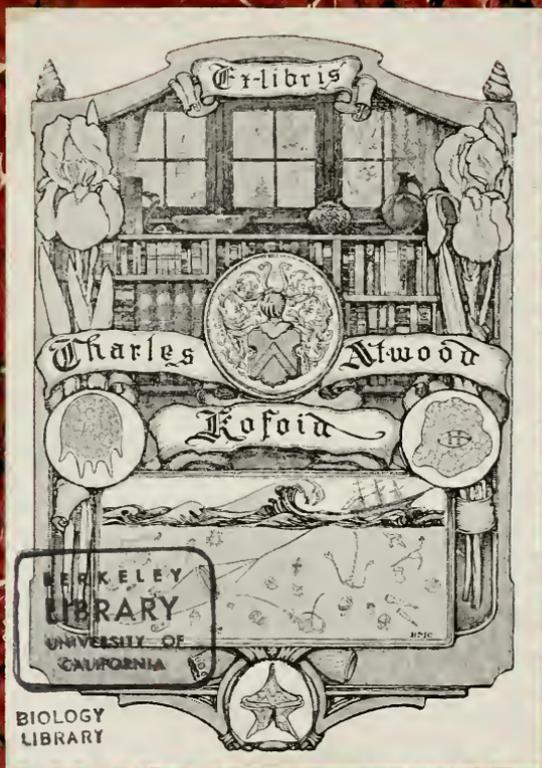


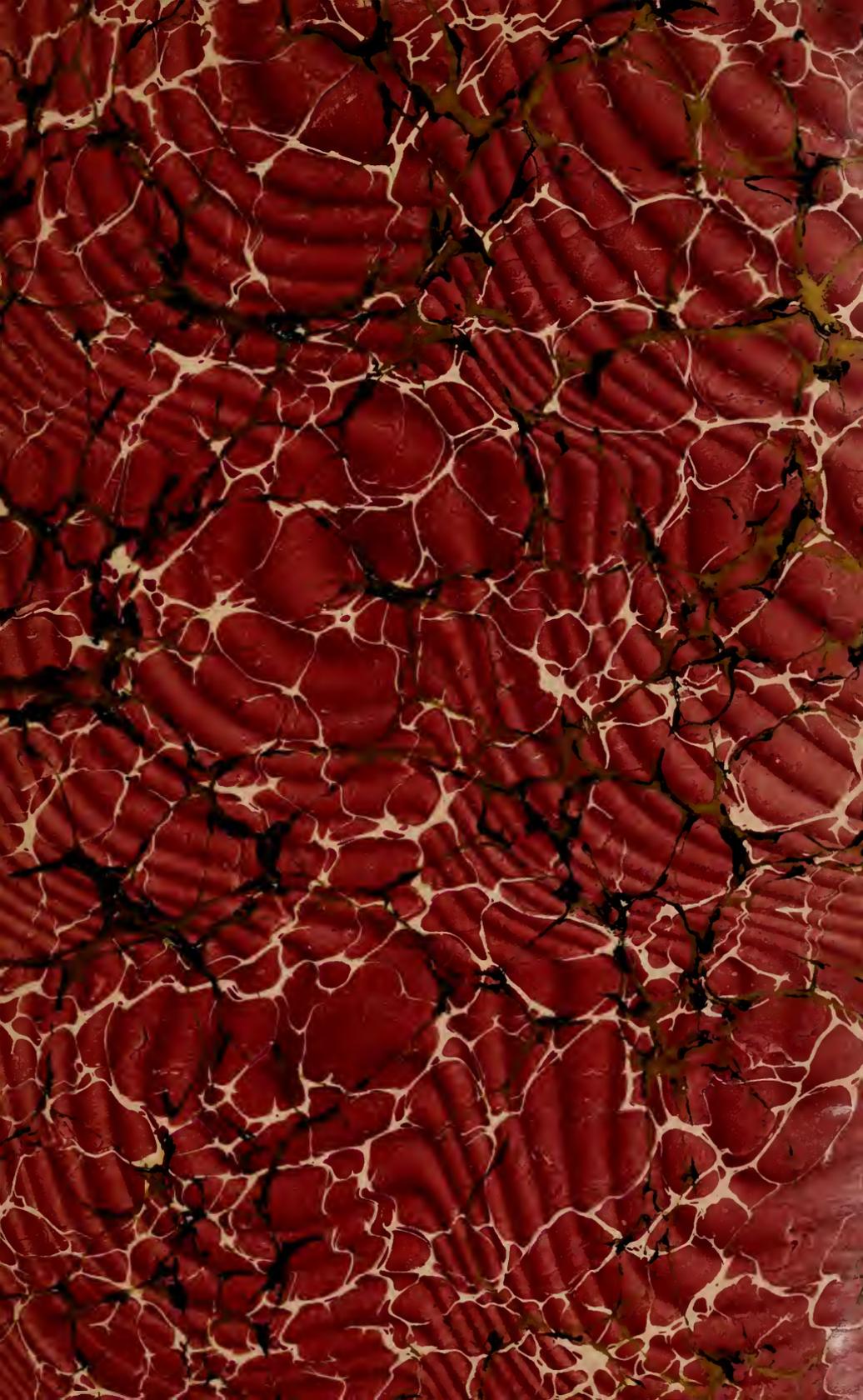
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PART I.

DISEASES OF POULTRY

BY

LEONARD PEARSON, B. S., V. M. D.,

STATE VETERINARIAN.

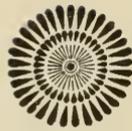
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LETTER OF TRANSMITTAL

DEPARTMENT OF AGRICULTURE,
HARRISBURG, PA., *March 8, 1898.*

To the Honorable Senate and House of Representatives
of the General Assembly of Pennsylvania:

Gentlemen: In compliance with the following concurrent resolution I have the honor to transmit herewith Part I, entitled "Diseases of Poultry."

LEONARD PEARSON.

In the House of Representatives,
March 1, 1897.

Resolved (if the Senate concur), That there shall be printed at the earliest possible date, in pamphlet form, fifteen thousand copies of Bulletin No. 17, of the Department of Agriculture, entitled "The Diseases and Enemies of Poultry," with such additional matter and changes as the authors may deem necessary to more fully explain this important subject; five thousand for the use of the Senate and ten thousand for the use of the present members of the House of Representatives: Provided, That the authors shall receive no extra compensation for preparing, writing, editing, proof reading, revising and indexing this pamphlet.

A. D. FETTEROLF,
Resident Clerk of the House of Representatives.

In the Senate, March 2, 1897.

The foregoing resolution in the House concurred in.

E. W. SMILEY,
Chief Clerk of the Senate.

Approved—The 9th day of March, A. D. 1897.

DANIEL H. HASTINGS.



PREFACE.

This report on the Diseases and Enemies of Poultry is written in answer to an extensive demand for information on the subject of which it treats. While a large number of articles on diseases of poultry may be found in poultry journals, live stock papers and poultry books, there has been no recent attempt in this country to produce a comprehensive, popular but accurate description of the diseases of fowls, together with the means to be employed to cure and prevent them.

In preparing the first part of this Bulletin, the Veterinarian has made free use of all of the works on diseases of poultry that he has been able to secure, and has drawn upon the English, French and German literature.

Special acknowledgment must be given to the agricultural and poultry periodicals, to the following authors: Zürn, Friedberger and Fröhner, Neumann, Raillet, Nocard and Leclainche, and the publications of the U. S. Department of Agriculture by Drs. Salmon, Smith, Moore and Stiles.

There is a great deal to learn in reference to these subjects, and a promising field for investigation and research is offered. It is hoped that some of the numerous imperfectly understood diseases of poultry may be carefully studied, and a future more complete report upon this subject issued under the auspices of the State Department of Agriculture.





PART I.

INTRODUCTION.

IMPORTANCE OF THE POULTRY INDUSTRY.

The production of eggs and poultry is one of the most important branches of agriculture. To those who have not given this subject especial attention, the statement that the annual poultry products of the United States are equal in value to the wheat crop, may appear something startling.

According to a recent estimate of the American Agriculturist, based on the last census and on an extensive inquiry, the number of fowls in the United States is about 383,000,000; these produce 1,141,000,000 dozen eggs each year, and the value of both amounts to \$343,000,000,00.

Pennsylvania is one of the leading states in the production of poultry. According to the same authority, there are in this State 15,347,000 fowls of all sorts—turkeys, geese, ducks and chickens—valued at \$8,236,000, and these produce 68,818,000 dozen eggs each year worth, at 20 cents per dozen, \$13,763,600, making a total value for poultry and eggs of about \$22,000,000.00.

At a very conservative estimate, one-tenth of the poultry, young and old, is carried away by disease each year. Hence the importance of this subject is manifest.

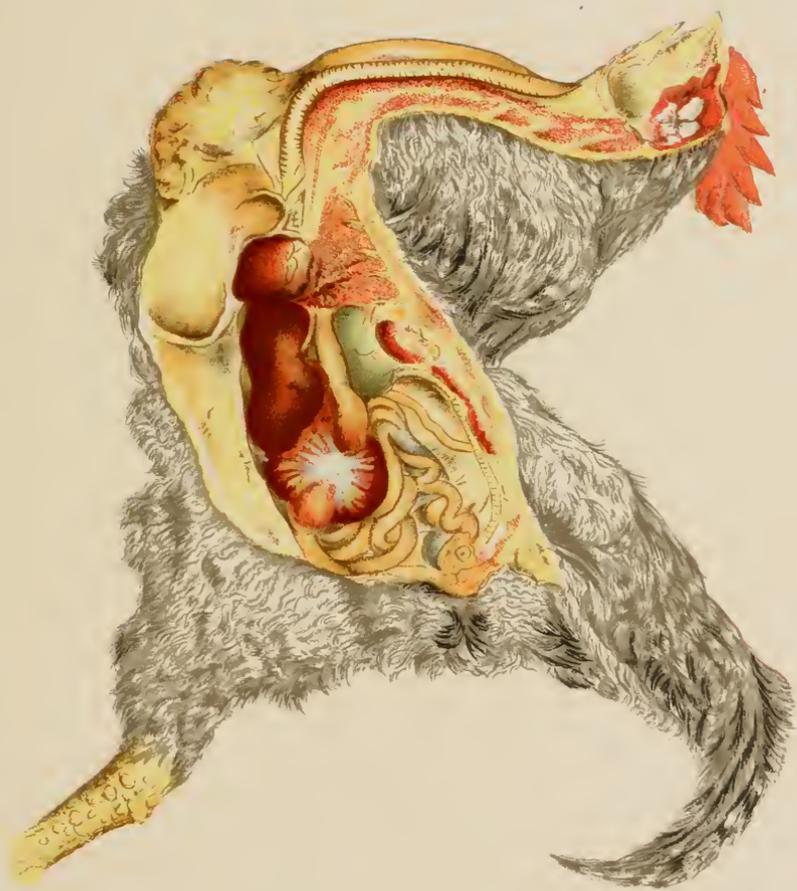
TREATMENT OF SICK FOWLS.

A number of difficulties are met with in treating fowls that do not confront the veterinarian or live stock owner in treating most of the other domestic animals. Fowls are not accustomed to being handled. They are of a semi-wild disposition, so that when it becomes necessary during illness to examine and administer medicine to them they are apt to resist. However, fowls can be treated as successfully as any other animals, provided they receive the same amount of careful, intelligent attention.

On all farms where poultry is kept in large numbers it is advisable to have a small building or room fitted up as a hospital for the care of sick and disabled birds. If such a place is at hand it will be possible to achieve much better results than when attempts are made to treat fowls in the buildings where their companions are, and where they are constantly annoyed by them, or than can be reached if the fowls are placed in a dirty box in some damp, out of the way place, under the impression that anything is good enough for a sick chicken.

CAUSES OF DISEASE.

The causes of diseases of poultry are various and attention is directed to the cause of each one treated upon in the following. It will be noticed that in most cases diseases are avoidable, that they result from misman-



agement in the way of feeding, housing or cleanliness. Some of them, however, are contagious and cannot be wholly prevented even when the feeding and sanitary conditions are of the best, but experience teaches that where conditions are good for birds they are bad for disease germs and vice versa, so that when contagious diseases prevail, their ravages are much greater among fowls that are poorly kept than among those that are cared for properly.

Contagious diseases and parasites are usually introduced by new fowls brought into the flock, and it is worth while, especially where pure bred fowls are grown, to place all new acquisitions in quarantine away from the flock for a few days, and until it has been shown that they present no evidence of disease. Great care should be used, also, in purchasing only from sound stock kept under favorable conditions.

SYMPTOMS OF DISEASE.

Birds show disease in a variety of ways, but in most cases if the affection is at all severe, they become listless, sluggish, torpid, inclined to keep away from their fellows, they are apt to stand with the head drawn down, the wings and tail pendant and feathers ruffled. In many diseases, diarrhoea is the first symptom, and in all cases of diarrhoea, attention should be paid to the droppings for the purpose of noting their color and whether they contain worms or an admixture of mucus or blood. Sometimes loss of appetite is the first symp-

tom of disease, sometimes paleness of the comb and visible membranes. In the skin diseases, the first symptoms appear on the surface and consist in a loss of gloss on some of the feathers and stiffness and brittleness of the feathers, and sometimes the appearance of naked spots.

The examination of the throat is important in many cases because it is the seat of two common and very serious affections of domestic fowls, namely, roup and gapes. In examining the mouth and throat the bill can be opened by pressing the thumb and finger on the angle at either side; then if the windpipe is pressed upward from the neck, the larynx can be forced into the back of the mouth and examined easily. It is frequently of advantage to have an assistant hold the fowl while the examiner carries out these manipulations and also holds the tongue down by bearing upon it with a wooden toothpick or some similar small object.

The temperature of the fowl is rarely measured, because fever is shown by symptoms of chilliness, etc., but it is well to know that the normal temperature of the domestic fowls varies between 106 and 107.5 degrees F. This is considerably higher than the temperature of the larger animals. If it becomes desirable to measure the temperature, it can be done by inserting a clinical thermometer into the cloaca. It should penetrate for about two inches and remain two or three minutes before it is withdrawn and read.

The heart beat of the fowl is quite rapid, varying from 110 to 140 per minute, but the determination of its rapidity is of little importance in diagnosing the disease of fowls, because when they are grasped for the purpose of counting the beat, it becomes so rapid that it is sometimes almost impossible to count it, running

up in many cases to 300 pulsations per minute. The heart beat can be easily felt by applying the fingers to the sides of the chest wall.

The rapidity of respiration is of more importance than the rapidity of the heart beat, because it can be determined at a distance from the fowl, and without annoying it and thus quickening this function. The normal breathing rate of the fowl at rest is from 50 to 60 respirations per minute. In diseases of the breathing organs and obstructions of them by growths or parasites, the respirations become quickened.

POST MORTEM EXAMINATIONS.

Very often it is not possible to determine the character of a disease affecting fowls until after they are dead, and as many of the poultry diseases are contagious, it is always advisable to *open and examine every fowl that dies in the flock*. This may enable the owner to check a contagious disease in its incipiency and avoid great loss. But in any case, it is advisable to know what fowls die from, so that similar occurrences may be recognized and prevented in the future. The anatomy of the fowl cannot be described at this time for lack of space, but anyone who is in the habit of opening and cleaning chickens, knows the general appearance of the healthy organs, will usually recognize marked departures from the normal.

If fowls die from unknown diseases, and particularly if they die in large numbers from disease that seems to

be contagious, information in regard to these affections may be obtained by correspondence with the State Veterinarian, and it is desired that fowls dying from vague diseases shall be expressed as soon as possible after they are dead to the Veterinary Department of the University of Pennsylvania, Philadelphia. They should be wrapped in cloth and heavy paper, packed in straw, nailed up in a box with a cake of ice and expressed as promptly as possible. A letter should always be forwarded either in the box or by mail explaining the general symptoms and characteristics of the disease. Such shipments may be made C. O. D.

THE MEDICATION OF FOWLS.

The medication of individual fowls is not difficult, but requires care and patience. There are several forms in which medicines may be administered. Pills can be given most readily. It is only necessary to secure the bird, open its bill and drop the pill into the back of the mouth, then close the bill and if the bird resists, hold it together until the pill has been swallowed.

Fluids are sometimes administered from a spoon, but if the fowl is badly frightened this may be a matter of considerable difficulty. The best way is to introduce a small rubber tube, about a third of an inch in diameter, into the mouth, pass it into the oesophagus and down to the crop. A little experience will enable one to do this quickly and without discomfort to the bird. Fluid medicines in any desirable quantity can be introduced through this tube.

Pasty mixtures are sometimes given. Medicines are mixed with sticky materials, as molasses, honey, etc., made into pasty masses and placed in the back of the mouth with a small wooden paddle. Flocks can be treated, when the birds will eat, by mixing medicines with the food or dissolving them in water. Sometimes powders are given by sprinkling them on moist grain. Chalk is frequently given in this way to birds with diarrhoea by mixing it with rice that has been moistened. It thus adheres to the kernels and is eaten without reluctance.

When a very sick fowl is under treatment, it is better to give small doses at frequent intervals than large doses at long intervals, for in this way the action of the medicine can be measured more accurately and the proper dose can be ascertained by trials. Fowls of different breeds and different sizes and ages require different doses. It is not always possible to determine these accurately, but the judgment of the poultry keeper must be called into play in all instances.

DISINFECTION.

Disinfection is alluded to very frequently in the following pages and is often of the greatest importance. Many poultry keepers are under the impression that it is sufficient to scatter strong smelling powders or liquids about the coops or poultry houses, and that so long as the odor of these materials is in the air, the premises are undergoing disinfection. Nothing could

be more misleading or further from the truth. Disinfection is practised for the purpose of destroying disease producing germs and disinfectants, or the materials used for disinfecting, will only destroy germs that they come in contact with. It is perfectly evident that when disinfectants are scattered about carelessly they come in contact with a very small fraction of the entire surfaces that may harbor germs, and unless all of these surfaces are covered and all of the germs reached the disinfection is apt to be fruitless. In order that disinfection may be carried out properly it is essential, first of all, to remove the manure, litter and rubbish of all kinds. This should be mixed with lime and placed in barrels, or it should be spread on fields at such a distance from the poultry runs that it cannot possibly contaminate them. However, if the disease is a virulent one it is always best to burn manure rather than take any chances with it. Then the interior of the building should be thoroughly swabbed or scrubbed out, and afterwards the disinfectants can be employed. Disinfectants are best used in solution because they can then be applied more evenly and perfectly. They can be applied with a brush, with a sprinkling pot or, best of all, with a spray pump, such as is used for spraying fruit trees. The disinfectants to be employed in special cases are mentioned hereafter in connection with the prevention of the different diseases. White-wash is always a good disinfectant, but its value can be greatly increased for this purpose by adding chloride of lime to it, one pound to three or four gallons, or carbolic acid, one pint to the bucketful.

CHAPTER I.

DISEASES OF THE SKIN.

A. *Those caused by parasites.*

1. FLEAS.

The bird flea, known as *Pulexavium*, is a very small, brownish insect. It has six legs but is without wings. Its body is somewhat elongated and flattened from side to side. This little parasite is exceedingly annoying to poultry and especially to pigeons. It is very active and lives not only on the bird but also on the perches and in the nests and crevices of poultry houses. By its constant biting it keeps fowls awake and causes them to scratch and hop about so that their rest is disturbed and eventually they become thin and weak and if they are not actually killed by the fleas, which occurs very rarely, they are so harassed that they are predisposed to other diseases and in this way the flea may be an indirect cause of death. Pigeons are annoyed by fleas far more than other poultry. The remedy is to al-

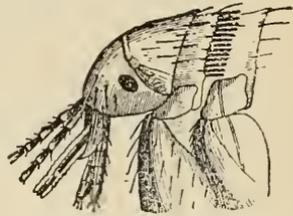


LARVA OF THE CHICKEN FLEA.
Twenty times natural size.

(17)

low the birds a dusting place and if the parasites are very numerous insect powder or sulphur should be mixed with the dust and when the fowls scratch and burrow in this powder it enters the spaces between the feathers, reaches the skin and so obstructs the breathing openings on the surface of the flea that it finds the conditions very disagreeable and becomes stupefied and falls off or goes away.

Or insect powder can be blown by means of a powder gun or blower between the feathers of the afflicted fowl. It is also necessary to so treat the roosting places, nests and poultry houses that the fleas will be either



HEAD OF THE CHICKEN FLEA.
Thirty times natural size.

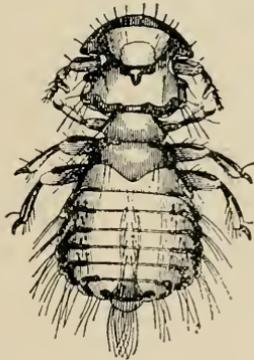
destroyed or driven away. Because if this is not done they return to the birds as soon as the dust is shaken from their feathers. Disinfection can be accomplished by spraying the interior of the building with a solution of carbolic acid (one part to twenty parts of water). Or a kerosene emulsion, such as is used for spraying fruit trees, can be employed for the same purpose.

2. LICE.

Bird lice differ considerably from the ordinary lice of haired animals. They do not suck blood as those do and cannot, for they are provided with a mouth

that only enables them to bite. They live on the crusts, scales and dead cells that gather on the surface of the skin and that are prevented from falling off by the feathers.

There are several varieties of lice belonging to four principal genera: these are *Goniodes*, *Goniocotes*, *Lip-
eurus* and *Menopen*. While these parasites differ considerably as regards their shape and size they resemble each other very closely in their habits. All of them are very small insects, from 1-100 to 1-6 inch long and their bodies are plainly divided into three parts; the head is very large and flat, the thorax, or second segment, is roundish and considerably smaller than the head; the abdomen, or most posterior segment, is long, oval and plump. Their color is usually grayish or yellowish, but some of them show different shades of brown. Although these parasites do not penetrate the skin and suck the blood as fleas do, and as the lice of mammals do, they cause a great deal of itching and annoyance while crawling about over the surface and sometimes they bite the skin and in that way occasion much irritation.



CHICKEN LOUSE.

Goniodes dissimilis, male.

One of the most common varieties. 20 times natural size.

At one time it was thought that lice were bred by filth and that they generated themselves, as it were, in dirty places, but it has been shown that this is not the case and that they are only produced by like parasites and have the property of reproducing themselves

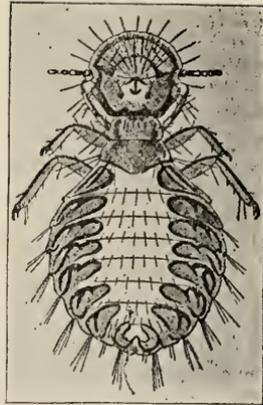
with great rapidity. It has been estimated that the third generation springing from a single individual may reach the enormous number of 125,000 within twelve weeks.

While it is true that neglect, dirt, filth, etc., favor the growth and propagation of lice, it should always be remembered that they cannot appear in the poultry yard unless they are brought in by an infested fowl or by a cage that a fowl has been in or some other object that an infested fowl has been in contact with.

But fowls are interchanged so frequently and fowls of different owners come in contact in so many ways at poultry shows, in markets, etc., that it is not at all difficult for a yard that was previously free from these parasites to become infested when least suspected.

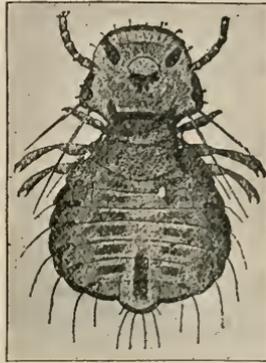
These parasites occasion as much loss as any disease that fowls are subject to. While they alone do not often kill birds, in many cases they so annoy them by their constant irritation that they prevent sleep and rest so that fowls and especially young ones do not grow and thrive as they should, and become thin and delicate. In this condition they do not produce eggs nor are they good for food, and so long as they continue to remain badly infested with lice they are absolutely unproductive and worthless.

The conditions that are most favorable to the propagation of lice have already been mentioned briefly.



CHICKEN LOUSE.
Goniocotes yigitis, female.
Ten times natural size.

Attention should also be called to the fact that poultry houses that are dark and damp furnish very favorable places for the growth of these insects. Then, also, fowls that are poor in condition are more apt to be infested with lice than those that are in good condition, healthy and sturdy. It has been noticed frequently that where there are a number of fowls in an infested pen those that are least rugged harbor the most lice. The probable reason for this is that fowls in poor condition have a somewhat dry and scurfy skin which provides

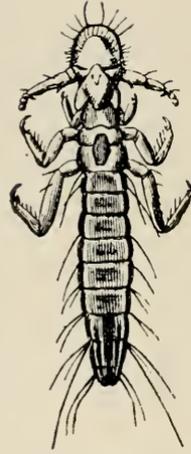


CHICKEN LOUSE.
Goniocotes hologaster, male.
Forty times natural size.

more hiding places and more food for lice than the smooth, pliable skin of the perfectly healthy bird. When fowls are afflicted in this way it can be noticed that they are uneasy and restless, they are constantly pecking at different parts of the body and scratching and shaking themselves. They also have an inclination to dust themselves and when caught and examined the lice can frequently be seen, when the feathers are spread apart, and especially about the head and neck, where they cannot be reached by the bill of the animal, beneath the wings and sometimes on all parts of the body. They may also be found in many cases, if a careful search is made, in the nests, on the perches and in cracks and out-of-the-way places at any point in the building.

In attempting to destroy lice it is necessary not only to treat the fowl but also the premises occupied by it.

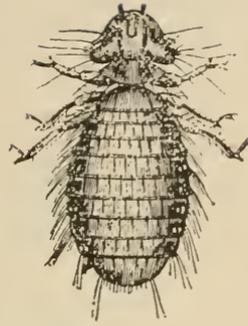
because if we simply destroy those that are on the bird they will return again from the surroundings just as fleas do. In treating an animal for the purpose of destroying lice two methods may be employed. We may use substances that will poison the lice outright or we may use substances that are not poisonous in themselves but which destroy lice by obstructing the pores on the surface of the insect and thus shutting off its supply of air and suffocating it. The latter plan is preferable in the case of young and weak birds. Little chickens but a few days old frequently acquire lice from their mothers or



THE LONG CHICKEN
LOUSE.
Lipeurus variabilis,
Male.

their surroundings and are sometimes annoyed seriously by them. In these cases it is advisable to apply a small quantity of bland oil, such as sweet oil or cotton-seed oil, to the chicken's head and perhaps to the sides of the neck if the parasites are very numerous, or lard may be used for the same purpose. In the case of older fowls sulphur ointment is a very efficient remedy. It should be applied in small quantity about the head, sides of the neck, beneath the wings and around the vent. Or insect powder (*pyrethrum*) may be blown between the feathers and this will destroy or drive away the lice. If the fowl is to be liberated immediately after the powder is applied it is well to first dampen the feathers so that it will not be at once shaken off. A dust bath should always be provided, and this goes a very long way toward keeping fowls free from all sorts of skin parasites. It is frequently advisable to add insect powder or sulphur to the dust.

