Road-runners (*Geococcyx*) of Western and Southwestern United States, Mexico and southward, and the Cuckoos (*Coccyzus*), two species of which are represented in Pennsylvania's avian fauna, and with the Belted Kingfisher, are the only species of this entire Order ever found in Pennsylvania excepting as the rarest of stragglers.

Genus *Coccyzus*.—The Cuckoos, also known as Rain-crows, Rain-pigeons, Rain-birds, Kow-kows, Kow-birds, Indian Hens and Regen-kucken.

Of the Cuckoos, Dr. Coues says, "There are about two hundred current species of the family. Many of them lay their eggs in other birds' nests. The American Cuckoos have been declared free of suspicion of such domestic irregularities; but, though pretty well behaved, their record is not quite clean; they do sometimes slip into the wrong nest. The curious infelicity seems to be connected in some way with the inability of the female to complete her clutch (full number) of eggs with the rapidity and regularity usual among birds, and so incubate them in one batch. The nests of our species of *Coccyzus* commonly contain young by the time the last lot of eggs is laid."

The European Cuckoo is strictly "parasitic," always laying its eggs in the nests of other birds, and this habit has been the origin

of the general but erroneous popular belief that our American species are likewise parasitic.

Although there are seventy-five species of Cuckoos found in America they are mostly tropical, and but two species find their way as far north as Pennsylvania. These are only summer residents in our State, and while they are not rare, they are not well known by most persons, excepting by their calls, as they are among our most shy and retiring birds. Our two species are so similar in appearance, notes and habits that few persons besides trained ornithologists distinguish between the two.

They are solitary, or living in pairs, not flocking, as may other birds do. They may be heard often and seen occasionally in dense portions of thickets, groves; woods and orchards, which they prefer.

The Cuckoos, or species of the Genus *Coccyzus*, agree in the sexes in being alike in color, plain brownish gray or grayish brown above, with more or less of a faint bronzy lustre, more grayish on head, on the side of which is a darker stripe; lower parts plain whitish, buffy or yellowish; tail-feathers (except middle pair), tipped with whitish. The young are similar to the adults in color. Nest, a slight flat structure of sticks, etc., usually on small trees or lower branches of larger trees. Eggs of a greenish blue color, in general, and two to five in number.

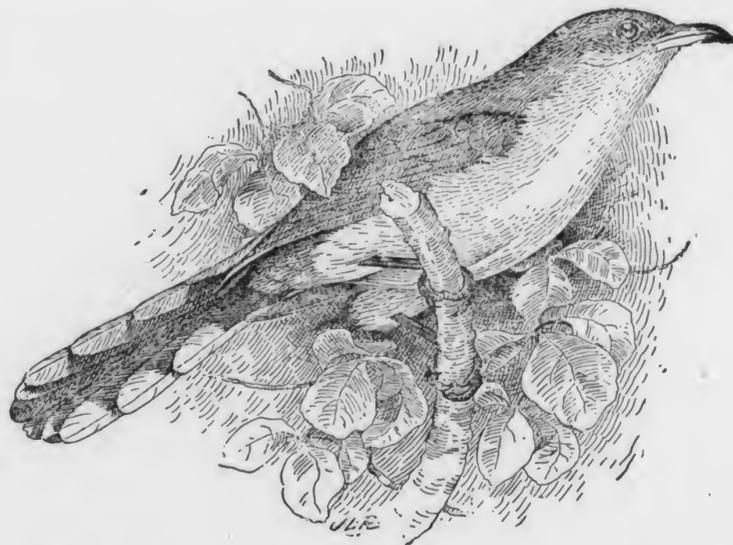


Fig. 12. Yellow-billed Cuckoo (*Coccyzus americanus*).

From Farmers' Bulletin No. 54 of U. S. Department of Agriculture, Washington, D. C. "Some Common Birds in Their Relation to Agriculture," by F. E. L. Beal, Biological Survey.

A. O. U. No. 387. The Yellow-billed Cuckoo (*Coccyzus americanus*).

To this bird, in various parts of the country, may be applied all of the common names mentioned above under the Genus *Coccyzus*,

with the additional name of "American Cuckoo," or, better, Yellow-billed Cuckoo. The latter name is given it because of the characteristic color of the lower bill or mandible, which is light yellow, excepting at the tip. The upper bill is entirely black, excepting just along its cutting edge, and thus it requires very careful and accurate observation to distinguish our two species of Cuckoos, even by looking for the characters which give them their specific common names.

The Yellow-billed Cuckoo is satiny olive gray above, with some rusty tinge, and white beneath. The wings are cinnamon red on their inner webs; tail feathers with large white spots, broadly tipped with white. Total length, 11.00 to 12.00 inches; tail, 6.50 inches; wing, 5.70 inches (from outer angle to tip); spread, or extent of wings, 15.50 inches.

It is found in North America from Florida to New Brunswick, and westward to the Great Plains, over which region it is a summer resident. It winters in Central and South America, the West Indies and Eastern Mexico. It comes to us in Pennsylvania about the first of May and remains until about the first of October. It is more common in the lower lands, and more rare in the mountainous regions of our State.

By the first of June it is building its nest, which consists of a rude platform of twigs, with a lining of a small quantity of grass, leaves, or other soft material. This is placed low (four to ten feet above the ground), but is well concealed by foliage. The nest is so flat that the wind often causes the eggs to be lost from it, and it is so loose and open that at times one may be able to see the eggs through it, from beneath. The eggs are from three to five in number, of a pale greenish blue color and 1.20 inches long by .90 inch wide. The eggs are laid at intervals of a few days, and as a result one or more fresh eggs may be found in the same nest with one or more young birds, the latter having hatched from the first eggs laid. Upon rare occasions both this species and the next will drop their eggs in the nests of other species of birds.

They utter quite a variety of notes, which it is quite impossible to express in print. The most common is their "Cawk-cawk-cawk-cawk-cawk," and a plaintive "Coo-coo-coo-coo-coo." Their notes closely resemble those of the next species (the Black-billed C.), but the voice of the Yellow-billed is harsher and stronger, and persons who are accustomed to them are able to recognize the differences without difficulty. Both of these species are much more often heard than seen.

Henry Nehrling, in "Our Native Birds of Song and Beauty," says "There is scarcely another bird which does more good than this bird. It subsists almost entirely on caterpillars, and even the large

and ugly hairy ones and those with formidable spines are eaten. Among the most important ones so destroyed are the canker-worm and the tent-caterpillar (*Clisiocampa americana*), and that of the *Vanessa antiopa*, as well as of numerous other butterflies, also grasshoppers, beetles, cicadas, small snails, etc., and different kinds of fruits as berries, mulberries, grapes and others. All of our cuckoos deserve the utmost protection. It is simply surprising how quickly a pair of these birds will exterminate the thousands of caterpillars infesting orchard and other trees in certain seasons; it makes no difference how hairy and spiny these may be, none are rejected by them, although no other birds will touch them, and the walls of their stomachs are sometimes completely pierced by the sharp stiletto-like hairs, without injury, and apparently not incommoding these birds in the least. Their benefit to the horticulturist is immense, and he has certainly no better friends among our birds."

In his Report of the Gypsy Moth Commission, referring to the birds which he found destroying the Gypsy moth, Prof. E. H. Forbush has published as follows concerning this bird and its allies:

"In a search through agricultural, entomological and ornithological literature, we find many instances on record in both hemispheres where birds have been instrumental in saving crops or forests by destroying injurious insects. Samuels (Mass.) states that in 1847, as an immense forest in Pomerania was on the brink of being utterly ruined by caterpillars, it was suddenly and very unexpectedly saved by a flock of cuckoos, who established themselves in the place for a few weeks and thoroughly cleaned each tree.

From observations made eleven species are known to be useful. In apparent order of their usefulness they are, yellow-billed cuckoo, black-billed cuckoo, Baltimore oriole, catbird, chickadee, blue jay, chipping sparrow, robin, red-eyed vireo, yellow-throated vireo and crow.

The cuckoo is the only bird that I have found mentioned in European literature as feeding commonly on the larvæ of the gypsy moth. Altum says the cuckoo is efficient especially in local ravages of the moth. Appearances indicate that the cuckoos lead the rest of the American birds in destroying the gypsy moth. Yet it must be considered that as these cuckoos are comparatively large birds, seeking by preference the larger larvæ, their feeding is readily observed. As the larvæ are usually swallowed whole by the cuckoo, their remains are readily recognized in the dissected stomach. It is difficult to identify with certainty the smaller larvæ when they are eaten by small birds. If these small birds consume the smaller larvæ in numbers equal to those of the larger ones eaten by the cuckoo, they are more beneficial, as the destruction of the larvæ

when young will prevent the injury they might do to vegetation before the cuckoo would be likely to attack them.

In 1891 yellow-billed cuckoos were observed in several of the worst infested localities, where they remained nearly all day, feeding on the gypsy larvæ or carrying them from time to time to their young. This habit of feeding on hairy larvæ seems to be quite constant with the cuckoos. They seem to prefer the gypsy larvæ even to the pupæ.

Mr. F. H. Mosher, an inspector in the employ of the Board, who observed this species in 1895, says that it will go to a bunch of pupæ and search for larvæ, pulling out the molts or casts, and will take pupæ only when larvæ are not to be found. This was noticed in different individuals of this species and in different localities. Some of the cuckoos would take no pupæ at all, but would continue their search for larvæ until they found them.

That the yellow-billed cuckoos feed their young quite constantly on these larvæ is evident from the observations made. The stomach of one young cuckoo when examined contained a number of partly digested larvæ and the heads of sixteen others. Ninety per cent. of the stomach contents consisted of these larval remains. When the young birds were able to fly, the parents would lead them to the worst infested spots and feed them frequently with caterpillars.

Mrs. C. E. Bailey, an agent of the Board and a field ornithologist of much experience, says that the yellow-billed cuckoo is very fond of the gypsy moth larvæ, sometimes eating nine or ten full-grown ones in less than a half hour. He also states that he has observed that it eats more caterpillars than the black-billed cuckoo."

Dr. Beal, in *Farmers' Bulletin No. 81*, of the United States Department of Agriculture (sent free, from Washington, D. C.), p. 6, says:

"Of the yellow-billed cuckoo, 109 stomachs (collected from May to October, inclusive) were examined. The contents consisted of 1,865 caterpillars, 93 beetles, 242 grasshoppers, 37 sawflies, 69 bugs, 6 flies, and 86 spiders. Most of the caterpillars belonged to hairy species and many of them were of large size. One stomach contained 250 American tent caterpillars; another 217 fall webworms. In places where tent caterpillars are abundant they seem to constitute a large portion of the food of these two birds. The beetles were distributed among several families, but all more or less harmful to agriculture. In the same stomach which contained the tent caterpillars were two Colorado potato beetles; in another were three goldsmith beetles and remains of several other large beetles. Besides grasshoppers were several katydids and tree crickets. The sawflies were in the larval stage, in which they resemble caterpillars so closely that they

are commonly called false caterpillars, and perhaps this likeness may be the reason the cuckoos eat them so freely. The bugs consisted of stink bugs and cicadas or dog-day harvest flies, with the single exception of one wheel bug, which was the only useful insect eaten, unless the spiders be counted as such."

A. O. U. No. 388. The Black-billed Cuckoo (*Coccyzus erythrophthalmus*).

To this bird are given, in different parts of the country, all the common names mentioned above under the Genus *Coccyzus*. It is mostly known in this State as Rain-crow and Kow-kow, although but few persons distinguish between this and the foregoing species.

The Black-billed Cuckoo may be recognized by the bluish-black color of its lower bill; no rusty brown on wings; no black in tail, and but a very narrow whitish tail tip, and red eye ring.

The full description of this species is as follows: Bill entirely black. Upper parts generally of a metallic greenish olive, ashy towards the base of the bill; beneath, pure white, with a brownish-yellow tinge on the throat. Under surface of all the tail feathers, hoary ash-gray. All, except the central on either side, suffused with darker to the short bluish-white and not well-defined tip. A naked red skin around the eye. Total length, about 12.00 inches; tail, about 6.60 inches; wing, 5.30 inches.

The Black-billed Cuckoo is more common in the lower lands of our State and along the edges of woods, thickets and brushy orchards, especially in damp regions. It is rather common from the Atlantic ocean westward to the Rocky mountains, and during the summer is found as far north as Labrador. With us it is a summer resident, arriving about the last of April and leaving about the last week of September. In its southern migrations it reaches Central and South America and the West Indies.

The nest of this bird is more compact than that of the Yellow-billed, and is also constructed with twigs, but has more lining of soft bark, root fibers, grass, leaves, etc. It is placed low in vines and bushes, and contains from two to five greenish-blue eggs, which are darker than those of the Yellow-billed, elliptical in shape, and 1.10 inches long by .85 inch wide.

The notes of the Black-billed are more connected and softer than those of the Yellow-billed Cuckoo, and may readily be distinguished by one who is accustomed to them. Nehrling (p. 435), says of this bird, "In its habits, notes, plumage, in its manner of flight and nesting, and in its food habits it is so similar to the Yellow-billed Cuckoo that it can scarcely be distinguished by the field ornithologist, unless close by. The nest is a little better built than that of the Yellow-billed Cuckoo, being constructed externally of fine twigs,

rootlets, the soft bark of the cedar, bark strips of the linden and iron-wood, and, generally, there is also a better lining which consists of plant-wool, leaf-skeletons and similar material."

Of the food of the Black-billed Cuckoo, Dr. Beal (in Farmers' Bulletin No. 54) says, "An examination of the stomachs of 46 black-billed cuckoos, taken during the summer months, showed the remains of 906 caterpillars, 44 beetles, 96 grasshoppers, 100 sawflies, 30 stinkbugs and 15 spiders. In all probability more individuals than these were represented, but their remains were too badly broken for recognition. Most of the caterpillars were hairy, and many of them belonged to a genus that lives in colonies and feeds on the leaves of trees, including the apple tree. One stomach was filled with larvæ of a caterpillar belonging to the same genus as the tent-caterpillar, while others contained that species. Other larvæ were those of large moths, for which the bird seemed to have a special fondness. The beetles were mainly click beetles and weevils, with a few May beetles. The sawflies were all found in two stomachs, one of which contained no less than 100 in the larval stage."

In discussing birds destroying the Gypsy moth, Dr. Forbush has written:

"Black-billed Cuckoo.—The black-billed cuckoo is probably nearly if not quite as useful as its congener in destroying hairy caterpillars, and appears to be almost equally as destructive to the gypsy moth larvæ. From personal observation, as well as from reports of the observations of others, I am led to believe that this bird does not feed as rapidly as the yellow-billed cuckoo, and spends more time beating the caterpillars, perhaps for the purpose of killing them, or possibly to divest them of their hairs before eating them. In the end, however, the caterpillar is swallowed whole. Like the yellow-billed cuckoo, this species feeds the caterpillars to its young. Neither species of the cuckoo is very numerous in the infested region, but both are fairly common and both are attracted by the gypsy moth to badly infested orchards or to the edges of badly infested woodland. Five cuckoos have been seen at a time in an infested tree. In some infested places they may be found at times in considerable numbers, and the number of larvæ they destroy is astonishing. They frequently take larvæ from under the burlaps."

In a Bulletin of the Massachusetts State Board of Agriculture, containing an article on "Birds as Protectors of Orchards," Prof. Forbush has published the following definite data concerning the Black-billed Cuckoo:

"On May 10 a black-billed cuckoo came into a tree near me at 3 P. M., and sat there until 4.40 P. M., then he went straight to a tent-caterpillar's nest. He looked it over for a short time and then

commenced eating the caterpillars. He picked twenty-seven caterpillars out of the nest before he stopped. The bird ate them all and did not drop one. Then he went to the tree, in which I believe he remained during the night, for on Saturday, the 11th, I found the bird in the same tree and in almost the same place at 5 A. M."

The Brewster Ornithological Club of Massachusetts has published a chart showing the following list of food of the Black-billed Cuckoo: Total percentage of animal food, 100, composed as follows: Caterpillars, 47 per cent.; beetles, 7 per cent.; bugs, 6 per cent.; grasshoppers, 30 per cent.; spiders and millipedes, 4 per cent., and some canker worms, potato beetles, tent-caterpillars, with an occasional mulberry in season. This bird has been seen to eat thirty-six caterpillars within five minutes. It is also quoted as one of the enemies of the gypsy moth, the brown-tail moth caterpillar, the American tent-caterpillar and white-marked tussock moth.

The most valuable and exhaustive study of the food of Cuckoos is published by the United States Department of Agriculture, Division of Biological Survey, Washington, D. C. From this we obtain many facts that are in support of the statements here made. Dr. Beal has published that these birds rank among our most useful species, when considered from an economic standpoint. Their habit of concealing themselves in foliage suggests, and close observation proves, that their diet consists for the most part of insects, largely caterpillars, found on trees and shrubs. This author has treated the feeding habit of our two species of Cuckoos together because they are so similar. We here give the chief features of his studies as published.