Neumann records a case where a farmer took the plaster from a building that was being torn down and threw it into the road so that it might be thoroughly pulverized by passing wagons. This powdered plaster was thrown into a poultry house infested with lice and a dust bath was made of it, with the result that the lice disappeared completely within a short time.



THE PALE CHICKEN LOUSE.

Menopen pallidum, female.

Another plan for removing lice is to place the body of the fowl in a box provided with an opening through which the head can project. The box is then filled with sulphur fumes which destroy the lice very quickly. A wash of very weak carbolic acid solution or of weak creolin solution has also been recommended for this purpose, but it is not well to dampen the fowl if it can be avoided because they are so very prone to take cold.

The destruction of the lice in the poultry house necessitates the thorough cleansing of the building. The movable fixtures should be removed, the walls should be thoroughly swabbed or washed down, the floor should be scraped and scrubbed and then the entire interior should be whitewashed with a whitewash to which chloride of lime (one pound to four gallons) has been added. Or prior to the whitewashing the interior of the building may be sprayed with a solution of carbolic acid (one part to twenty of water) or fumigated by burning sulphur after all of the cracks and

crevices have been carefully closed. Kerosene emulsion is also highly efficient as a spray for the interior of an infested poultry house. The perches and nests should be scrubbed with a strong solution of washing soda or lye or scalded with hot water. If this treatment is carried out and if the poultry house is white-washed two or three times a year there will be little trouble in keeping the fowls free from lice.

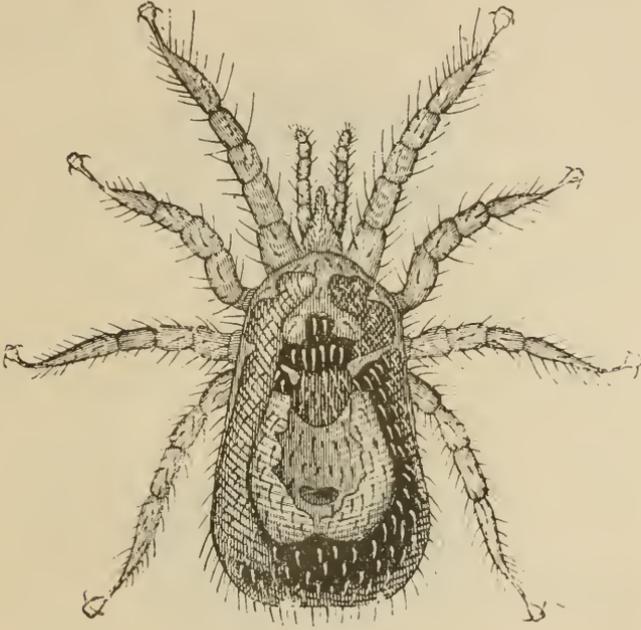
3. MITES AND TICKS.

These parasites are usually, though improperly, described as lice. They are exceedingly annoying to all kinds of poultry and sometimes cause such loss of condition that lice are suspected but none can be found.

THE COMMON POULTRY MITE, the *Dermanyssus galline*, is a small, oblong parasite, about 1-32 of an inch long and 1-70 of an inch broad. It is provided with eight legs and each foot has two claws.

The abdomen is surrounded by short bristles. The color is yellowish or brownish, but when the animal is full of blood it becomes dark brown or dull red. The back sometimes shows little white spots. This parasite is one of the most destructive known. It affects all varieties of domestic fowls and sometimes when present in large numbers passes to other animals, cattle, dogs, cats, horses and sometimes to people. One of the striking peculiarities in regard to it is that it does most of its work at night. Upon the ap-

proach of day it leaves its victim and retires to a dark, secluded spot. A space beneath the end of the perch or under the nest or between the cracks of the floor



THE RED POULTRY MITE.

Dermanyssus gallinae—Female—80 times natural size.

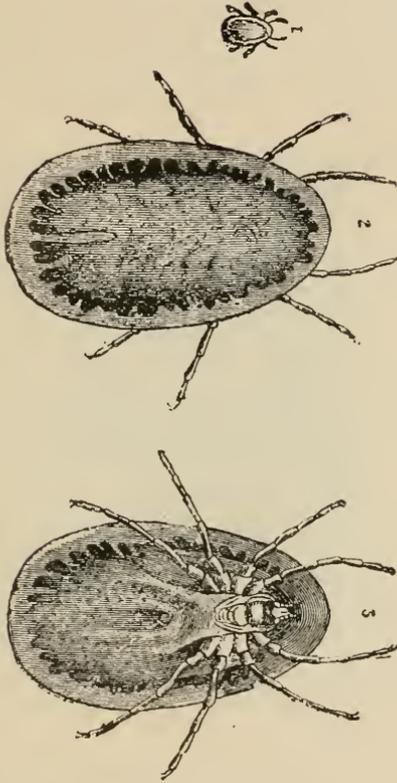
or walls may sometimes contain a large number of these parasites, both male and female, together with a quantity of eggs and young. They multiply so rapidly that after a few have been introduced into the poultry house it may become overrun within a few weeks. This mite is very resistant and difficult to destroy. Some of them have been preserved alive without food for more than a year.

In contradistinction to the habit of the bird lice, this

parasite sucks the blood of its victim and one of them may remove quite an appreciable quantity. It is especially hard on young chickens and turkeys and on setting hens. In the former case, by preventing rest at night and by removing blood from the weak and growing bird, it produces weakness and sometimes death. In the latter case, by constantly disturbing the setting hen during the night when she should have perfect rest, the annoyance may be so great that she will be impelled to leave the nest and allow the eggs to become chilled or in her endeavor to relieve herself of the parasites, the eggs may be broken. The remedies to be employed to destroy these parasites are similar to those employed for destroying bird lice. But in this case the disinfection and cleansing of the surroundings are of even greater importance. Special pains should be employed to introduce whatever disinfecting solution is used into all cracks and spaces where these parasites might lodge. Carbolic acid solution (1 to 20) especially valuable for this purpose, and if a good treatment of the building with it is followed by the application of whitewash the insects can be thoroughly eradicated.

The BIRD TICK (*Argas marginatus*) is in some respects similar to the parasite above described. It is confined to pigeons. It is of an oval shape, of a brownish color, and its head is located beneath the body. It sucks the blood from its victim and sometimes occurs in such large numbers that it destroys pigeons in two weeks, producing death from exhaustion. It is found most frequently about the neck and beneath the breast, but it may also appear on other parts of the body. Sometimes it passes to those who have to handle infested pigeons, and in these cases it

may cause by its bite a very painful itching spot that



THE PIGEON TICK—*Ixodes morphotus*, Female.
 1. Natural size. 2. Magnified, seen on upper surface. 3. Same, seen on lower surface.

will remain sore for several days. When these parasites are found adherent to the skin of the pigeon, they should be covered with oil or with benzine. This enables one to pull them off without leaving the head in the skin. If the head is broken off a sore place results. The cleansing and disinfection of the pigeon house is of the greatest importance and should be

carried out in the most thorough manner. The interior should be thoroughly scraped and scrubbed and then fumigated or sprayed and whitewashed.

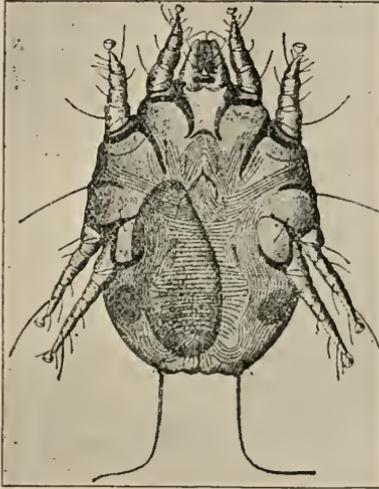
4. MANGE.

Mange of birds is of two kinds: That affecting the feathered parts of the body and that affecting the legs and feet. Of the first kind there are two principal varieties, which have such prominent characteristics that they can usually be distinguished without difficulty. Mange of the legs and feet is considered on page 83, in connection with the diseases of the legs and feet. Fortunately, mange of poultry is not common in this country, but as we are constantly importing fowls of all descriptions from all parts of the world, and constantly interchanging them, the disease may be introduced into any locality at any time, and it is therefore important that it should be understood so that its ravages may be checked before extensive injury has been occasioned.

MANGE OF THE BODY.

The first variety of body mange is caused by an exceedingly small parasite known as *Epidermopter bilobatus*. The first indication of this disease is the ap

pearance of a bare spot about the neck or on the head. The feathers become dry and brittle and either break off or fall out. Then the skin becomes covered with yellowish scales which gradually increase in thickness as the disease advances until they sometimes reach a thickness of an eighth of an inch. When old, these

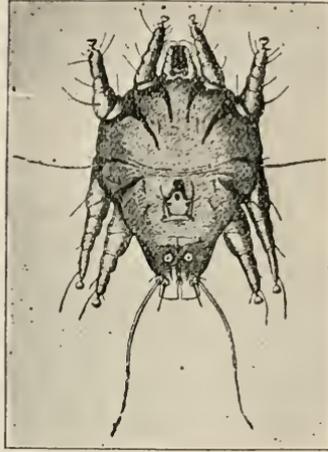


THE PARASITE OF ONE FORM OF BODY—MANGE OF FOWLS.
Epidermoptes bilobatus, Female—150 times actual size.

scales are grayish and have the appearance of thick scabs. If they are pulled off it is found that the skin beneath is red and bleeds easily. As a rule these areas do not itch, but sometimes they do, and then the bird scratches them vigorously. After becoming established about the head and neck the disease may spread to the body and sometimes covers a very large surface. The symptoms of this affection resemble those of favus so closely that it has been thought by

some that the disease is in fact produced by a vegetable parasite, but as yet this has not been proven.

The other variety of body mange is caused by a parasite known as *Sarcoptes levis*. Of late years it has been common in Europe, and has prevailed especially during the spring and summer. It may begin on any part of the body and usually spreads until the entire skin is affected. When it has reached this stage the whole body is bare and

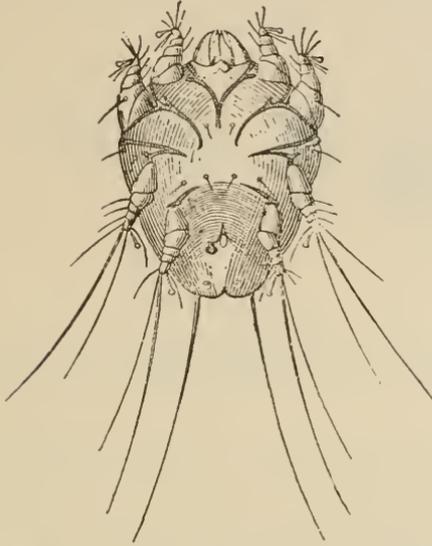


THE PARASITE OF ONE FORM OF BODY
— MANGE OF FOWLS.

the only feathers that remain are a few in the tail and some in the wings. The skin is healthy in appearance, with the exception that it is devoid of covering. It is smooth, flexible and normal in color. There is no itching and the general health of the fowl is usually good, although sometimes, after having been afflicted for a long time it may become thin and gradually waste away. When feathers are pulled out on the border of the diseased area it is noticed that the lower end of the sheath is covered with scaly layers and the parasite can usually be discovered among them.

Schaeffer has recently reported a case where this disease appeared among a flock of 70 hens and nearly all of them lost all of their feathers, with the exception of those in the wings and tail. The parasite could

easily be found by pulling out a feather and examining its base. These fowls had been kept in dirty pens



THE PARASITE OF ONE FORM OF BODY-MANGE OF FOWLS.
Sarcoptes levis, male—200 times natural size.

and were also afflicted with mange of the legs. The pens were re-arranged and cleaned and the fowls were sprinkled twice a week with a weak solution of creolin poured on to them from a watering pot, with the result that in about four months they had recovered and feathered out again.

The treatment to be employed in these cases is first of all to isolate the afflicted fowls. Then disinfect the premises that they have occupied, and afterward give them individual treatment if they are worth it. The local treatment consists in the application to the diseased skin of remedies that will destroy the parasite producing the disease. One of the best applica-

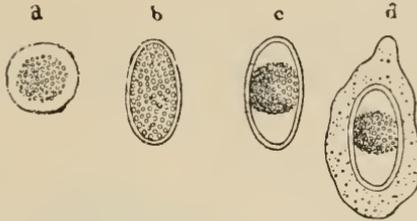
tions for this purpose is a solution of balsam of Peru in alcohol (1 part to 5). This can be applied with a sponge or soft brush, and should reach not only the diseased area but the healthy skin for a distance of about an inch on all sides. Another efficient application is sulphur ointment, or a solution of creolin (1 part to 50) may be used, but should be applied lightly and not rubbed in, because if applied too freely or energetically it may poison the fowl.

5. PROTOZOA.

Barnyard fowls, turkeys, and especially pigeons, are sometimes attacked by a peculiar wart-like growth that appears about the head, the base of the beak, the eyelids and the orifices of the nose, and sometimes spreads to the base of the wings and the general surface of the body. These growths are yellow and smooth and resemble the warts that frequently appear on the hands. They are contagious, spreading from one bird to another, usually slowly, but sometimes with considerable rapidity, and are caused by a minute animal parasite belonging to the *Protozoa*.

That these growths are contagious has been frequently proven by experimentation. One of them can be removed and a small portion of it rubbed over the scarified skin of a healthy fowl. Within eight or ten days the surface will show a perceptible elevation at the point of inoculation, and a few days later the new warty growth will be plainly developed. These warts

are not destructive to the pigeon unless they are very numerous, or occur so plentifully about the eyes and nose as to obstruct these openings, or spread from the



PROTOZOA, FROM A FOWLS INTESTINE.

Coccidium perforans,

a, b, coccidia extracted from the epithelial cells of the intestine, and representing the first phases of development; c, encysted coccidium, found free in the intestine; d, adult coccidium encysted in an enlarged and deformed epithelial cell.

corners of the beak into the mouth. If they are numerous in these localities they cause serious inconvenience, the bird becomes thin and weak and finally dies. The English poulterers sometimes refer to this disease as a pox of the chicken but this designation is very misleading because fowls do not suffer from pox in the sense that mammals do.

The remedy for these warts is to remove all infected birds from the pigeon loft, renew the nests, clean the interior and treat the individual by burning the wart out with a hot iron or apply tincture of iodine or turpentine. Creolin is also efficient, but it is necessary that the top of the growth should be sliced off before the creolin is applied, then by placing a drop on the end of the wart and renewing the application every three or four days as long as necessary, the condition may be permanently cured. Tincture of iodine constitutes by far the best remedy.

6. FAVUS.

In some respects this disease resembles mange. It is, however, produced by an entirely different parasite, and on close examination it can be seen that the condition of the skin is different from that which exists in mange. The parasite of favus is a vegetable growth, known as *Achorion schorleinii*.

Favus usually commences about the comb, head and neck. It causes the feathers to become brittle and break off and fall out, and when these are examined closely it is seen that their interior is filled with scales and with branching threads resembling minute roots. These are the filaments of the vegetable parasite or fungus. When the

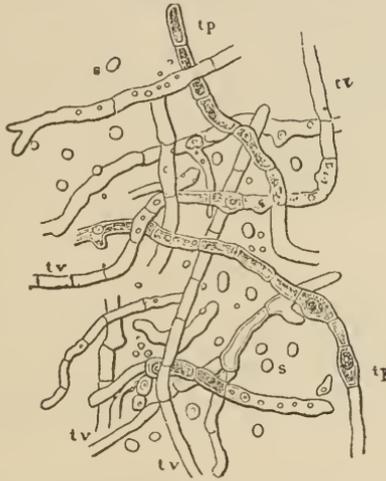


HEAD AND NECK OF A FOWL AFFECTED WITH GENERALIZED FAVUS.

comb is involved, it becomes swollen, its surface becomes scaly, whitish and powdery. The eyelids are frequently affected, and in some rare cases the feathered surfaces are involved to such an extent that the bird becomes almost naked. Upon the skin there develops a thick yellowish or grayish crust or scab in the form of rather small, roundish disks, depressed at the centre. The odor of the diseased bird is peculiar and

disagreeable and resembles that of a mouldy or musty grain bin. It becomes thin, weak, exhausted, and unless relieved it dies.

If a small portion of a crust or the contents of a feather growing on the diseased skin is moistened with a weak solution of acetic acid and placed under the microscope it will be seen that it is made up of cells



THE *Achorion Schonlein* OF THE FAVUS OF POULTRY.

Eight hundred times natural size; tv, empty tubes; tp, tubes containing protoplasm and spores; s, isolated spores.

from the skin among which thread-like branching filaments penetrate in all directions. There are also numerous little round bodies which are the spores or seeds of the parasitic plants. Favus is contagious and spreads from one animal to another. It is more apt to affect animals that are in poor health and weak than those which are hearty and strong. It is also more apt to start at a point where the skin is broken than where it is intact. There are numerous observa-

tions on record which seem to indicate that favus may be communicated from fowls to man and it is important therefore that birds in this condition should be handled very carefully.

The diseased fowls should in all cases be removed from the flock as soon as this malady is recognized. Then they may be treated by applying oil or glycerine to soften the scab, and when this has been removed an application of creolin (1 part to water 30 parts), or carbolic acid (1 part to water 100 parts), should be used, or the surface may be painted with tincture of iodine, or an ointment composed of benzine, 1 part, and soft soap, 20 parts, may be applied and thoroughly rubbed in.

B. Those not caused by parasites.

1. IRRITATION OF THE SKIN.

It sometimes happens that when fowls are exposed to cold rains or to draughts while they are wet or to an accidental application of irritant drugs, such as carbolic acid, kerosene or similar substances, sometimes used for the purpose of killing lice, that the skin becomes irritated and red. The redness may continue for several days and some feathers may drop from the affected parts. This condition is not very serious, and can easily be remedied by applying mild ointments such as the oxide of zinc ointment or cosmoline. The removal of the cause is usually sufficient to effect a cure.

2. INFLAMMATION OF THE SKIN.

The causes of the previous affection when unusually severe, or when they continue to act for a considerable time, produce not only the mild condition above described, but also an inflammation of the skin that is more or less intense. A similar condition may result from the accumulation around the posterior portion of the body. In cold weather these accumulations alternately thaw and freeze and pull upon the feathers they are attached to, thus leading to an inflammation of the adjacent skin that can be recognized by redness, swelling, tenderness to pressure and discharge from the surface.

The remedy consists in cleansing the skin by the use of soap and water, cutting off the feathers if necessary, and then applying the ointment above mentioned.

3. DISTURBED MOULTING.

During the spring while fowls are shedding their feathers they are in a delicate condition and are more apt to become diseased upon exposure to deleterious influences than at any other time. Their tenderness and loss of vitality is shown by the fact that they lose their spirits and activity to some extent. Their appetites are somewhat capricious, and the production of eggs falls off very greatly. If the loss of condition

at this time is unusually great, or if the fowl is poorly nourished or weakened from any cause, moulting is retarded and the old feathers remain in the plumage, giving the fowl an unkempt, faded, weather-beaten appearance. This result is frequently dependent upon improper feeding at this critical time.

To achieve the best results, fowls must *always* be fed carefully and their rations should be as nearly balanced as possible. During the moulting season especial care is necessary, and the food should be more nitrogenous than at other times. Unless fowls have the material in them and in their food for the production of new feathers the old ones will not be shed. In order that unusually nutritious food may be thoroughly digested it is necessary that the fowls should have free exercise in the open air, but they should also be protected from bad weather, from cold rains and when delicate should be housed early in the evening. A diet containing meat, either raw or cooked, and bones, is appropriate for moulting fowls, and it is also well to give some stimulating food, such as chopped onions or garlic, or a small quantity of pepper. Some of the English poulterers recommend stale bread soaked in ale for valuable fowls during the moulting season, and the Douglas mixture is also in high repute among them. This mixture is made by dissolving 1 oz. of sulphuric acid and half a pound of sulphate of iron in two gallons of water. One or two table-spoonful of this solution are placed in each pint of the drinking water, and the effect is that of a gentle tonic. One should always pay particular attention to the cleanliness of the poultry house during the moulting season, because if lice or mites are present then they will do more harm than at other times.

4. OBSTRUCTION OF THE RUMP GLAND.

There is a gland at the point of the rump that secretes an oily substance that tends to keep the feathers in this region oily and sleek. This gland is the largest of the superficial glands of the body and sometimes the orifice through which it discharges its secretion becomes obstructed. Then the region of the gland swells and becomes painful. It may swell to such an extent that it reaches the size of a walnut. This causes considerable pain, the afflicted fowl becomes sluggish and generally indisposed and when it is caught and examined the local swelling can be readily discovered.

If the gland cannot be emptied by gentle pressure a small incision should be made into it with a sharp knife and its contents removed. If, however, the condition has existed for a long time, the gland may fill with a thick, cheesy-like material that cannot be squeezed out. It then becomes necessary to make a somewhat larger opening and scoop the substance out with the handle of a small spoon or some similar object. Then the cavity should be washed out by injecting into it a very weak solution of carbolic acid (1 part of carbolic acid to 200 of water), or a solution of boracic acid (15 grs. to the ounce). To prevent the parts from becoming hard while healing an application of oil or cosmoline should be made.

CHAPTER II.

DISEASES OF THE BREATHING ORGANS.

A.—*Those caused by parasites.*

1. GAPES.

Gapes undoubtedly destroy more young chickens than any other disease. It is a disease caused by a small worm that occupies the upper air passages. This worm was first discovered near Baltimore by Wiesen-
thal in 1799. Since then it has been described by numerous zoologists and is at present found in all parts of this country and Europe. All of the domestic fowls



GAPE WORM.—*Syngamus trachealis*.
Natural size and five times natural size.

are attacked by it and some of the semi-wild birds. In Europe it causes great loss among the pheasants.

The worm is known as *Syngamus trachealis*, is of a reddish color and the female is about one-half to three-fourths of an inch long, while the male is about one-fifth of an inch long. The male is constantly attached to the female, the funnel-shaped lower end surrounding a pore on the side of the female a little less than one-third of the distance from its head. On account of this peculiar union a gape-worm is sometimes described as a "branch-worm" and on account of its color it is in some places known as the "red-worm." The head is broad and flat and arranged for sucking. This disc-like head is placed against the lining membrane of the wind-pipe at any point between the mouth and the bronchial tubes. Sometimes there are as many as 30 or 40 worms in a single fowl, but usually not so many. Three or four of them suffice to destroy a young chick but a greater number are necessary to destroy an adult.

When the worms are coughed out other fowls eat them greedily and in this way they become infected in turn, because the mature females are full of eggs. It has been shown by experiment that after birds are fed upon worms containing eggs they may develop gapes within two to three weeks. Another and perhaps the principal way in which the disease is spread is through the agency of earth-worms. Many of the eggs of the gape-worm when thrown out on the ground gain ac-

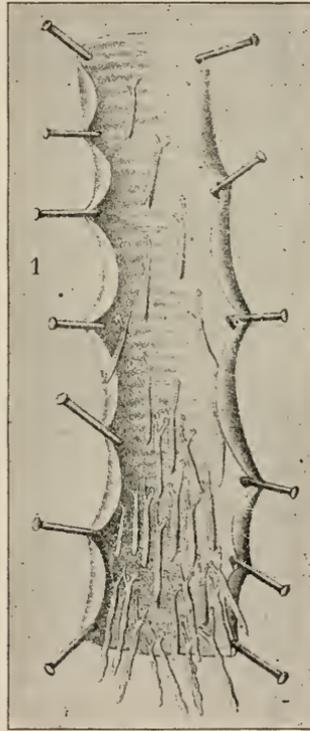


A PAIR OF GAPE WORMS
ATTACHED TO A SEC-
TION OF WIND PIPE.

cess to the interior of the earth-worm, then when the earth-worm is eaten by a chicken young gape-worms develop from these eggs and the chicken becomes diseased. Some of the gape-worms are partially coughed up and then swallowed by the fowl; the eggs in them pass through the digestive tract and are voided with the faeces so that in this way, also, the soil of the barn-yard or the water may become contaminated.

The symptoms of gapes are very easy to recognize. The afflicted fowl has difficulty in breathing; it opens its mouth frequently and gaps, or gasps for breath. This manner of opening the mouth is the characteristic from which the disease derives its name. There is some coughing accompanied by the expulsion of frothy slime. Sometimes the mature worms are coughed out. The afflicted bird loses its spirits, it stands about with the feathers ruffled and head down, at intervals opening its mouth as though gasping for air. If there is any doubt as to the nature of the disease an examination of the throat should be made. This is done by catching the bird and holding the mouth open by pressing with the thumb and finger on each side of the beak. This forces the mouth open and exposes the throat. Then by introducing a small object to depress the tongue the larynx may be exposed and the interior examined. Pressure upon the larynx from below will force it up into plainer view. Death results in some cases quickly, from suffocation, and in other cases slowly, from exhaustion and secondary diseases. When this disease appears in a flock, the afflicted fowls should at once be removed in order to prevent the distribution of the parasite. The worms can frequently be removed from the wind pipe by introducing a loop made by doubling a horse-hair. This

when introduced and turned around dislodges the worms and draws them out. Or, a feather from which all of the barbs have been removed with the exception of those at the point, may be used for the same purpose. Some recommend a timothy head from which the seeds have been removed by rolling between the hands or by shaking, but this is so large that it is difficult to use it except in mature fowls. For chickens, the projections on the lower part of the timothy head may be removed and only those on the tip allowed to remain. This appliance has the advantage over the horse hair and feather that its sharp spines or hooks are more likely to adhere to the worm and permit its removal. Sometimes oil or turpentine are applied to these various instruments before they are introduced into the wind-pipe. It is advised in some cases to inhale the smoke of tobacco. This is done by placing them in a closed box and blowing smoke into it from a pipe. The worms are in this way stapedified but unless care is used the fowls will also be stupified and perhaps



THE WIND PIPE OF A PHEASANT, CUT OPEN LONGITUDINALLY, SHOWING GAPE WORMS ATTACHED TO ITS INTERIOR.

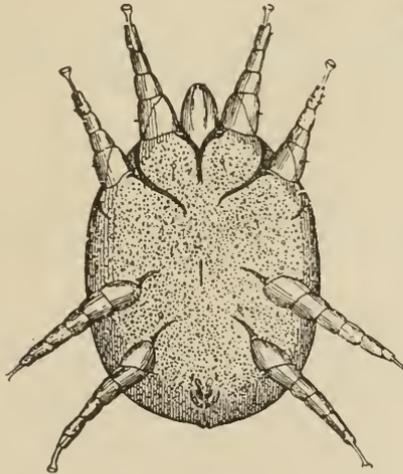
suffocated. However, the fowl can stand more tobacco smoke than the worm, so that after its release from the box it usually coughs up the weakened parasites. Powdered lime is also used for removing the gape worm by dusting it in such a way that the fowl is caused to inhale some of the fine particles. Some times the fowls are placed in a box over which a sheet of muslin is spread and lime is sifted through this muslin top and the fowl is obliged to inhale the dust. This procedure is somewhat dangerous unless great care is exercised, and cannot be very highly recommended.

In the way of internal treatment, camphor, asafoetida and garlic are all of value. Camphor should be given in pills of about one grain each. Asafoetida should be given in one grain pills and garlic should be chopped in fine pieces and fed with the food.

The treatment of the soil over which the infected fowls roamed is of great importance and especially if they were kept in confined spaces. By treating the soil with lime and spading or ploughing it up frequently the eggs of the gape-worm may be destroyed. Or the ground may be thoroughly soaked with a solution of sulphuric acid (one part to one hundred). The water troughs and feeding places should all be thoroughly cleansed and disinfected with coperas solution (one pound to two gallons of water). The bodies of the dead fowls should be buried deeply at a distance from the barn-yard, or burned.

2. DISEASES OF THE AIR PASSAGES CAUSED BY MITES.

There is a minute parasite similar to the parasite of mange that infests the air passages and specially the windpipe, the bronchial tubes and the large air spaces in the chest. It is known as *Cytodites nudus*. Sometimes these parasites penetrate beyond the air sacs and reach the air spaces in the bones. When present in large numbers, they cause an inflammation of the parts they infest, but when present in small



THE AIR-SAC MITE OF FOWLS.

Cytodites nudus, one hundred times natural size.

numbers they seem to produce no disturbance. The disease produced by them in the bronchial tubes is of the nature of a bronchitis of a severe type and sometimes there is inflammation of the lungs, or pneumonia,

as well. These conditions are indicated by difficult and rapid breathing and, Zurn says, by a peculiar tone that is similar to that produced by fowls when a foreign body enters the windpipe. Otherwise the birds seem lively and have a fairly good appetite. It is only when these parasites are present in enormous numbers that the disease they produce is sufficiently severe as to cause death.

The treatment of these cases is not at all satisfactory, so that it is cheaper in the end to destroy the afflicted fowls than to attempt to cure them. Upon opening a bird that has died of this disease the parasites can be seen in great abundance in the parts mentioned.

If treatment is attempted the inhalation of the vapor of tar or of burning sulphur is as promising as anything.

3. PNEUMONIA CAUSED BY MOULDS.

Several varieties of the common moulds that grow so plentifully in dark, damp places have been known to enter the air passages of fowls, penetrate to the lungs and grow there, causing a fatal pneumonia. The moulds that have been discovered in this locality are of three varieties of *Aspergillus* and one of *Mucor*. It is probable that they enter the lungs in the form of dust, because their spores are exceedingly small and could readily pass into the lungs in this way. Then, if they find the conditions there favorable to their growth they multiply and cause little spots of disease

wherever they grow. Sometimes they spread out over the lining membrane of the air tubes and cause a diffuse inflammation and thickening that somewhat resembles the change that takes place in diphtheria. In the lungs, the growths are characterized by the appearance of little round nodules, where the tissue dies and becomes yellowish and of the consistency of cheese. In old cases, these spots sometimes become loaded with lime salts and then they are hard and even stony. The principal symptom is difficult breathing. The respiratory movements are rapid and accompanied by a hoarse sound. The appetite is diminished, the spirits are depressed, the bird is disinclined to move, its feathers become ruffled, it loses flesh rather rapidly and towards the end develops a diarrhoea that hastens it to its fatal termination. The entire course of the disease is rather long and usually covers several weeks.

Treatment in these cases is not to be recommended because the outlook for recovery is poor. However, if anything is done the best results can be obtained by causing the bird to inhale the vapor of iodine. This plan of treatment is carried out by mixing equal parts of tincture of iodine and hot water. The steam as it rises carries the iodine vapor and by holding the vessel beneath the bird's head it is obliged to inhale this medicine. Iodide of potash may be administered internally in doses of one to two grains twice daily.

It is far better, however, to prevent the disease than to allow it to develop and then attempt to cure it. When it is remembered that moulds occur principally in damp, dark places, it will be seen that good drainage, ventilation and light will prevent their growth and thus ward off the disease. Disinfection and white-washing are also of the highest value in this direction.

B. Those not caused by parasites.

1. CATARRH OF THE NASAL PASSAGES. "PIP."

All sorts of fowls, and especially the young, take cold easily when exposed in damp places. An earth floor in the poultry house, particularly if it is poorly drained, is a fruitful source of colds. Poorly constructed buildings with cracks in the walls or broken window panes, permitting a draught to blow through and strike the fowls while roosting at night, is a common cause of cold.

Colds are recognized by the well-known symptoms of discharge from the nose, sometimes also from the mouth, swelling of the eyelids, depression of spirits, shown by disinclination to move about actively, marked loss of appetite, inclination to stand in a warm, bright place, with the head drawn down and feathers ruffled, and, if the fowl is a laying hen, cessation of egg production. Since the nasal passage is stopped up the fowl breathes more or less through the mouth, and this may lead to dryness and hardening of the tip of the tongue. This condition is often described by poulterers as "pip," and especially when young chickens are affected.

The treatment is simple and consists first of all in bettering the conditions to which the fowls are subjected, and thus removing the cause of the disease. Holes in the roof and sides of the buildings should be patched, broken window panes replaced, and if it is not possible to keep the floor of the poultry house dry at all times it should be removed to another location. The fowl should be placed in a warm, dry coop, where

the sun can shine in freely, supplied with small quantities of tempting food and clean water in clean vessels, to which may be added a small amount of chlorate of potash (15 grs. to the pint). A little onion or garlic in the food is also of advantage. If the discharge from the nose collects about the orifices and obstructs them, or if the eyelids are swelled to such an extent that they cannot be opened, the collection of matter should be removed by means of a sponge or soft cloth moistened with warm water.

2. LARYNGITIS AND BRONCHITIS. SORE THROAT.

If the cold is of an especially severe type, on account of the fact that the exposure to which the fowl was subjected was intense or of long standing, or if the fowl is young or of a naturally weak constitution, the membranes of the air passage may become afflicted with catarrh that reaches beyond the head into the throat, and into the branching bronchial tubes that penetrate the lungs. In these cases, the discharge from the nose is more profuse, the depression of the fowl's spirits is greater, there is considerable difficulty in breathing, and in severe cases the bird may gasp for breath very much as though its windpipe were obstructed by gape worms.

The general treatment in these cases is the same as for pip, but more attention should be devoted to the fowl because it is in a more serious condition. In

place of chlorate of potash in the drinking water it is better in these severe cases to add small quantities of baking soda (bicarbonate of soda) and Glauber's salt (1 drachm to each pint). It is also of advantage to give small doses of sal ammoniac (1 grain) mixed with honey.

Since roup, a very contagious disease of fowls, commences in a similar way, it is very important to immediately remove from the flock all birds showing the symptoms described above, because if it should prove that they were afflicted with roup the extension of the disease might in this way be prevented.

3. LUNG FEVER OR PNEUMONIA.

If the exposure to which a fowl is subjected is of an unusually severe character, it may result that the bird will develop inflammation of the lungs or pneumonia. Symptoms of this very severe affection are at first similar to those of the two preceding diseases, but they rapidly become worse, and within a short time the patient evinces great difficulty in breathing. It loses all ambition and sense of fear, remains stubbornly in one place and when caught and examined it will be noticed that the muscles in the lower part of the body, those of the abdomen, contract and expand with each respiration and in this way assist the muscles of the chest to expel and renew the air in the diseased lungs. Pressure on the sides of the bird will cause considerable pain. If the fowl dies, and unfortunately most of

them do when afflicted with pneumonia, it will be found that the lungs are very red and full of blood, and portions of them when cut off and placed in a vessel of water will sink instead of floating as pieces of healthy or slightly diseased lungs do. The air tubes are filled with a yellowish or reddish frothy fluid which in some cases is expelled in small quantities during life.

The treatment of these cases is not profitable, because so few of them recover. If, however, one wishes to treat an especially valuable fowl, and will consent to devote the time and care to the case that it requires, good results may follow.

Half a teaspoonful of whiskey in a little warm water, together with from 2 to 3 grains of saltpetre and ammonium carbonate may be administered at intervals of from three to four hours. It is also well to cause the fowl to inhale fumes of burning sulphur, but this vapor should not be administered in a concentrated form. The fowl must be kept in a warm, dry place.

CHAPTER III.

DISEASES OF THE DIGESTIVE OR GANS.

A. Those caused by parasites.

There are a great many parasites that infest the digestive organs of fowls. Some of these are of but little moment, because they occur in small numbers and do but little harm; while others are of the greatest consequence because they are sometimes exceedingly numerous and seriously affect the health of the afflicted bird or cause death. The number of parasites that sometimes infest fowls without producing appreciable effects is almost incredible; while in other cases a much smaller number of parasites of the same species may not only cause great inconvenience but may destroy the life of the infested bird. So it is evident that the effects of parasites depend not only upon the number and activity of the parasites themselves, but also upon the strength and resisting powers of the bird affected.

Usually, the number of fowls in a flock that harbor parasites of the same kind is considerable. So that when one of a flock is killed by parasites, and the cause

of death is disclosed by a dissection of the bird, it is fair to assume that other fowls that present the symptoms shown by the dead one, suffer from the presence of the same kind of parasite.

Of all varieties of poultry, guinea fowls and pea fowls are least subject to the ravages of parasites. Of the other varieties, those that live on dry land seem to be more troubled with parasites than those that swim in the water, as ducks and geese.

1. TAPEWORMS—CESTODES.

A tapeworm is a row of more or less distinct organisms joined together in the form of a band or tape. At one end there is a somewhat conical or globular segment supplied, at its free end, with four suckers, and in the center between these with a crown of thorns. This segment is usually termed the head of the tapeworm, but in reality it is not a head for the tapeworm has and requires no head. It has no mouth, no eyes, no nervous system, no intestinal canal. It derives its nourishment from the fluids surrounding it by absorbing them through its outer skin. The first segment, popularly termed the head, is known in scientific language as the *Scolex*, and its function is to attach itself to the lining membrane of the intestines by its suckers and hooks, and by a process of division develop tapeworm joints from its other extremity.

The segments close to the scolex are small and immature, further away they are larger and more developed, at the end of the chain they are mature or ripe. The ripe segments are detached from time to time and pass into the contents of the intestinal canal and escape from the body with the faeces. These mature segments are provided with contractile fibres in their walls and are able to move about. They contain eggs. Their life outside of the animal in which they are developed is short, and when they die and break open the eggs escape. If these fall in a damp place, they retain their vitality and power to mature for a long time, in some cases many months.

A remarkable and interesting fact in connection with the life history of the tapeworm is that the eggs will not develop into mature worms in the body of an animal belonging to the species of the one in which they were produced. It is necessary that they should first enter the body of an animal of a different species and there develop into embryos, which pass through the walls of the intestinal canal and penetrate to distant parts of the body. There the embryos remain in a somewhat more advanced state of development until their host dies and is consumed by an animal belonging to the species of the original host.

This can be illustrated by briefly describing the life

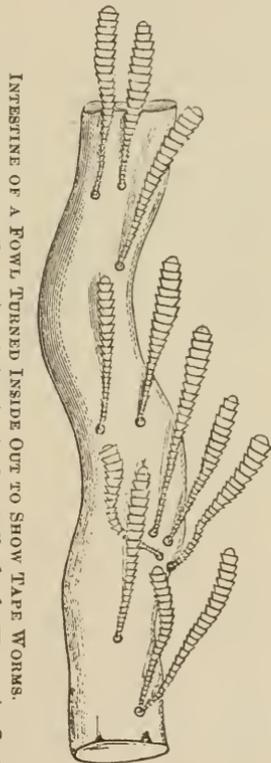
A TAPE WORM OF FOWLS—*Drepanidictyon imbricatum* formis.



history of one of the common tapeworms of man (*Tænia soleum*) usually called the "pork tapeworm." The eggs from the mature tapeworm of this species pass from the body of a person harboring it and some of them are consumed by swine. They hatch out in the stomach or intestines of the swine, penetrate the intestinal walls and reach the muscular portion of the animal. There, they constitute the so-called "bladder worm" or "measles" of pork. The hog is slaughtered and if its flesh is eaten raw or imperfectly cooked, the consumer swallows the living parasites which develop in the intestinal canal into mature tapeworms.

In the same way it is necessary for the tapeworms of fowls to pass through the body of an intermediate host before they can re-appear as tapeworms in fowls. It has been shown by definite experiments and numerous observations that the intermediate hosts in some cases are small animals such as snails, molluscs, worms and insects and it seems probable that these animals are the intermediate hosts for bird tapeworms in all cases.

A single tapeworm in the intestinal canal of a fowl may do no harm. But when they are numerous symptoms of disease appear. One of the



INTESTINE OF A FOWL TURNED INSIDE OUT TO SHOW TAPE WORMS.

first effects is the irritation of the membrane lining the digestive tract. This produces diarrhoea and may lead to loss of flesh. Zurn has observed that fowls afflicted with tapeworms have an unusual thirst and an especial liking for cold water of which they drink large quantities and he claims that this symptom should always be regarded with suspicion. In time, as the result of the continued irritation of the intestinal canal and the fact that much of the nourishment that it contains is diverted to the worm and lost to the fowl, the bird becomes weak and thin. Its droppings are frequently mixed with mucus and sometimes with blood. A close examination of them sometimes reveal segments of the tapeworm and a careful microscopic examination may reveal eggs in large or small quantities. Sometimes the tapeworms indirectly produce an irritation of the nervous system that is characterized by fits.

If the afflicted fowl dies, it will be found that its organs are pale and contain but little blood. If the intestinal canal is opened the tapeworms can be discovered hanging by their thin ends to the mucous membrane, with the rest of the body floating in the canal. It is easiest to discover the worms when the intestine is opened with a pair of scissors while it is held below the surface of warm water.

Illinger has described an outbreak of tapeworm disease among geese that was so extensive that it became almost impossible to raise these fowls in a certain district. When the goslings reached the age of ten or twelve weeks they would commence to become thin, notwithstanding the fact that their appetites continued good, and finally they would develop epileptiform fits and severe diarrhoea and shortly thereafter would die. Death usually occurred within two weeks after the appearance of the first symptoms. Upon

dissecting these birds, tapeworms (*Tænia lancolata*) were found in the intestines in great numbers.

As to the treatment of fowls afflicted with tapeworms, a large number of remedies are recommended and used with more or less profit.

One of the standard remedies among European poulterers is powdered bark of the pomegranate root, of which one teaspoonful is apportioned for the feed of each fifty chickens. Powdered areca nut may also be used in doses of from thirty to forty grains, mixed with butter to form a pill. This quantity should be administered to each bird, but it is not a good remedy for turkeys. Dr. Stiles of the Bureau of Animal Industry has recently experimented with the oil of turpentine as a remedy for fowls and finds that the largest safe dose is about one tablespoonful. This remedy is very useful for the purpose of removing parasites of all kinds from the intestinal canal of most of the domestic animals and it is altogether probable that it will prove of considerable value in treating fowls with tapeworm. It should be followed by an equal quantity of castor oil. As with most other diseases of poultry it is very much better to prevent than to attempt to cure, and knowing what we do with reference to the development and life history of tapeworms, it is quite possible, in most cases, to avoid their effects.

To prevent tapeworm disease among fowls it is important, first of all, to keep no birds in the flock that are supposed to be infested by tapeworms. It is also important that fowls should not be allowed to roam where other fowls are known to have contracted or carried these parasites. Especial attention should be devoted to the removal of droppings of fowls that may possibly be infested and these droppings should either be destroyed or treated in such a manner that the tape-

worm eggs in them may be killed. This can be done by disinfecting them with a strong solution of carbolic acid, quicklime, or as Dr. Stiles suggests, by keeping them in a dry place for several months or through the winter, for it is probable that they can not withstand this treatment.

If fowls are raised on fresh uncontaminated land there is but little danger that they will become infected.

Dr. V. A. Moore, of the Bureau of Animal Industry, has recently called attention to a peculiar disease of chickens that is characterized by the development of small nodules in the walls of the intestine. These nodules were about a sixth of an inch in diameter and quite hard. When opened it is found that the larger ones contain greenish pus. These nodules were produced by a small tapeworm recognized as *Davainea tetragona*. This disease has been recognized in fowls from the District of Columbia, North Carolina and Virginia but has not as yet been discovered among the poultry of Pennsylvania. It is quite destructive.

2. SUCKING WORMS—TREMATODES.

These worms are of an oval shape, have rather plump bodies and are provided on their ventral surfaces with suckers by means of which they attach themselves to the part they are in contact with.

There are several species that infest the domestic fowl but it is not known that any of them are very prevalent or very destructive in this country. Their mode of development is similar to that of tapeworms; that is, it is necessary for the embryo to pass through an

intermediate host, as a worm, before it can develop into a mature parasite in the body of the fowl. The symptoms occasioned by these parasites are similar to those produced by tapeworms but are of a less violent and serious character.

The remedies and means of prevention are practically the same.

3. ROUND WORMS—NEMATODES.

The round worms are elongated and usually quite slender parasites, mostly of a whitish color and are provided with a mouth and digestive canal. When present at all they are apt to exist in considerable numbers, and sometimes occur in vast quantities. There is one form of round worms known as *Trichosoma contortum*, a little white worm from one-half to three-fourths of an inch long, that has been found beneath the mucous membrane lining the oesophagus and crop. Sometimes as many as thirty of these worms have been found in the oesophagus in a single bird. They interfere seriously with the passage of food through this tube, affect the digestion and appetite and cause wasting and weakness. At length, the oesophagus becomes engorged with food, it cannot contract or pass its contents along and the animal dies within a few days.

Some species of round worms collect in the intestine in great numbers, in fact, as many as five hundred have been removed from the body of a single fowl. By their presence they occasion a good deal of irritation of the digestive tract, interfere with nutrition, cause diarrhoea and weakness and death. Sometimes the disease caused by these parasites follows a long course and

does not terminate fatally for a number of weeks or perhaps not at all. In other cases, death results very quickly. The termination depends upon the strength of the fowl and the number and variety of the worms. If the worms are present in sufficient numbers to entirely occlude the intestine, death is produced very quickly.

Another species of round worm, *Heterakis maculose*, has occasioned great loss among birds. This worm is white, cylindrical and pointed at each end; the male is about an inch long and the female one and a quarter inches. Sometimes several hundred of them are found in the intestine of a single pigeon.



A ROUND WORM OF THE PIGEON.

Birds with round worms may be treated by administering the remedy recommended by Baronio, consisting of equal parts of the root of male shield fern, tansy and savory, of which mixture one drachm is made into a tea with six ounces of water and this fluid is mixed with sufficient flour to form pills and these are administered to the infested fowls. Or, the powdered areca nut may be given in doses of from thirty to forty grains for chickens and fifteen grains for pigeons.

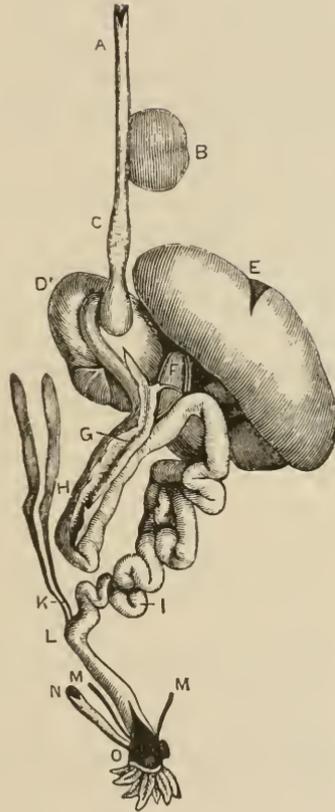
The prevention of disease resulting from the presence of the round worms may be accomplished by enforcing the general regulations recommended above, in connection with the discussion of tapeworms. The frequent removal and the care of the manure is very important.

A. *Those not caused by parasites.*

1. CATARRH OF THE CROP.

When, for any reason, the contents of the crop stagnate for an unusual length of time it may undergo fermentation, just as food accumulated in any other warm, moist place would undergo fermentation, and this results in the production of a rather irritative compound which, acting for a more or less prolonged period upon the lining membrane of the crop, produces a superficial inflammation known as catarrh. The same result may occur when parasites are embedded in the lining membrane of the crop or when fowls eat irritant materials.

This condition may be recognized by the appearance of a swelling in front of the breast which is soft to pressure



DIGESTIVE APPARATUS OF BIRDS.

A, œsophagus; B, crop; C, infundibulum; D, gizzard; E, liver; F, gall bladder; G, pancreas; H, duodenum; I, small intestine; K, caeca; L, large intestine; M, ureters; N, oviduct; O, cloaca.

and sometimes so very soft and drum-like that it is evident that it contains gas. The appetite is entirely lost or becomes abnormal, the fowl is mopish, its feathers are ruffled and it may attempt to vomit. If the crop is pressed upon forcibly, sour and offensive smelling material may be expelled through the mouth.

The cure of this condition is not difficult unless it has continued for such a long time that the fowl is considerably weakened. The irritant, fermenting or putrefying contents should be expelled by pressure from without while the fowl is held with the head down. Then a small quantity of salicylic acid (two grains) dissolved in water should be administered for the purpose of checking further fermentation or hydrochloric acid may be given in one drop doses diluted with two teaspoonfuls of water. The fowl should be kept from food for a day or two and usually this is all that the case requires.

2. OBSTRUCTION OF THE CROP.

If a fowl has gorged itself with food that is difficult of digestion, such as old and dry grain or hard and indigestible substances, as straw, wood, stones, etc., and this material remains in the crop for several hours the walls of the crop will become exhausted by the unusual distention and then the fowl is unable to remove the obstruction in any way. The recognition of the condition is not difficult because there exists a large, firm, hard swelling in the region of the crop. Upon

feeling of it, the nature of its contents can frequently be determined.

If it is not possible to remove the contents by pressure, as in the case above, and if it does not pass away naturally within a day, it becomes necessary to perform an operation for the purpose of emptying the organ. To do this, the feathers should be removed by clipping them off with a pair of shears from a vertical line about half an inch wide along the most prominent portion of the crop. Then with a sharp, clean knife an incision about one inch long should be made through the skin and down to the obstructing material. This can then be removed with the handle of a spoon, or with the finger, or with the loop of a hairpin. When the crop is thoroughly emptied, its walls should be united by sewing them with white silk. Care should be taken to avoid including anything besides the walls of the crop in the first seam. After this is perfectly united the other tissues and the skin may be drawn together with a second set of stitches. The sewing should be done neatly and the tissues should not be drawn together so that they pucker. The ends of the first set of stitches should be left long and allowed to hang outside of the wound. In five or six days union will have taken place and the stitches can then be removed by cutting through them with a pair of sharp scissors and drawing them out. After this operation, the bird should be allowed no food for twenty-four hours, and only a small amount of water, to which a few grains of salicylic acid have been added.

3. SIMPLE INDIGESTION AND LOSS OF APPE- TITE.

These conditions result from such a variety of causes that it is rather difficult to classify them as a disease. Usually they are merely symptoms of disease in different organs or of general disease. If, after a careful examination, no cause for loss of appetite can be discovered it may be that it merely results from indigestion and will respond to appropriate treatment for this condition. But in all cases, a very careful examination should be made for other diseases. Frequently, indigestion is produced by too rich food given in large quantities and especially when the bird is unaccustomed to it. Sudden changes of diet are also detrimental and when birds are exposed to weakening influences, such as sudden changes of weather, unsanitary conditions, etc., they may find it impossible to digest the food that they are accustomed to and have been thriving upon. Or, indigestion may result from feeding things that cannot be digested or that are digested very slowly and ferment while passing through the digestive canal. Putrid food of all kinds will come within this class. Sometimes, foreign bodies lodge in the crop or gizzard or other point in the digestive tract and if they are sharp and cannot be digested or dissolved, they may remain stationary for a long time, causing serious inflammation and possibly death. If it is discovered that substances, such as large pieces of glass, or pieces of metal, etc., are present, they should be removed by an operation similar to the oper-

ation performed in impaction of the crop, provided they are in the upper or neck portion of the gullet.

When the cause of loss of appetite is known the selection of an appropriate form of treatment is a matter of but little difficulty. If it is decided that the fowl cannot be cured it will be best in all cases to kill it at once so that it may be saved for food. If the disease is allowed to go on until serious changes take place it will not be safe to use the flesh.

It is well to begin treatment by giving two or three teaspoonfuls of castor oil to empty the bowels and remove irritant substances.

One of the best general remedies is hydrochloric acid. This substance is very strong and must be administered in very small quantities freely diluted with water. The dose for an adult fowl is from one to two drops given with at least a dessert spoonful of water. Pills of either black or red pepper, are in high repute among poultry keepers and are undoubtedly quite efficient in stimulating the secretion of digestive juices and in that way leading to restoration of appetite. Chopped onion or garlic in the food are also good.

4. IRRITATION OF THE DIGESTIVE CANAL AND DIARRHOEA.

This subject has been considered in part in connection with the condition produced by intestinal worms and with the subject above. Similar irritations of the membrane lining the digestive canal may be produced

by other foreign bodies in the intestine or, what amounts to the same thing, by indigestible or imperfectly digested food that remains there for an unusual length of time. The first evidence of irritation of the digestive tract is loss of appetite and general depression. This is quickly followed by diarrhoea, and the voidings are sometimes mixed with mucus or, in bad cases, with blood. When this symptom appears the fowl loses flesh very rapidly, becomes weak and soon dies.

The first measure in the way of treatment is to place the bird in a warm dry place where it will not be annoyed by its companions and supply it with small quantities of food that is easy of digestion. This should be given in a fresh state in clean troughs or vessels and all of the surroundings should be kept clean. If the diarrhoea is severe, cooked food should be preferred, such as boiled meal, rice or barley; oat meal is also good. Small pieces of chocolate constitute a useful remedy for this condition in cage birds. Linseed meal is also good and the gelatinous substance that separates from linseed when it is boiled is of great value in diarrhoea. It is good of itself, and it also furnishes an excellent medium for the administration of other more active remedies. Opium can usually be relied upon to check this disease unless it has gone so far that no treatment will avail. Opium is best used in the form of the tincture, known as laudanum. The dose is from five to ten drops. Tincture of catechu is very efficient and may be given in doses of five to twenty drops with a little water for each fowl, or for fifty fowls, half ounce in meal.