In the laboratory of the Biological Survey 109 stomachs of the Yellow-billed and 46 of the Black-billed cuckoo were examined. All were taken between May and October, inclusive, except one of the yellow-billed collected in Texas in January. These stomachs were obtained in twenty States, the District of Columbia and Canada, and were fairly distributed over the country from Louisiana and Texas to Canada, and from Massachusetts to Kansas and Nebraska. A greater number would have been desirable, but the contents of those examined were so uniform that it seems fair to infer that they give a reasonably accurate idea of the general food of the species. It has been deemed best to treat the two species together, since they prove to be very much alike in diet. The greatest difference is that the Yellow-billed Cuckoo eats more beetles (Coleoptera) and fewer bugs (Hemiptera). The seasonal variation in diet is much less than in most birds. Of the 155 stomachs of both species examined, only one contained any vegetable food, and this only two berries of the wild rough-leaved cornel (*Cornus asperifolia*). One

other stomach contained a bit of rubbish, probably taken accidentally with some insect. They have been seen to eat mulberries. These observations show that cuckoos do at times eat fruit, but the results of our investigation indicate that it is not their usual habit.

The insect food of cuckoos consists of beetles, grasshoppers, cicadas, bugs, ants, wasps, flies, caterpillars and spiders, of which grasshoppers and caterpillars constitute more than three-fourths. The great majority of the insects found in the stomachs were harmful kinds. Caterpillars, katydids and tree crickets are exactly the prey that cuckoos might be expected to secure from their peculiar method of hunting in foliage, while the large numbers of grasshoppers eaten furnish additional proof of the fact so often illustrated that birds are particularly fond of grasshoppers, and that species not naturally ground feeders become so during the grasshopper season.

It is a matter of common observation that cuckoos feed largely on caterpillars, and stomach investigations not only confirm this but show that unlike most other birds they eat freely of hairy and bristly species. Nearly half of the cuckoo's food was found to be caterpillars. An attempt was made to obtain an approximate idea of the actual number in the stomachs by counting the heads and jaws, but in many cases this was nearly impossible, as many of the insects were very young and the jaws consequently minute. The result of this estimate, however, showed that no less than 2,771 caterpillars were contained in 129 stomachs, or an average or more than 21 in each. If the whole number of stomachs (155) is considered, the average is reduced to 18, and it is absolutely certain that this is much below the actual number.

During May and June, when ten-caterpillars are defoliating the fruit trees, these insects constitute half of the cuckoo's food. When cuckoos visit the nests of the tent-caterpillars they apparently eat as many of the occupants as possible. Most of the stomachs that contained the larvæ at all were filled with them, some having more than 100 individuals. Mr. Otto Lugger, formerly of the Department of Agriculture, examined one stomach which was so full that he concluded that the bird had devoured the whole colony, as there were several hundreds of these hairy caterpillars.

Perhaps the most curious insects found in the cuckoo stomachs were the larvæ of the Io moth. These caterpillars are thickly covered along the back and sides with spines growing from tubercles, which are not only very sharp but poisonous, and sting the hand quite severely when carelessly touched. Nevertheless, they were found in five stomachs, one of which contained seven, another three, and the others one each.

It is noticeable that the larvæ of moths, particularly hawk-moths (*Sphingidæ*), are eaten much oftener than those of butterflies. Whether this comes from preference and selection on the part of the bird or from the greater abundance and more conspicuous habits of the insects still remains to be determined. As to the kinds of caterpillars eaten, it may be said that the hairy and spiny species far outnumber the smooth, but this may be due either to the greater abundance of the hairy ones or to the bird's preference.

This diet of hairy caterpillars has a curious effect upon the birds' stomachs. A cuckoo's stomach, unlike that of seed-eating species, has only a thin muscular coat on the outside, and the usual smooth lining is almost entirely devoid of rugæ or folds so characteristic of the stomachs of many birds. This inner layer is almost always found pierced by at least a few caterpillar hairs; often by so many as to be completely furred and the membrane itself almost entirely concealed. Incidentally this hairy lining affords an excellent means of determining the motion of the food during digestion. If a stomach be divided in the plane of its two greater diameters the hairs on each half will be found brushed around a center like the nap on the top of a silk hat, indicating that the whole mass of food revolves in this plane. It may also be noticed that the skins of caterpillars taken from the stomachs of birds are always twisted like a cord or rope, and often require considerable untwisting before their characters can be determined.

In a review of the food of cuckoos the most striking point is the great number of caterpillars or lepidopterous larvæ which enter into the year's diet. These insects are crude feeders, eating immense quantities of vegetable tissue, and are usually so distended with it that the amount of real nutrition in any one of them must be small. In fact, stomachs of birds that have eaten largely of caterpillars always show a quantity of this finely cut vegetable matter derived from the insects' stomachs. As digestion in birds is rapid it would seem necessary to fill the stomachs several times a day with such quickly digested and slightly nutritious food as this, while the number of caterpillars found in a stomach at any one time probably represents but a small portion of the actual daily consumption. From these considerations it appears that cuckoos must eat an enormous number of larvæ in the course of a season. If the contents of all the stomachs examined are regarded as so many daily meals of the same bird, then the result indicates that the bird has eaten 2,771 caterpillars in 155 consecutive days, at the rate of only one meal each day, and some days not eating any. Now, 155 days is about the length of time that cuckoos remain in their summer range; moreover, as indicated above, one cuckoo must eat several

meals a day, so this number (2,771) probably falls far short of the actual number of caterpillars devoured by each cuckoo during the season.

In view of such considerations it seems hardly possible to overestimate the value of the cuckoo's work. All caterpillars are harmful, many of them are pests, and any of them are likely to become so. The common tent-caterpillar formerly fed upon the wild cherry, but has now turned its attention principally to apple trees, sometimes completely defoliating them. What this caterpillar has done, many

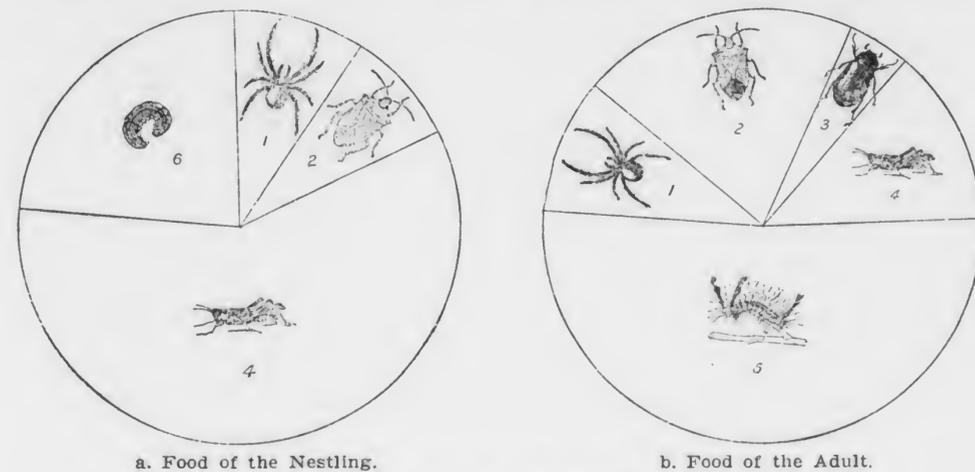


Fig. 13. The Food of Cuckoos.

(a) The Nestling and (b) the Adult or Winged Bird.

(1. Spider; 2. Stink-bug; 3. May-beetle; 4. Grasshopper; 5. Caterpillar; 6. Cutworm.)

[The diagrams show the proportions of the various orders of insects in the food, each order being represented by the insect belonging to it that is most commonly eaten by the bird whose food is shown. (In the case of the Hymenoptera a division is sometimes made between the parasitic members of the order, which are very useful, and those that are neutral or injurious. The figures of insects are reduced from cuts kindly loaned by Dr. L. O. Howard.)]—Dr. Judd in the Yearbook of the United States Department of Agriculture for 1900.

others may do. In the cuckoos we probably have one of nature's most efficient checks on the increase of these harmful species. It is said that hairy caterpillars are protected by their coats from the attacks of the ichneumon flies; if this be true, the work of the cuckoos in destroying the hairy species is complementary to that of the ichneumons, which help to destroy the smooth-coated caterpillars. Considering the number of grasshoppers, locusts and other insects that cuckoos eat in addition to caterpillars, it is evident that from an economic point of view these birds are two of our most valuable species, and as they have not been convicted of doing any harm, they should be protected and encouraged in every possible way.

Besides insects proper, a number of spiders were found in the stomachs examined, most of them the long-legged kinds commonly known as 'daddy longlegs' or harvestmen (*Phalangidæ*). One stom-

ach contained seven, the mass of tangled less looking like a bunch of coarse hair. When we consider the disgusting odor of these spiders, their long legs, and the fact that their bodies have the texture of sand-paper, we are again forcibly reminded that tastes differ. But the most remarkable thing which the cuckoos had eaten was a small tree frog (*Hyla*) which had been swallowed whole!

In view of Audubon's accusation that the Yellow-billed Cuckoo sucks the eggs of other birds, it may be said that eggshells were found in several stomachs taken in July and August, but only in very small quantities—no more than found in the stomachs of nearly every species that has been examined. It is probable that these were merely empty shells eaten for the sake of the lime they contained. It may be added that one stomach disclosed a snail shell, which was probably taken for the same purpose. A number of stomachs contained each from one to three bits of gravel, but why the stones were swallowed was not apparent. Cuckoos do not eat hard seeds, and even if they did their stomachs are not muscular enough to act as a mill for grinding, as are those of gallinaceous and fringilline birds.

(To be continued in November Quarterly.)

PENNSYLVANIA DEPARTMENT OF AGRICULTURE.

DIVISION OF ZOOLOGY.

## THE ZOOLOGICAL QUARTERLY BULLETIN.

VOL. II, No. 3.

THE ECONOMIC VALUE

OF

# OUR NATIVE BIRDS.

DISCUSSED BY ORDERS AND FAMILIES.

- ORDER XI. COCCYGES, CUCKOOS, ETC.  
 FAMILY 17. CUCULIDÆ. THE CUCKOOS. (Concluded).  
 FAMILY 18. ALCEDINIDÆ. THE KINGFISHERS.  
 ORDER XII. PICI. THE WOODPECKERS, ETC.  
 FAMILY 19. PICIDÆ. WOODPECKERS.

(To be continued.)

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By H. A. SURFACE, M. S., ECONOMIC ZOOLOGIST.

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### KINDS OF INSECTS EATEN BY THE CUCKOOS.

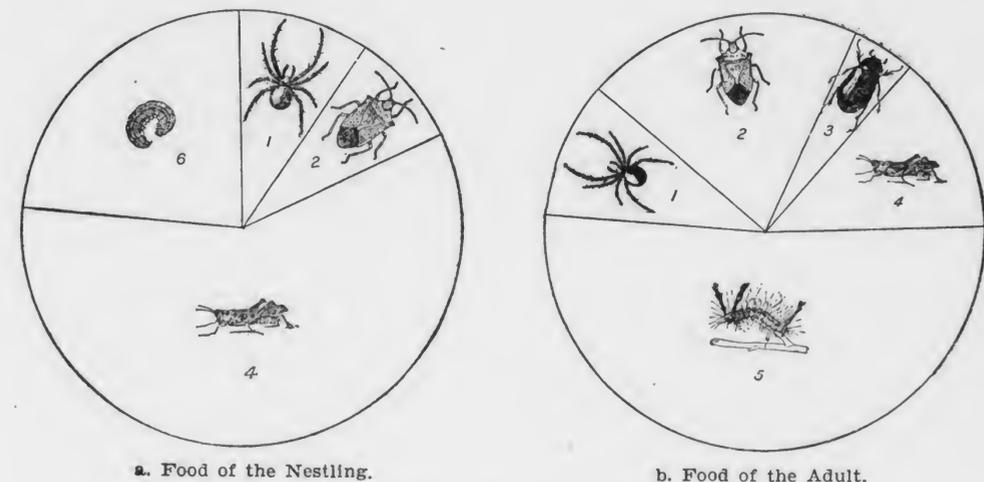


Fig. 13. The Food of Cuckoos.

(a) The Nestling and (b) the Adult or Mature Bird.

(1. Spider; 2. Stink-bug; 3. May-beetle; 4. Grasshopper; 5. Caterpillar; 6. Cutworm.)

[The diagrams show the proportions of the various orders of insects in the food, each order being represented by the insect belonging to it that is most commonly eaten by the bird whose food is shown. The figures of insects are reduced from cuts kindly loaned by Dr. L. O. Howard.]  
—Dr. Judd in the Yearbook of the United States Department of Agriculture for 1900.

It is not enough to say that any particular bird eats insects. We should not stamp any insectivorous creature as being either beneficial or obnoxious unless we know the kinds of insects that it destroys. A careful classification of insects known to be eaten by the Cuckoos has been made (mostly by the United States Department of Agriculture), and the importance of these birds and their food justifies a discussion of the subject.

#### Beetles. (Fig. 13, No. 3.)

The beetles found in the stomachs of Cuckoos belong to several families, no one of which forms a large percentage of the total food. In one stomach 17 per cent. of the food contained was also beetles, belonging to five different families. In May beetles constitute 14 per cent. of the food of these birds as studied, but later in the season their proportion decreased, and after July practically disappeared. The useful ground beetles and caterpillar hunters are

rarely eaten, which is easily explained by the fact that they live on the ground, while the Cuckoos feed chiefly in the trees. One specimen, however, was found which had eaten one of the largest and most predaceous of the ground beetles of the kind which emits a very obnoxious odor (*Calosoma*). This was the most beneficial insect that has been found eaten by these birds. The leaf-eating beetles were naturally found more numerous than those of other groups. Two stomachs contained each two specimens of the Colorado potato beetle. Snapping beetles, which are the adults of wire worms, the short-horned wood borers, of which the flat-headed apple-tree borer is a type, the long-horned wood borers (to which the round-head apple-tree borer belongs), the Darkling beetles (of which the meal worm is a representative), the fire flies and the snout beetles all have been found represented in the stomach contents of the Cuckoos studied. Altogether beetles constituted a little more than 6 per cent. of the food of the birds for a year.

#### True Bugs, or the Order Hemiptera. (Fig. 13, No. 2.)

This order of sucking insects was found represented in the stomachs of Cuckoos by the cicadas or locusts, pentatomids or stink-bugs, and a few other species. A list of the True Bugs eaten includes cicadas or dog-day harvest flies, also called locusts, which seem to be a favorite food article, of which no less than five were found in one stomach and four in another. Members of the stink-bug family were found in quite a number of stomachs, but not in large quantities in any. A few assassin bugs, which are very predaceous on other insects, were also found. No True Bugs were contained in the stomachs collected during January, which, of course, were in the Southern States, but in May they amounted to 12 per cent. of the food eaten, and were not found to vary much until after August, when they began to disappear. During the total year Bugs (Hemiptera) amounted to 6 per cent. of food of these birds.

#### Orthoptera, or Grasshoppers, Katydid and Crickets. (Fig. 13, No. 4.)

The insects of this order that were eaten by the Cuckoos consisted commonly of grasshoppers, katydids and tree-crickets. All of these are injurious. The Snowy tree-cricket is the insect that often punctures the canes of raspberry and other plants, and does considerable damage by laying its eggs in such places in the fall of the year. This insect would seem naturally to fall in the way of Cuckoos, as it lives during its entire life in trees and bushes, feeding upon the foliage, and a study of the stomachs of the birds

shows that the Snowy tree cricket is often eaten. The common grasshoppers are evidently favorites, as they are eaten by so many birds. Several stomachs each contained from ten to twenty of these insects—a good meal for so small a bird.

Katydid and their eggs were found in many stomachs, and often several specimens had been eaten by one bird. This is to be expected, since the katydids pass their entire life in the trees and bushes, laying their eggs upon the twigs or leaves. Insects belonging to the Order Orthoptera were found in 86 of the 155 stomachs examined, and constitute about 30 per cent. of the food of these birds for the entire year. Beginning with about 3 per cent. in May, they increase to over 43 per cent. in July, and do not fall much below this point during the remainder of the year.

#### Caterpillars.

Of the entire amount of food for the year, 48 5-10 per cent., or nearly one-half, consists of caterpillars, which were found in 129 of the 155 stomachs examined. This means that 83 per cent. of the Cuckoos had recently eaten caterpillars at the time they were killed. In January (in the south), caterpillars constituted about 15 per cent., and in May the percentage rose to 60. In July and August they were reduced a little to make room for the grasshoppers, and in September they reached the maximum of 75 per cent.