5. CONSTIPATION.

Constipation is the opposite of diarrhoea, but it is frequently produced by the same conditions. If parasites obstruct the intestinal canal, of course nothing can pass and the result is constipation of a most obstinate form. Sometimes the intestine becomes unusually dry, particularly after a bird has been afflicted with diarrhoea for some time; then its contents accumulate in hard masses and form obstructions. These obstructions of dry intestinal contents may appear at any point of the canal but frequently develop close to the lower opening, in the diverticulum known as the cloaca.

Constipated birds give evidence of the condition by uneasiness, loss of appetite, frequent, unsuccessful attempts and general depression. If the obstruction is in the lower part of the bowel the treatment consists in injecting small quantities of warm water by means of a rubber syringe, or water in which linseed has been boiled may be used for this purpose and should be preferred in cases where there is considerable irritation. Sweet oil or glycerine may also be injected, all of which tend to soften and facilitate the removal of the impacted masses. When this treatment is applied to hens, great care should be exercised to prevent the introduction of the nozzle of the syringe into the opening of the oviduct. Sometimes it is necessary to employ a small blunt instrument, such as the handle of a small spoon to facilitate the removal of the faecal masses in this location.

Internally, castor oil is a valuable remedy. It should be given in doses of two teaspoonfuls; or, the common compound cathartic pill may be administered. Calomel is also a good laxative or purgative for fowls and is given in doses of from one-half to two grains mixed with sufficient butter to form a pill. Small cage birds should receive a fragment of a cathartic pill, the size depending upon the size of the patient. Epsom salts are good and safe; the dose for an adult fowl is one tablespoonful of a saturated solution.

6. POISONING.

Fowls may be poisoned by the same chemicals and agencies that poison larger animals.

Poisoning with Arsenic.—One of the most frequent poisons is arsenic in one of its numerous forms. Arsenic is used so freely on farms for the purpose of poisoning potato bugs, worms that infest trees, rats, etc., that it frequently happens that it comes within the reach of poultry and poisons them. The symptoms of arsenic poisoning are loss of appetite, great thirst, discharge of saliva from the mouth, attempts to vomit, anxiety, restlessness and diarrhoea. Before death the bird may evidence considerable pain, breathe with difficulty, tremble and it may have convulsions.

After death, the examination of the digestive tract will show that it is considerably inflamed. It is red, full of blood and its contents are mixed with blood.

The treatment to be employed when it is known that

fowls have been poisoned with arsenic is to administer the white of an egg every hour or the thick liquid in which flaxseed has been boiled. If possible, the chemical antidote, iron sesquioxide or dialized iron, should be given. If there is much diarrhoea and pain tincture of opium in doses of five to ten drops is useful. Powdered chalk given in water is also good.

Poisoning with Salt.—Small quantities of salt are very beneficial for fowls but large quantities may cause serious illness or even death. From half an ounce to an ounce of salt is fatal for a chicken. This quantity will cause loss of appetite, great thirst, redness of the membranes lining the mouth and throat, pain and diarrhoea, and if the poisoned fowl is opened after death it will be found that the intestines are in a condition resembling that found when death results from arsenical poisoning, but usually the inflammation is not of quite such a severe type. Such substances as mackerel brine, beef pickle, etc., are even more poisonous than pure salt and smaller quantities will produce the same symptoms.

The treatment consists in the administration of the remedies recommended for arsenic poisoning, with the exception of the iron compounds.

Poisoning with Mould.—When fowls are permitted to eat food that has undergone decomposition or has become very mouldy they are sometimes poisoned. This subject has been referred to under the head of irritation of the digestive canal and diarrhoea.

7. DROPSY.

The membrane lining the abdominal cavity sometimes becomes inflamed as the result of external injuries or severe irritation of the intestinal canal or the penetration of a foreign body through the intestinal wall. Sometimes this condition is caused by parasites. Usually the disease is of a severe type and cannot be treated successfully. It may produce death within a very short time. But sometimes it follows a chronic course, causing prolonged illness, and in these cases, fluid usually collects in the abdominal cavity constituting the condition known as ascites or abdominal dropsy. The evidence of this condition consists in an enlargement of the abdomen; it is distended in all directions but particularly downward and sometimes to such an extent that the lower part of the belly reaches the ground. It is hardly necessary to say that in these cases the fowl is spiritless and disinclined to move about actively; when it is caught and the swelling is examined by the touch it will be noticed that it is soft and that by pressing upon one side waves can be felt on the other side indicating that it contains fluid.

8. JAUNDICE OR THE YELLOWS.

When the action of the liver is interfered with the bile may not be poured out into the intestine in a normal manner and its retention leads to a yellow discoloration.

oration of all parts of the body, shown especially about the comb, orifices of the nose and membrane lining the mouth and throat. This condition is frequently produced by parasites but sometimes it results from too high feeding and too little exercise. In these latter cases, a dose of calomel should be administered; the food, which must be cut down in quantity, should be of a simple character and contain green substances, and the fowl should be allowed plenty of exercise.

CHAPTER IV.

DISEASES OF THE EGG-PRODUCING ORGANS.

1. PARASITES AND FOREIGN BODIES IN EGGS.

The egg is produced as follows: the yolk develops in the ovary, which is a large conglomerate mass, the appearance of which may be compared roughly to that of a bunch of grapes of different sizes. When the yolk reaches its full development in this organ, the membrane containing it breaks and it is discharged into the oviduct. In passing through the oviduct it becomes surrounded by albumin, known as the white of the egg. The development of the albumin requires about six hours. In the lower part of the oviduct, it remains for about twenty-four hours and during this time it becomes covered with a membrane and a shell.

If foreign bodies, or parasites of any kind, are present in the oviduct, they may readily become incorporated with the albumin and in that way become enclosed in the egg. There are a number of parasites of poultry that have been found encapsulated in this way. The imprisonment of parasites in the egg is not a very serious matter, however, because it occurs quite in-

frequently; but it is serious when the germs of decay are present in the oviduct and become imprisoned in the egg, because this leads to the early decomposition of the egg. The organism that may enter the egg in this manner and produce decomposition are of several kinds, but as their effects are about the same it is not important to discuss them separately. They cause the yolk to become light in color and cloudy and cause the liberation of gas that is usually taken up by the fluid parts of the egg, but escapes when the shell is broken, and is of a most unpleasant odor.

These germs do not get into the oviduct by passing into the fowl with its food, water or the air that it breathes, but enter through the cloaca, and are often introduced by the organs of the male during the act of copulation. This condition may be avoided by the enforcement of cleanliness in the poultry houses and poultry yards. Hens and cocks should never be allowed to go about with masses of filth adhering to the feathers about the vent nor should they be compelled to roost in filthy places or walk about and scratch in masses of decaying and putrefying material.

Cleanliness and disinfection enable the poulterer to avoid this infection of the egg.

2. MALFORMED EGGS.

One of the most frequent malformations of eggs is the so-called "double egg," the egg containing two yolks. These eggs are usually of very large size and develop when two yolks reach maturity in the ovary at

the same time and are discharged into the oviduct together. Cases have been known in which three yolks have been found in the same egg.

Sometimes eggs of unusual shape are noticed; they are pear-shaped, spherical, flattened, pointed at each end or bent. Sometimes they contain projections at some point on the surface. All of these conditions result from accidental influences, and as a rule they do not recur.

An important malformation, or rather lack of development, consists in the production of eggs without shells or with soft shells. This condition usually results from the fact that the hen which produced the egg laid it before the shell had time to develop or that she was not supplied with the proper kind of nourishment, and therefore could not produce the lime salts necessary for the secretion of the shell.*

The treatment in the latter case consists in giving fowls ground oyster shells, broken egg shells or pieces of ground bone.

3. EGG BOUND.

Sometimes an egg becomes caught in the oviduct and cannot be expelled. It may be that this comes from the fact that the egg is too large or that irritation or inflammation has caused a swelling that obstructs the passage, or that the cloaca is obstructed with a mass of faeces. In these cases, it is necessary to sup-

*See Inflammation of the Oviduct.

ply assistance. If it is found that the cloaca is obstructed, the faecal masses should be removed in the manner described under constipation. If the egg is large, or the passage small, the injection of oil or glycerine may enable the hen to expel it. If, however, it cannot be removed in this manner an attempt should be made to expel it by placing the hen upon her back and pressing above the egg through the abdominal walls and in that way forcing it out. If it cannot be removed in this way, the only alternative is to break it and remove the shell piece by piece. The fragments of shell should be removed with the finger or a pair of forceps. When the pieces of shell cannot be removed at once, sweet oil should be injected in order to lubricate the passages as freely as possible and facilitate the removal of the sharp, broken pieces.

4. INFLAMMATION OF THE OVIDUCT.

The oviduct sometimes becomes inflamed as the result of the manipulations necessary to overcome the condition of egg-bound, and sometimes it becomes inflamed from causes that are not understood. When this inflammation exists, the hen makes movements as though she were attempting to lay an egg, is very uneasy, rubs the posterior portion of the body along the ground, and in these ways indicates irritation of that part. Sometimes the first symptoms of beginning inflammation of the oviduct is the production of eggs with soft shells. This condition has been found not

only among chickens, but also among ducks, geese and turkeys.

The treatment of this disease is not very satisfactory. It consists in placing the bird in a quiet place where it will not be annoyed and, in acute cases, injecting a weak solution of tannic acid (1 part to 100), to which a small quantity of chlorate of potash (2 or 3 parts to 100) has been added. This fluid should be made warm before it is injected, and should be administered carefully and in small quantities. The best syringe for this purpose is a soft rubber bulb supplied with a hard rubber nozzle. Laxatives, such as castor oil or calomel should be administered in sufficient quantities to keep the bowels loose. The food should be non-stimulating, and given in small quantities.

5. PROLAPSUS OF THE OVIDUCT.

As a result of great straining to expel an unusually large egg, the oviduct may be turned inside out and project from the body of the hen. It can then be seen as a red swelling protruding from the rear part of the body, the hen becomes very uneasy, and it is impossible for her to lay eggs while in this condition. In examining these cases, particular attention should be paid to the color of the inverted membrane. If it is very dark, and of a purplish or bluish tinge, treatment should not be attempted, for this indicates that gangrene is about to begin, and in these cases the fowls can not be saved, so that it is better to destroy them

while still fit for food. If the membrane is red, it should be washed off with warm water, covered with a thin coating of vaseline and pushed back very carefully. If it is expelled again it should be again returned and a small piece of ice placed in the opening. This will usually cause the parts to contract to such an extent that they will not fall out. From the beginning of the treatment, the hen must be kept in a quiet place and allowed very little food.

CHAPTER V.

DISEASES OF THE BRAIN AND EYE.

1. CONGESTION OF THE BRAIN.

Congestion of the brain may be caused by extreme excitement, by blows on the head or sunstroke. It is characterized by staggering, stupor, unusual movements, such as walking backwards or walking in a circle, unusual and irregular movements with the wings and feet and twisting the head backwards or to the side. Sometimes the bird will fall on its side and make peculiar movements with its feet and wings, as though attempting to run or fly.

The treatment consists in keeping the animal perfectly quiet in a dark place, the administration of laxatives, such as two teaspoonfuls of castor oil or one and one-half grain doses of calomel, and the application of cold cloths or ice to the head.

2. EPILEPSY.

Epilepsy is not a very common disease among poultry, but still it is met with from time to time and

among all varieties of barnyard fowls. It is characterized by the occasional occurrence of fits which do not terminate fatally, disappear after a time and leave the fowl in a normal condition. During the fit, the fowl will make beating movements with its wings, its legs will draw up and it will fall down, sometimes turn over on its back, or it may stand upright with its legs apart, head turned backward and the mouth and eyes opening and closing spasmodically. Epilepsy is sometimes caused by intestinal parasites, and is cured by the removal of these worms. It is claimed that bromide of potash given in quantities of a few grains each day in the drinking water is of value in these cases, but it is not probable that treatment will prove to be at all profitable.

3. FEATHER EATING.

This habit is classed among the affections of the nervous system because if it is not nervous disease it is such an overpowering habit that it can scarcely be distinguished from the disease.

Where this habit is prevalent in a poultry yard, the fowls present a most untidy appearance, the feathers about the neck and upper part of the breast are plucked out, and sometimes they are partially removed from other parts of the body. If the flock is watched for a little while it will be noticed that the birds pluck the feathers from each other. This habit usually starts with one fowl and spreads by force of example to the others.

In order to prevent it, a fowl that is noticed plucking feathers should be at once removed from the flock before the others have had time to learn the habit. If it is not desirable that the bird should be killed, several methods for preventing the continuation of the habit are recommended. The best and most humane is to file away the bill in front and on the sides so that it will not close tightly, but when shut leaves a space of about one-tenth of an inch. This will prevent the bird from grasping the feather with sufficient force to remove it, but will not interfere with eating. Another remedy that has been suggested is to place a piece of wire through the mouth as a bit and carry the upper end of wire through a hole that has been punctured in the comb. This has the effect of preventing the fowl from closing the beak tightly, and therefore from pulling out the feathers, but is rather a cruel procedure and cannot be recommended. In all cases, fowls inflicted in this way should be allowed a large yard, so that they may have plenty of exercise.

4. EGG EATING.

This is another habit that spreads from fowl to fowl similar to the above. If eggs are allowed to remain too long in the nests so that they become broken, or if soft shell eggs are produced by any of the hens in the flock some of the fowls may get into the way of eating them, and the habit once started spreads from bird to bird until in some cases it becomes almost impossible to secure any eggs at all.

The treatment in these should be to remove the bird that spreads the habit as soon as it is detected, or if this is not done, and the habit becomes well established, a special form of nest should be used which permits the egg to roll out and escape from the reach of the hen as soon as it is deposited.

5. TUMORS OF THE EYELIDS.

Sometimes wart growths appear upon the eyelids and they may become large enough to interfere with the vision or by pressure upon the eye balls destroy the sight. Not only warty growths appear in this region, but also other tumors of a variety of kinds. When it is evident that they are becoming large enough to become harmful, they should be snipped off with a pair of sharp scissors, and the wound cauterized with lunar caustic.

6. INFLAMMATION OF THE EYE.

Inflammation of the eye is sometimes caused by parasites and sometimes by mechanical irritation such as blows, wounds received in fighting, etc. Or, the eyes may become inflamed as a result of taking cold. These inflammations are of different kinds and different degrees of severity, dependent upon the part of the eye

affected and the extent of the injury. In most cases, they are characterized by swelling of the eyelids, interference with vision, cloudiness of the front of the eye, sometimes, total blindness. In the latter case, treatment is not to be recommended; the fowl should be destroyed at once. But if the trouble affects only one eye, or is not an unusually severe type, it may be treated by cleansing the eyelids with warm water, to which boracic acid has been added in the proportion of 15 grs. to the ounce. The fowl should be kept in a dark place and fed small quantities of food and allowed plenty of fresh air until it is recovered. Cloudiness of the front of the eye—the cornea—may be treated by dusting a small quantity of calomel over the surface and repeating the application once daily as long as necessary.

A strong solution of common salt is a good eye wash for simple troubles.

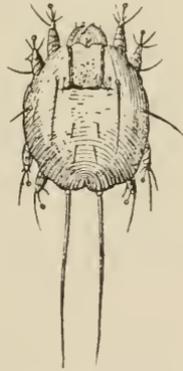
CHAPTER VI.

DISEASES OF THE LEGS AND FEET.

A. *Those caused by parasites.*

MANGE OF THE LEGS AND FEET.

Mange of the legs, or chalk legs, is a contagious disease caused by a parasite known as *Sarcoptes mutans*. It is confined exclusively to the legs and feet and never extends to other parts of the body. When the parasites of this disease are placed on the legs of a healthy fowl they work their way under the large scales on the front of the leg or on the upper part of the toes. They multiply rapidly and within a short time it may be noticed that the scale commences to rise and a little yellowish crust forms about its edge. In time, other scales become involved, the crust increases in thickness and scurfy, powdery material piles up in considerable quantity until in old cases the entire feet and legs may be involved and to such an extent that they seem to be several times their normal thickness. When this thick crust is pulled off it is found that the surface is raw and bleeding. The interior of the crust



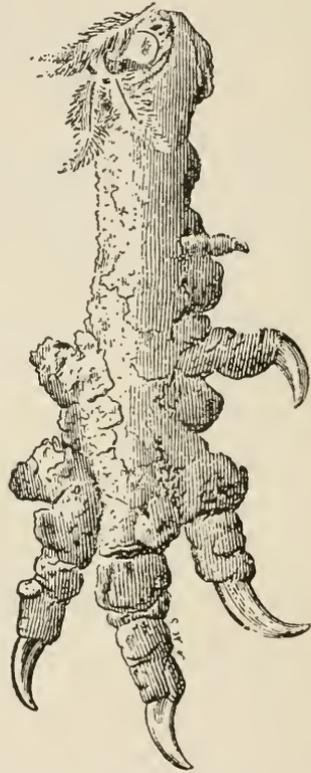
THE PARASITE OF
MANGE OF THE LEGS
AND FEET.

Sarcoptes mutans—
male—100 times natural
size.

is hollowed out by a great number of small cavities and a close examination of these cavities will show that they contain parasites. Frequently, a cavity will contain an old female and a large number of young. These young are born alive, so that no eggs are present in the scabs unless a female has been crushed and the eggs have escaped from her body.

In time, the disease becomes so bad that the bird cannot walk. It lies on its breast, hops about from place to place, becomes thin and at last dies from exhaustion.

It is not very difficult to cure this disease, provided careful attention is devoted to it. The first thing to do is to remove the diseased fowl from the flock, disinfect the poultry house, the nests and perches. The treatment of the individual begins with the removal of the scab so that the parasite may be reached and destroyed. The scab may be removed by soaking it with oil, either sweet oil or cottonseed. This should be applied freely and allowed to remain for twenty-four hours, after which large sections of the crust may be taken away without pain



THE FOOT OF A FOWL AFFECTED WITH MANGE.

to the bird, or vaseline or soft soap may be used for the same purpose. The action of the oil may be intensified by wrapping the legs in cotton after it is applied and binding the cotton on with a narrow bandage or with a soft cord. Following the removal of the scab, the legs should be treated with a solution of balsam of Peru in alcohol, equal parts. Or strong sulphur ointment or creolin solution one part, water, ten parts, may be applied once daily.

B. *Those not caused by parasites.*

1. CORNS.

As a result of standing on too sharp or too narrow perches or having to fly from heights on to a hard floor, the feet of fowls are sometimes irritated in such a way that the skin becomes thick, hard and painful. These thickenings constitute corns and occasion some lameness and when the bird is caught and examined closely the cause of the trouble can be recognized without difficulty.

The treatment consists in paring the elevation off with a sharp knife, painting the surface with tincture of iodine and removing the cause by making the perches wide and smooth or lowering them, as may be required.

2. BUMBLEFOOT.

The causes that produce corns will, if of an especially severe type, cause deep and serious bruises of the joints of the feet and legs. These bruises are followed by swellings of the joints, the parts become very tender and sore so that it becomes difficult for the bird to walk. The principal joint of the foot may become very much enlarged so that the deformity can be seen from a considerable distance. A close examination will show that the swelling is very painful to pressure and is sometimes feverish and soft. If it does not terminate within a short time, germs from the injury may enter the bones or pass to joints further up the leg and lead to swelling, great soreness and sometimes to abscess formation or gangrene.

The causes of bumblefoot should be avoided and the treatment of the condition consists in applying flaxseed poultices, by tying a bag of cheesecloth containing the poultice around the foot, or applying an ointment made of creolin and vaseline (one part to forty). If the swelling becomes soft, so that it is evident that it contains pus it should be opened by making an incision into it with a sharp knife and its contents should then be syringed out with a solution of creolin and water (one part to fifty). In the more severe cases, accompanied by the formation of large abscesses or gangrene, no treatment can be successful. Some cases of bumblefoot develop to a certain extent and then continue in the same condition for a long time, leaving the fowl with a chronic deformity of the feet. These old cases are best treated by painting the enlarged joints with iodine or by opening the swellings and applying iodine to their interior.

3. GOUT.

Fowls of the heavy breeds, when kept in a high condition and allowed but little exercise, may develop a disease that is practically identical with gout in man. It usually develops rather slowly, beginning as a somewhat indefinite lameness that might be mistaken for rheumatism. But shortly the joints of the feet and legs, and sometimes of the wings as well, swell, become painful to pressure, the bird becomes disinclined to move; later, little tumors, that are rather hard, appear about the affected joints and still later the skin covering these enlargements becomes dry, brittle and breaks, exposing a yellow or grayish crumbling, chalky mass which is composed principally of uric acid and its salts. Sometimes, the toes dry up, lose their life and fall off. The general spirits of the fowl are, of course, depressed, because it is difficult for it to get around. It becomes feverish, loses its appetite, wastes away and toward the end develops a diarrhoea that hastens death.

Treatment of gout consists in removing the enlargements by scraping them off with a blunt instrument or cutting them away with a knife, and, internally, bicarbonate of soda should be administered. This can be supplied by adding it to the drinking water in quantities of about a teaspoonful to the pint.

4. FREEZING.

The feet, combs and wattles of fowls exposed during very cold weather are frequently frozen. Usually but little can be done after the injury has taken place unless the condition is detected early, at which time it may be possible to save the frozen parts by removing the frost with applications of snow or cold water, anointing the frozen parts with cosmoline or camphorated oil and placing the fowl in a reasonably, though not very, warm place, and keeping the frozen parts moistened with the applications mentioned.

CHAPTER VII.

DISEASES OF THE BONES.

1. RICKETS.

Rickets is a disease of the bones that prevents their becoming hard and stiff as they should, thus allowing them to bend and become deformed under the weight of the fowl. The bones that are most frequently subject to deformity in cases of rickets are those of the legs and the breast bone because these carry the most weight. Rickets usually results from improper feeding. A growing fowl should not only have food to make flesh but also to make bone, and unless this is supplied in sufficient quantity and in an available form, the imperfectly nourished bones develop the condition above described.

The treatment consists in giving sufficient food of a proper sort, such as grains of all kinds, ground bone, ground shells, wallplaster from old buildings, broken egg shells, etc. A composition in high repute among the poulterers of England is Parrish's chemical food. Phosphate of lime, which is the principal and most valuable ingredient of Parrish's chemical food, can be administered in doses of two or three grains per day to each young chick that is noticed to be rickety in the least degree.

2. FRACTURES.

Fractures of the legs and wings are not infrequent. As a rule, it does not pay to treat them unless the fowl is unusually valuable or a cage bird that there is especial reason for saving. Fractures of the legs can usually be splintered and the bones kept in position with little difficulty by applying a splint of cork, leather or quill. The leg should be wrapped in absorbent cotton, the bones placed in a proper position, the splint applied and then wrapped with soft wool, yarn or with a narrow muslin bandage. After splinting, the bird should be kept as quiet as possible. If it is a large adult fowl it may be necessary to place it in a small box or basket for from two to three weeks. At the expiration of this period union has usually taken place.

Fractures of the wing are somewhat more difficult to treat, because the muscles and feathers interfere with the application of a bandage, so that the best method is merely to fold the wing in its natural position against the side of the bird and hold it there by a bandage passed around the body, until the fracture has united.

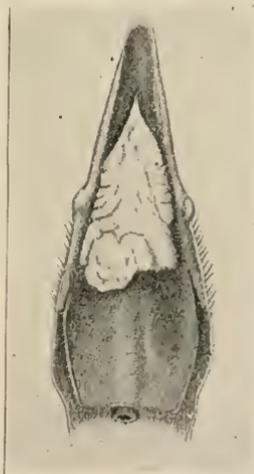
CHAPTER VIII.

CONTAGIOUS DISEASES.

1. DIPHThERIA OR ROUP.

Diphtheria, croup or roup, is a very common disease among poultry, and undoubtedly destroys millions of dollars worth of fowls in the United States every year. There are two forms of roup, one caused by bacteria and the other by protozoa, but since the symptoms, remedies and means of prevention are very much alike in both cases it is not necessary that they should be considered separately in this report.

Roup is, in all cases, a contagious or "catching" disease. It spreads from one fowl to another and may be carried from flock to flock by the interchange of birds. It is thought by some that roup may be produced by exposure, and that it is merely a severe cold or catarrh, but careful observation shows that this view is not correct, and that roup



THE FLOOR OF THE MOUTH OF
A FOWL, SHOWING DIPHTHE-
RITIC PATCHES.

can only be produced by the specific organisms of the disease. It is undoubtedly true that unfavorable influences, such as those that cause colds predispose poultry to roup and place the birds in such a condition that they are more apt to develop it when exposed to it, and perhaps cause the appearance of the disease in a severe and fatal form when it would have followed a mild course if these unfavorable conditions had not existed. Young fowls, tender breeds, and birds in poor condition, and especially those that are poorly cared for, are most predisposed to roup. All varieties of domestic fowls may contract it. It also affects cage birds and outbreaks have been described among wild birds.

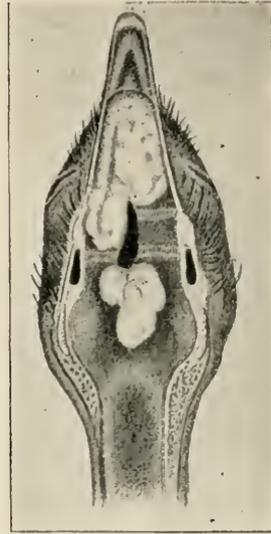
The characteristic symptom from which this disease derives its name consists in the appearance of white patches on the membrane lining the mouth and nose, the air passages; and these same patches occasionally develop on the skin, in the intestines or in the lungs. The patches or roup are at first white and resemble a white mould. The size of the patch is indefinite and never the same in two individuals. It may be very small, or it may extend over the entire lining membrane of the mouth. Sometimes, it appears first on the sides of the tongue, sometimes on the roof of the mouth, sometimes in the throat or about, or in, the nose or eye, on the skin of the head, or in the deeper parts of the body. At first, the fowl does not show much inconvenience. As the patch matures it becomes yellow, its borders dry and adhere closely to the mucous membrane, and if it is large enough, it may obstruct the air passages or the mouth and cause serious difficulty in breathing. At this stage of the disease the fowl refuses food, becomes sluggish and

presents the usual well-known appearance of a sick chicken. The patches sometimes putrefy and become exceedingly offensive. When they are scraped away it is noticed that the tissues beneath are raw and sore. The interference with breathing may be so serious that the bird will hold its mouth open and struggle for air like a chicken with gapes. The entire face is sometimes covered with patches of false membrane, the eye may become affected or destroyed and the air passages may be completely obstructed so that death is caused by suffocation. The corner of the mouth seems to be a favorite seat for the development of diphtheritic false membrane.

The disease usually follows a chronic course lasting several days or several weeks. In some outbreaks, however, the germ of the disease seems to be more virulent than in others, and in these cases the birds may die after the lapse of but a few days. In strong individuals, and especially where the general type of the outbreak is not of a very virulent character, the tendency is toward recovery, but the disease is nevertheless destructive, because recovered birds are frequently thin and unproductive for a long period. The fact that fowls suffering from roup do not show evidence of general disturbance until the local changes are quite obvious, is due to the fact that roup is essentially a local disease of the mucous membranes, and general disease does not result until the air or food passages are obstructed or interfered with by the patches, or general infection takes place.

The treatment of roup must begin with the isolation of the afflicted fowl and thorough disinfection of the poultry house and yards. This disinfection should be carried out with great care, and should be preceded by

a thorough cleansing of the droppings. The yards should be sprinkled with lime, the feeding place should be scrupulously cleansed and disinfected, and the water supply should be looked to carefully, in order to avoid possible impurities or contamination. The fowls that die should be cremated or deeply buried at a distance from the poultry grounds. The individual patients need not be destroyed, as is sometimes done, because it is frequently possible to save them by means of very simple treatment. It is important to place them in warm, dry quarters, and feed nutritious, attractive food. Douglass mixture, referred to on page 38, is useful. The diphtheritic patches should be removed by scraping lightly with a blunt metal or wooden instrument, or by rubbing them off with a swab made by wrapping a small pledget of cotton about the end of a toothpick. After they are removed, the raw surface thus exposed should be treated with an antiseptic, for the purpose of destroying the disease germs that remain. One of the best applications for this purpose is a 10 per cent. solution of nitrate of silver, to be applied cautiously and in small quantities, with a camel's hair brush. Or, a 2 per cent. solution of creolin or carbolic acid



THE ROOF OF THE MOUTH OF A FOWL, SHOWING DIPHTHERITIC PATCHES.

are removed, the raw surface thus exposed should be treated with an antiseptic, for the purpose of destroying the disease germs that remain. One of the best applications for this purpose is a 10 per cent. solution of nitrate of silver, to be applied cautiously and in small quantities, with a camel's hair brush. Or, a 2 per cent. solution of creolin or carbolic acid

may be used. A solution of corrosive sublimate (1 part to 1,000 of water) is also sufficient, but must be used with great care. Iwersen recommends petroleum in this disease and advises that a drop of this substance shall be placed in the nasal passage of the diseased fowl, and that the diseased membranes be treated with light applications applied with a small brush. If the nose is stopped up, peroxide of hydrogen, diluted with an equal amount of water, may be injected with a glass and rubber medicine dropper. If the dropper has a bent point, the medicine may be squirted into the back of the nose through the openings in the roof of the mouth.

Roup or diphtheria may be prevented by avoiding unsanitary conditions, by enforcing cleanliness, disinfecting frequently and preventing the introduction of foreign fowls into the flock until they have been kept isolated long enough to make sure that they are healthy.

Cases have been reported from time to time in which it has been claimed that diphtheria of fowls has been conveyed to people and vice versa. Recent investigations, however, indicate that this disease in man and birds is caused by different organisms, and that the probability of transmission is not very great.

With reference to this matter, Dr. V. A. Moore writes as follows:* "Although the number of reported cases of the transmission of diphtheria to the human species and vice versa is small in comparison with the extent of the disease in poultry, the evidence that such a transmission is possible is quite sufficient to discourage the careless handling of diseased fowls. It is quite a common practice, usually in the rural districts.

*Bulletin No. 8, U. S. Department of Agriculture, 1895.

to bring sick chickens into the house for treatment where the children of the household are allowed to fondle them at will. It is not improbable that when this disease is thoroughly investigated the number of cases of direct infection from this source will be found to be much larger than is at present supposed. Until such investigations are satisfactorily completed the indiscriminate handling of diphtheritic fowls, especially by children, and the exposure of fowls to the infection of diphtheria in the human species whereby they may become carriers of the virus, should be strenuously avoided."

2. FOWL CHOLERA.

The designation fowl cholera includes several infectious diseases of poultry, none of which have been thoroughly studied in this country during recent years. The fowl cholera that occurs in France and Germany is very well understood, but its symptoms do not agree fully with those of the various diseases known as fowl cholera in this country. The Bureau of Animal Industry in Washington has made some investigations of outbreaks of fatal contagious diseases among chickens and pigeons but the work is not yet completed. So far as it has gone, it indicates that one of the affections known as fowl cholera is caused by a rod-shaped bacillus that is exceedingly resistant to extremes of temperature, and can probably live in protected places for a long period.*

*Bulletin No. 8, U. S. Department of Agriculture, 1895.

The symptoms of American fowl cholera were first described by Dr. Salmon in 1880. They include the voiding of faeces of which the part that is normally white is yellow. The white part of the faeces is excreted by the kidneys, and the yellow discoloration of this excrement is usually the first indication of disease. Shortly thereafter the droppings become thin and fluid, they are voided frequently and envelop by a layer of thin mucus. The fowl becomes depressed, it stands still or assumes a sitting posture, goes into a sunny, warm place if possible. The plumage becomes ruffled, the head is drawn down, the comb becomes pale and bloodless, and the appetite is depressed or lost. The depression and torpidity of the fowl increases until it seems to become unconscious and cannot be aroused by objects that usually frighten it. The bird becomes thin and weak and sometimes passes into a stupor and dies. In other cases, it may have convulsions prior to death.

The symptoms of the European fowl cholera, which may also occur in this country, although it has never been proven definitely, are in many respects similar to the above. In many cases, the disease runs such a very short course that no evidence of illness is discovered until the bird tumbles over in convulsions and dies. Sometimes, the course of the disease is so rapid that more than half of a large flock of apparently healthy chickens will die during a single night. Usually, however, the disease lasts from one to three days, and is evidenced by loss of appetite, depression, ruffling of the feathers, hanging wings, inclination to get away from the flock, high temperature, discharge of mucus from the mouth, diarrhoea, thin faeces, that are at first slightly yellowish, but later on greenish and

having an offensive odor; great thirst, bluish discoloration of the comb, and death either in a stupor or preceded by convulsions. After death, the dissection of the bird reveals numerous red spots on the internal organs and especially on the intestines. The lungs are congested, red, full of blood; the liver is full of blood and somewhat enlarged, and the blood itself is dark and thick. The intestines sometimes contain a red mass of clotted blood.

Another disease that is usually included with fowl cholera is a form of infectious enteritis of chickens, which consists in an inflammation of the bowels that is of a very severe type, and causes death within one or two days after the beginning of the attack. The first symptom is diarrhoea, there is loss of appetite and depression, but the torpor is not so profound as in the disease described above.

McFadyean has recently described an outbreak of disease among turkeys that was characterized by an inflammation of the lungs and pericardium. The symptoms were general stiffness of the neck and limbs, hanging of the wings and tail, roughness of the feathers, difficult breathing, discharge of frothy mucus from the mouth, diarrhoea, with thin, whitish or yellow faeces and death. In this outbreak, a germ was found that was in many respects similar to the germ of fowl cholera, but presented points of difference that were sufficiently well marked to enable him to classify it as another organism.

Eqizootic dysentery has been discovered among chickens and ducks and reported upon by veterinarians in a number of places. The disease begins as a diarrhoea, usually attacking young chickens first. There is depression, chilliness, ruffling of the plumage,

loss of appetite, gradually becoming more intense until the animal dies, during the second week of the attack.

All of the above conditions are popularly known as fowl cholera, and, moreover, the term as commonly used, undoubtedly includes a number of other diseases that are not contagious at all. When fowls die in large numbers it is usually said that the disease affecting them was fowl cholera, although it may have been produced by mismanagement of almost any kind.

The treatment of individual fowls afflicted with such a highly contagious disease as true fowl cholera is not to be recommended, because in the first place, so long as the infected fowl remains around, there is danger that its poisonous products may be carried to healthy birds. Secondly, there is little chance of curing it and it is hardly worth while to try.

The important point in this connection is the prevention of disease, and fowl cholera can usually be prevented by preventing the introduction of fowls suffering from it or that come from infected localities. If the disease is once introduced, the most stringent measures should be enforced as regards cleanliness, disinfection and the total destruction of the carcasses of the dead birds. The birds that are still healthy should be removed from the flock and placed in a wholesome locality. The droppings from the diseased fowls should be burned or thoroughly disinfected by mixing with a ten per cent. solution of sulphuric acid or with a quantity of lime equal in amount to the manure. The building should be disinfected by cleaning it very thoroughly, flushing the floor with a saturated solution of copperas and spraying the interior with a 5 per cent. solution of carbolic acid followed by white-washing. If the pens and runs can be abandoned for a year and grass

grown in them, this is the best plan, but if it is not possible to do this they should be cleaned with as great thoroughness as possible and slacked lime scattered over the surface of the earth, which should be plowed.

It should be remembered that the germs of fowl-cholera may be carried in the feathers, so that a perfectly healthy fowl, coming from a diseased flock, may carry the disease to another flock a long distance away. These germs may also be carried on the shoes and clothing of persons; by vermin, as rats or mice, or they may become attached to light objects, such as leaves, and be carried long distances by the wind. If the disease exists among the fowls along the water course, those lower down the stream may receive the germs with their water supply. So, whenever this disease prevails in a locality, one cannot guard his fowls too carefully.

3. BLACKHEAD—INFECTIOUS INTERO-HEPATITIS OF TURKEYS.

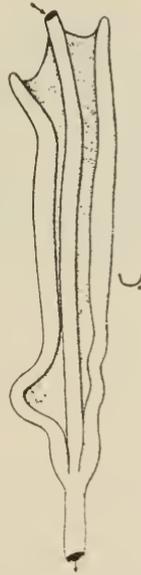
The disease of turkeys popular known as blackhead, has prevailed for a long time in the New England states and particularly in Rhode Island. Attention was called to it some few years ago by Mr. Samuel Cushman, an officer of the Agricultural Experiment Station of Rhode Island, but all of our recent investigations in regard to blackhead results from the investigations of Drs. Theobald Smith and V. A. Moore.*

The disease is called "blackhead" because in some of the turkeys afflicted with it, the comb and head become

*Bulletin No. 1, Circular No. 5, Bureau of Animal Industry, U. S. Department of Agriculture.

dark. The designation is not a good one, however, because this discoloration of the head may come from other causes than this particular disease, and sometimes in this disease the head does not become dark. As yet, a good popular, descriptive name has not been suggested.

Infections entero-hepatitis is caused by protozoa, minute animal parasites so small and simple that they can scarcely be distinguished from some members of the vegetable kingdom. These gain access to the digestive tract of turkeys and enter the caeca, which are two prolonged pouches springing from the union of the small and large intestines. Within the caeca, the protozoa of this disease irritate the mucous membrane and cause it to become thickened and ulcerated. The caeca also become distended and sometimes extraordinarily large. The protozoa penetrate to the liver and cause there the formation of yellowish spots resembling small abscesses filled with cheesy pus. This appearance results from the death of localized areas of liver tissue. The surrounding parts of the liver are full of blood, and the entire organ is considerably enlarged.



CÆCA OF HEALTHY TURKEY.

The central tube is the small intestine, the food passing downward in the direction of the arrow. At the junction of the caeca with the intestine, the food is drawn into the caeca by suction. The thickness of the caecal wall is shown in a. One-half natural size (Moore).

These are the principal features revealed by a post mortem examination. The symptoms are rather indefinite because the disease does not follow a regular course, so that a slightly affected turkey may present certain symptoms, while one in a more advanced stage of the disease may present entirely different symptoms, that may be so different from the first that no connection between the cases would be suspected by an ordinary observer. It has been noticed by those who have investigated this disease, that turkeys frequently appear to recover from it; this is, after having been afflicted, sometimes quite seriously, they pick up in condition thereafter and apparently recover, but a post mortem examination of these fowls will show distinct evidence of the disease. The walls of the caecum are still thickened, the spots in the liver remain, and a microscopical examination of the contents of the caecum reveal the living parasite of the disease, so that these apparently recovered birds continue as sources of infection and can convey the disease to other fowls.

Young turkeys are most



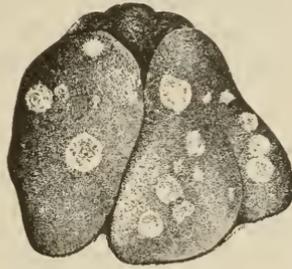
CAECA OF TURKEY SHOWING EFFECT OF PROTOZOAN DISEASE.

The upper two-thirds of one caecum is affected, also an area, as near the union with the colon. The other caecum is thickened at the points, b. The thickness of the affected caecal walls is shown in section c. One-third natural size (Moore).

predisposed to the disease. When it is severe, they lose condition, develop diarrhoea, become thin, weak, ragged-looking, their heads sometimes become dark, and they gradually die in an emaciated, exhausted condition. The disease can be recognized positively after death by discovering the conditions described above.

Blackhead has been discovered among turkeys in eastern New York, and although its presence has not been demonstrated positively among the turkeys of Pennsylvania, it is quite possible that it exists here and some outbreaks of disease that have been described closely resemble blackhead. Our knowledge of this disease is so recent that as yet it is only possible to experiment with remedies with a view to curing the affection. Dr. Smith suggests the use of quinine and it may be that salicylate of soda, creolin or calomel will prove advantageous, but as yet the use of any drug is purely experimental.

It has been shown by Dr. Moore's experiments that the parasite of the disease exists in the droppings from afflicted fowls, and that it may be transferred directly to healthy birds by keeping them where these droppings have been allowed to accumulate. The malady has also been produced in healthy turkeys by feeding the diseased organs of its victims. These investigations are very important, because they indicate a means of avoiding the spread of the disease. Old



LIVER OF TURKEY.
Showing effect of protozoan disease. One-third natural size.

turkeys on affected farms should be disposed of whether they appear to be sound or not. The roosting place should be thoroughly cleansed, droppings should be collected and disinfected and the entire locality should be disinfected as thoroughly as possible by spraying with carbolic acid solution, saturating the floors and earth with saturated solutions of copperas and covering the soil with lime. Then, if turkey breeding is to be continued, fresh stock should be purchased from regions where the disease does not exist or turkeys should be hatched under hens and in this way the nucleus of a new and sound flock may be acquired.

4. TUBERCULOSIS.

Tuberculosis, or consumption, is a very common disease among people and among several species of our domestic animals, particularly cattle and swine. It is also found, although comparatively rarely, among other species of the domestic animals. In some places fowls are frequently found that are afflicted with this disease. For a long time it was thought it might have been acquired through eating the expectorations of tuberculous animals or man, or feeding upon tuberculous organs of slaughtered animals, but recent investigations have made it practically certain that tuberculosis of fowls is not the same disease as tuber-

culosis of the higher animals, and although these are similar it is caused by a somewhat different germ, and it is not probable that it is ever acquired from the higher animals nor that the higher animals can acquire tuberculosis from fowls. The principal symptoms of tuberculosis are those of a lingering illness that gradually becomes more severe. Sometimes, tubercles appear as hard and horny or as soft and cheesy swellings on the skin or about the joints. There is wasting, the comb and the membranes of the head become pale, the strength of the fowl is gradually lost and finally it dies, after having shrunken to a mere mass of bones, skin and feathers.

After death, little white or yellow tubercles which contain cheesy matter may be found in the liver and spleen. About half of the fatal cases of tuberculosis in birds show tubercles, which appear as rather dense round masses, in the walls of intestine. They may also be found in some cases in the peritoneum, the membrane lining the abdominal cavity, and in the lungs. Many of the birds in Zoological Gardens die of tuberculosis, and it is very common among cage birds. A number of cases in parrots have been seen at the Veterinary Hospital of the University of Pennsylvania. Tuberculosis of parrots differs somewhat from that of chickens, in that it may be caused by a germ identical with that causing tuberculosis of man, and may be derived from or transmitted to people. So that tuberculous parrots are a menace to human health.

There is no cure for tuberculosis, and the most efficient means of preventing it consists in killing and burning fowls that may be suffering with it and there-

oroughly disinfecting the premises previously occupied by them.

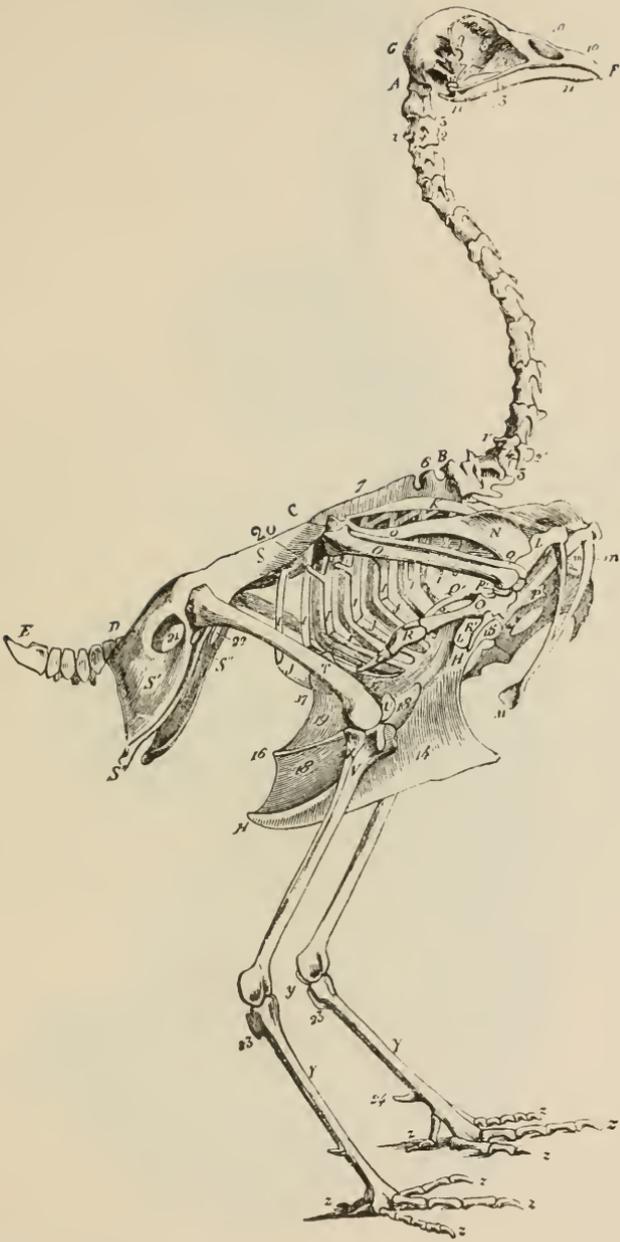
5. GOING LIGHT.

Pigeon fanciers speak of a disease of pigeons known as "going light," which means that the diseased birds are becoming lighter and thinner or, in other words, wasting away. The designation is applied so generally and loosely that it has not been possible to attach a definite meaning to it or discover that it relates to a single disease. An outbreak of disease among pigeons has been studied by Dr. Moore, who found that a rather chronic wasting disease was produced by a germ that in some respects resembled the germ that causes hog cholera. "Going light" might be defined in many cases as a chronic, wasting disease of pigeons, that is due to a cause that is unknown, but which is probably of an infectious nature. In some of the outbreaks, the disease runs a much more rapid course than in others, and causes death within a few days. In other cases, its course is quite prolonged and the bird sometimes recovers. If treatment is employed it should consist in the administration of general tonics, such as quinine, in one grain doses twice a day; cod liver oil, one-half teaspoonful, 3 or 4 times daily; reduced iron in the food. Warm, well ventilated, comfortable surroundings, and nourishing and attractive food must be provided. The pigeon loft should be thoroughly cleansed

and disinfected in reference to this affection, and if pigeon fanciers will notify the State Veterinarian when outbreaks appear they will be investigated with a view of discovering the exact cause and the measures to be taken to cure or prevent it.

DESCRIPTION OF OPPOSITE PLATE.

From A to B, cervical vertebrae. 1, spinous process of the third vertebra; 2, inferior ridge on body of the same; 3, styloid prolongation of the transverse process of the same; 4 vertebral foramen of the same; 1', 2', 3', 4', the same parts in the twelfth vertebra. From B to C, dorsal vertebrae; 6, spinous process of the first; 7, crest formed by the union of the other spinous processes. From D to E, coccygeal vertebrae. F, G, head; 8, interorbital septum; 9, foramen of communication between the two orbits; 10, premaxillary bone; 10', external openings of the nose; 11, maxilla; 12, os quadratum; 13, malar bone; H, sternum; 14, brisket or keel; 15, episternal process; 16, internal lateral process; 17, lateral external process; 18, membrane which closes the internal notch; 19, membrane of the external notch. I, etc., superior ribs, 20, posterior process of the fifth; J, inferior ribs; K, scapula; L, Coracoid bone; M, forculum—m, m, its two branches; N, humerus; O, ulna—o, radius; P, P', bones of carpus; Q, Q', bones of metacarpus; R, first phalanx of the large digit of the wing. r, second phalanx of the same; R, phalanx of thumb; S, ilium, s', ischium, s'', pubis, 21, sciatic foramen, 22, foramen ovale; T, femur; U, patella; V, tibia, x, fibula, y, single bone of tarsus; Y, metatarsus, 23, superior process representing a united metatarsal bone; 24, process supporting the claw; z, etc., digits. —Chauveau.

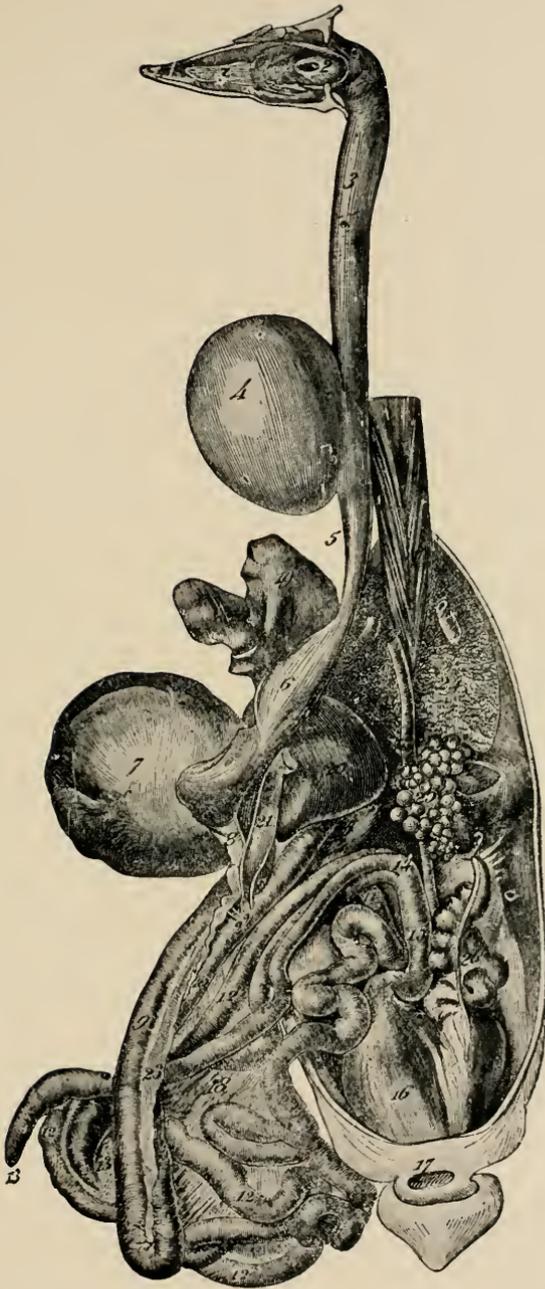


SKELTON OF A FOWL.

DESCRIPTION OF OPPOSITE PLATE.

The abdominal muscles have been removed, as well as the sternum, heart, trachea, the greater portion of the neck, and all the head except the lower jaw, which has been turned aside to show the tongue, the pharynx and the entrance to the larynx. The left lobe of the liver, succentric ventricle, gizzard and intestinal mass, have been pushed to the right to exhibit the different portions of the alimentary canal and to expose the ovary and oviduct.

1, tongue; 2, pharynx; 3, first portion of the oesophagus; 4, crop; 5, second portion of the oesophagus; 6, succentric ventricle; 7, gizzard; 8, origin of the duodenum; 9, first branch of the duodenal flexure; 10, second branch of the same; 11, origin of the floating portion of the small intestine; 12, small intestine; 12', terminal portion of this intestine, flanked on each side by the two caeca; 13, free extremities of the caeca; 14, insertion of these two organs into the intestinal tube; 15, rectum; 16, cloaca; 17, anus; 18, mesentary; 19, left lobe of the liver; 20, right lobe; 21, gall-bladder; 22, insertion of the pancreatic and biliary ducts; 23, pancreas; 24, lung; 25, ovary (in a state of atrophy); 26, oviduct.—Chauveau.



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LOCALITIES WHERE MANY OF THESE ANIMALS CAN
BE FOUND.

TAPEWORMS OF POULTRY AND THE DESTRUCTION
OF NOXIOUS ANIMALS.

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ILLUSTRATED.



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Birds of Prey—Shooting—The Grass Suit—When Snow

Covers the Ground—Shooting Hawks from Blinds—
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 Shown on Plates—Opossum, Rabbits, Wild and Tame
 Cats—Squirrels and Weasels—Dogs and Wolves—
 Feathered Heads—Turkey Buzzards and Sparrows—
 Sea Gulls, Cuckoos, etc., pages. 660-731

LIST OF ILLUSTRATIONS.

The name Fisher, which appears after names of different birds of prey, indicates that the illustration has been reproduced from Dr. A.K. Fisher's report, Bulletin No. 3, United States Department of Agriculture, Washington, D. C., entitled "The Hawks and Owls of the United States," published in 1893. This document, prepared by Dr. Fisher, one of the foremost Ornithologists in the United States, under the direction of Dr. C. Hart Merriam, Chief of the Biological Division of the National Agricultural Department, deals fully with the birds of prey in their relation to agriculture. It is, without doubt, the best work on this subject that has been published.

The name of Ward, which follows names of different animals, signifies that the specimen from which the illustration was reproduced was furnished from the valuable collection of Messrs. H. A. and F. A. Ward, of Rochester, New York, proprietors of one of the largest and best equipped natural science establishments in the country.

The name Audubon, placed after a few names of birds and mammals, shows that the illustration has been copied, with some minor changes, from Audubon's "Birds of North America, or the "Quadrupeds of North America" by Audubon and Bachman.