One of the most important and conspicuous caterpillars eaten was the common tent-caterpillar, which makes a large, showy silken tent in fruit and wild cherry trees. This was found in seventeen stomachs, with fragments in several others. When it is considered that this species of caterpillar can be obtained only during May and June, and that only fifty stomachs were collected in these months, it will be seen that more than one-third of the birds that could get these insects had eaten them. Although the remains in many of the stomachs could not be identified with certainty, there is no reasonable doubt that tent-caterpillars constitute at least one-half of the food of the Cuckoos during the time of the year when they are to be found.

The writer dissected a Yellow-billed Cuckoo that had been killed at Cornell University by flying against a wire, and in its stomach found fifty-two large-sized specimens of tent-caterpillars. The hairs from the body of these larvæ were found lining the interior of the stomach in the manner that is described elsewhere.

Another caterpillar that is also very destructive and conspicuous is frequently found eaten by the Cuckoo. This is the destructive fall webworm. In one stomach alone 217 heads of this insects were

counted and fragments of others indicated that 250 would be nearer the correct number. The larvæ of the white-marked tussock moth, which are so destructive to shade trees in parks and city streets, are also frequently eaten. One stomach contained the remains of a number of army worms, but as these caterpillars feed upon grass and other plants that grow in the open, they are not naturally found in numbers upon trees. It is probable that the army worm would be more extensively eaten if the fields infested with them were in the immediate vicinity of the woods. Besides eating caterpillars of ordinary size, Cuckoos often indulge in a meal of the larvæ of larger moths and hawk moths, also called humming bird moths, of which the tobacco worm and tomato worm are examples. In fact, these Sphingid larvæ appear to be favorites, and make up a large proportion of the hairless caterpillars eaten. In the stomachs of these birds have been found giant silk worms and larvæ of the royal moth as large as a man's finger.

Only three butterfly larvæ were identified. While the Cuckoos eat many larvæ of moths and butterflies, the remains of the adult insects were found only once. This shows that these birds rank among the most valuable for destroying all so-called worms that feed upon vegetation, and that they are peculiar chiefly from the fact that they feed most on hairy caterpillars.

#### Other Insects.

A little more than 5 per cent. of the food of Cuckoos is made up of insects belonging to other orders than those above mentioned. Among these are the flies, saw flies and other Hymenopterous insects. Tipulids, or crane flies, which are often abundant in the larval state feeding upon the roots of plants, constitute a great part of the flies that are eaten. They were found in a great many stomachs, but not in great numbers in any one. The larvæ of saw flies, which are worm-like insects represented by currant worms and so closely resembling caterpillars that they are called "false caterpillars," were also eaten in considerable numbers. One bird had eaten over sixty larvæ of saw flies. Ants were frequently found, and these were probably taken when they were running over the branches and leaves of the trees in search of plant lice or scale insects, which give out the sweet juices ("honey dews") which attract them. A few dragon flies, or "snake feeders," also called "snake doctors," were also found eaten, but not enough to be of importance. The Cuckoos examined had also devoured a few spiders, mostly "daddy long-legs," or harvestmen.

Concerning the food of Cuckoos, "Neltje Blanchan" has written, in "How to Attract the Birds," as follows:

"Slim, large cuckoos glide among the leafy branches and count themselves lucky to enter a neighborhood infested by large caterpillars. The sudden appearance of a new insect pest often attracts numbers of birds not commonly seen in the neighborhood. If dead or mutilated larvæ of tent-caterpillars are seen near the torn tent it was probably opened by an oriole, for the cuckoo does his work more thoroughly, leaving no remains. The Black-billed Cuckoo has been an invaluable ally of the farmers in their herculean task of destroying the gypsy moth, an alarming pest which, although only recently introduced from Europe, has already laid waste large sections of New England. The stomach of a single Yellow-billed Cuckoo examined contained 217 fall webworms! Hairs have been considered a means of protection by many caterpillars. Most birds will not touch the hairy kind, but cuckoos are not so fastidious. The walls of their stomachs are sometimes as closely coated with hairs as a gentleman's beaver hat."

In a discussion of the food of nestling birds in the Year Book of the United States Department of Agriculture for 1900, Dr. Judd has published that cuckoos are exclusively insectivorous, and "they probably do more to protect foliage than any other birds, and should be rigorously protected by the horticulturist, for they subsist largely on hairy caterpillars and other larvæ which defoliate the orchard. They also eat beetles. The food of the young, as indicated by a laboratory examination of eight nestlings of the Black-billed Cuckoo (*Coccyzus erythrophthalmus*), differs from that of the adults in that beetles and hairy caterpillars are absent, being replaced by grasshoppers and smooth caterpillars. Three times as many long-horned and short-horned grasshoppers were eaten by these nestlings as by five adults that were collected during the breeding season."

In the Year Book of the United States Department of Agriculture, for 1900, Prof. Forbush has published some important statements concerning the food habits of the Cuckoos. He says:

"Probably no group of insects contains a greater number of orchard pests than the order Lepidoptera, which comprises butterflies and moths, with their larvæ, or caterpillars. Tent-caterpillars, canker worms, fall webworms, tussock moths, codling moths, and a host of others are among the worst enemies of the fruit grower. It is, therefore, fortunate that there are in the United States two birds that subsist, to a great extent, upon caterpillars, apparently preferring them to any other food. These are the cuckoos, the yellow-billed (*Coccyzus americanus*) and the black-billed (*C. erythrophthalmus*). For years it has been a matter of common observation that these birds feed largely on caterpillars, but until a number of

stomachs had been examined, it was not known how great a proportion of their food is made up of these harmful insects. The examinations indicated that caterpillars of various species, including some of the most destructive, constitute more than 48 per cent. of their food. One stomach contained at least 250 tent-caterpillars, probably a whole colony, in the young stage. In another 217 heads of the fall webworm (*Hyphantria cunea*) were counted, and this probably fell far short of the real number, as these larvæ are very small, and in many instances nothing but jaws remained undigested. In the stomachs of 155 cuckoos taken in various parts of the country were found 2,771 caterpillars of various species, or an average of 18 to each stomach. When we consider that a caterpillar is so soft and easily digested that soon after being swallowed it has entirely passed from the stomach, it is evident that in one day far more than this number (18) must have been eaten by the average bird. Many caterpillars are protected from the attacks of birds and parasitic insects by a covering of hair, and hairy caterpillars are only rarely eaten by most birds. Cuckoos, however, seem to prefer them to the smooth kind, and apparently eat them whenever they can be found. Caterpillar hairs are often stiff, bristly, and sharp at the end, like minute thorns, and it frequently happens that when a cuckoo's stomach is opened and emptied it is found to be completely furred on the inside by hairs which have pierced the inner lining and become fast. Cuckoos eat many noxious insects besides caterpillars, such as beetles, bugs and grasshoppers. Unfortunately, they are naturally rather shy birds, preferring the edges of woodland and groves to the more open cultivated grounds and orchards. If, however, they are unmolested, they soon gain confidence and in many cases frequent shade trees about houses and lawns, or even in the very heart of the city."

One of the first standard writers in ornithology was Alexander Wilson. In his classical "American Ornithology," he says, "Both parents unite in finding food for their young. This consists, for the most part, of caterpillars, particularly such as infest apple trees. They are accused, with some justice, of sucking the eggs of other birds, like the crow, the blue jay and other pillagers. They also occasionally eat various kinds of berries, but from the circumstance of destroying such numbers of noxious larvæ, they prove themselves friends of the farmer and are highly deserving of their protection."

It is remarkable that after all this array of evidence in favor of these birds, which are really not rare, although not commonly known, we should be compelled to say that they are persecuted, shot and stoned at almost every opportunity. Perhaps one reason for



Plate XV. Kingfisher (*Ceryle alcyon*). Almost half natural size. Photographed by H. A. Surface, Economic Zoologist.

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Plate XV. Kingfisher (*Ceryle alcyon*). Almost half natural size. Photographed by H. A. Surface, Economic Zoologist.

this is the superstitions with which they are regarded. They are called Rain Crows because their call is more frequently heard before rain fall, but this should not be taken as any evidence of their producing the rain. Unfortunately, many persons in the country believe that these birds call up rain. We have seen them stoned and shot, and their nests robbed, and we know of one definite case, when the obnoxious bounty law was in force, in which the bounty of fifty cents was paid by an officer for the head of a cuckoo under the supposition that it was the head of a hawk. The money was paid without question as to the identity of the bird.

#### Enemies.

While Cuckoos have very few natural enemies, we know of their having been captured and eaten by pigeon hawks, and because they frequent the lower branches of trees, they are sometimes caught by cats, and their eggs are eaten by snakes, particularly by black-snakes and blue racers and also by red squirrels.

#### How to Aid Cuckoos.

To induce these birds to live about the premises it is desirable to plant a few evergreens, such as pine, spruce and cedar in which they will find concealment and protection which they demand. Also permit a corner to grow up as a clump of vines and bushes. It is very desirable to plant a few grape vines and also mulberry trees near the premises. The birds feed occasionally upon mulberries, and seem to take a special delight in living in vine-covered trees because of the protection that is given them by the extra dense foliage. They are very careful in selecting their nests, and it is important that in springtime, when they are looking for nesting sites, cats should be kept away from the localities where these birds are desired. Of the Cuckoo, Minot has written in the "Land and Game Birds of New England," "They feed particularly upon berries and also they feed upon fresh water fish and aquatic larvæ, but they are chiefly insectivorous. They undoubtedly confer great benefits upon agriculturists, and are our principal birds to attack and devour caterpillars in mass."

#### FAMILY 18. ALCEDINIDÆ. THE KINGFISHERS.

The birds of this family agree in having the head large, bill long, straight and strong, usually longer than head, wings long, tail short, legs quite small and short, the outer and middle toes united half the length and the tibia or shank of the leg unfeathered below. They also have twelve tail feathers, not stiff-pointed. There are about 180 species or different kinds of Kingfishers known, most of



Plate XVI. Pileated Woodpeckers (*Ceophleus pileatus*), on a pine tree, to the heart of which they have chiseled for boring-beetle larvæ. This shows the rectangular hole made when working for grubs. Photographed in a Centre county forest by H. A. Surface, Economic Zoologist.

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them being found in the Malay Archipelago; eight are known in tropical and subtropical America and one in the United States. They are remarkable for their brilliant or striking colors, and all are carnivorous, many feeding upon fishes.

A. O. U. No. 390. **The Belted Kingfisher** (*Ceryle alcyon*).  
(Plate XV.)

The Belted Kingfisher, commonly known as Kingfisher (sometimes called simply Fisher), may be known by its large pointed bill, large head, ashy blue color above, whitish colors beneath crossed by a bluish band, and black tail speckled and barred with white. The female is readily distinguished by the chestnut or rusty bands across the breast and at the sides. It is thirteen inches long, with wing six inches from the angle to the tip, and tail three and one-half inches in length.

In summer this bird is found in North America from Florida to Labrador and westward, and is common along streams wherever small fishes abound. It is one of the common summer residents of Pennsylvania, and is often seen around mill ponds and along the larger streams. It prefers localities where the streams are bordered by trees in which it can perch when watching for its food, and those which have steep or vertical banks of sand or earth suitable for its nesting sites.

After having passed the winter from Maryland to Panama and South America, it comes north about the first of April and remains with us until about the last week of November or until the streams are covered with ice. It sometimes remains in this State during the winter, especially near springs that are inhabited with small fish, where the ice does not form and during mild winters.

This is one of the most picturesque birds of our landscape, when it is seen sitting upon a projecting branch over the water, turning its head first to one side and then to the other. One can know by this that it is watching for its food, which consists chiefly of small fishes. When it locates a fish near enough the surface of the water to be taken, it makes a curved descent and strikes the water with such force as to become submerged. It rarely misses its prey, and at once reappears to take wing with the fish in its mouth, and flies to its perch to devour its prize or carries it as food to its young.

The marks made in fishes by the Kingfishers are peculiar. They have the appearance of holes made by gigs or spears, but are not so deep. It sometimes occurs that this bird and the Herons in striking their prey hit them but do not capture them. The result of the injury may or may not be fatal. If the fish recover, the injured spot will be forever marked by an irregularity of the scales, which, instead of lying in rows at this place, will be arranged in

the form of a rosette. It is not infrequent that fishes bearing these tell-tale scars are captured.

The accuracy of the Kingfisher in taking its prey is remarkable. The Hon. A. N. Cheney, late Fish Commissioner of the State of New York, told the writer that he had seen one of these birds make eleven dives for black bass, and only once in that time did it fail to bring up its fish.

The Kingfisher feeds upon any kind of fish that is small enough for it to take, but seems to prefer those species that are not protected by sharp dorsal spines, as are the sunfish, black bass and perch. That large family of fishes commonly known as Minnows contains dozens of species in our State which do not grow to a size too large to be taken by the Kingfisher. This is the family of fishes which furnishes most of the food for the small fish-eating birds, reptiles and fishes. Suckers are frequently eaten by these birds; and since the sucker is one of the chief enemies of the spawn or eggs of trout and other desirable fishes, the results of the Kingfisher are beneficial in this regard. It does not catch many trout in streams, and only where such fish are confined in open shallow ponds, as at hatcheries, is this beautiful bird to be considered an evil. It also eats crayfish, dragon flies, and perhaps other aquatic insects.

Concerning the food of the young Kingfisher, Dr. Judd writes as follows in the Year Book of the Department of Agriculture for 1900:

"Kingfishers are piscivorous, but not entirely so, for they occasionally eat frogs and mice. In like manner fish constitute the principal food of the young, though sometimes other food is taken. The stomachs of five half-grown nestlings and five adults examined in the laboratory contained only fish; but those of two nearly fledged birds examined by Mr. R. Hayward, a correspondent of the Department of Agriculture, contained, besides fish, beetles of three kinds, ground beetles, water beetles and few little dung beetles (Aphodius)."

One of the attractive sights in springtime is a lone Kingfisher flying up or down a stream uttering his harsh rattling cry, which has been described as resembling the sound of a policeman's rattle. It follows the course of the stream, and has favorite perches upon which to alight. Upon these it may remain motionless for hours or until it sights its prey or is frightened away by an intruder, when it leaves the perch, uttering its startling, rattling call.

This bird may at times nest in hollow trees, but it generally burrows in banks along the streams, making holes from four to six feet in length, at the depth of which a space is especially enlarged for the nest. When newly-made the nest is not given any lining, such as is to be found later. The white eggs, from six to eight in

number, are placed upon the sand. In the course of time this nest becomes lined with fish bones and scales, which are ejected by the parents and young. As the nest is used again year after year, it happens that each year the eggs are laid upon the lining of bones and scales from the victims of former years.

It was formerly thought that Kingfishers glued together a mass of bones, thus making a raft upon which their eggs were laid, and that the incubating bird floated about upon the water on this raft until the eggs were hatched and the fledgelings could take wing. Dame Nature was supposed to be especially kind to these birds at this time, during the seven days preceding and seven days following the shortest day of the year. The weather was consequently supposed to be continuously calm for the preservation of the Alecyon or Kingfisher from extermination by severe winds. Hence, the bird was regarded as a harbinger or producer of calm weather, and the term "Halcyon Days" is a figure of speech referring to a period of calmness. Thus, also, originated the superstition that the head, feathers and other parts of Kingfisher can be used as a charm against certain dangers, especially tempests.

The enemies of this bird are chiefly sportsmen who desire to try their skill upon all winged creatures, and snakes and weasels, which go into their holes to devour their eggs or young. Although these birds are not directly beneficial to man, they are certainly so attractive and picturesque in every area of aquatic scenery where they are found and their real injury to the interests of man is so slight that they should be protected instead of destroyed. Of course, it may occur that at a favorite fish pond, and especially at hatcheries of fish commissions, where choice fish are exposed in shallow ponds without proper places for concealment, Kingfishers may form the habit of continually feeding upon the inmates of ponds or hatcheries. This should be treated as other cases where birds injure property, and the individual should be dealt with according to its deserts. Where it is necessary to reduce the number of Kingfishers on account of their excessive raids upon choice fishes, it is possible to do so by placing steel traps upon poles in or near the water.

Ord says of this bird: "Like the love-lorn swains of whom poets tell us, he delights in murmuring streams and falling waters; not however merely that they may soothe his ear, but for a gratification somewhat more substantial. Amidst the roar of the cataract, or over the foam of a torrent, he sits perched upon an over-hanging bough, glancing his piercing eye in every direction below for his scaly prey, which with a sudden circular plunge he sweeps from their native element, and swallows in an instant. His voice, which is not unlike the sound produced by the twirling of a watchman's

rattle, is naturally loud, harsh and sudden; but it is softened by the sound of the brawling streams and cascades about which he generally rambles. Mill-dams are particularly visited by this feathered fisher; and the sound of his pipe is as well known to the miller as the rattling of his own hopper."

## ORDER XII. PICI. WOODPECKERS AND THEIR ALLIES.

This order of birds is composed of the Woodpeckers and their related families which are not represented in this State. It contains 350 known species in the world, about one-half of which are American, 75 North American, and about 9 found in Pennsylvania. All birds belonging to this order have toes arranged two in front and two behind, excepting one genus, in which one hind toe is missing. This particular arrangement of the toes of Woodpeckers is brought about by the reversal or turning back of the outer toe. The one which would correspond with the outer front toe thus becoming the additional hind toe, and by this means incurring a firmer clasp in climbing and clinging to the trunks of trees than could be had with three toes in front and only one behind. The beak is straight, hard, strong, and chisel-shaped at the tip.

### FAMILY 19. PICIDAE. THE WOODPECKERS.

The birds of this family are distinguished by the characters of the order given above, together with the twelve stiff-pointed tail feathers upon which the birds rest as upon a third leg. The tongue is long, barged, pointed and pliable, capable of being extended for a great distance, and the bill is especially fitted for cutting into wood. They live in trees and are insectivorous. They are generally solitary in their habits, or at best live alone in pairs, excepting during the time of migration, when they often move slowly through the woods, in scattered flocks, flitting from tree to tree and searching for food, sometimes with several species of birds in the same flock. We have thus seen the Downy Woodpecker, Hairy Woodpecker, Chickadee, Tufted Titmouse, Brown Creeper and White-bellied and Red-bellied Nuthatches moving together as a scattered body through some of the larger woods of the central portion of this State, keeping up a constant calling back and forth, as if thus holding back the most advanced members and also bringing up the rear and stragglers, while passing slowly from tree to tree in search of food, and at the same time migrating slowly but steadily southward.

The Woodpeckers feed upon the insects to be found by searching the trunks of trees, the Nuthatches upon the larger branches, the Titmice upon the smaller branches and the Chickadees upon the tips of the twigs. The number of insects which are injurious to forest trees thus taken in a day by a scattered flock of such birds, feeding slowly through the woods upon their migrating tour, is fairly incredible.

The flight of the Woodpeckers is undulating, with a dipping (up and down) motion, which is characteristic, and one who is accustomed to it may know these birds by their peculiar flight, even though seen at a great distance.

They are adapted to the life of climbers by their short legs, strong toes, sharp claws, toes arranged two in front and two behind, their stiff tail feathers upon which they rest, etc. In fact, they are excellent creepers, climbers and perchers, and the very best of natural carpenters. The strong bill is used like a chisel both for cutting and boring holes into hard or soft wood to obtain the insects upon which they feed, and they also dig holes into trees in which they nest. Their call note may be a quick sharp or rattling call, or continued notes, and also a series of taps rattled off with incredible speed and vigor as they pound with the bill upon some hard resonant branch or stump.

Not only are the call notes of the different species readily distinguished by one who is accustomed to them, but the sounds of their tappings are likewise characteristic. On this subject, Mr. Wm. Brewster writes: "Thus, *P. pubescens* (the Downy Woodpecker) has a long, unbroken roll; *P. villosus* (the Hairy Woodpecker), a shorter and louder one, with a greater interval between each stroke; while *S. varius* (the Yellow-bellied Sapsucker), commencing with a short roll, ends very emphatically with five or six distinct disconnected taps. In this latter species I am convinced it is literally a call of recognition, as I have repeatedly seen the bird, after producing it, listen a moment, when it would be answered from a distance, and its mate would shortly appear and join it." (Ann. Lyc. Nat. Hist., xi, 1875, p. 144.)

The shape of the holes made by the Woodpeckers depends upon the use to which they are to be put. The hole made merely for obtaining larvæ has the sides straight and is shaped like a pyramid with the point toward the centre of the tree or branch where the larvæ are located. (See Plate XVI). We have seen and photographed holes showing this shape, five inches deep, made by the Pileated Woodpecker. Those holes that are made for nesting purposes are circular or oval. They are drilled into the tree horizontally for a distance and then turned downward; although in the western plains

where trees are not to be found, Woodpeckers nest in banks, as do Kingfishers here. They all nest in trees or poles, on posts in this State. They generally prefer dead wood and soft timber in which to make their nests, although they sometimes use quite solid wood. Some species such as the Red-headed and the Downy Woodpeckers are learning to nest in telegraph and telephone poles, and it is not unusual to see them utilizing such places for this purpose. The nests are excavated to a depth varying from a few inches to two feet, and are not lined with any material excepting some of the small pieces left from the excavation. The eggs are pure white and generally elliptical in shape.

Nearly all species of Woodpeckers are so cunning that in excavating holes for nests they carry the chips thus made far away from the trees in which they are working. This avoids the possibility of detection by the presence of a pile of fresh fragments beneath their burrows. However, in making holes for insects for food they do not take such precaution, and drop the chips carelessly about themselves. The Flicker has a peculiar method of avoiding the labor of flight in carrying away chips. It will bring a mouth full of these fragments up to the entrance of the hole and by a sidewise fling of the head spread them fan-shaped in a broad radius on the wind and before they reach the ground they are so scattered as to be practically imperceptible.

As a rule the sexes of woodpeckers differ but little. The male may have more red spots on his head than has the female. The young are similar to the female in color, as with most species of birds.

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#### ANALYTIC KEY FOR DETERMINATION OF THE SPECIES OF PENNSYLVANIAN WOODPECKERS.

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(Reconstructed from Chapman's Key in "Birds of Eastern North America.")

- I. No red on head or nape.
  - A. Under parts white, without black spots or streaks.
    - a. Wing less than 4 in. long; outer tail feathers white barred with black.
      - 394. Downy Woodpecker, Female.
    - aa. Wing over 4 in. long; outer tail-feathers white, without black bars.
      - 393. Hairy Woodpecker, Female.

AA. Under parts with black spots, bars, or streaks.

b. Outer tail-feathers black, generally with a narrow white margin; rump white.

395. Red-headed Woodpecker, Female.

bb. Outer tail-feathers black and white, a large black patch on the breast.

402. Yellow-bellied Sapsucker, Female.

II. With red somewhere on the head.

1. Red confined to a red band across the nape, or a red crest on the back of the head, or small patches of red on either side of the nape. Crown always black or gray.

A. Larger than the Robin.

a. Under parts black, wing over 8.00 inches long.

405. Pileated Woodpecker, Female.

aa. Under parts more or less spotted or streaked with black.

A black patch on the breast; throat brown; rump white.

412. Flicker, both Male and Female.

AA. Smaller than Robin; under parts white or whitish, without black streaks or spots.

a. Outer tail-feathers barred with black.

394. Downy Woodpecker, Male.

b. Outer tail-feathers white, without any black.

393. Hairy Woodpecker, Male.

2. Whole top of head red.

BB. Throat red.

a. Primaries spotted with white, belly yellowish.

402. Yellow-bellied Sapsucker, Male.

b. Primaries black, rump and belly white.

406. Red-headed Woodpecker, Male.

BB. Throat white.

a. Breast and belly black.

405. Pileated Woodpecker, Male.

b. Breast black or blackish, sides streaked, belly yellowish white.

402. Yellow-bellied Sapsucker, Female.

(To be continued in No. 4 of this Volume.)

PENNSYLVANIA DEPARTMENT OF AGRICULTURE.

DIVISION OF ZOOLOGY.

## THE ZOOLOGICAL QUARTERLY BULLETIN.

VOL. II, No. 4.

THE ECONOMIC VALUE

OF

# OUR NATIVE BIRDS.

DISCUSSED BY ORDERS AND FAMILIES.  
ORDER XII. PICI. THE WOODPECKERS, ETC.  
FAMILY 19. PICIDÆ. WOODPECKERS.

Issued Quarterly from the Department of Agriculture, OFFICE OF THE  
ECONOMIC ZOOLOGIST, Harrisburg, Pa.

By H. A. SURFACE, M. S., ECONOMIC ZOOLOGIST.

February 15, 1905.

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1905.

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(For an Analytic Key to determine the species see pages 63 and 64.)

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(Continued from page 64, of No. 3.)

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This is one of the rather small woodpeckers found throughout the State of Pennsylvania. It is at times abundant and commonly known as a "Sapsucker" or "The Spotted Sapsucker." It is common throughout the eastern part of the United States and remains with us during the winter. It is known by its medium size, being only

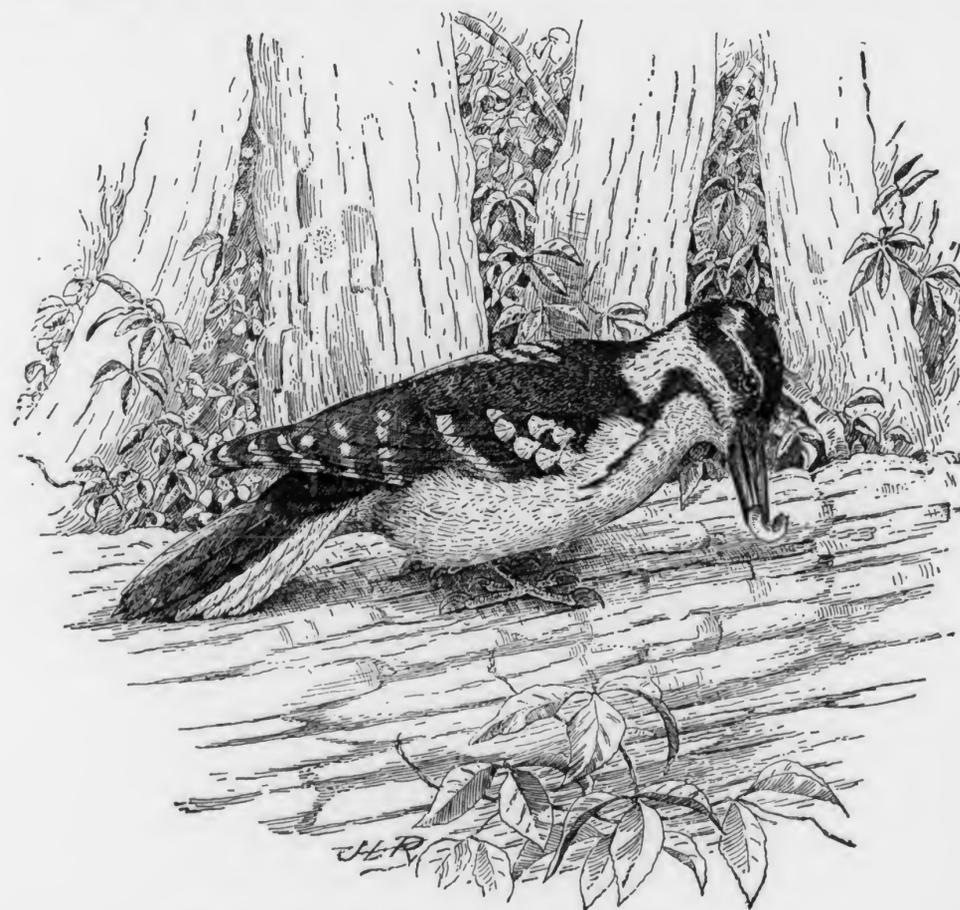


Fig. 14. The Hairy Woodpecker (*Dryobates villosus*)

(From Dr. Beal's "Farmers' Bulletin No. 54, Some Common Birds in Their Relation to Agriculture," U. S. Department of Agriculture, Washington, D. C.)

nine to ten inches in the length, extent of wings fifteen to seventeen inches, and length of outer joint of wings (including quills) four and one-half to five inches, tail three and one-half inches long and

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Fig. 14. The Hairy Woodpecker (*Dryobates villosus*)

(From Dr. Beal's "Farmers' Bulletin No. 54, Some Common Birds in Their Relation to Agriculture," U. S. Department of Agriculture, Washington, D. C.)

nine to ten inches in the length, extent of wings fifteen to seventeen inches, and length of outer joint of wings (including quills) four and one-half to five inches, tail three and one-half inches long and

bill one and one-tenth. In color it is entirely black and white, excepting a scarlet patch on the back of the head of the male. The young and female differ from the male in the absence of this patch. The upper parts are black with a white stripe down the back. It is spotted and streaked lengthwise with white. The outer tail feathers are entirely white and not barred with black, and in this feature it is to be distinguished readily from its smaller relative, the Downy Woodpecker. The under parts are white and the wings thickly spotted with white, with two white stripes on the side of the head, making a white stripe above the eye and another beneath the eye extending to the back of the neck.

These birds are common in the forests and orchards of our State, laying from four to six or seven eggs, which are one inch in length and three-fourths as wide and white in color, as are the eggs of all woodpeckers. The Hairy Woodpecker feeds mostly on insects, which it takes from the trunks and larger branches of trees, but occasionally it will descend to the ground, and will at times feed on berries, as discussed in the following notes from Dr. Beal's publication. The most exhaustive study of the food of woodpeckers has been made by Dr. Beal, of the United States Department of Agriculture, in his Bulletin on "The Food of Woodpeckers," published by the Division of Ornithology and Zoology of that Department. As this Bulletin is now out of print, we feel that we can do our citizens no greater service than to make free extracts from its contents:

The Hairy Woodpecker, like the Downy, has been accused of depredations on fruit, but the stomachs examined do not show that cultivated varieties form any considerable part of his fare. Besides the general resemblance between the two birds there is also a remarkable similarity in their food habits, as shown by the stomach contents; the greatest difference being that the Hairy eats a smaller percentage of insects than the Downy. Eighty-two stomachs have been examined, collected during every month in the year, except February, and coming from 19 States, mostly from the northern United States. The proportion of different kinds of food is as follows: Animal, 68 per cent.; vegetable, 31 per cent; mineral, 1 per cent. The insect material was made up of ants, beetles, caterpillars, bugs, and grasshoppers. Spiders and myriapods also were present. An inspection of the percentages shows that ants are not so highly prized by the Hairy as by the Downy, since they constitute only about 17 per cent. of the whole food, or one-fourth of the insect portion. Beetles, both larval and adult, stand relatively higher than in the case of the Downy, comprising 24 per cent. of all food, or more than one-third of the insect matter. Caterpillars were eaten

in greater quantities, both actually and relatively, amounting to 21 per cent. of the whole food, or more than one-third of all the insect material. Spiders are well represented, and aggregate nearly 6 per cent. of the entire food. Among the miscellaneous insects were a few aphids or plant lice. Grasshoppers were found in only 1 stomach, but Professor Aughey found them in 4 out of 6 stomachs examined by him in Nebraska.

Mr. F. M. Webster states that he has seen a Hairy Woodpecker successfully peck a hole through the parchment-like covering of the cocoon of a *Cecropia* moth, devouring the contents. On examining more than 20 cocoons in a grove of boxelders he found only 2 uninjured.

The Hairy Woodpecker selects a somewhat larger variety of vegetable food than the Downy, though of the same general character. The following list of fruits and seeds found in the stomachs does not indicate that the bird visits orchards and gardens for fruit so much as swamps and thickets, where wild grapes, woodbine, and dogwood abound:

## Grain:

Corn.

## Fruit:

Dogwood berries.  
Virginia creeper berries.  
June or service berries.  
Spice berries.  
Sourgum berries.  
Wild black cherries.  
Choke cherries.  
Wild grapes.  
Blackberries or raspberries.

## Fruit—Continued.

Pokeberries.  
Unidentified.

## Miscellaneous:

Poison ivy seeds.  
Poison sumac seeds.  
Harmless sumac seeds.  
Barngrass seeds.  
Hazlenuts.  
Seeds unidentified.  
Cambium.  
Spruce foliage.  
Rubbish.

The only grain discovered was corn, which was found in two stomachs. In one case it was green corn in the milk, but this is hardly sufficient to prove the habit of eating corn. Fruit aggregates a little more than 11 per cent. of the food of the species, and is fairly distributed among all the items in the above list. Since blackberries are the only kind of cultivated fruit found in the stomachs, and since they grow wild in abundance, it is evident that the Hairy Woodpecker does not at present cause any great damage by his fruit-eating habits. The substances in the miscellaneous list form about 11 per cent. of the whole food, and are practically of the same character as in the case of the Downy. Poison ivy seeds were eaten by 7 birds, and poison sumac by only 1, so that not so many seeds of these undesirable shrubs are distributed by the Hairy as by the Downy. The weed seeds in the stomachs were few in number, but in Iowa both the Hairy and the Downy Woodpeckers feed

largely on weed seeds in winter, stomachs taken then containing little else. Rubbish amounts to about one-twelfth of all their food, which is the largest percentage shown by any species.

Dr. Merriam says that in northern New York the Hairy Woodpecker, like the other woodpeckers of the Adirondack region, feeds largely on beechnuts. In late fall, winter, and early spring following good yields of beechnuts the nuts form the principal food of the woodpeckers.

#### How the Woodpecker Catches a Grub.

Did you ever see a Hairy Woodpecker strolling about a tree for what he could pick up?