The remainder of the illustrations have been made especially for this work from specimens.

CHAPTER III.

American Hawk Owl (adult)—Ward.

Bald Eagle (adult)—Fisher.

Bald Eagle (young)—Ward.

Barn Owl (adult)—Fisher.

Barred Owl (adult)—Fisher.

Broad-winged Hawk (adult)—Fisher.

Cooper's Hawk (adult)—Fisher.

Cooper's Hawk (young)—Ward.

Duck Hawk (adult)—Fisher.

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Golden Eagle (adult)—Fisher.
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Marsh Hawk (adult)—Fisher.
Mississippi Kite (adult)—Fisher.
Pigeon Hawk (adult)—Fisher.
Red-shouldered Hawk (adult)—Fisher.
Red-shouldered Hawk (young)—Ward.
Red-tailed Hawk (adult)—Fisher.
Rough-legged Hawk (adult)—Fisher.
Rough-legged Hawk (young)—Ward.
Saw-whet Owl (adult)—Ward.
Screech Owl (adult; red and gray coats)—Fisher.
Sharp-shinned Hawk (adult)—Fisher.
Sharp-shinned Hawk (young)—Ward.
Short-eared Owl (adult)—Fisher.
Snowy Owl (adult)—Ward.
Sparrow Hawk (adults; male, female)—Fisher.
Swallow-tailed Kite (adult)—Fisher.
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Blue Jay (adults)—Audubon.
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Crow Blackbird (adult).
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Great Northern Shrike (adult)—Ward.
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Black or Silver Gray Fox (adult)..Audubon.
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Gray Fox (adult)—Ward.
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Along Penn's Creek.
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 In Clinton County.
 The Narrows, Pennsylvania Railroad.
 Where Foxes Rove.

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- Plate I.—*Cotugnia digonopora*.
 II.—*Cotugnia bifaria*.
 Amabilia lamelligera.
 III.—*Dicranotaenia coronula*.
 Dicranotaenia aequabilis.
 Dicranotaenia furcigera.
 Taenia conica.
 IV.—*Dicranotaenia sphenoides*.
 Drepanidotaenia lanceolata.
 V.—*Drepanidotaenia lanceolata*.
 Drepanidotaenia fasciata.
 VI.—*Drepanidotaenia fasciata*.
 VII.—*Drepanidotaenia fasciata*.
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 VIII.—*Drepanidotaenia gracilis*.
 IX.—*Drepanidotaenia anatina*.
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 XI.—*Drepanidotaenia sinuosa*.
 XII.—*Drepanidotaenia sinuosa*.
 Drepanidotaenia setigera.
 Taenia Krabbei.
 Kowalewski nec Moniez.
 XIII.—*Drepanidotaenia sinuosa*.
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- XVII.—*Davainea cesticiillus*.
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- XIX.—*Echinocotyle Rosseteri*.
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- XX.—*Taenia contaniana*.
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The following named illustrations of eggs, natural size, have been made from carefully selected specimens in the collection of Messrs. Ward, of Rochester, New York.

American Crow.
 Bald Eagle.
 Barn Owl.
 Barred Owl.
 Blue Jay.
 Broad-winged Hawk.
 Cooper's Hawk.
 Duck Hawk.
 Goshawk.
 Great Horned Owl.
 Long-eared Owl.
 Marsh Hawk.
 Red-shouldered Hawk.
 Red-tailed Hawk.
 Saw-whet Owl.
 Screech Owl.
 Sharp-shinned Hawk.
 Sparrow Hawk.
 Turkey Buzzard.

CHAPTER IX.

With the exception of those after which the name Ward appears, the heads shown in this chapter have been reproduced from heads sent to the Smithsonian Institution, Washington.

D. C., or to the office of the author for identification. These heads, with numerous remains of other birds and mammals, came from county officers in Pennsylvania, who believed the birds to be Hawks and Owls; and those of the quadrupeds to be one or the other of mammals, viz., Wolves, Foxes, Weasels, the Wildcat or the Mink, which were all mentioned in the Scalp Act of June 23, 1885.

HEADS OF BIRDS.

American Herring Gull.
 Cooper's Hawks—Ward.
 Cooper's Hawk (downy young).
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 Goshawk—Ward.
 Marsh Hawk—Ward.
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 Pheasant or Ruffed Grouse (adult).
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 Sharp-tailed Grouse (adult).
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Black Squirrel.
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 Waiting for a shot.
 To Trap a Fox.



LETTER OF TRANSMITTAL.

DEPARTMENT OF AGRICULTURE,
HARRISBURG, PA., *June 15, 1897.*

To the Honorable Senate and House of Representatives
of the General Assembly of Pennsylvania:

Gentlemen: In compliance with the following concurrent resolution, I have the honor to transmit herewith Part II, entitled "Enemies of Poultry."

B. H. WARREN.

In the House of Representatives,
March 1, 1897.

Resolved (if the Senate concur), That there shall be printed at the earliest possible date, in pamphlet form, fifteen thousand copies of Bulletin No. 17, of the Department of Agriculture, entitled the Diseases and Enemies of Poultry, with such additional matter and changes as the authors may deem necessary to more fully explain this important subject; five thousand for the use of the Senate, and ten thousand for the use of the present members of the House of Representatives: Provided, That the authors shall receive no extra compensation for preparing, writing, editing, proof reading, revising and indexing this pamphlet.

A. D. FETTEROLF,
Resident Clerk of the House of Representatives.

In the Senate, March 2, 1897.
The foregoing resolution concurred in.

E. W. SMILEY,
Chief Clerk of the Senate.
Approved—the 9th day of March, A. D., 1897.

DANIEL H. HASTINGS.



PREFACE.

Unfortunately, ignorance concerning the true worth of numerous species of wild birds and other feral animals is so widespread that it is frequently impossible to present in public documents the requisite information which will be of real service to the citizens—especially farmers and horticulturists—who should be fully and correctly informed of the economic relations of the different forms of animal life which have such an important place in nature's garden.

This ignorance is not by any means confined, as many would have us believe, to those in humble walks of life. The merry, light-hearted and active piccannyns of the south watch with especial interest birds, mammals and insects in their chosen haunts. Such observers, without books or educated instructors, have learned from the great book of nature truths which would make the hearts of naturalists throb with delight; and, if placed on record, some of these observations would, no doubt, materially add to scientific literature. Again, we find a class of stalwart, rough but ingenuous mountaineers and woodsmen who, from their early boyhood days, have been obliged to struggle and labor incessantly to maintain themselves with the necessities of life. These men, good-hearted and true that they are, have not had the advantages of education; they do not, of course, know the latin names of the wild creatures which a Wise Creator has placed in the ample field of nature, and in many instances they do not even know the proper common

names of birds, mammals, insects (if latter possess vulgar names), etc., which they see, but they do know much of the life and habits of these and other forms of life. The information which this class of people possess concerning birds, mammals and insects, if given wide publicity, would be worth thousands and thousands of dollars annually to the citizens of this Commonwealth. Turn your attention in another direction; go among men high in social and educational rank, or those who have gained marked distinction and place in the political field, and speak of the importance, yes, the dire necessity of issuing at public expense books on natural history topics, and in the majority of instances you will find they decry such propositions "as a useless outlay of public funds." During the past ten years the time of the writer has been largely occupied in preparing books, reports, papers and bulletins for gratuitous distribution. By such work and an extensive experience in the lecture field, it has been learned that to meet with popular favor and have books, etc., read by the average citizen, one must eliminate in his writings all technical matter possible, and at the same time embellish with numerous, well designed and truthfully executed illustrations. The naturalist who prepares books or other documents which the average school child can read intelligently will do much more service to the present and future generations than the one who prepares strictly technical matter that can only be perused by the general reader with the aid of dictionaries. In future years, when the hand that pens these lines is still in death or has returned to mother earth, the great importance of the many truths contained within the pages of this work will become apparent. This statement last made is given not because the writer is so egotistical

as to believe that Part II of this report is an able production from a literary standpoint, but because he is well aware that unless a strong public sentiment is not soon created to correct unjust prejudices which exist against many of our most serviceable birds and other wild animals, these creatures will soon be exterminated if reckless scalp acts, which so many favor, are enacted and hat-bird hunters pursue their nefarious trade. Should such a condition confront the people of this Commonwealth it will be found, when too late to remedy, that the annual loss from innumerable insect foes would be very considerably in excess of the enormous loss we at present suffer yearly in Pennsylvania.

Entirely independent of the data which the writer has accumulated during many years of active field work and incorporated in this volume, Part II contains much matter of especial value from the pens of some of the highest zoological authorities in the country. All this, together with the notes and field observations of hundreds of intelligent farmers, horticulturists, poulterers, sportsmen and naturalists throughout the State, will tend to make this document a standard work in the somewhat limited yet exceedingly important field it so fully covers. In conclusion the writer would extend his most cordial thanks to his Excellency, Governor D. H. Hastings, for his wise approval of the concurrent resolution which provides for this publication. Ex-Governor Beaver approved two bills authorizing the publication of the Birds of Pennsylvania. These approvals give conclusive proof that Centre county has furnished executives who, by their signatures, have done more to create popular sentiment in behalf of zoological matters than any of their predecessors.



POULTRY AND ITS ENEMIES.

CHAPTER I.

MISCELLANEOUS INTRODUCTORY NOTES.

THE VALUE OF PENNSYLVANIA'S POULTRY.

It is estimated that the value of poultry of all kinds and the eggs produced in Pennsylvania last year was about \$22,000,000. By these figures it will be seen that the industry is one of great importance; in fact it is one of the most important branches of agriculture, as statistics show that "the annual poultry products of the United States are equal in value to the wheat crop."

THE VALUE OF FOWLS AND EGGS IN THE UNITED STATES.

Pennsylvania, one of the leading States in the Union in the production of poultry, has, it is stated, about 275,000 persons engaged, on a more or less extensive scale, in the poultry raising business. My esteemed colleague, Dr. Pearson, says, basing his statement on a recent estimate published in the American Agriculturist, that

"According to a recent estimate of the American Agriculturist, based on the last census and on an extensive inquiry,

the number of fowls in the United States is about 383,000,000; these produce 1,141,000,000 dozen eggs each year, and the value of both amounts to \$343,000,000.00. There are in this State 15,374,000 fowls of all sorts; turkeys, geese, ducks and chickens, valued at \$8,236,000 and these produce 68,818,000 dozen of eggs each year worth, at 20 cents per dozen, \$13,763,600, making a total value for poultry of about \$22,000,000"—Pearson.

The loss to poultry, both old and young, through disease is considerable. Dr. Pearson observes that, at a very conservative estimate, one-tenth of the poultry of this Commonwealth is, each year, carried away by disease. However, as the various diseases, with best remedies for the same, of domestic fowls, are carefully discussed in Part I of this document, I deem it unnecessary to make further reference to diseases which are such a hindrance to success in poultry-raising, and which, sometimes, destroy, if not promptly and intelligently treated, the entire population of the poultry yard.

LOSS IN PENNSYLVANIA FROM PREDATORY ANIMALS.

When I prepared the preliminary report (Part II., Bulletin No. 17, Dept. of Agriculture, issued in Nov., 1896), entitled "Some Furred and Feathered Enemies of Domestic Fowls," I was unable, because of insufficient data, (which, with a number of books and valuable papers belonging to the Commissioner of Forestry and myself, had been carelessly thrown away by some workmen who were making alterations about a closet where our property was stored), to give even an approximately correct estimate of the loss to poultry annually incurred through the depredations of predatory animals. To give an accurate estimate of the money lost through depredations of wild animals to the poultry interest would, of course, be impossible, as probably few individuals in our State, who are the possessors

of a flock of barn-yard fowls, keep any record of the loss of poultry or eggs which are destroyed in the course of a year by any of the wild animals which it is well established subsist in part, at least, on young or old poultry and eggs. However, through the aid of circulars and postal cards making inquiries as to probable money loss annually sustained from the visits of foxes, minks, weasels, wildcats, rats, certain species of hawks and owls, crows, etc., it is learned that the yearly loss in Pennsylvania is probably about \$750,000.

This sum is a large one, and, perhaps, to a person who has given little thought and attention to the matter, it will appear to be excessive. Such, however, judging from the answers received at this office, does not appear to be the case, as may be seen by consulting the replies of farmers and poulterers, which are given in full on succeeding pages of this work. Well informed gentlemen, who are thoroughly familiar with the poultry business, and the losses effected by the depredations of the various animals commonly included under the caption "Enemies of Domestic Fowls," claim that the average loss yearly to each individual farmer and poultry-raiser throughout Pennsylvania, through the depredations of the many species of birds, mammals, etc., which kill poultry or destroy their eggs, is fully **five dollars**.

If there are, as it is claimed, 275,000 poultry raisers in this State and they each sustain an annual loss of five dollars, the aggregate loss would be \$1,375,000.

No doubt, there are hundreds, yes, thousands, of farmers and other persons who are engaged in rearing poultry who, individually, and perhaps yearly, suffer a much greater loss than five dollars, as can readily be seen by consulting reports made to this Department

and printed in different chapters which appear on succeeding pages. Such cases, however, although quite numerous could not, with any degree of fairness, be used exclusively in making up estimates. It is also worthy of particular note to bear in mind that when proper care is taken to protect fowls from their furred and feathered foes, the loss annually can be very materially lessened. Farmers and other poultry raisers who make no efforts to have their poultry safely housed at night time, naturally sustain losses from the attacks of nocturnal marauders, such as foxes, minks, weasels, opossums, rats, the Great Horned Owl, etc. These losses, frequently, could easily be avoided if proper precautionary measures were adopted. Those who reside in sections near large woods, mountainous districts, streams and ponds often suffer very great losses from predatory animals, unless particular pains are taken to guard the fowls and exterminate the sly pilferers. I have known a single pair of Cooper's hawks, in the spring when they had a nest of young in a woods about half a mile from a friend's barnyard and chicken coops, to destroy in one week over fifty young chickens. A pair of Sharp-shinned Hawks, when compelled to provide food for a nest of young, have been known to visit a single farm and kill, on an average, five or six young chickens daily, for a period of a week or ten days.

Goshawks will also sometimes visit farm houses for several days in succession and kill poultry, both old and young. Usually, however, the Goshawk, when breeding, keeps in the woods, where he finds an abundance of food, an important item of which, unfortunately, is that noble game bird the Ruffed Grouse. The Duck Hawk, a summer resident, in a few localities of this

State, also, at times, destroys some poultry, particularly ducks.

TRAP OR SHOOT THE TROUBLESOME HAWKS.

When the poultry raiser discovers that a hawk or hawks of any species are paying regular visits to his poultry yard, he should, at once, begin an investigation and learn, if possible, where the nest or nests of such unwelcome visitors are located. When this information is obtained the bold feathered deprecaters can usually be shot or trapped at their nests. When this is done the nests and young should be destroyed as no humane person would want to leave the young hawks to die of starvation, as is so commonly done by the heartless and money loving plume-hunters, who have practically depopulated the southern states of the beautiful herons. The hat-bird and plume-hunter, in the pursuit of his nefarious business—one, kind reader, which has been made possible because our mothers, sisters and sweet-hearts, seem determined to decorate their headgear with showy feathers—visits the breeding places of the herons, egrets, etc., and shoots the old birds from the nests. The clamorous young, by thousands, in some large nesting places, have been left by the heartless wretches, to die by the tortures of starvation, as the carcasses of their parents, denuded of the showy feathers, lay rotting on the ground.

KEEP YOUR EYE ON THE CROW.

Frequently it happens that a pair of crows will set up house-keeping in a woods in the neighborhood of the farmer's chicken coops, and if left undisturbed they will pick up a good many young chickens, and steal all the eggs they can find. A visit to the woods will generally enable you to discover the home of these

black-coated poultry thieves, which, of course, can be destroyed, together with the old birds. Should you fail to find the nest of the crow, you can easily dispose of him by drilling an egg, insert a little strychnine in the hole, and place the deadly bait in a nest he has been robbing or in a conspicuous place where he will be likely to see it as he comes spying around after the chirping offspring of the fussy and ever solicitous old hen, who, often penned up in a coop or fastened by a long cord and one leg to a peg in the ground, is ever on guard to shield her family of youngsters.

HERONS, BLACKBIRDS AND JAYS.

Several species of the heron tribe occasionally devour the young of ducks and other birds which are found about streams, ponds and marshy ground frequented by these long-legged waders. Of late years, however, the herons and bitterns have so greatly decreased in numbers, that the damage they do by destroying the young of ducks or other kinds of birds is trifling.

Crow blackbirds are abundant in this State and if these birds were as much given to preying on young chickens and destroying the eggs of domestic fowls, as they are to devouring the young and eggs of different species of small insectivorous birds, they would no doubt cause considerable loss annually. Fortunately, however, the habit of feeding on the eggs of domestic fowls and their young seems to be confined, so far as my observation goes, to individual blackbirds, "black-sheep," so to speak, which appear here and there in different communities. Blackbirds which have acquired an appetite for the eggs and young of domestic fowls can easily be destroyed, but when this is done it would

not, in my opinion, be a wise procedure for the farmer to place all blackbirds under ban, because of the misdeeds of a few individuals which may have developed a taste for forbidden food. Although blackbirds, undoubtedly, destroy the homes of a good many small wild birds, the fact seems pretty well established that these birds, during the summer season, are much more beneficial than harmful to the farmer. Nine times out of ten an investigation will show that when crows and blackbirds visit the corn fields, when the young corn blades are an inch or two above the ground, that they are there, not to destroy the corn, as many suppose, but to feed on the cut-worms which are often so abundant as to ruin entire fields and render a replanting necessary.

THE JAYS.

The "Scrub" or Florida Jay (*Apelocoma floridana*) is greatly detested in some parts of Florida where they are plentiful. The enmity to these birds, known locally as "Scrub Jays" because they are found in a thick under-growth, arises from the fact that they destroy the eggs of chickens. They come about buildings and destroy the eggs, and they will also, I am informed, sometimes attack and kill young fowls as well as different species of wild birds which they can master.

In attacking the young of chickens or other fowls, the jays, it is asserted, always strike at the head, and with a few vigorous strokes of their bills, soon perforate the tender coverings of the brain. Usually when not disturbed the jay will eat the brain matter, pick out the eyes, and leave the rest of the fowl undisturbed.

The habit of destroying eggs and poultry must be

rather common with the species under consideration, as I found, in 1885, at several localities which were visited in Orange and other counties along the St. Johns river, that special efforts were made by the residents to destroy these birds, on account of the reasons narrated in the preceding paragraphs.

The Florida Blue Jay, a local race technically styled (*Cyanocitta cristata florincola*), is a little smaller and has less white on tips of secondary and tail feathers than the Blue Jay (*Cyanocitta cristata*). It is also in bad repute with Florida farmers who assert that it sneaks the eggs of chickens.

THE JAY KILLED BIRDS AND SQUIRREL.

Referring to the Blue Jay, Audubon wrote: "It robs every nest it can find, sucks the eggs like the crow, or tears to pieces and devours the young birds. A friend once wounded a grouse (*Bonasa umbellus*), and marked the direction which it followed, but had not proceeded two hundred yards in pursuit, when he heard something fluttering in the bushes, and found his bird belabored by two blue jays who were picking out its eyes.

The same person once put a flying squirrel into the cage of one of these birds, merely to preserve it for one night; but on looking into the cage about 11 o'clock next day he found the mammal partly eaten. A blue jay at Charleston destroyed all the birds of an aviary. One after another had been killed, and the rats were supposed to have been the culprits, but no crevice could be seen large enough to admit one. Then the mice were accused, and war was waged against them, but still the birds continued to be killed, first the smaller, then the larger, until the Keywest pigeons, when it was discovered that a jay which had been raised in the aviary was the depredator. He was taken out and placed in a cage, with a quantity of corn, flour and several small birds which he had just killed. The birds he soon devoured, but the flour he would not condescend to eat, and refusing every other kind of food, soon died.

In the north it is fond of ripe chestnuts, and in visiting the trees is sure to select the choicest. When these fall it attacks the beech nuts, acorns, peas, apples and green corn. In Louisiana they are so abundant as to prove a nuisance to the farmers, picking the newly planted corn, the peas and sweet

potatoes, attacking every fruit tree, and even destroying the eggs of pigeons and domestic fowls. The planters are in the habit of occasionally soaking some corn in a solution of arsenic, and scattering the seeds over the ground, in consequence of which many jays are found dead about the fields and gardens."

JAYS ARE NOTORIOUS NEST ROBBERS.

Although Blue Jays have decreased greatly in many sections of the country since that able naturalist, Audubon, penned the paragraphs last quoted, they have not by any means deviated, as far as can be learned, from the thieving practices of their loquacious ancestors.

The Blue Jays of the present day have had transmitted to them the same carnivorous tastes which years of observation in the woods and chosen haunts of the jays, prompted the gifted Audubon to write so positively about their pernicious habits.

Every farmer's boy who is familiar with the garrulous and inquisitive jays, is well aware that they are especially fond of eggs and young birds. Whenever an opportunity offers, whether it be in woodland, orchard, garden or bramble, these blue-coated robbers put forth all their energies to steal the eggs and young of their neighbors—birds which consume, during their summer sojourn with us, myriads of noxious insects.

These numerous forms of insect-life, which are devoured by the beneficial birds whose homes are so frequently despoiled by the robber-jays, would, if not kept in check by their natural enemies, bring about a destruction of trees and other plant-life which cannot be computed.

SAVE THE BIRDS.

The absolute necessity of protecting in every way possible the beneficial or the insect-eating birds cannot

be too strongly urged upon all classes of our people. Farmers and fruit-growers, particularly, should make especial efforts to encourage the presence of beneficial birds on their premises. The Pennsylvania Board of Game Commissioners, assisted by the members of the State Sportsmen's Association, have prepared, with great care, a game bill, which is, at present writing, in the hands of the Legislature. If this measure becomes a law, it will afford protection to insectivorous birds which has never before been given in this State.

If the section, as originally framed, of this bill, which deals with "wild song and insectivorous birds," passes both branches of the General Assembly and receives executive approval, the days of the hat-bird killer and the commercial bird-egg hunter will be numbered, as they most assuredly should be.

The millinery taxidermists, the bird-egg-collecting fad, so common with school boys, have in the last ten or fifteen years caused an enormous depletion of bird-life.

The millinery trade requires bright-plumaged birds to satisfy its tender-hearted, charming and lovable customers.

20,000 BIRDS IN FOUR YEARS.

To fill the orders received from the millinery establishments, taxidermists have scoured the woods, orchards, mountains and fields in search of victims. In this manner immense numbers of showy species such as orioles, tanagers, warblers, rose-breasted grosbeaks, cardinals, indigo buntings, jays, bob-o-links, woodpeckers, snow birds, larks, etc., have been slaughtered. Some few years ago I met a taxidermist in one of our large cities, who, with the aid of one assistant (a taxidermist) and several men and boys, whom he em-

ployed to shoot birds during migrations and in the early summer, cleared over \$3,500 in less than one year by the sale of mounted birds for hats and bonnets. His expenditures, he said, were about \$1,500 in the ten months he was actively engaged in the business. He sold the birds at prices ranging from one dollar and fifty cents per dozen, for small-sized, dull-plumaged birds, (song sparrows, hair-birds, juncos, English sparrows, oven birds, etc.), to five, six, eight and ten dollars per dozen, for male scarlet tanagers, red-winged black-birds, bob-o-links, rose-breasted grosbeaks, indigo birds and bright-plumaged warblers such as the Blackburnian, Kentucky, Yellow and Magnolia. This same individual also, some years before, or when the craze of decorating woman's headgear with birds first began, in one season obtained from the coast of New Jersey 1,100 terns, chiefly the Lesser Tern (*Sterna antillarum*) and gulls, for which he gave the gunners fifteen and twenty-five cents apiece, and then stuffed and sold them for hats at twelve and fifteen dollars per dozen.

During the four years which this man engaged in supplying birds to milliners he collected, mostly in Pennsylvania and New Jersey, at least 20,000 skins.

Why produce here these statistics of the hat-bird taxidermist?

They are given simply to call attention of the farmers of Pennsylvania, for whose especial benefit the legislators directed this report should be prepared, to one of the chief causes which has been in active operation for the past ten or fifteen years to destroy birds, many of which rank among the first of all natural agencies which the Wise Creator has placed in our midst to keep in check ravenous insect hosts, that, if unchecked, would soon lay our crops to waste.

A PROTEST FROM THE BAY STATE.

This wanton and senseless destruction of bird-life is not by any means restricted to Pennsylvania. In Massachusetts, where about three-quarters of a million of dollars has been expended during the past four or five years to repress a single insect foe—the Gypsy Moth—hat-bird hunters, professional snarers, or “pot-hunters,” and the ubiquitous small boy with an old musket, are playing havoc with the feathered population, many of which, if unmolested, and allowed to follow their natural inclinations would undoubtedly be a potent factor to aid in keeping in check the voracious Gypsy Moth. Regarding the agencies which are rapidly bringing about the extermination of the feathered tribes in the Bay State, I take the following paragraphs from the annual report of the Massachusetts Game Commission, for 1896:

“Reports from our deputies and other reliable sources show a still further decrease in our game birds. Especially is this true in the eastern and middle sections of the State. This depletion is due to over shooting and that most destructive of all weapons, the snare. In some sections snares have been set by the thousands, completely clearing out the ruffed grouse, and, if this nefarious work is not stopped, this finest of game birds will be entirely destroyed. It seems useless for the State to expend money for the protection of game unless this work can be suppressed. All snaring should be prohibited, under severe penalty of fine or imprisonment, or both, at the discretion of the court. The time in which game can be killed should be shortened, and the open season for all game be the same. Unless some decided action is taken, there will be in the near future no game in our woods and fields.

SAVE OUR SONG BIRDS.

“As to song and insectivorous birds, the laws should be more vigorously enforced. Now, any boy who can raise \$1.50 to buy an old Springfield musket, considers himself privileged to take any wild thing he sees for a target. This, together with the fashion of decorating ladies’ hats with skins and wings of

birds, has led to the depletion of insectivorous birds to such a degree that scarcely a crop of any kind can be raised without spraying with poison to kill the insects which were formerly kept in check by the birds. The penalty for this destruction of the balance of nature is everywhere apparent, and the horticulturist and farmer are heavily taxed for want of foresight in protecting their own interests.

"If the destruction of these birds cannot be otherwise restrained, let the law for their protection extend to 'the possession of their skins or any part thereof,' except for scientific purposes."

THE SNARER IN EVIDENCE IN PENNSYLVANIA.