There is a whur-r-rp of gay black and white wings and the flash of a scarlet topknot as, with a sharp cry, he dashes past you, strikes the limb solidly with both feet, and instantly slides behind it, from which safe retreat he keeps a sharp black eye fixed upon your motions. If you make friends with him by keeping quite, he will presently forgive you for being there and hop to your side of the limb, pursuing his ordinary work in the usual way, turning his head from side to side, inspecting every crevice, and picking up whatever looks appetizing. Any knot or little seam in the bark is twice scanned; in such places moths and beetles lay their eggs. Little cocoons are always dainty morsels, and large cocoons contain a feast. The butterfly hunter who is hoping to hatch out some fine cecropia moths knows well that a large proportion of all the cocoons he discovers will be empty. The Hairy Woodpecker has been there before him, and has torn the chrysalis out of its silken cradle. For this the farmer should thank him heartily, even if the butterfly-hunter does not, for the cecropia caterpillar is destructive.

But sometimes, on the fair bark of a smooth limb, the woodpecker stops, listens, taps, and begins to drill. He works with haste and energy, laying open a deep hole. For what? An apple-tree borer was there cutting out the life of the tree. The farmer could see no sign of him, neither could the woodpecker, but he could hear the strong grub down in his little chamber gnawing to make it longer, or frightened by the heavy footsteps on his roof, scrambling out of the way.

It is easy to hear the borer at work in the tree. When a pine forest has been burned and the trees are dead but still standing, there will be such a crunching and grinding of borers eating the dead wood that it can be heard on all sides many yards away. Even a single borer can sometimes be heard distinctly by putting the

ear to the tree. Sound travels much farther through solids than it does through the air; notice how much farther you can hear a railroad train by the click of the rails than by the noise that comes on the air. Even our dull ears can detect the woodworm, but we cannot locate him. How, then, is the woodpecker to do what we cannot do?

Doubtless experience teaches him much, but one observer suggests that the woodpecker places the grub by the sense of touch. He says he has seen the Red-Headed Woodpecker drop his wings until they trailed along the branch, as if to determine where the vibrations in the wood were strongest, and thus to decide where the grub was boring. But no one else appears to have noticed that woodpeckers are in the habit of trailing their wings as they drill for grubs. It would be a capital study for one to discover whether the woodpecker locates his grub by feeling, or whether he does it by hearing alone. Only one should be sure that he is looking for grubs and not for beetles' eggs, nor for ants, nor for caterpillars. By the energy with which he drills, and the size of the hole after he has found his tidbit, one can decide whether he was working for a borer.

But when the borer has been located, he has yet to be captured. There are many kinds of borers. Some channel a groove just beneath the bark and are easily taken, but others tunnel deep into the wood. I measured such a hole the other day, and found that it was more than eight inches long and larger than a lead-pencil, bored through solid rock-maple wood. The woodpecker must sink a hole at right angles to this channel and draw the big grub out through his small, rough-sided hole. You would be surprised, if you tried to do the same with a pair of nippers the size of the woodpecker's bill, to find how strong the borer is, how he can buckle and twist, how he braces himself against the walls of his house. Were your strength no greater than the woodpecker's, the task would be much harder. Indeed, a large grub would stand a chance of getting away but for one thing—the woodpecker spears him, and thereby saves many a dinner for himself.—(From a book, entitled "The Woodpeckers," by Fannie H. Eckstorm, published by Houghton, Mifflin & Co., Boston.)

Woodpeckers.—Of these most useful birds the three resident species have all been seen feeding upon the caterpillars or pupae of the Gypsy moth.

The flicker has also been seen carrying the caterpillars to its young. Mr. W. O. Colt, an inspector in the employ of the Board, says that he watched a female flicker take nearly full-grown larvæ to

its young. The bird made regular trips to its nest at intervals of from three to five minutes. The Downy Woodpecker was observed by Mr. Bailey to eat a few caterpillars, and to peck many others and afterwards drop them from the tree to the ground.

From what is known of the habits of woodpeckers, it was expected that they would be found to feed on the Gypsy moth pupæ. The Downy and Hairy Woodpeckers are known to feed in winter to a greater or less extent on the hibernating pupæ of many insects. Yet the Hairy Woodpecker only has been observed to peck into the pupæ of the Gypsy moth. This bird is not at all common in the district, but both old and young birds have been seen feeding upon the pupæ by Mr. Mosher.—("The Gypsy Moth," by Edw. H. Forbush, Ornithologist, and Prof. C. H. Fernald, Entomologist of the Massachusetts State Board of Agriculture.)

894. DOWNY WOODPECKER (*Dryobates pubescens*). Plate XVIII.

The Downy Woodpecker is also called the Sapsucker and the Little Sapsucker. This is our most abundant woodpecker and the one that is most common and familiar about the abode of man. It lives in orchards and among old trees on lawns, as well as in small groves and woods, but frequents cultivated regions more than it does the depths of forests. It is found throughout the eastern part of the United States very commonly, being by far the best known and perhaps the most useful of the woodpeckers. In the southern portion of our State the one that is most common is the variety or type known as the Southern Downy Woodpecker. To this variety is applied the scientific name *Dryobates pubescens pubescens*. In the northern portions of Pennsylvania the slightly larger and whiter form is found, which inhabits the northeastern and northern states, and has been given the varietal name "*medianus*," which makes the full scientific name of this variety *Dryobates pubescens medianus*.

The Downy Woodpecker does not migrate, but stays in our State during the entire year, moving from place to place during the winter, spring and fall, but continuing to work and take the insects, mostly injurious, from the trunks and larger branches of our fruit, shade and forest trees. It is one of the most conspicuous and attractive birds of the winter time, becoming very confidential and easily approached, especially when fed and properly treated.

This little woodpecker can be known by its small size, as it never exceeds seven inches in length, and also by the fact that its outer tail feathers are barred with black and white. Otherwise it is

exactly the same color as the Hairy Woodpecker described on another page of this Bulletin. It should be stated that the terms "Downy" and "Hairy" refer to the relative size of these birds and not to any condition of their plumage. The upper parts of this bird are white with a white line down the back in the middle, and the wing feathers and the coverts are spotted with white. The middle tail feathers are black and the two outer ones are white barred with black. There is a white stripe above the eye and another below the eye, as described for the Hairy Woodpecker, and the under parts are white. The female is similar in color to the male, excepting that it has a scarlet band on the nape or the back of the neck, while she has no scarlet or red coloring. Also her colors are more subdued or brownish. The length of this bird varies from six to seven inches, and the extent or spread of wings is from eleven to twelve inches, the length of the wings is from three and one-fourth to four inches, tail is under three inches in length and the bill is about two-thirds of an inch in length.

It builds nests in hollow trees or limbs, but generally makes holes for itself in dead wood, as do the other woodpeckers. It lays from four to six white eggs, which are three-fourths of an inch in length and six-tenths of an inch in diameter.

The attention of the observer is attracted to this bird by its sharp quick call, which is a peek-peek repeated at intervals.

Its presence is often recognized by the sound of its tapping upon the wood from which it is taking insects for its food. In the spring time it enjoys beating a tattoo upon the dead wood. Chapman says of this bird, "Like other Woodpeckers, in the spring he beats a rolling tattoo on a resonant limb, sounding a reveille which is a credit to so small a drummer."

The Downy is a sociable Woodpecker, and when the gay summer visitors have returned to their southern homes and the wind whistles drearily through the leafless trees, he joins the Chickadees and Nuthatches, and during the winter they are inseparable companions. Perhaps they share with him the snug quarters in some old trunk which he has hollowed out for a winter home."

There is no species of bird that responds more readily to proper winter treatment than does the Downy Woodpecker. We have several highly valued letters in our hands from correspondents in different parts of the State, who tell us how they have attracted this bird to their premises and have preserved it and enjoyed the pleasure and benefits of its presence, by using the methods that are outlined in another part of this Bulletin under the title, "Means of Aiding Woodpeckers."

Dr. Beal writes that the Downy Woodpecker is the smallest, not

only of the seven species under consideration, but of all those inhabiting the United States. He is also one of the most familiar, being no stranger to the shade trees about houses and parks, while his fondness for orchards is well known. He is so quiet and unobtrusive that the first notice one has of his presence may be a gentle tapping or scratching on the limb of a tree within two or three yards of one's head, where our diminutive friend has discovered a decayed spot inhabited by wood-boring larvae or a colony of ants.

One hundred and forty stomachs of the Downy Woodpecker have been examined. They were collected during every month in the year and in 21 states, the District of Columbia, Ontario and New Brunswick. The stomachs contained 74 per cent. of insects, 25 per cent. of vegetable matter, and 1 per cent. of mineral matter or sand. The insects belong to the following orders: Ants (Hymenoptera), beetles (Coleoptera), bugs (Hemiptera), flies (Diptera), caterpillars (Lepidoptera), and grasshoppers (Orthoptera). Spiders and myriapods were also present. While all of these were eaten to some extent, they appear in widely different proportions. The ants constitute almost one-third of all the animal food, or about 23 per cent. of the whole, indicating a very decided taste for this rather acid and highly flavored article of diet. Beetles stand a little higher in order of importance, amounting to about one-third of the entire insect food, or somewhat more than 24 per cent. of all. Many of these belong to the family of May beetles, a few were the predaceous ground beetles, but by far the greatest number were wood-boring larvae, a fact showing that this little bird while securing his dinner is doing good work for the forest. One-fifth of the animal food, or 16 per cent. of the total, consists of caterpillars, many of which apparently are wood-boring species; others are kinds that live on stems and foliage. Among insects the most interesting are the bugs (Hemiptera), which are represented in the stomachs by several species, notably by plant lice (Aphides), which in several instances were found in considerable quantities, amounting to 4 per cent. of the whole food. From the minute size and very perishable nature of these insects it is evident that they must disappear from the stomach in a very short time, and it is fair to infer that many more were eaten than shown by the food remains. Spiders, including harvestmen or daddy longlegs, were eaten freely, and amounted to nearly one-tenth of the whole. A few bits of snail shell were found in one stomach.

Eleven Downy Woodpeckers from Kansas collected in winter (December) deserve special notice. Eight of them had eaten the eggs of grasshoppers to an average extent of 10 per cent. of all their

food. This, besides being in itself a good work, emphasizes the fact that this bird resorts to the ground for food in case of necessity. Four stomachs of the Downy Woodpecker in Nebraska contained grasshoppers.

The late Dr. Townend Glover, entomologist of the Department of Agriculture in the U. S. Agr. Rep. for 1865 and 1866, states that the stomach of a Downy Woodpecker shot in February "was filled with black ants." He states further, "On one occasion a Downy Woodpecker was observed by myself making a number of small, rough-edged perforations in the bark of a young ash."

Vegetable Diet: In the matter of vegetable diet, the taste of the Downy Woodpecker is varied, prompting him to eat a little of a good many things rather than a large quantity of any one. The following is a list of the vegetable substances that were identified:

## Grain:

Indeterminable.

## Fruit:

Dogwood berries.  
Virginia creeper berries.  
June or service berries.  
Strawberries.  
Pokeberries.  
Apples.  
Unidentified.

## Miscellaneous:

Poison ivy seeds.  
Poison sumac seeds.  
Harmless sumac seeds.  
Mullein seeds.  
Hornbeam seeds.  
Nut, unidentified.  
Flower petals and buds.  
Galls.  
Camblum.  
Seeds, unidentified.  
Rubbish.

Material believed to be fragments of grain was found in two stomachs, but the quantity was so small that it may be dismissed without further comment. Fruit is by far the largest item of vegetable diet, forming one-tenth of the whole food. Strawberry seeds were found in only 1 stomach, apple pulp was supposed to be identified in 2, and the other varieties mentioned in the table were distributed in about the same proportion; so that no great economic interest can attach to this part of the birds' diet. The seeds and other things included under the head 'Miscellaneous' constitute about one-twelfth of the total food. Seeds of poison ivy were found in 20 stomachs and poison sumac in 1. These plants, far from being harmful to the birds, seem to form a very agreeable article of diet, and are eaten by many species. Unfortunately these seeds are protected by a hard, horny covering which successfully resists the action of the stomach, so that they pass through the alimentary canal uninjured. It is probable that we owe to birds, more than any other agency, the presence of these noxious plants beside fences, copses, and hedge rows. The remaining vegetable food, about 5 per cent., was classed as rubbish, and will be discussed in connection with some of the other woodpeckers.

No beechnuts were found in any of the stomachs examined, but Dr. Merriam says that in northern New York they feed extensively on this nut, particularly in fall, winter, and early spring. On April 5, 1878, he shot 4 Downy Woodpeckers, all of whose gizzards were full of beechnuts and contained nothing else. The birds were often seen on moss-covered logs, and even on the ground, searching for the nuts exposed by the melting snow. Dr. Merriam states also that he has seen this woodpecker in the fall eat the red berries of the mountain ash.

Concerning the Downy Woodpecker, Mrs. Eckstorm has written in the following charming style:

"No better little bird comes to our orchards than our friend the Downy Woodpecker. He is the smallest and one of the most sociable of our woodpeckers, a little, spotted, black-and-white fellow, precisely like his larger cousin the Hairy, except in having the outer tail feathers barred instead of plain. Nearly everything that can be said of one is equally true of the other on a smaller scale. They look alike, they act alike, and their nests and eggs are alike in everything but size.

Downy is the most industrious of birds. He is seldom idle and never in mischief. As he does not fear men, but likes to live in orchards and in the neighborhood of fields, he is a good friend to us. On the farm he installs himself as inspector of apple trees. It is an old and an honorable profession among birds. The pay is small, consisting only of what can be picked up, but, as cultivated trees are so infested with insects that food is always plentiful, and as they have usually a dead branch suitable to nest in, Downy asks no more. Summer and winter he works on our orchards. At sunrise he begins, and he patrols the branches till sunset. He taps on the trunks to see whether he can hear any rascally borers inside. He inspects every tree carefully in a thorough and systematic way, beginning low down and following up with a peek into every crevice and a tap upon every spot that looks suspicious. If he sees anything that ought not to be there, he removes it at once.

A moth had laid her eggs in a crack in the bark, expecting to hatch out a fine brood of caterpillars; but Downy ate them all, thus saving a whole branch from being overrun with caterpillars and left fruitless, leafless and dying. A beetle had just deposited her eggs here. Downy saw her, and took not only the eggs but the beetle herself. Those eggs would have hatched into boring larvae, which would have girdled and killed some of the branches, or have burrowed under the bark, causing it to fall off, or have bored into the wood and, perhaps, have killed the tree. Nor is the full-grown borer ex-

empt. Downy hears him, pecks a few strokes, and harpoons him with unerring aim. When Downy has made an arrest in this way, the prisoner does not escape from the police. Here is a colony of ants, running up the tree in one line and down in another, touching each other with their feelers as they pass. A feast for our friend. He takes both columns, and leaves none to tell the tale. This is a good deed, too, since ants are no benefit to fruit trees and are very fond of the dead-ripe fruit.

And Downy is never too busy to listen for borers. They are fine plump morsels much to his taste, not so sour as ants, nor so hard-shelled as beetles, not so insipid as insects' eggs. A good borer is his preferred dainty. The work he does in catching borers is of incalculable benefit, for no other bird can take his place. The warblers, the vireos, and some other birds in summer, the chickadees and nuthatches all the year round, are helping to eat up the eggs and insects that lie near the surface, but the only birds equipped for digging deep under the bark and dragging forth the refractory grubs are the woodpeckers.

So Downy works at his self-appointed task in our orchards, summer and winter, as regular as a policeman on his beat. But he is much more than a policeman, for he acts as judge, jury, jailer and jail. All the evidence he asks against any insect is to find him loafing about the premises. "I swallow him first and find out afterwards whether he was guilty," says Downy with a wink and a nod.

Most birds do not stay all the year, in the north, at least; and most, in return for their labors in spring, demand some portion of the fruit or grain of midsummer and autumn. Not so Downy. His services are entirely gratuitous; he works twice as long as most others. He spends the year with us, no winter ever too severe for him, no summer too hot; and he never taxes the orchard, nor takes tribute from the berry patch. Only a quarter of his food is vegetable, the rest being made up of injurious insects; and the vegetable portion consists entirely of wild fruits and weed-seeds, nothing that man eats or uses. Downy feeds on the wild dogwood berries, a few pokeberries, the fruit of the woodbine, and the seeds of the poison ivy, whatever scanty and rather inferior fare is to be had at Nature's fall and winter table. If in the cold winter weather we will take pains to hang out a bone with some meat on it, raw or cooked, or a piece of suet, taking care that it is not salted, for few wild birds except the cross bills can eat salted food, we may see how he appreciates our thoughtfulness. Shall we grudge him a bone from our own abundance, or neglect to fasten it firmly out of reach of the cat and dog? If his cousin the hairy and his neighbor the chickadee come and eat with him, bid them a hearty welcome. The

feast is spread for all the birds that help men, and friend Downy shall be their host."

Dr. Trimble, in his book, entitled "Insects Injurious to Fruits," (out of print), says, "Holes have been made directly into the cocoons of the codling moth caterpillars, and these cocoons are robbed of their contents by the Downy Woodpecker. Some holes made in trees are different. They are parallel, and have not been made in a dry scale, but in green bark, where no insects live. The bird that makes these is the Yellow-bellied Woodpecker. Our investigations in regard to the insect enemies of fruits would be only partial, if no attempts were made to ascertain how far the birds are useful to us in controlling them. To make such work as this complete, requires more exact and positive knowledge than could be procured from any of these sources; and I have killed a very large number of birds and examined the contents of their stomachs, especially of those frequenting orchards. Most of these examinations have been made with a magnifying glass and many with the microscope. Some species I have shot at short intervals during the season, to know how far their food varied at different times; and I have thus ascertained that the contents of the stomach at any one time are not an infallible criterion by which we can examine the usual food of the bird. On the fifth of May, I shot seven different birds; they had all been feeding freely on small beetles, and some of them on nothing else. There was a great flight of these small beetles that day; the atmosphere was teeming with them. A few days after the air was filled with ephemera flies, and the same species of birds were then feeding upon these.

The killing of so many birds has been a most repugnant task; but I have nerved myself to it in the cause of science. I felt there was a want of such information, and once procured it could not be wanted again. The comparatively few thus sacrificed would become martyrs for the good of many. Many of these investigations have been of surpassing interest, from the consciousness that such knowledge, if properly disseminated, would create a public sentiment even stronger than law, for the protection of the birds.

I have found in the Baltimore Oriole the remains of Curculios, the real plum weevils. The Downy Woodpecker and the Chickadee eat the caterpillar of the Apple Moth.

The bird that knows how to find this formidable enemy of the fruit grower (the codling moth) and destroys it in such numbers, is an object of special interest, and a scientific account in a work like this becomes a necessity, that it may be positively identified.

The stomach of a Downy Woodpecker contained one beetle, the heads of the larvae of two Apple Moths, and the heads of the grubs

of three small borers. The bird, when first seen, was pecking or sounding an old fence post, and then flew to an apple tree. There was an orchard of some twenty or thirty old apple trees here. \* \* \*

Shot another Downy Woodpecker to-day. It had been eating several black beetles, and three grubs, but they were not the larvae of the Apple Moth.

The bird that knows how to find the Apple Worm under the scales of bark on the trees, has been here. I find the unmistakable mark, the round hole in the scale leading directly into the place where the worm had been in its cocoon. The parallel lines of holes are on the apple trees here also.

During an excursion in the upper part of Morris county, N. J., made for the purpose of investigating the insects and birds, I had an opportunity of seeing a Downy Woodpecker in an old orchard, and passed an hour watching his actions. His creeping power is wonderful. I was especially interested to see with what speed he could move down the body of a tree backwards. This seemed even more rapid than the forward motion.

Here I was gratified in being able to ascertain how he finds where to peck through the scales of bark, so as to be sure to hit the Apple Worm that is so snugly concealed beneath. The sense of smell will not account for it. Such an accurateness of one of the senses would be beyond the imagination. Instinct, that incomprehensible something, might be called in to explain to those who are satisfied to have wonders accounted for by means that are in fact only confessions of ignorance. Birds have instincts undoubtedly, so have we; but they are mixed up confusedly with other faculties. Most of the actions of insects are purely instinctive and utterly unaccountable. But the Apple Moth is not a native of this country, the Downy Woodpecker is. The bird would not have been created with a special instinct to find the larvæ of a moth that did not exist in the same country. Other insects live under these scales of rough bark; but in very numerous examinations, I have not seen such a hole made except when leading directly into the cocoon of this particular caterpillar.

This little bird finds the concealed larvae under the bark, not from any noise the insect makes; it is not a grub of a beetle having a boring habit, and liable to make a sound that might betray its retreat, in seasons of the year when not torpid. A caterpillar makes scarcely an appreciable noise, even when spinning its cocoon, and when that is finished it rests as quietly as an Egyptian mummy in its sarcophagus.

There is no evidence that the Downy Woodpecker ever makes a mistake; it has some way of judging. The squirrel does not waste

its time in cracking an empty nut. There is no reason to believe that this bird ever makes holes through these scales merely for pastime, or for any other purpose except for food. He knows before he begins that if he works through, just in that spot, he will find a dainty morsel at the bottom of it, as delicious to him as the meat of the nut is to the squirrel. But how does he know it? By sounding,—tap, tap, tap, just as the physician learns the condition of the lungs of his patient by what he calls percussion. The bird uses his beak, generally three times in quick succession, sometimes oftener; then tries another. Watch him. See how ever and anon he will stop in his quick motions up and down, and give a few taps upon the suspected scale, and then test another, and another, until the right sound is communicated to that wonderful ear.

Here is evidence enough of the usefulness of this bird to entitle it to exemption papers for ever. Reader, look carefully at the head, as represented in Fig 14 and Plate XVIII. Do not call that bird "Sapsucker." That name will create a prejudice with some. The whole tribe of Woodpeckers labors under a prejudice in some neighborhoods. Some will eat cherries, and some are supposed to be fond of grapes. But the chief food of all of them is insects, and many of those insects are our worst enemies. It will be well to let the Woodpeckers have their own way, but by all means protect the Downy. \* \* \* \* \*

402. THE YELLOW-BELLIED SAPSUCKER. (*Sphyrapicus varius*). Fig. 15.

This bird is rare in Pennsylvania during the greater portion of the year for the reason that it passes through our State during its migrations and nests from Massachusetts northward. We have had occasionally reports of its nesting in the northern portion of this State, but in general throughout Pennsylvania it must be regarded as a migratory bird, rather than as a summer resident. In the fall they tarry with us in their journey to the southern states and Cen-

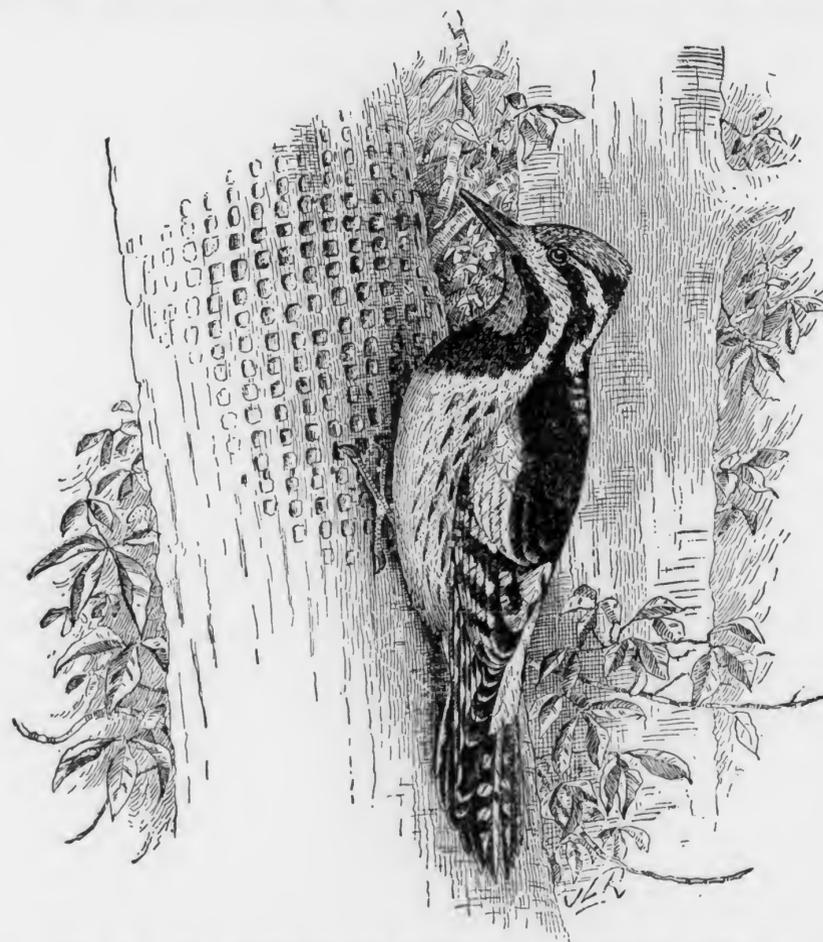


Fig. 15. The Yellow-bellied Sapsucker (*Sphyrapicus varius*).

(From Dr. Beal's "Farmers' Bulletin No. 54. Some Common Birds in Their Relation to Agriculture," U. S. Department of Agriculture, Washington, D. C.)

tral America where they pass the winter. During the migrating periods of spring and fall they are not uncommon in this Commonwealth, and they then leave behind them such characteristic marks, in the form of rows of holes around the trunks of trees, that one is

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able at all times of the year to recognize their erstwhile presence. It is during the latter part of the month of April and the early part of May that they travel northward through this State, and from the latter part of September to the middle of October they are on their return or southern trip. They may be found rarely as winter residents.

The Sapsucker is to be recognized by the black spot on the breast, the black and white color, the red of the head, and its medium size. The crown of the male is deep scarlet and the throat is cardinal. The female is similar in color, but the throat is white and the crown sometimes black. Both have the black irregularly barred with black and yellowish white, and a white line at the side of the head starting from the nasal feathers and dividing the black of the throat from the black stripe at the back of the eye. The wing feathers are spotted with white and the coverts are mostly white. The tail is black with white outer feathers. The total length of this bird is about eight and one-half inches, the extent of wings is fifteen inches, the length of the wing is about five inches and of the tail about three and one-half inches.

When migrating its notes are not loud but low and unattractive. It is to be seen mostly upon living trees, rather than upon dead ones, and it is rendered inconspicuous by its protection by the foliage. It is known at most times to take its food from the living wood rather than from dead wood, and consequently does not make a loud tapping noise while at work, as do the woodpeckers that feed mostly on insects in the dead wood.

This is the bird that has brought all of our birds of the woodpecker family into disrepute by the farmers and fruit growers by puncturing the trees and making rows of holes around them, such as are to be seen in Figure 15, and also in the log in Plate XVII.

The trunk used for mounting the birds photographed in that plate was taken from an orchard in Adams county and shows the holes just as they were made by this bird. The purpose of making these holes is in doubt, but in the extracts given below the truth is doubtless set forth by Dr. Trimble.

A Sapsucker (or, as it should be called, a Yellow-bellied Woodpecker) at work on an apple tree. It had made almost three hundred marks. Some were new and others old ones drilled out. This was in the forenoon. I watched it about half an hour. I returned in the afternoon. The same kind of bird was on the same apple tree, and busily at work pecking holes. I watched for about an hour, sometimes approaching so near that it would fly a short distance and watch me closely till I would go thirty or forty yards from it, when it would at once return and resume the pecking work. If I

were in sight it would keep on the opposite side of the limb, occasionally peeping around cautiously to see if I was coming nearer. Sometimes, during the intervals of these peeps, I would quietly approach so closely that the moment it saw me it would fly away, but to return again as soon as I had retired to a proper distance. After bo-pepping until I had no more time to spare, I shot this poor bird, expecting to find positive evidence in the stomach of what it made these holes for, and found two seeds or pits, with the purple skins of the same fruit, seven small ants, and one insect of the chinch bug kind, about the size of those found in the beds of some taverns. But of bark or sap there was not even a trace.

Later in the day I shot another of the same species of bird in an old orchard out of town. The stomach of this one contained the pulp of an apple and one ant,—nothing else. This one was on the upper part of an apple tree, and was not pecking or sounding. The investigation of this bird so far is unsatisfactory. I have seen no evidence that these holes are made in search of food. Ants are certainly found sometimes about these holes, and apparently in pursuit of the sap that exudes from them; but the idea suggested by some, that the birds make them to attract these ants by such tempting baits, is a palpable exaggeration of the reasoning power of this bird.

From what I have seen to-day, as well as from former observations, and from the testimony of several careful observers among farmers of my acquaintance, I am led to believe that Baird is mistaken in calling the Downy Woodpecker, a Sapsucker. Wilson evidently believes the same thing, although he does not say so in express words. The bird that makes these parallel holes has a bad reputation, and I am anxious to relieve my little friend that finds the apple worm, from all charges that will bring him into trouble. I believe that the Yellow-bellied Woodpecker is the only one that makes such holes. The Downy Woodpecker makes many holes in apple and pear trees also, but not in this regular manner. The one is in search of the larvæ of the apple moth under the dry scales of the bark; the other seeks—I don't know what, in the green bark itself.

These parallel rows are often very numerous. The trunks and larger branches will often be seen covered with them. The rows will be almost adjoining for many feet, and the holes in the rows as near each other as represented in (Fig. 15) and running all around the tree. In old orchards where trees have been grafted high up, these holes may be sometimes seen in the stock and not in the graft, and sometimes in the graft and not in the stock. Rows of trees of one kind of fruit will be filled with these holes, while adjoining

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rows of other kinds will be exempt. So far as I have noticed, these holes have been made only in October. Sometimes they will be seen in cherry trees, and I have observed those trees thoroughly drilled. Some evergreens are so pecked in this way as to bleed the next season to an injurious extent. But I have not been able to ascertain that they impair either the growth or the fruit-bearing power of the apple tree.

The grub of the apple tree borer works between the bark and the wood during the first of the three years of its life, but it is always either under or so near the surface of the ground as not to be likely to be found by the Woodpeckers. I have never seen any bird in pursuit of this grub. The two following years it is always so far within the wood as to be out of reach of the birds. I know no other grub that works under the bark of living apple trees; but an apple tree in decay will often be found teeming with grubs.

Dr. Beal says that it is to this species that the term "Sapsucker" is most often and most justly applied, for it drills holes in the bark of certain trees and drinks the sap. It feeds also on cambium, insects, wild flowers and berries.

Dr. Merriam says, "The motive which induces this species to act upon young and growing trees is, I think, but partly understood. It is unquestionably true that they feed, to a certain extent, both upon the inner bark and the fresh sap from these trees, but that the procurement of these two elements of sustenance, gratifying as they doubtless are, is their chief aim in making the punctures I am inclined to dispute.

"As the sap exudes from the newly-made punctures, thousands of flies, and yellow jackets, and other insects congregate about the place, till the hum of their wings suggests a swarm of bees. If, now, the tree be watched, the woodpecker will soon be seen to return and alight over the part of the girdle which he has most recently punctured. Here he remains, with motionless body, and feasts upon the choicest species from the host of insects within easy reach. In making each girdle they work around the trunk, and from below upwards, but they may begin a new girdle below an old one. They make but few holes each day, and after completing two or three remain over the spot for some time, and as the clear fresh sap exudes and trickles down the bark they place their bill against the dependent drop and suck it in with evident relish—a habit which has doubtless given rise to the more appropriate than elegant term Sapsucker, by which they are commonly known in some parts of the country. I have several times watched this performance at a distance of less than 10 feet, and all the details of the process were distinctly seen, the bird looking at me, meanwhile, "out of the corner of his eye." When his thirst is satisfied he si-



Plate XVI. Pileated Woodpeckers (*Ceophloeus pileatus*). Two Specimens with Their Natural Holes for Borers in a Pine Tree, Photographed on the Tree in a Centre County Forest, by the Economic Zoologist.



Plate XVII. Woodpeckers and Other Insectivorous Birds, Mounted on a Natural Apple Stump, Showing Holes Made by the Yellow-Bellied Sapsucker. From a photograph of specimens prepared in the office of the Economic Zoologist.



Fig. XVIII. The Downy Woodpecker (*Dryobates pubescens*).

(Three-fourths natural size. From a mounted specimen, photographed in the office of the Economic Zoologist.)



Plate XIX. The Pileated Woodpecker (*Ceophloeus pileatus*), about one-third natural size. From a photograph by H. A. Surface, Economic Zoologist.



Plate XX. A Young Red-headed Woodpecker (*Melanerpes perythrocephalus*), slightly over half natural size. Photographed by H. A. Surface, Economic Zoologist.

lently disappears, and as silently returns again, after a few hours, to feast upon the insects that have been attracted to the spot by the escaping sap. This bird, then, by a few strokes of its bill, is enabled to secure both food (animal and vegetable) and drink in abundance for an entire day; and a single tree, favorably situated, may suffice for a whole season."

Eighty-one stomachs were examined, collected at different times through the year, and it was found that the insect matter was made up of ants, wasps, flies, bugs, grasshoppers, crickets, and mayflies. Some spiders also were present. Of the whole food, 36 per cent. consisted of ants,—a higher percentage than in any other woodpecker, except the Ficker. Beetles amounted to 5 per cent., and do not appear to be a favorite food. Flies (Diptera) in various forms were eaten in larger numbers than by any of the others. Among them were several long-legged crane flies (Tipulids). Spiders were eaten to a small extent only, and most of these were Phalangera or "daddy-longlegs," which, taken with the crane flies, would indicate a slight preference for long-legged prey. Bugs, wasps, caterpillars, crickets, and mayflies collectively amount to about 6 per cent., no one of them reaching any important figure. Five stomachs of the Yellow-bellied Woodpecker examined in Nebraska contained grasshoppers. The number in each stomach varied from 15 to 33.