During recent years it appears, from reports which reach this office from various sections of the State, that the snaring of birds has been carried on to a great extent. This murderous method is engaged in principally by a class of foreigners who are apparently thoroughly acquainted with all the devices of the poachers of the Old World. Ruffed grouse, in some regions of the State, have been almost entirely extirpated through this villainous practice. Although Ruffed Grouse, undoubtedly, suffer the most from snares, this method of capture is, unfortunately, by no means confined to these game birds. These death-dealing and cunningly hidden snares have, on several occasions, been discovered in swamps and meadow lands, places where Woodcock and Wilson's or English snipe are known to frequent. Men who make a business of hunting meat or bird's skins for the market, catch numbers of small song and bright-plumaged birds by the use of birdlime and snares, the latter artfully placed about the nests.

A member of our State Game Commission in the early part of November, 1896, visited the market stalls of one of our large cities and examined forty Ruffed

Grouse; eight had been shot, the remainder had been snared.

BIRD BUTCHERY IN PIKE COUNTY.

The following article from the pen of the Milford Pa., correspondent of the New York Sun, published November 15, 1896, will give some idea of the snarer's work in Pike county, and the same condition of affairs exists in other counties of Pennsylvania:

"Hunters in Pike county complain of the scarcity of game in certain sections where in years gone by it was very abundant, and they attribute the scarcity to poachers. It is true that large bags of birds have been captured in the present season, and these lead to the stories that game is plentiful.

"This, however, is not the case," said the veteran guide and hunter, Charley Mott, of this borough. "Nine out of every ten of the supposed large bags of birds are the results of from 400 to 600 snares, covering the choicest hunting grounds for a radius of five miles or more from the home, or temporary stopping place, of the poacher. The shipments to New York city usually represent the fruits of the set guns of two or more of the poachers, and are the result of from four days to one week with the deadly devices.

"One week ago a shipper of birds was seen travelling in the woods, not with dog and gun but with a two-bushel sack fastened over his shoulder and directing his course toward the grounds that a few years ago were the most famous to be found anywhere for that noble bird, the Ruffed Grouse. What manner of cover or grounds productive of birds can long stand such wanton and illegal destruction and continue to give pleasure to the sportsman?

"For many years," continued Mr. Mott, "I found great pleasure and fine sport shooting on the grounds referred to, but the wonderful scarcity of birds of late and the discovery as to the cause of this scarcity have led me and sporting friends to abandon the section as a shooting resort."

Mr. Mott is of the opinion that if measures are not taken soon to protect young grouse from the summer woodcock shooters and to break up the marketing of snared birds, grouse will be virtually extinct in Pike county in the near future.

BIRD-EXTERMINATORS IN NEBRASKA AND GEORGIA.

According to the New York Sun: "J. H. Den and three companions are reported to have killed 700 wild geese and ducks in the northern part of Nebraska on a recent hunting trip. Seven hundred such birds would weigh not much, if any less, than a ton.

H. J. Lamar, Jr., and a party of hunters went to Leesburg, Ga., dove hunting. The amount of game that they killed makes one think of the wild pigeons away back in the fifties. The party killed 8,000 of the birds. The American Field says of this killing that 'such fiendish work by men who claim to be sportsmen makes our blood boil with indignation. * * * Their inhuman greed was unsportsmanlike.'

If this kind of work is allowed to go on for a few years we will have no game of any kind to shoot.

PASSING OF FAMILIAR BIRDS.

The great value of insectivorous birds cannot be overestimated. The fact is evident to all who have given any attention to the subject that if the wasteful, cruel and useless slaughter of birds is not soon checked numerous species will be obliterated from regions where in former years they were abundant. About twenty years ago wild pigeons bred in immense numbers in certain sections of Pennsylvania; but they are now gone. Why have they left? The reason is, primarily, because they were so relentlessly pursued by netters and market hunters, and, secondly, on account of the destruction of the primitive forests where they resorted to breed. Fifteen years ago the beneficial and shrewily dressed Red-headed Woodpecker was one of the most common birds to be met with on a day's outing in the rural districts. Now, it is rather unusual to see one of these birds in sections where, in my boyhood days, they were abundant.

What has been largely instrumental in bringing about this change? Why, the love of pecuniary gain

and the vanity of the fair sex have inspired the military taxidermists to slaughter, year after year, these frolicsome tenants of hollow trees; beautiful defenceless creatures, whose livelihood was earned mainly by destroying insects and larvae destructive of forest shade and fruit trees. It is true this bird sometimes visited the corn field or cherry tree, but the damage done on such occasions was trivial when compared with the good he did in the orchard or forest.

Men, we are told, particularly a class of miserly fellows who have been married for some years, are prone to comment in no favorable way about the cost of lovely woman's head dress. So far as the writer is concerned he believes it is every man's duty, and if he has the right kind of a wife, I know it would be a pleasure, to assist, so far as he is financially able, in obtaining the requisite head adornment for his better half. I do not believe, however, that any man should be asked or expected to encourage the decoration of his wife's head with feathers which have been torn from the bodies of mute and lifeless birds. The chief objection I have to offer to this hat and bonnet business is the persistence which so many ladies have for decorating their pretty heads with beneficial birds' skins. Do away with such ornamentations, double, if you desire, the amounts paid for feathers, add an extra quantity of artificial flowers, vines and iridescent ribbons, but spare, I beg of you, the harmless and defenceless members of "the summer's tuneful host."

THE PENNSYLVANIA AUDUBON SOCIETY.

It is certainly fortunate in many ways that the Pennsylvania Audubon Society, with headquarters in Philadelphia, has lately been largely instrumental in

arousing in different quarters of the State a strong desire to protect song birds. The officers of this organization include a number of the best-know citizens of Philadelphia. They are:

President.

WITMER STONE.

Vice Presidents.

MISS FRANCES E. BENNETT,
 MRS. A. T. COPE,
 MRS. S. C. F. HALLOWELL,
 MRS. WM. FURNESS JENKS,
 MRS. BEULAH M. RHOADS,
 MISS ANNE H. WHARTON,
 EDWIN SWIFT BALCH,
 BENJAMIN LEE, M. D.,
 S. WEIR MITCHELL, M. D.,
 HON. SAMUEL W. PENNYPACKER, LL. D.,
 RT. REV. O. W. WHITAKER, D. D.,
 WM. ROTCH WISTER,
 MRS. RICHARD M. CADWALADER,
 MRS. BRINTON COXE,
 MRS. I. MINIS HAYES,
 MISS A. C. KNIGHT,
 MISS M. CARY THOMAS,
 CHARLES C. ABBOTT, M. D.,
 HORACE HOWARD FURNESS, LL. D.,
 REV. HENRY C. McCOOK, D. D.,
 J. RODMAN PAUL,
 JOSEPH WHARTON,
 JAMES D. WINDSOR.

Directors.

MISS E. W. FISHER,
 MISS ELLEN L. LUNDY,
 HENRY C. MERCER.

Secretary.

MRS. EDWARD ROBINS.

Treasurer.

WILLIAM L. BAILY.

This organization of ladies and gentlemen publish

and distribute gratuitously, a very interesting and valuable little pamphlet, which can be obtained by addressing the secretary, Mrs. Edward Robins, 114 South 21st St., Philadelphia, Pa.

The good work of the Audubon Society has struck a popular vein as is evidenced by the fact that within a period of five months, from about the first of January of the present year, over fourteen hundred ladies and gentlemen have placed their names on the membership rolls of the society.

The earnest and commendable efforts of this society cannot fail to do a vast amount of good, and all classes of our citizens should aid in this new field of labor, which, if carried to a successful end, will be of incalculable value to this and future generations. No class of our citizens would derive greater benefits from the protection of birds than the farmers and fruit-growers.

To successfully protect birds in this State it is very essential to secure the hearty co-operation of the farmers and the farmers' boys.

Unfortunately, however, in some sections of Pennsylvania, different species of birds and mammals are regarded with disfavor because of a lack of knowledge of their beneficent services. When these mistaken opinions are corrected and the praiseworthy aim of the Audubon Society is thoroughly understood, I am satisfied that the farmers of this Commonwealth will extend such assistance that the professional hat-bird hunter, snarer, and meat-hunter, will be forced to abandon their nefarious trade.

With a view of giving a brief idea of the magnitude of insect depredations throughout the United States, a few paragraphs are added under the sub-head "Insect Ravages." Such records should certainly have

influence to aid in staying the hand which is too often unjustly raised against birds and other wild animals which are friends rather than enemies of the human race.

INSECT RAVAGES.

The plum crop in many regions of Pennsylvania is almost a total failure because of the ravages of the curculio and the fungus known as black knot. Yet, if orchardists would heed advice and follow the recommendations of scientific men who give special attention to the life histories of insects, fungi and birds, plum culture could, no doubt, be conducted with much greater satisfaction and profit.

During recent years there has been a very great increase both in number and virulence of the parasitic fungi and insect pests with which the farmer and the horticulturist has to contend. Besides these enemies the cultivator of the soil has to combat certain species of birds and mammals which annually do considerable damage to the cultivated crops. The destruction of forests, both by lumbermen and devastating forest fires—especially the latter—has caused many insects to abandon their habitations in the forests and take up their abodes in the cultivated lands.

PENNSYLVANIA LOSES \$5,000,000 A YEAR.

Eminent entomological authorities assure us that at least one-tenth of all the cultivated crops of this country are annually destroyed by insects, and that the aggregate amount of damage done is between \$200,000,000 and \$300,000,000 every year in the United States. Of this immense sum it is a very conservative estimate to state that Pennsylvania's share, through insect ravages alone, is about \$5,000,000 annually.

Some four years ago the Pine Bark beetle committed depredations in the pine forests of Southwestern Pennsylvania and in West Virginia amounting to fully \$1,000,000, and last year, according to the estimates of our correspondents, the army worm damaged crops, chiefly cereals, to the extent of at least \$300,000. In 1895, "rose bugs" and English sparrows caused, according to the testimony of our Erie county correspondents, fully \$50,000 loss to vineyards in the famous Erie grape belt.

THE LOSS IN OTHER STATES.

In North Carolina, the insect hosts annually, it is said, destroy over one and one-half million dollars worth of agricultural products. In 1893, the loss from granary insects to the corn crop alone in the State of Alabama was claimed to be \$1,671,882, and in the Lone Star State grain weevils, according to a well known writer, cause an annual loss in stored cereals of over \$1,000,000. In 1874, the Western States were visited by grasshoppers which played such havoc with the crops that their depredations amounted to \$45,000,000. The chinch bugs were so numerous in Illinois in 1864 that they cost the people of that State over \$73,000,000, and in Missouri in 1874 the same voracious pests devoured agricultural products to the amount of \$19,000,000. In the cotton raising States the annual loss through the cotton worm from 1864 to 1880 was estimated at about \$15,000,000.

Dr. Packard states that: "Each species of plant on an average supports three to four species of insects, and numerous plants, particularly those in general cultivation, afford subsistence to many more. Many species, which now attack garden vegetables or fruit or vines, once lived in the forest on entirely different vegetable life."

TREE-INHABITING INSECT PESTS.

There is, it is said, not less than seventy-five kinds of injurious insects inhabiting the apple orchard. Before the apple and other fruit trees were introduced to America, many of these insect enemies lived on such forest trees as the oak, elm, wild cherry, maple, ash and willow.

Forest trees are, as Dr. Packard states, "particularly liable to depredations of insects, certain species of which attack the roots, others the bark, some the wood, many the leaves and a few the fruit and nuts.

The oak harbors between 500 and 600 kinds of insects; the hickories afford maintenance to 140 recorded species, the birch to over 100 species, the maple 85, the poplar 72, while the pine yields nourishment to over 100 different kinds."

BIRDS AND MAMMALS AS A CLASS ARE BENEFICIAL.

There is, however, no doubt that certain species of birds and mammals are detrimental and their fondness for domestic fowls and game—both furred and feathered—as well as various kinds of small wild song birds is such that no one who is acquainted with their true life-histories will attempt to defend them. The number (species) of poultry and game devouring animals, dressed either in coats of light-weight feathers or of soft warm fur, is small as compared with the species which are serviceable or neutral.

It is unwise to overlook the great benefits conferred by the majority of our birds and mammals in the cultivated field, the meadow, the forest and the orchard, by destroying the troublesome rodents and multitudes of insects, which, as Dr. Elliott Coues well says: "singly are insignificant, but collectively a scourge, which prey upon the hopes of the fruit grower, and which if undisturbed would bring his care to nought."

THE SNAPPER AND A BROOD OF DUCKS.

Some years ago a blacksmith residing near a small creek on the outskirts of the borough of West Chester, had a flock of about fifteen young ducks, which were cared for by a cross old Brahma hen that always scolded whenever her web-footed brood disported in the muddy water of a small dam which had been made in the stream for their accommodation. The ducks went there with great regularity, notwithstanding the protests of their clucking, bad-tempered and fussing foster-parent. Suddenly the ducks began to disappear; one, and sometimes two, were spirited away in a day. First the cats were accused and they were promptly shot. Next a frolicsome setter pup was whipped when he "stood" the old hen and the surviving members of her palmate family. The poor, misused dog immediately after his castigation, was chained in the barn. The death of several cats and the confinement of a dog, whose lung power, both in daylight and dark, furnished abundant evidence of the entire absence of consumptive or asthmatic troubles, did not put an end to the thinning out of the ducklings. There were no minks, weasels, or foxes about the premises, and all the hawks and owls for miles around, had been killed for bounty. Sleek-coated meadow mice, it is true, were plentiful about the creek and in the tangled, matted grassy coverts of adjoining fields. But as these little creatures, which, curious to relate, had multiplied with marvelous rapidity a few months after the hawks and owls had been slain, subsisted on grass roots, cereals, grapevines, etc., such vegetarians certainly did not molest the ducks. At last, viewing the matter from every imaginable standpoint, attention was directed to a

certain small boy who played "hooky" to rob bird's nests and went fishing when his mother sent him to Sunday school. Because this mischievous urchin, some days before, had been observed trying to catch a snapper which he said "lived in the dam and killed the ducks," he was believed to be the aggressor. The boy was watched, and yet the ducks continued to decrease. One afternoon, when all but two of the flock had been stolen, the blacksmith who was looking at the pair dabbling in the water, was surprised to see a large snapping turtle seize one and drag it to the muddy bottom. This turtle, which weighed about seven or eight pounds, and the dead duck were both fished out of the pool with an iron rake.

ODD TRAITS OF ANIMAL-CHARACTER.

The totally unexpected discovery made by the good-natured disciple of Vulcan brought about a great change. The small boy was presented with a new fishing line, treated to pie and lots of "taffy." He listened with boyish pride and becoming modesty to such soft phrases as "Oh my! what a bright child," "Good boy," "Fine little man," etc. Poor innocent little fellow: he had not disturbed the old hen's brood, yet all the time this "good boy" knew that he had, only the day before, stood on guard, near the door of the old smithshop, while a companion had stolen a dozen hen's eggs and a lot of pigeons from the industrious and frugal blacksmith's barn. However, this gave him no concern as their rightful owner never learned the facts.

The slandered and howling setter was given full liberty, and in less than an hour afterward, as if to celebrate the happy event. Mr. Pup killed three chickens in a neighbor's garden, and, in an adjoining

yard, he ran down and mauled a kitten belonging to a short-haired, meddling old maid.

This kitten, to repair its damaged anatomy, had to retire the balance of the week to rest in swaddling bands and arnica fumes.

Expressions of regret were also uttered on account of the premature and violent demise of the Thomas feline group planted at the foot of a grape vine. This shaggy-coated and crooked old vine had for years served as a shelter and breeding place for several generations of the sparrow kind, and when these cats were buried at its base to invigorate the growth, there was hidden in a thick cluster of large leaves and fading, whitish blossoms, the tenantless nest of a pair of sweet-voiced Chipping Sparrows, that these same cats had destroyed the day previous to the commencement of their unexpected contract to "grow grapes."

FISHES THAT CATCH DUCKS AND BIRDS.

The taste which birds, such as the herons, cranes, kingfishers, certain hawks, owls and eagles, the mergansers and several kinds of sea ducks, gulls, terns and other oceanic birds have for fishes is well known. It does not, however, appear to be generally understood that we have numerous members of the finny inhabitants of our rivers, lakes and ponds which seldom allow a toothsome young duck or other small-sized birds, which they can capture, to escape.

Small mammals, such as mice, shrews and moles are also sometimes eaten by these scaled animal-catchers. On the ocean, in salt water bays and large rivers, and about the Great Lakes, numerous ducks, gulls, terns and other swimming birds are gobbled up by hungry fishes. Sandpipers, the smaller herons and other birds which wade about in shallow waters, are likewise often

caught by voracious pike or pickerel, bass and trout. in ponds and streams. I have on two different occasions seen brook trout catch young birds—one an Indigo Bunting and the other an awkward Maryland Yellow Throat, which had accidentally gotten into the water.

Pickerel which are plentiful and which grow to good size in the numerous ponds or lakes in the northeastern section of Pennsylvania, often, I am told, catch ducks, sometimes when nearly full grown, as well as other birds which get into the water intentionally or otherwise.

Last summer I shot a warbler, at Lake Ganogo, a very pleasant, healthful and romantic resort on the Lehigh Valley Railroad, in Wyoming county. The bird fell into the water of the lake, and when I had almost reached it with a boat, a good sized black bass seized it and disappeared from view.

MUD HENS ARE CAUGHT.

I have repeatedly been informed by fishermen and egg-hunters along the Atlantic coast, in New Jersey and Virginia, where the Mud Hen or Clapper Rail (*Rallus longirostris crepitans*) breeds in abundance, that eels and several species of fishes destroy many of the young rails. In the Florida waters the gar and some other fishes have such a keen appetite that adult ducks are often killed or maimed by them. I once shot a drake Wood Duck in Florida, which fell in the water about seventy-five yards from where I stood. Probably ten minutes elapsed before I could get the specimen, which from the way it kept moving and bobbing about in the water I thought was only wounded, but so injured that it could not fly or dive. When the duck was retrieved I was surprised to find that it had been

struck with several pellets of No. 5 shot which caused instant death. Its breast and abdomen were so badly lacerated that it was valueless for cabinet purposes. A guide who was with me said it was the work of a gar, black bass or catfish, all of which, he claimed, would do such tricks. At different times I threw into the St. Johns river, at a wharf where catfish were abundant, small birds which had been too badly damaged by shot to be skinned; the catfish would come to the surface and carry them out of sight. The place, of course, where these experiments were made, was a kind of feeding ground which I had established for the catfish by throwing, almost daily for nearly a month, into the water the carcasses of several hundred birds which had been skinned.

THE VORACIOUS PIKE.

Pike which love to hide in still waters where lily pads, tall grasses and rushes grow, have on different occasions been known to catch and devour small birds perched on low branches, leaves and grasses resting on or near the water's surface.

Ducklings of both wild and domesticated kinds are very frequently, it is asserted, captured when dabbling in the water by numerous kinds of greedy fishes.

A RED SQUIRREL, SPARROW AND HUNGRY CHUB.

In my school boy days when fishing on the historic Brandywine, I heard a loud out-cry among a colony of birds in a cluster of low willows and hazel bushes which overhung the banks and stream where the waters rushed madly over a stony bed to form a deep dark pool where fallfish or chubs lay in wait for food. I was acquainted with the spot, having repeatedly

caught the hungry chubs with grub-worms, grass-hoppers or mussels, in this their favorite trysting place. The birds' sharp and angry notes induced me to hurry to the spot where I discovered a prying Red Squirrel to be the originator of all the confusion. The squirrel had detected a partly feathered young ground sparrow and in endeavoring to catch it had knocked or scared it into the water and it was struggling at the edge of the pool when suddenly there was a splash, and the bird vanished. A stone cast at the squirrel drove him away as well as the birds he had annoyed.

I then directed my attention to fishing and cast my hook baited with a "willow worm" into the pool, a quick jerk and a taut line, told me I had a fish, which when landed proved to be a sixteen inch chub. On opening the stomach of this fish I found the young sparrow which had so mysteriously, about fifteen minutes before, left the water's surface.

FOREST FIRES VS. WILD AND DOMESTIC ANIMALS.

The time is fast approaching when the citizens of this great Commonwealth will be compelled to adopt some stringent measures to prevent the destructive forest fires which occur yearly, generally in the spring and autumn, and often also during the dry summer season.

FOREST FIRES INCREASING.

During recent years or since forest fires have increased so markedly in many of the mountainous portions of Pennsylvania, there has been a great decrease in the number of woodpeckers, nuthatches and different species of wood warblers, vireos, likewise the sweet voiced thrushes, many of which subsist, to a large degree, on numerous forms of forest-tree de-

stroying insects. This disappearance of avian life is, no doubt, to be attributed, in part at least, to the fires, which destroy so many of these birds in the breeding season.

SERIOUS LOSS IN 1895.

From reliable statistics, on file in this Department, we find that in the year 1895 there were about 225,000 acres burned over, occasioning a great loss to valuable timber, aggregating fully one million of dollars.

In 1895 twenty buildings were destroyed, among which were several saw-mills; two men and several horses and cattle lost their lives in the fires, which also consumed a considerable quantity of cut and sawed timber. In the same year the farmers spent \$45,000 in wages alone, to pay men and boys to aid in extinguishing the flames. Besides the great loss to our lumberinterests and to the farmers whose fences, buildings and other personal property are continually endangered by the flames' ravages, the reducing of these semi-annual conflagrations, which in the majority of cases, are, from reports at hand, the result of either grossly careless or maliciously inclined persons, is absolutely necessary as the continued destruction of our timbered areas by the woodman's axe and the devastating flames, will before many years seriously menace the water supply of our State. The restoration of forest trees on thousands of acres of land, now practically valueless, is a matter of the utmost importance from a hygienic standpoint. The fact, however, remains true that this can never be accomplished unless some vigorous means, through legislative aid, are taken to repress the forest fires.

OF GREAT INTEREST TO FARMERS AND SPORTSMEN.

To farmers, sportsmen and naturalists the forest fire question is one of great moment, as investigations show that the amount of animal life, particularly birds and mammals, destroyed yearly, is, in the aggregate, very large. Persons who have followed in the pathways of the great hissing, crackling, smoking and life-destroying flames, have found the charred remains of pheasants, wild turkeys, quails, rabbits, fawns, etc., besides several kinds of small wild song birds, especially such species that nest on or near the ground. Last spring and summer (1896) in almost every district where the fires burned over a large acreage numerous nests of grouse, besides many turkeys, and innumerable homes of small wild birds were destroyed.

GREAT DESTRUCTION OF WILD ANIMALS.

Through the courtesy of Dr. J. T. Rothrock, Forestry Commissioner of this Department, the Zoologist has been enabled to collect, from the district visited last spring and summer by forest fires, a large amount of valuable data showing the great destruction caused by these conflagrations to game of different kinds, as well as to many species of small wild song and insectivorous birds which have their habitations in the forests, old slashings, and bark peelings; localities that were mostly burned over.

The ruinous fires that did so much damage to animal life, occurred last year much later than is usually the case, and the injury to small wild birds and game, both furred and feathered, was, according to all accounts, considerably greater than is customary to be noticed when the usual "Spring Fires" take place.

The fires, last year, raged with the greatest fury in the latter part of May and the early part of June, or during a time when birds had their nests filled with eggs or brood of young.

LOCOMOTIVES NOT THE CHIEF CAUSE OF FIRES.

The assertion that steam locomotives are the chief cause of forest fires in this State is not, according to my observation, correct, nor is the claim proven by statistics of this Department.

My official duties are such that I have occasion to travel at least nine months of the year through Pennsylvania. Much of this time is spent in the mountains and lumbering operations where forest fires are of common occurrence. While it is, of course, true that sparks from engines of steam cars sometimes start serious conflagrations, careful investigations during the past three years show that fires which originate through such causes are rather exceptional.

RAILROADS ADOPT BEST PREVENTIVES KNOWN.

It is also a fact that our railroad companies not only use the most improved spark arresters for their engines, but they likewise give particular instructions to section bosses and track walkers in their employ, to adopt promptly such means as may be necessary to stop any and all fires which occur along the lines of their respective systems. Through my own personal observation and from the statements of numerous close observing and reliable gentlemen who have devoted much attention to the cause and effect of forest fires it has been found, except in isolated cases, that many of the ruinous forest fires which have in recent years been started by steam engines, originated not from puffing and ponderous locomotives of the well-

equipped and admirably conducted steam railways of our Commonwealth, but from the little (and in many cases defective) "dinkey" engines, such as are in use on many lumbering operations.

A COMMON CAUSE OF FOREST FIRES.

Another and very fruitful cause of forest fires is the custom, as practiced in numerous regions, of setting fire in the early spring to undergrowth, dry fallen leaves, and dead wood, so that grazing and pasture grounds will be furnished for cattle and sheep. The people who do this work know it is contrary to law, but they nevertheless follow it up year after year. Instances are known where in order to escape detection, men have taken lighted candles and placed them under piles of leaves and other combustible materials. These candles in a few hours would burn out and start fires when the men who had arranged the contrivances would be many miles from the place.

Old huckleberry patches are often fired, so a new crop of vigorous bushes will come up the following spring. Thus, for the sake of a few bushels of berries, men will start fires that destroy many thousands of dollars worth of property and much wild animal-life.

Deer hunters oftentimes, in order to clear up underbrush so they can get better shots at deer, will burn extensive tracts of land.

CARELESS SPORTSMEN.

As many of the fires can be traced to the carelessness of sportsmen, it would seem an awful lesson to them to read what a frightful destruction to game these fires are. It should teach them to not only be careful themselves, but encourage them to give information

that would result in the punishment of those who will fully set fire to the forests. If this is not done at once it will be but a short time only until game will be extinct, or what is left will be without forest protection, and consequently the pleasure of the true sports man will be gone.

One frequently reads in the newspapers during the gunning season items like the following, which was clipped from a Lancaster county paper:

"On Tuesday a woods belonging to Robert Black, of near Ful-ton House, was set on fire by gunners. They ran a rabbit into an old tree, and in order to get him out built a fire around the tree. The woods were soon on fire, and five acres were burned over. A great deal of fence was destroyed and many young trees were damaged."

The following extract is taken from an editorial published in the Philadelphia Press, Dec. 5, 1896:

"The prevention of forest fires in this State appeals to many interests. Most of them are affected indirectly by the changed conditions which the destruction of the forests brings about. To all sportsmen, however, the forest fires are of immediate concern, since they are very destructive of game. As the camp fires of careless sportsmen are among the most prolific causes of forest fires, it is well for them to know that they are sinning against their own interests, and, what their shooting in season would never do, making game scarcer each year. If they would stay to see the damage done by the fires which they have caused to ignite they would see this for themselves. In the wake of the life-destroying flames in the spring and summer may be found the charred remains of many brooding birds and young game animals. Is it too much to hope that the knowledge of this will prompt some of them to have a little more care about the fires they build and a little less indifference to the possible results of leaving them unextinguished when they break camp?"