Mr. William Brewster states that at Umbagog Lake, Maine, "After the young have hatched, the habits of the Yellow-bellied Woodpecker change. From an humble delver after worms and larvæ, it rises to the proud independence of a flycatcher, taking its prey on wing as unerringly as the best marksman of them all. From its perch on the spire of some tall shrub it makes a succession of rapid sorties after its abundant victims, and then flies off to its nest with bill and mouth crammed full of insects, principally large Diptera."

The vegetable food of the Sapsucker is varied. The following fruits and berries were found in the stomachs: Fruit: Dogwood berries, Black alder berries, Wild black cherries, Blackberries or raspberries; Miscellaneous: Poison ivy seeds, Mullein seeds, Juniper seeds, Buds, Seeds unidentified, Cambium, Rubbish.

The quantity of fruit found in the stomach formed 26 per cent. of the entire food, but the only kinds identified that might possibly be cultivated were blackberries and raspberries, and these were in only two stomachs. Unidentifiable fruit pulp was found in twelve stomachs. Miscellaneous seeds to the amount of 5 per cent. complete the list of substances eaten by this species. Poison ivy seeds were found in only one stomach, and most of the other things were distributed in about the same proportion.

405 THE PILEATED WOODPECKER (*Ceophloeus pileatus*).  
Plates XVI and XIX.

This bird is also known as the "Woodcock," Indian Hen, Log Cock, Black Woodcock and Crow Woodpecker. It was at one time rather abundant in most of the wooded regions of Pennsylvania, but its large size, striking colors and loud notes both in calling and tapping, combined to attract the attention of the gunners, and it is now approaching extinction throughout those portions of this Commonwealth where it yet remains. It is found yet in the wooded regions of the northern districts of this State where large timber has been permitted to stand, but the axeman and gunner are continuing to reduce its numbers to such an extent that its deserted nesting holes or large excavations in the trees are much more familiar in the forests than is the bird itself.

This bird is found in general throughout North America. Dr. Coues says: "It is known in North America, a common resident everywhere in heavy timber. But this is a very wild, wary and solitary bird, one which disappears first with the clearing away of forests in the advance of civilization. Nests in remote and secluded woods and swamps, usually at great height; the taking of eggs is something of an exploit."

The Pileated Woodpecker is a permanent resident where it occurs in the forests of our State, taking practically the same food in winter as in summer, and living in the same general region.

This bird is to be known by its large size, being by far the largest of our woodpeckers, its black colors, the large white spot under the wing, and the red crest on the head. The upper parts are black to blackish brown and the top of the head is scarlet in both sexes. The feathers lengthen to form a crest. A narrow white stripe borders this crest, separating it from the brownish dark ear-coverts. A yellowish white stripe begins at the nostril and passes down the sides of the neck to the shoulder. The male has a scarlet stripe at the base of the lower mandible and red on the front part of the crown. The female is without red in these two places, although she has the red crest. The length is seventeen inches, wing nearly nine inches, with an extent of twenty-seven, tail slightly over six inches and the bill from one and one-half to two inches.

The nest is placed high from the ground in large trees, being from twenty-five to eighty feet above the base of the tree. The entrance is rounded or oval, and owing to its large size is readily to be distinguished from that of the other woodpeckers. The eggs are four to six in number, white, and one and one-fourth inches in length by about one inch in diameter.

Dr. Beal has examined twenty-three stomachs of Pileated Wood-

peckers, taken during the fall and winter, and found that 51 per cent. of their contents consisted of animal matter and insects and forty-nine per cent. vegetable matter. The insects were principally ants and beetles, with a few of some of the other orders. The ants were mostly of the larger species that live in decaying wood. A large portion of the beetles were in the larval form, and all were of the wood-boring species. There were also a few caterpillars, also wood-borers, a few plant lice, several cock-roaches, of a species that live under the bark of dead trees, a few white ants and a few flies, with one spider. The gizzard of one contained hundreds of ants and no other food.

Vegetable Food.—Seeds and berries of a few plants were found in the stomachs of those individuals examined at Washington: Sour-gum, Flowering dogwood, Black haw, Cassena, Hackberry, Persimmon, Wild grapes, Virginia creeper, Greenbrier, Sumac, Poison sumac, and Poison ivy.

The above shows that these birds are valuable as destroyers of larvæ which injure forest trees and ants that promote the decay of timber, and also that they feed upon such plant seeds as are not important to mankind, avoiding cultivated fruits and berries.

In the stomachs of this species of bird which we have received we have found mostly black ants and wood-boring beetle larvæ, belonging to the family of Long-horns (Cerambycidæ) or round-headed borers, and also the Flat-headed borers.

This is one of the most striking, remarkable and interesting birds of the deep forests and the higher portions of our State.

The white on the wing shows quite conspicuously when flying and the general color of the body is black and white. The name Woodcock is so well established for this bird in the forested region of Pennsylvania that many persons make the error of thinking this is the bird to which the law refers as a game bird. Of course, the true Woodcock is a snipe-like bird, fitted for wading, with a very long bill for probing swamp mud for its food. It is not at all related to the Pileated Woodpecker, and the latter is protected by law at all times of the year.

As this Woodpecker is about the size of the crow, we see why the appellation "Crow Woodpecker" is sometimes given to it. Its original distribution extended over nearly all of the wooded portions of the United States, but it is unfortunately a favorite mark for hunters, and its loud call, large size, and very loud redounding raps on dead wood apprise sportsmen of its presence and lead to its destruction.

The words of Geord Ord in discussing the Ivory-billed Woodpecker, which is a southern bird, would apply in almost every detail

to this species. The reference to its economic features or habits as a preserver of forest trees is especially applicable.—(Ord's Zoology, page 327, recently republished by Samuel Rhoads, of Philadelphia).

"In these almost inaccessible recesses, amid ruinous piles of impending timber, his trumpet-like note and loud strokes resound through the dreary wilds, of which he seems the sole lord and inhabitant. Wherever he frequents he leaves numerous monuments of his industry behind him. We there see enormous pine trees with cart loads of bark lying around their roots, and chips of the trunk in such quantities as to suggest the idea that half a dozen of axe-men had been at work there for the whole morning. The body of the tree is also disfigured with such numerous and large excavations that one can hardly conceive it possible for the whole to be the work of a Woodpecker. With such strength, and an apparatus so powerful, what havoc might he not commit, if numerous, on the most useful of our forest trees! And yet with all these appearances, and much of vulgar prejudice against him, it may be fairly questioned whether he is at all injurious; or, at least, whether his exertions do not contribute most powerfully to the protection of our timber. Examine closely the tree where he has been at work, and you will soon perceive that it is neither from motives of mischief nor amusement that he slices off the bark, or digs his way into the trunk. The sound and healthy tree is not in the least an object of his attention; the diseased, infested with insects, and hastening to putrefaction, are his favorites; there the deadly crawling enemy have formed a lodgment, between the bark and tender wood, to drink up the very vital juice of the tree. It is the ravages of these vermin which the intelligent proprietor of the forest deploras as the sole perpetrators of the destruction of his timber. Would it be believed that the larvæ of an insect or fly, no larger than a grain of rice should silently, and in one season, destroy some thousand acres of pine trees, many of them from two to three feet in diameter, and a hundred and fifty feet high. Yet whoever passes along the highroad from Georgetown to Charleston, in South Carolina, about twenty miles from the former place, can have striking and melancholy proofs of this fact. In some places the whole woods, as far as you can see around you, are dead, stripped of the bark, their wintry-looking arms and bare trunks bleaching in the sun, and tumbling in ruins before every blast, presenting a frightful picture of desolation. And yet ignorance and prejudice stubbornly persist in directing their indignation against the bird now before us, the constant and mortal enemy of these very vermin, as if the hand that probed the wound to extract its cause, should be equally detested with that which inflicted it.

Until some effectual preventive, or more complete mode of destruction can be devised against these insects and their larvæ, I would humbly suggest the propriety of protecting, and receiving with proper feelings of gratitude, the services of this and the whole tribe of woodpeckers, letting the odium of guilt fall to its proper owners."

406. RED-HEADED WOODPECKER (*Melanerpes erythrocephalus*). Fig. 16 and Plate XX.

This is one of the most conspicuous woodpeckers of our State during the summer time, and is often called "Tricolor" from three conspicuous colors seen upon both the male and the female. The beak, wings and tail are glossy blue black, while the secondary wing



Fig. 16. The Red-headed Woodpecker (*Melanerpes erythrocephalus*).  
(From Dr. Beal's "Farmers' Bulletin No. 54, Some Common Birds in Their Relation to Agriculture," U. S. Department of Agriculture, Washington, D. C.)  
feathers, the upper tail coverts and the under parts from the breast and the tips of some of the outer tail feathers are white. The whole head, neck and front portion of the breast are crimson red, and a

striking contrast of pure colors gives this bird a very attractive appearance. The young differ decidedly in color by having gray streaked with dusky at the parts where the adult birds are red. The feathers, the beak and the wings are also edged with gray, and other variations of color would lead the uninitiated to think they are not the same species of bird as the parent with the conspicuous crimson on the head. Plate XX shows a photograph of a young bird with the plumage as here described.

The Red-headed Woodpecker is found in eastern North America from Florida to Canada and westward to the Rocky mountains. It winters from Virginia southward, and occasionally stays all the year in our own State. As severe as was the last winter we know of individuals remaining in Pennsylvania, and received a specimen in January from Mr. H. A. Brightbill, of Perry county. The migration of the bird depends in part upon the temperature, but mostly upon the food supply. They arrive in this State generally from the second week in April to the early part of May, and depart in October. They are quite unequally distributed, being very rare in some places and common in others. They are common along the Allegheny, Susquehanna and Schuylkill rivers, and in many other valleys, but are rare in the northern and higher portions of this State.

They nest mostly in dead trees, but often in telegraph poles. They have learned to adapt these modern auxiliaries of applied science to their own needs. Their eggs are four to six in number, white, as are the eggs of all woodpeckers, one inch in length and three-fourths of an inch in diameter.

The call note of this bird is a sharp shrill, trilling chirp and also a toad-like "cluck." One who is accustomed to it can readily recognize any of our species of woodpeckers by the character of the notes which it utters.

In general the Red-headed Woodpecker is known to feed upon acorns, beechnuts, berries and fruits, as well as upon insects, and it sometimes stores provisions, as we have seen the California Woodpecker do. Dr. Merriam says that he has known of their remaining all winter in certain parts of New York where the beechnuts were abundant and they could consequently procure food. Dr. Beal states that in the northern part of its range, where the oak is replaced by the beech, the Red-headed Woodpecker takes the beechnut as its principal food, and Dr. Merriam also cites proof of this fact. He has shown that these woodpeckers invariably remain throughout the winter in beech localities when there are good nut years, but migrate whenever the crop fails. In Lewis county, N. Y., whenever conditions are such that gray squirrels are present in abundance, it is also a good year for the Red-head. A specimen re-

ceived in January from Perry county, Pa., contained mostly Indian corn and fragments of acorns. It is not uncommon for them to take a few grains of corn with their diet, but for this reason they are not to be condemned.

We have often seen these birds perch on dead branches where they could command a clear view for some distance, and suddenly dart forth and chase insects while on the wing, returning to their perches to remain as sentinels on watch for the next victim. It is also quite common for them to sit upon telegraph poles and watch for grasshoppers, and one of our favorite amusements when a boy was to throw pebbles near them and see them dart forth through the air to overtake what they evidently supposed was a flying insect that should be captured and eaten.

This woodpecker has been accused of eating birds' eggs, and also young birds. Of over one hundred stomachs examined only two contained pieces of egg shells. We do know, however, where one was killed in some peculiar way apparently by picking into a hen's egg that was in the worst possible stage of decomposition. Although other observers have seen them preying upon hens' eggs, and occasionally feeding upon birds eggs, this is such a very rare feature of their feeding habits that it should not be held against them. There is no doubt but that this is the most destructive of our woodpeckers as far as damages and injury to grain and fruit are concerned, although it is nowhere sufficiently destructive to justify killing it. Where the Red-head is abundant it will take cherries from the trees in spring and early summer as readily as will robins, but the remedy for this has been proven to be the planting of Russian mulberries, shadberries, early varieties of soft sweet cherries and other fruit-bearing shrubs and trees, for their food. It is also true that where they are numerous they feed upon corn in the fall, but this may be avoided by driving them from that particular place at that time of the year and getting the corn into the crib as early as possible. There have been many eye-witnesses of more or less damage to fruits, berries, etc., by the Red-head, but strict examinations do not reveal such an array of damaging points against the species. A person seeing a bird with a choice fruit, or in some way inflicting damage, is more impressed by it than by the sight of hundreds of the same species quietly pursuing their ordinary vocations. Thus an occasional act, such as a visit to the cherry tree, is taken as a characteristic habit.

One hundred and one stomachs of the Redhead were examined from specimens collected throughout the year, although the bird is not generally abundant in the Northern States during the winter months. The specimens were taken in 20 States, the District of

Columbia and Canada, and are fairly well distributed over the whole region east of the Rocky Mountains. The contents of the stomachs consisted of: Animal matter, 50 per cent.; vegetable matter, 47 per cent.; mineral matter, 3 per cent. The animal and vegetable elements are nearly balanced, and the mineral element is larger than in any except the Flicker. The insects consist of ants, wasps, beetles, bugs, grasshoppers, crickets, moths and caterpillars. Spiders and myriapods also were found. Ants amounted to about 11 per cent. of the whole food, which is the smallest showing of any of the 7 species under consideration, and is in harmony with the habits of the bird, which collects its food upon exposed surfaces where ants do not often occur. Beetle remains formed nearly one-third of all food, the highest record of any one of the 7 woodpeckers. The families represented were those of the common May beetle (*Lachnosterna*), which was found in several stomachs, the predaceous ground beetles, tiger beetles, weevils, and a few others. Among the May beetle family is a rather large, brilliant green beetle, known to entomologists as *Allorhina nitida*, but commonly called by the less dignified name of 'June bug.' It is very common during the early summer in the Middle and Southern States, but less so at the North. This insect was found in 11 stomachs, and 5 individuals were identified in a single stomach, which would seem an enormous meal for a bird of this size. Another large beetle eaten by this woodpecker is the fire-ground beetle (*Calosoma calidum*), a predaceous beetle of large size and vile odor. *Passalus cornutus*, one of the staghorns, a large insect, was also found, as well as a pair of mandibles belonging to *Prionus brevicornus*, one of the largest beetles in the United States. A preference for large beetles is one of the pronounced characteristics of this woodpecker. Weevils were found in 15 stomachs, and in several cases as many as 10 were present. Remains of Carabid beetles were found in 44 stomachs to an average amount of 24 per cent. of the contents of those that contained them, or 10 per cent. of all. The fact that 43 per cent. of all the birds taken had eaten these beetles, some of them to the extent of 16 individuals, shows a decided fondness for these insects, and taken with the fact that 5 stomachs contained Cicindelids or tiger beetles forms a rather strong indictment against the bird.

Grasshoppers and crickets formed 6 per cent. of the whole food, a larger percentage than in any of the other 7 species. The aggregate for all other insects is 4 per cent., and the most important kinds are wasps and their allies. As this bird has often been seen capturing insects on the wing it is probable that the wasps were taken in that way.

The vegetable food of the Redhead presents considerable variety,

and shows some points of difference from that of the other woodpeckers. The following is the list of substances identified:

Grain:	Fruit—Continued.
Corn.	Apples.
Fruit:	Pears.
Dogwood berries.	Unidentified.
Huckleberries.	Miscellaneous.
Strawberries.	Sumac seeds.
Blackberries.	Ragweed seeds.
Mulberries.	Pigweed seeds.
Elderberries.	Acorns.
Wild black cherries.	Seeds unidentified.
Choke cherries.	Galls.
Cultivated cherries.	Flower anthers.
Wild grapes.	Rubbish.

Corn was found in 17 stomachs, collected from May to September, inclusive, and amounted to more than 7 per cent. of all the food. While it seems to be eaten in any condition, that taken in the late summer was in the milk, and evidently picked from standing ears. This being the largest percentage of grain shown by any of the 7 species corroborates some of the testimony received, and indicates that the Redhead, if sufficiently abundant, might do considerable damage to the growing crop, particularly if other food was not at hand. While the fruit list is not so long as in the case of the Flicker, it includes more kinds that are, or may be, cultivated; and the quantity found in the stomachs, a little more than 33 per cent. of all the food, is greater than in any of the others. Strawberries were found in 1 stomach, blackberries or raspberries in 15, cultivated cherries in 2, apples in 4, and pears in 6. Fruit pulp was found in 33 stomachs, and it is almost certain that a large part of this was obtained from some of the larger cultivated varieties. Seeds were found in but few stomachs, and only a small number in each.

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412. THE FLICKER. (*Colaptes auratus luteus*). Fig. 17.

This common and well known bird is also known as the Golden-winged Woodpecker, Pigeon Woodpecker, Yellow-hammer, High-hole, High-holder, High-holer, Yellow-wing, Yarrup, etc.

Top of head ashy, band across back of head scarlet, back olive brown conspicuously barred with black, rump white, tail feathers above black, with white markings tinged slightly with yellow, and with yellow shafts, black spot on side of throat under eye, side of head and throat dove color, black crescent on breast; lower breast and under parts white, more or less washed with light brown, and marked with large, round, black dots; tail beneath yellow; long feathers of wing yellow below, and with yellow shafts. The female



Fig. 17. The Flicker. (*Colaptes auratus luteus*).

(From Dr. Beal's "Farmers' Bulletin No. 54, Some Common Birds in Their Relation to Agriculture," U. S. Department of Agriculture, Washington, D. C.)

lacks the red streaks or spot on the side of the throat. Length twelve inches. Nests in holes in trees. This familiar bird, whose call we associate with the warm promising days of early spring, before the leaves appear on the trees, differs from the other Woodpeckers in being something of a ground feeder. It eats wood-boring grubs, to be sure, but it is very fond of ants, and is quite apt to be discovered on the ground before a large ant hill. Two stomachs examined contained over 3,000 ants each. The Flicker occasionally takes a little fruit.

In the investigation of its feeding habits 230 stomachs were examined, taken in every month of the year, although January and February have but 1 each. They were collected in 22 states and contained 56 per cent. of animal food, 39 per cent. of vegetable, and 5 per cent. of mineral. It will be seen that the quantity of animal or insect material is less than in either of the preceding species, and the mineral matter somewhat greater. The following orders of insects were represented: Ants, beetles, bugs, grasshoppers and crickets, caterpillars, Mayflies and white ants. Spiders and myriapods also were present. An inspection of this insect matter shows the rather remarkable fact that more than three-fourths of it, or 43 per cent. of the whole food, consists of ants. If the mineral matter is thrown out as not being properly food, we find that more than 45 per cent. of the Flicker's food for the year consists of ants. Among the stomachs examined several contained nothing but ants. In two of these the actual number of ants in each stomach exceeded 3,000. These were mostly small species that live in burrows in the earth, so that it is evident that when Flickers are seen upon the ground they are usually in search of ants, although the other insects found in the stomachs account in part for this ground-feeding habit. Prof. Samuel Aughey examined 8 stomachs of Flickers in Dixon county, Nebraska, in June, 1865. All of them contained grasshoppers, and the number in each stomach varied from 15 to 48.

As a large part of the food of the 7 woodpeckers studied consists of ants, the question may be asked whether the birds are doing good or harm by destroying them. There are so many different species of these insects, and they have such widely different habits, that it is difficult to make any assertion that will apply to all, but it is safe to say that many kinds are decidedly harmful, because they attend, protect, and help to spread plant, root, and bark lice of various species. These lice are among the worst enemies of plant life, and everything which tends to prevent their destruction is prejudicial to the interests of agriculture. Other species of ants destroy timber by burrowing in it; still others, in warmer climates, do much harm to fruit trees by cutting off the leaves and undermining the ground. Many species infest houses and other buildings. Apparently, then, birds do no harm in destroying ants, but on the contrary probably do much good by keeping within bounds these insect pests, whose greater abundance would be a serious injury to man. The Flicker takes the lead in this work, eating ants to the extent of nearly half of his whole food.

Next in importance to ants are beetles, which form about 10 per cent. of all the food, less than half the quantity eaten by the Hairy and Downy Woodpeckers. Among these were May beetles and

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Top of head ashy, band across back of head scarlet, back olive brown conspicuously barred with black, rump white, tail feathers above black, with white markings tinged slightly with yellow, and with yellow shafts, black spot on side of throat under eye, side of head and throat dove color, black crescent on breast; lower breast and under parts white, more or less washed with light brown, and marked with large, round, black dots; tail beneath yellow; long feathers of wing yellow below, and with yellow shafts. The female

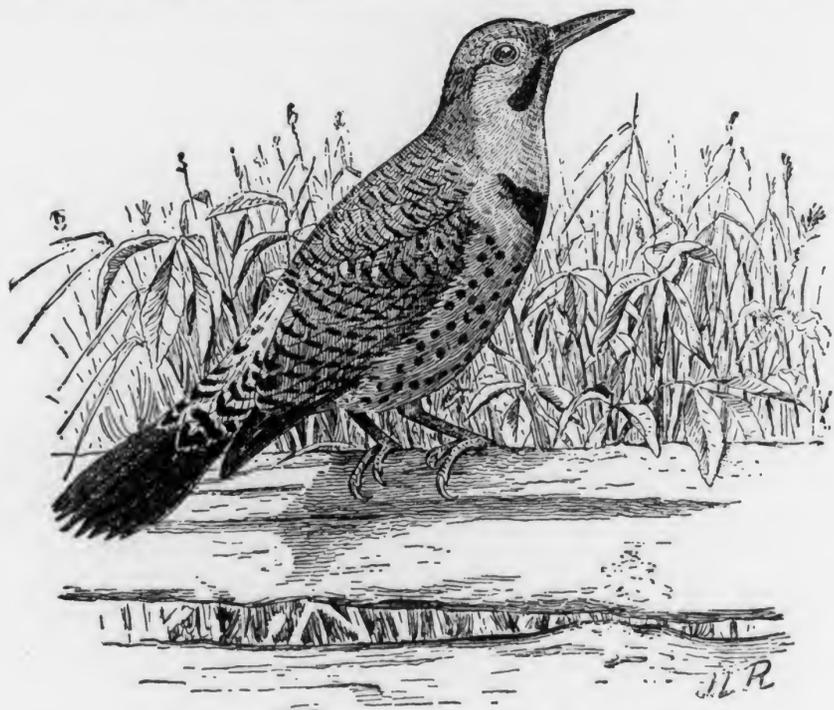


Fig. 17. The Flicker. (*Colaptes auratus luteus*).

(From Dr. Beal's "Farmers' Bulletin No. 54, Some Common Birds in Their Relation to Agriculture," U. S. Department of Agriculture, Washington, D. C.)

lacks the red streaks or spot on the side of the throat. Length twelve inches. Nests in holes in trees. This familiar bird, whose call we associate with the warm promising days of early spring, before the leaves appear on the trees, differs from the other Woodpeckers in being something of a ground feeder. It eats wood-boring grubs, to be sure, but it is very fond of ants, and is quite apt to be discovered on the ground before a large ant hill. Two stomachs examined contained over 3,000 ants each. The Flicker occasionally takes a little fruit.

In the investigation of its feeding habits 230 stomachs were examined, taken in every month of the year, although January and February have but 1 each. They were collected in 22 states and contained 56 per cent. of animal food, 39 per cent. of vegetable, and 5 per cent. of mineral. It will be seen that the quantity of animal or insect material is less than in either of the preceding species, and the mineral matter somewhat greater. The following orders of insects were represented: Ants, beetles, bugs, grasshoppers and crickets, caterpillars, Mayflies and white ants. Spiders and myriapods also were present. An inspection of this insect matter shows the rather remarkable fact that more than three-fourths of it, or 43 per cent. of the whole food, consists of ants. If the mineral matter is thrown out as not being properly food, we find that more than 45 per cent. of the Flicker's food for the year consists of ants. Among the stomachs examined several contained nothing but ants. In two of these the actual number of ants in each stomach exceeded 3,000. These were mostly small species that live in burrows in the earth, so that it is evident that when Flickers are seen upon the ground they are usually in search of ants, although the other insects found in the stomachs account in part for this ground-feeding habit. Prof. Samuel Aughey examined 8 stomachs of Flickers in Dixon county, Nebraska, in June, 1865. All of them contained grasshoppers, and the number in each stomach varied from 15 to 48.

As a large part of the food of the 7 woodpeckers studied consists of ants, the question may be asked whether the birds are doing good or harm by destroying them. There are so many different species of these insects, and they have such widely different habits, that it is difficult to make any assertion that will apply to all, but it is safe to say that many kinds are decidedly harmful, because they attend, protect, and help to spread plant, root, and bark lice of various species. These lice are among the worst enemies of plant life, and everything which tends to prevent their destruction is prejudicial to the interests of agriculture. Other species of ants destroy timber by burrowing in it; still others, in warmer climates, do much harm to fruit trees by cutting off the leaves and undermining the ground. Many species infest houses and other buildings. Apparently, then, birds do no harm in destroying ants, but on the contrary probably do much good by keeping within bounds these insect pests, whose greater abundance would be a serious injury to man. The Flicker takes the lead in this work, eating ants to the extent of nearly half of his whole food.

Next in importance to ants are beetles, which form about 10 per cent. of all the food, less than half the quantity eaten by the Hairy and Downy Woodpeckers. Among these were May beetles and

their allies, and a few snapping beetles, but the greater number were Carabids or predaceous ground beetles. Most of these were in the adult form, but some larvae of tiger beetles were identified. As these last live in burrows in the sand, and as Carabids live upon the ground, their presence in the stomachs again points to the terrestrial habits of the bird. The same is true of the grasshoppers and crickets. None of the other insects mentioned were eaten to any great extent, the whole aggregating only about 3 per cent. Two stomachs contained each a single bedbug. Where they were obtained it is as difficult to surmise as it is to understand what motive could prompt the bird to swallow such an insect. Five stomachs contained each a few bits of snail shell.

In the matter of vegetable diet the Flicker has the most extensive list of any of the 7 woodpeckers, and many of the articles of food can only be obtained on the ground or among low bushes. Following is a list of all the vegetable substances identified in the Flicker's stomach:

Grain was represented by corn and buckwheat, and fruit by the following: Dogwood berries, Virginia creeper berries, hackberries, black alder berries, sourgum berries, cat or green brier berries, blueberries, huckleberries, pokeberries, June or service berries, spice berries, elderberries, mulberries, wild grapes, wild black cherries, choke cherries, cultivated cherries and blackberries.

Miscellaneous: Poison ivy seeds, poison sumac seeds, harmless sumac, waxberries or hayberries, juniper berries, knotweed or smartweed, clover seed, grass seed, pigweed seed, mullein seed, ragweed, magnolia seed, acorns, seed unidentified, cambium, rubbish.

Buckwheat was found in only one stomach and corn in but five. It will be noted that nearly all of the above fruits are wild, and consequently the bird is not to be condemned upon this examination. Only one bird contained cherries, and this shows that it is too commonly believed that these birds are injurious. They are unjustly accused and should be preserved.

"From my study window, a week ago, I saw two Flickers on the hole of an apple tree. They were there partly for business and partly for fun, as it appeared. They were not far apart, and they would slide about from one position to another, in a sort of deprecatory manner, much of the time jerking the head and gesticulating with the body, like veritable Frenchmen, as though it were impossible to express their feelings on that particular occasion. This performance was varied, now and again, by probing in a crevice of the bark or fork of the tree, for some choice morsel. Just below these birds was a business-like little Downy Woodpecker whose every movement told that he had no time for such foolishness as

was going on above him. He had come for a meal, and this he proceeded to get, in the usual manner. These, and hundreds of others like them—humble workers, to be sure, but none the less effective, are busy all through the winter doing for men what men cannot so well do for themselves."

"I wonder how many readers of the Deseret Farmer have ever really thought of their dependence upon such humble workers as these, and how many have realized that without the aid of the birds bountiful harvests and laden orchards would be impossible. When we understand these things, we shall cease to be indifferent to the character of the services rendered, and the work of these unobtrusive helpers will not go unappreciated." (S. G. Goodwin, in the Deseret Farmer.)

"With the exception of the Flicker, a law unto himself among his clan, our native woodpeckers are instrumental performances only. The rap-tap-tapping of their bills against the tree trunks is as cheerful music as any in the spring woods. The Sapsucker hammers his vigorous, impetuous, staccato proposal with more sense of musical values, perhaps, than the others; but all are musicians, though they can't sing a note. Songless birds have found various ways of expressing their sentiments. Some dance, some ogle, and none is more ridiculous in his antics to woo the well-beloved than the Flicker, whose vocal accomplishments are by no means to be despised. All the woodpeckers delight in sound, however produced. Hairy and Downy frequently tap on the tin roofs and gutters of our houses simply because they like the noise.

The Flicker (*Colaptes auratus luteus*), our largest common woodpecker, is much in fields, where it feeds on ants, leaving its more strictly arboreal congeners to delve laboriously into the trees for the wood-boring species."

"The wood insects are a mighty host. The oaks alone are infested by about eight hundred species. Among these there are many which, if allowed to increase unmolested, would destroy the trees.

Now mark this provision of Nature. Certain birds are fitted to prey on insects of certain habits, so that birds form an almost perfect protection to the tree. First, the Woodpeckers, tunneling into the trunk, branch and twig, draw forth ants and borers, which destroy the wood and bark. Next, the titmice, creepers, nutchatches and kinglets search the crevices in the bark and the surface of the twigs and buds for the eggs and pupae of insects hidden on the under sides of branches, in holes and crevices, or under loosened bark. They eat aphides, scales, small beetles, and other bark insects, as well as caterpillars and other creeping things. (Rep. N. J. State Board of Agr. 1903-4.)

### THE MEANS OF AIDING WOODPECKERS.

These valuable birds are among those that respond most readily to proper treatment by mankind. We have before us several letters from persons who have written to us concerning their success in attracting them to their premises by putting out fat meat, tallow, nuts, etc., for them to eat during the winter. By thus attracting, feeding and protecting these birds, they will remain in such a region all winter. This gives a practical method and hint for their winter care and preservation, yet if birds do not have favorable nesting sites they can not remain all year upon the premises. As Woodpeckers nest in trees, stumps and poles, such places should be provided for them either naturally or artificially. A section of a dead tree set in the ground like a telegraph pole has been sufficient to become a nesting site of a pair of Downy Woodpeckers for several successive years. We know where one person in clearing a grove near his house left a dead tree, because the Woodpeckers were using it as their nesting place, and for three or four years these valuable birds have been making their home there. Another prominent agriculturist in this State in trimming his apple trees left a stump of a dead branch projecting from the living tree, and in this the woodpeckers nested and reared their young, feeding them on obnoxious pests in the orchard. Upon the lawn of Prof John Hamilton, former Secretary of Agriculture of Pennsylvania, we have counted the nests of no less than four woodpeckers, representing two species. Some of these had rested in cavities and others had bored holes in dead trees erected or left for this purpose.

Squirrels will climb the trees where these birds nest, and the little red squirrel or chickaree will take the eggs and young from the nest. As a means of preventing this it is sufficient to put a band of tin one foot or more in width around the tree. Of course, if other trees be within jumping distance of the one that is used as the nest, it will be necessary to band all in the clump in order to prevent the squirrels from climbing those that do not have bands and jumping to others which one may wish to protect.

People who butcher their own live-stock generally do this work in the fall of the year. At such a time the offal or dressings should be saved by hanging them in the branches of trees, and by bands of tin protecting them from cats. The lungs or lights and other portions of dressed animals could easily be suspended in forks of a branch in a tree and afford food for such valuable birds as the Woodpeckers and Nuthatches during the entire winter. It is not at all uncommon to see such birds in abundance where they have thus been attracted, and we know of one prominent pear-grower who by in-

ducing them birds to remain all winter upon his premises had his pear crop preserved from the attacks of the Pear-Tree Psylla. The birds destroyed these insects, which were present in the orchard in the fall and early part of the winter in immense numbers.

It is also a very easy matter to collect a quantity of walnuts, hickory nuts and other nuts in the fall and in the winter crack them, and put the fragments into shallow trays, properly protected for these birds. We could give the names of several persons in this State who have preserved the birds around their premises by this means during the past year.

Finally, let one who wishes to protect the birds make a study of their food as given in this Bulletin, and to provide for them during the summer plant such bushes and trees as we have named in the list of vegetable food taken by each respective species. Among the valuable trees or shrubs to attract the Woodpeckers and other desirable birds are the mulberries, including the Russian varieties, the June berry or service berry, dogwood, hack-berry, elder, sour-gum, blueberry, huckleberry, Virginia creeper, wild grape, wild cherries and common berry bushes. All that is necessary to secure the presences of beneficial birds around the premises is to afford them proper protection and give them means of obtaining sufficient food of the kinds they prefer.

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Explanation:—In the following Index references are given to both Volumes I and II, which are designated by their respective Roman numerals.

The respective Quarterly number of Volume I is in parentheses before its page number or numbers. Since Volume II is paged consecutively through the entire year its Quarterly numbers are not needed in the Index.

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