An examination of ninety reports, on game destruction, received, chiefly from lumbermen, by my colleague and loyal friend, Dr. J. T. Rothrock, shows an immense

loss of property as well as great destruction of animal life. These fires not only consume different kinds of birds and other wild animals, but domestic fowls—turkeys especially—occasionally lose their lives by them. The Commissioner of Forestry, under the direction of Secretary Edge, in July, 1896, sent out a circular making inquiry as to the extent of damage done by the forest fires which took place as previously stated in May and June of last year. The information given on destruction in the succeeding paragraph is a summary of what was sent by those who kindly and promptly responded to the “fire circular.” These reports came from twenty counties and they represent about one-half of the counties of the Commonwealth which suffered from the ruinous conflagrations which occasioned fully one million dollars loss. Of the ninety correspondents all but six testify to great damage of pheasants or Ruffed Grouse, which in this State nest habitually on the ground. Next in the list we find “rabbits” mentioned by fifty contributors as having been destroyed; 41, turkeys (wild or domestic); 18, squirrels of different kinds; 14, quails; 9, other birds; 12, eggs and 3, deer.

FOR THE COMMONWEALTH'S WEAL.

The preceding paragraphs on bird-slaughter, the matter relating to forest fires and the loss occasioned by them to animal-life, together with the two or three pages that briefly show the enormous amount of loss annually incurred from insect enemies, although somewhat foreign to the subject matter of this book, have nevertheless indirectly an important connection with the interests of the agriculturist and poultry-raiser.

There are about 212,000 farms in Pennsylvania, and probably every one of the individuals who resides on a

farm is engaged, to a more or less extent, in raising domestic fowls. This being the case it is of the utmost importance, not only for the individual farmer's advantage, but for the general welfare of the Commonwealth, that every effort should be made to correct the popular prejudice which exists, in many localities, against different species of our furred and feathered tenants.

WILL SUFFER FOR OUR BLUNDERS.

However, the lack of proper knowledge, as to the true economic relations of birds and mammals, is, by no means, restricted to the agricultural people, as has been repeatedly evidenced from the fact that, on several occasions, barriers have been placed, by officials (no doubt well meaning but certainly not well-informed), in the way of proposed efforts to educate the masses in different branches of the natural sciences.

The fruits of such blunders are manifest now, and in years to follow they will be much more apparent. Laboring under an idle delusion that some of the most serviceable birds to be found about one's premises are injurious, we see men destroying all hawks and owls they find; yet there are probably not more than five or six of these birds (species) which are sufficiently numerous in the State to do serious damage to domestic fowls and game. The fact that some species of raptorial birds live almost wholly on different forms of noxious insect-life is, seemingly, unknown to the great majority, and as a natural sequence these sharp-eyed feathered benefactors are killed with the same zest as are their poultry-game-eating kinsfolk.

The smaller kinds of owls which love an insect diet, have, likewise, been hunted as eagerly by scalp-hunters

"for the benefit of agriculture and for the protection of game, within this Commonwealth,"* as that powerful night-prowling poultry and game thief, the Great Horned Owl.

TURKEY BUZZARDS SLAIN.

Turkey Buzzards which subsist almost exclusively on carrion, and which because of their great worth as scavengers are carefully protected in southern States by stringent laws and strong public sentiment, have been wantonly destroyed as they were believed to be "bad on chickens and young turkeys." Probably if the facts were known the "heads and ears" of these dead vultures were worth at the office of some justice of the peace—a man, perhaps, locally famous for his profound knowledge of legal lore—fifty cents each to the scalp hunter. In addition to the fifty cents bounty, the wise (?) justice of the peace received twenty or twenty-five cents for his services, but the elector in whose presence "were burned," the "head and ears" of the "bold, bad" buzzard, whose alleged deeds of rapine had brought sorrow into numerous poultry yards and many dollars loss to the owners thereof, got nothing for his signature and trouble, unless, of course, he, and the slayer of the predatory (?) bird had some private understanding not contemplated by the act of Assembly.

NIGHT HAWKS AND WHIP-POOR-KILLS KILLED.

These practical, blood-thirsty manifestations of ignorance and love of pecuniary gain, have not, by any means, been confined to the noble and ignoble birds of prey, and their nocturnal relatives, the owl. Night hawks and Whip-poor-wills, birds that subsist upon winged insects of most harmful habits, have been de-

*From section 1 of "Scalp Act," approved June 23, 1885

stroyed as poultry thieves. One county commissioner, thrice elected to the office because of his wisdom, prudent and economical ways, sanctioned the paying of bounties for nighthawk's heads. When the commissioner's attention was called to the injustice of such payments he claimed he favored them because the "blamed bird must be a hawk otherwise it would not have been named as it was."

Although the framer of the act, when he wrote "to be paid for every hawk fifty cents," did not evidently mean to include nighthawks, probably a legal decision to pay for them was strictly proper. This incident demonstrated to the writer the great importance of employing common names for wild animals which would not be misleading as is the appellation "nighthawk."

SHRIKES AND WEASELS.

The Shrikes or Butcher birds which feed mainly on large-sized beetles, grasshoppers, other detrimental insects, mice and the pestiferous English Sparrow, have been captured, it is said, in goodly numbers, and sold for premiums in several counties under the "catchy" but misleading names of "Little Blue" or "Little Bird" hawks. Dr. C. Hart Marriam, U. S. Dept. of Agr., Washington, D. C., says:

"There are two kinds of weasels in the eastern states. The smaller kind feeds chiefly on mice and insects, and is not known to kill poultry. The larger also preys mainly on mice and rats, but in addition sometimes kills rabbits and poultry.

Both species are friends of the farmers, for the occasional loss of a few chickens is of trifling consequence compared with the good that these animals are constantly doing in checking the increase of mice."

Additional illustrations could be added to further emphasize the imperative need of a better and more

general understanding of the economic relations of birds, mammals and insects, and the important bearing such facts have, so far as the farmer and poulterer are concerned, but time and space do not permit.

CONTAINS AN ABUNDANCE OF INSTRUCTIVE DATA.

Part II of this volume has been prepared in a manner which, it is believed, will prove in future years, that the money expended for its publication has been well spent. If this document reaches the farmers, for whose especial use it has been written, and its pages are carefully perused, they (or many of them) can be enlightened in various directions. In addition to the author's careful field observations, he has quoted freely from numerous publications of the best naturalists, as well as from written communications of hundreds of intelligent and observant farmers and other persons throughout this Commonwealth.

FOOLISH AND EXPENSIVE LEGISLATION.

Prior to the passage of the famous and odious bounty act of June 23, 1885, which provided for the payment of bounties for the destruction of various kinds of beneficial animals, clothed either in fur or feathers, as well as some few species of both birds and mammals, which investigations of economic zoologists have shown to be detrimental to the game and poultry interests, hawks and owls were much more numerous, both in the summer and winter seasons, than they have been since this "Scalp act" was in force.

A SERIOUS BLUNDER.

The payment of nearly ninety thousand dollars in a period of less than two years by our citizens for the heads of hawks and owls was unquestionably a serious

blunder, and one which has been the indirect cause of very considerable loss to the agricultural interests of our Commonwealth.

DON'T ADVOCATE UNWISE BOUNTY ACTS.

During the past ten or twelve years a large number of our citizens have urged Pennsylvania's lawmakers to enact bounty or scalp acts, whereby premiums could be given for the destruction of different kinds of birds and other animals, which it was very generally supposed subsisted almost wholly on poultry and game of different varieties. Acts of Assembly in this direction were passed and it was soon demonstrated after they were in active operation, that the loss occasioned by the killing of beneficial animals was much more harmful than otherwise.

BIRDS OF PREY AS A CLASS BENEFICIAL.

The note books of the writer who was authorized a few years since by Secretary Thomas J. Edge to investigate the economic status of the raptorial birds, for whose luckless "heads and ears" a premium of fifty cents each was paid, show that of about 500 of these birds whose decapitated bodies were obtained from justices of the peace and magistrates, only 69, or a little less than one-seventh, were detrimental kinds, viz: Cooper's Hawk, 25; Sharp-shinned Hawk, 16; Great Horned Owl, 13; Barred Owl, 10; Duck Hawk, 2; Pigeon Hawks, 2; and Goshawk, 1. The remainder were species which post-mortem examinations clearly demonstrated were of immense value to aid in keeping in check the prolific and destructive field mice as well as several kinds of insects which do great injury to cultivated crops.

ONLY FIVE WERE DETRIMENTAL SPECIES.

In a period of two days the writer obtained from one official fifty-two hawks and owls which had been killed by two hunters in a week's time on the Brandy wine meadows near the borough of West Chester, Pa. In this lot were three Cooper's Hawks, one Sharp-shinned Hawk and a Great Horned Owl, or a total of five birds, which subsist largely on poultry, small wild birds and game. The remaining forty-seven birds were all of the beneficial group, namely: Screech, Short-eared, and Long-eared Owls, Red-tailed, Red-shouldered, Sparrow and Rough-legged Hawks.

NAILED ON BARN.

During the winter of 1895 and '96 in traveling over the State attending Farmer's Institutes, a record was made of the birds of prey and the remains of other animals to be seen nailed on barns and other out buildings and here it is:

BENEFICIAL.

Hawks.
Sparrow, 3.
Red-tailed, 21.
Red-shouldered, 6.
Rough-legged, 3.

Owls.
Short-eared, 9.
Long-eared, 7.
Barn, 2.
Screech, 6.
Saw-whet, 1.

DETRIMENTAL.

Hawks.
Cooper's, 2.
Sharp-shinned, 9.
Goshawk, 2.
Pigeon, 1.

Owls.
Great-Horned, 5.
Barred, 2.
Snowy, 1.

OTHER BIRDS, ETC.

In addition to the hawks and owls particularized in the two preceding columns, the remains of the following species of birds and other animals were seen hanging to the sides of barns, sheds, &c.:

Crows, 16.	Northern Raven, 1.
Great Blue Heron, 4.	Great Bittern, 2.
Blue Jay, 2.	Grebes, 2.
Fish Hawk, 2.	Night Hawk, 2.
Kingfisher, 1.	Night Heron, 3.
Green Heron, 4.	Black Bear (Skulls or paws), 8.
Foxes, 2.	Woodchucks, 2.
Raccoons, 5.	Squirrels, 27.
Downy and Hairy Wood- peckers, 7.	Pileated Woodpecker, 1.
King Bird, 1.	Opossum, 3.

INCREASE OF DESTRUCTIVE RODENTS.

The marked scarcity in grass fields and meadow lands during the winter season (when these birds formerly were most numerous in the farming districts) of Red-tailed, Red-shouldered, Rough-legged and Sparrow hawks, and the Long-eared and Short-eared owls, for several years past, has been the cause of considerable comment among thoughtful and intelligent farmers, who attribute the appreciable increase in hordes of ravenous field or meadow mice to the wholesale slaughter, as carried on under the Scalp act of 1885, of their natural enemies, the hawks and owls.

VULTURES, EAGLES, HAWKS AND OWLS.

The following list embraces the rapacious birds which are attributed to the fauna of Pennsylvania. This list includes species which occur here during all

seasons of the year, as well as those known as migrants and "stragglers:"

THE BUZZARDS, EAGLES AND HAWKS.

- Turkey Buzzard (*Cathartes aura*).
 Bald Eagle (*Haliaeetus leucocephalus*).
 Red-tailed Hawk (*Buteo borealis*).
 Broad-winged Hawk (*Buteo latissimus*).
 Marsh Hawk (*Circus hudsonius*).
 Sparrow Hawk (*Falco sparverius*).
 Goshawk (*Accipiter atricapillus*).
 Cooper's Hawk (*Accipiter cooperi*).
 Sharp-shinned Hawk (*Accipiter velox*).
 Duck Hawk (*Falco peregrinus anatum*).
 Osprey (*Pandion haliaetus carolinensis*).
 Red-shouldered Hawk (*Buteo lineatus*).
 Golden Eagle (*Aquila chrysaetos*).
 Pigeon Hawk (*Falco columbarius*).
 American Rough-legged Hawk (*Archibuteo lagopus sancti-johannis*).
 Mississippi Kite (*Ictinia mississippiensis*).
 Swallow-tailed Kite (*Elanoides forficatus*).
 Black Vulture (*Catharista atrata*).

The twelve first mentioned of the eighteen birds named in the above column breed regularly in the State. Of these, some, for example, the Turkey Buzzard, Goshawk and Bald Eagle, are restricted to a few localities or to certain sections of the Commonwealth, yet, nevertheless, they annually rear their families within our borders.

The rest of this group, with, possibly, the exception of the daring and little dove-eating Pigeon Hawk (*Falco columbarius*), which, it is asserted, breeds occasionally in certain of our remote and higher mountainous districts, occur in Pennsylvania only, as mi

grants, winter sojourners or extralimitants, i. e., birds which have wandered far from their usual geographical range.

THE OWLS.

- Great Horned Owl (*Bubo virginianus*).
- Barred Owl (*Syrnium nebulosum*).
- Barn Owl (*Strix pratincola*).
- Screech Owl (*Megascops asio*).
- Long-eared Owl (*Asio wilsonianus*).
- Saw-whet Owl (*Nyctala acadica*).
- Short-eared Owl (*Asio accipitrinus*).
- Snowy Owl (*Nyctea nyctea*).
- Great Gray Owl (*Scotiaptex cinerea*).
- American Hawk Owl (*Surnia ulula caparoch*).

Of this list of owls the six species first named in the preceding column are common residents (i. e., are found during all months of the year) in Pennsylvania. Audubon once found the Short-eared Owl nesting in this State, and, probably, the species may still breed in some secluded situations within the Keystone boundaries. The three remaining species of this owl-group come to us at irregular intervals in winter time from the dreary, cold and barren boreal wilds.

Few, if any, of the common and native birds are better known to people in general than are certain of these birds of prey, some of which are rather common at all times or during some period of the year, in almost every section of the State.

These raptorial birds are, with the few exceptions previously noted, serviceable rather than detrimental and their presence about our farm land should be encouraged. There is unquestionably a strong prejudice in the minds of many citizens of both the city and country districts against not only hawks and owls.

but also numerous other kinds of birds and mammals which are friends rather than enemies of the farmers and fruit-growers. To correct these popular and mistaken notions is highly essential. The Department of Agriculture is now engaged in collecting reliable data through competent scientific specialists and otherwise, which when published cannot fail to be of great value as it will show beyond all possible doubt what species of birds and mammals are beneficial or harmful. Investigations in this line, however, are necessarily slow as large numbers of birds and quadrupeds must be collected in the field and the contents of their stomachs examined most carefully before positive conclusions can be safely arrived at as to their true economic relations.

PUBLIC SENTIMENT IN FAVOR OF BOUNTIES.

In the early part of February of this present year the Board of Game Commissioners distributed several thousand circulars soliciting, by a series of questions, information on different subjects relating to game, the seasons for taking the same, violations of game laws, etc. Among these queries the following concerning bounties and the animals on which such premiums should or should not, in the opinion of the correspondent, be paid, appeared:

"Do you favor the paying of bounties for the killing of birds and other animals which destroy game and fish?"

"What species of hawks, owls and other wild animals do you think should be placed on the bounty list?"

These circulars were mailed to State Grange officials and all subordinate granges in the State; a number of Farmer's clubs; to the various organizations embracing the Pennsylvania State Sportsmen's Association, and to the numerous names of representative

farmers and sportsmen which appeared on lists that the members of the Senate and House had kindly sent the Game Commission.

At the present writing, May 20, 1897, about 2,000 replies have been received at the office of the Game Commission. An examination of these answers on the bounty subject reveals that, on an average, about twenty persons to a county made a reply, pro or con. Two answers were received from one county, seven from a second, and ten came in from a third; with these and perhaps a few other exceptions, the answers returned from the counties, ran in about the following proportions: Adams, 30; Bradford, 22; Chester, 25; Delaware, 16; Erie, 27; Fulton, 20; Clearfield, 23; Crawford 35; Sullivan, 22; Mifflin, 26; Lancaster, 25; Luzerne, 30; Westmoreland, 28; Lehigh, 35; Northampton, 37, and Tioga, 37.

The percentage, however, in favor of bounties, as shown by the following columns of figures, is very great, and in view of this sentiment it is not at all surprising that a bounty act recently passed the House of Representatives with but few negative votes:

REPORTS OF COUNTIES.

<i>County.</i>	<i>Percentage for Bounty.</i>	<i>Percentage against Bounty.</i>
Adams,	90	10
Allegheny,	84½	15½
Armstrong,	75½	24½
Beaver,	75	25
Bedford,	100	0
Berks,	75	25
Blair,	91	9
Bradford,	86½	13½
Bucks,	80	20

Butler,	83 $\frac{1}{3}$	16 $\frac{2}{3}$
Cambria,	100	0
Cameron,	100	0
Carbon,	100	0
Centre,	100	0
Chester,	80	20
Clarion,	91 $\frac{2}{3}$	8 $\frac{1}{3}$
Clearfield,	100	0
Clinton,	76	24
Columbia,	89	11
Crawford,	43 $\frac{1}{3}$	56 $\frac{2}{3}$
Cumberland,	100	0
Dauphin,	87 $\frac{1}{3}$	12 $\frac{2}{3}$
Delaware,	64	36
Elk,	85 $\frac{1}{2}$	14 $\frac{1}{2}$
Erie,	75	25
Fayette,	70	30
Forest,	100	0
Franklin,	100	0
Fulton,	100	0
Greene,	84	16
Huntingdon,	95	5
Indiana,	88 $\frac{1}{3}$	11 $\frac{2}{3}$
Jefferson,	85	15
Juniata,	99	1
Lackawanna,	100	0
Lancaster,	96	4
Lawrence,	25	75
Lebanon,	100	0
Lehigh,	78 $\frac{1}{2}$	21 $\frac{1}{2}$
Luzerne,	92 $\frac{1}{2}$	7 $\frac{1}{2}$
Lycoming,	100	0
McKean,	100	0
Mercer,	90	10
Mifflin,	98	2

Monroe,	94 $\frac{1}{2}$	5 $\frac{1}{2}$
Montgomery,	83 $\frac{1}{8}$	16 $\frac{2}{8}$
Montour,	100	0
Northampton,	94	6
Northumberland,	100	0
Perry,	100	0
Philadelphia,	83 $\frac{1}{2}$	16 $\frac{2}{8}$
Pike,	100	0
Potter,	86	14
Schuylkill,	100	0
Snyder,	100	0
Somerset,	100	0
Sullivan,	80 $\frac{1}{10}$	19 $\frac{9}{10}$
Susquehanna,	66 $\frac{2}{3}$	33 $\frac{1}{3}$
Tioga,	80 $\frac{1}{2}$	19 $\frac{2}{8}$
Union,	100	0
Venango,	75	25
Warren,	82	18
Washington,	63 $\frac{2}{3}$	36 $\frac{1}{3}$
Wayne,	63	37
Westmoreland,	85 $\frac{1}{2}$	14 $\frac{1}{2}$
Wyoming,	100	0
York,	70	30

By these answers it will be seen that from twenty-three counties not a negative reply on the bounty question was returned. In this connection, however, it should be stated that over one hundred circulars, a number of which contained much interesting, and, in some cases, very valuable data, were received at the office of the Game Commission, with no names to indicate who had sent them. Such anonymous communications, as in well-regulated newspaper offices, were consigned to the waste basket.

The counties, with few exceptions, from which over

ninety per cent. of the answers are in favor of bounties, have considerable woodland and mountainous territory or wildland, where the predatory animals are usually much more numerous than in well settled farming districts. Only two counties—Crawford and Lawrence—show a majority of answers in opposition to bounties. The citizens of Crawford county during the active enforcement of the odious Scalp act of 1885, paid in a period of about two years about \$10,000, three-fourths of which, it is reliably stated, was for “hawks and owls.” This expenditure of the county funds created a strong feeling against such laws: as it is asserted that much of this money was obtained for skins of red squirrels and chipmunks which were called “minks” and “weasels” and by divers other sharp practices successfully employed to fool officials who were unable to recognize “heads” and “ears” of the genuine or pseudo kinds offered by the scalp-hunters or ingenious scalp-maker. As nearly all districts along the border lines of the State were made the dumping grounds to pay tribute for the victims of scalp-hunters in neighboring States, it is likely that on account of such practices the greater portion of the negative replies (75 per cent.) were sent from Lawrence county.

THEY FAVOR KILLING ALL HAWKS AND OWLS.

A careful examination of the answers favoring a bounty on birds shows, I regret to say, that not over fifty, of fully 1,300 persons, seem to be able to distinguish the beneficial from the harmful species of hawks and owls, and as a result of this want of knowledge or perhaps it may have been, and no doubt was, so far as some individuals were concerned, carelessness, an overwhelming number of replies say, “bounty on all hawks and owls.”

START A CAMPAIGN OF POPULAR EDUCATION.

Here again we have another striking example of the urgent necessity for Pennsylvania to begin, not in coming years when our beneficial feathered friends are wiped out of existence, but NOW, a campaign of popular education which will correct erroneous ideas so generally cultivated about the raptorial birds as well as many other wild animals.

Since going over the bounty data from all counties, I feel it to be a public duty to prepare a report on these sorely abused birds which will enable every fair-minded individual who comes into possession of this document to be able to readily distinguish every species of the raptorial bird-kind credited to the fauna of the grand old Keystone Commonwealth.

NO MORE CHICKENS' HEADS FOR HAWKS.

If bounty laws are desired by the citizens of Pennsylvania, of course they will probably be enacted, and if county officials are, in the discharge of their duties, called upon to determine the names of heads of different kinds of birds and other animals, they should surely have some guide to aid them in arriving at proper conclusions. To meet such an emergency, the concluding chapter in this work has been prepared. This chapter will certainly enable any justice of the peace, county commissioner or magistrate to recognize all animals' heads which are likely to be presented for bounty. The heads of chickens, turkeys, grouse, English Sparrows and other birds, pieces of worn-out buffalo robes, the skins of colts and mules should never, in future days, be the media of depleting counties' exchequers as they have in former years.

CHAPTER II.

TESTIMONY FROM FULLY ONE THOUSAND OBSERVERS.

ESTIMATES GIVEN BY HUNDREDS OF FARMERS AND POULTRY RAISERS AS TO THE MONEY LOSS ANNUALLY INCURRED TO THE POULTRY INTERESTS OF PENNSYLVANIA THROUGH DEPREDATIONS OF PREDATORY ANIMALS. WHAT SEVERAL HUNDRED SPORTSMEN SAY OF THE POULTRY-DEVOURING BIRDS AND QUADRUPEDS WHICH THEY HAVE FOUND IN THEIR RAMBLES THROUGH FOREST, FIELD AND MARSH. NUMEROUS NOTES AND OPINIONS CONCERNING THE CROW FROM FARMERS AND POULTERERS.

This chapter is one of especial value, as it is made up entirely of observations of practical farmers, poultry-raisers, and sportsmen, who, from many years' observation, are qualified to speak with accuracy concerning the good and bad habits of animals which destroy poultry, game and song birds, or, on the other hand, those which protect the farmers' crops.

These answers show, most conclusively, that there are certain birds, as well as other animals, which are a source of great loss annually to both agricultural and game interests. It is, however, unfortunate that so small a number of the correspondents, who so kindly took the trouble to respond to queries sent them by the Game Commission and the Zoologist, mentioned by name the hawks and owls, which had been observed committing the numerous acts of violence

cited. These records would have been much more valuable had such instructive data been added, and, I am quite confident they would have proven that the culprits, in the vast majority of cases, were one or the other of the following species:

Sharp-shinned Hawk,	Pigeon Hawk,
Cooper's Hawk,	Great Horned Owl,
Goshawk,	Barred Owl.
Duck Hawk,	

The failure to particularize the birds of prey by their common names, is due, in many instances, to a lack of proper information concerning these grievously persecuted birds. As there can be little doubt on this score it certainly is high time that the State of Pennsylvania, if prompted by no other reason than that of economy, should give wide circulation to this and other popular reports dealing in a plain way with the economic relations of our wild animals, many of which are rapidly disappearing as civilization advances.

For many years the people of the Keystone Commonwealth gave no attention whatever to the forestry question and the result has been the loss of millions of dollars. However, in the last five or six years the great importance of this much neglected subject, through the indefatigable efforts of our able and efficient Commissioner of Forestry, Dr. Jos. T. Rothrock, the members of the Pennsylvania State Forestry Association, assisted by the wise approvals of Governors, Robert E. Pattison and Daniel H. Hastings, has become apparent and a strong public sentiment in behalf of forest restoration and protection is the result.

In this connection it should be stated that the Forestry legislation gained up to this point is merely preparatory to the work proper. It provides the basis

and gives encouragement by which the citizen and the State may work together toward a common end.

It is sincerely hoped that this judicious work of popular education will not be restricted to Forestry, but will expand widely and embrace the field of Zoology. What would a forest be without its happy, vivacious host of sweet-voiced choristers and other tenants which keep in check the hidden insect enemies?

Year by year the extermination of animal-life goes steadily on, yet no systematic efforts are made to counteract the unjust prejudices entertained by the masses. If the beneficial birds and mammals, which subsist almost entirely on detrimental forms of insect-life, continue for a few more years, as it has in the past fifteen, crops can only be cultivated with the greatest amount of labor and expense. Even now, in many parts of this State, and the same is true of almost every other State in the Union, numerous crops could not be grown to maturity and profit, if it were not for the liberal use of insecticides which modern economic entomological science has contributed to aid in staying the destruction which man, through ignorance, has brought about by disturbing nature's balance.

The total loss of crops in some regions has been carefully investigated and found to be chiefly due to the destruction of insectivorous birds.

It is not, of course, expected that farmers, poulterers and sportsmen should be asked to protect the harmful raptorial birds, which are fully described on succeeding pages, but it is important, in numerous ways, that they should have a better general knowledge of many of these birds, which they now destroy on all occasions, under the belief that they are doing service, rather than harm, to the poultry, game and agricultural interests.

WHAT FARMERS SAY ABOUT THE LOSS OF POULTRY.

ESTIMATES OF DAMAGE BY HAWKS, OWLS AND MAMMALS.

Farmers and poultry raisers throughout the State responded as follows to a question sent out by the Zoologist and which reads:

"If you are engaged in raising poultry, please state about what money loss you sustain annually from depredations of animals, such as minks, wildcats, weasels, foxes, hawks, owls, rats, etc."

ADAMS COUNTY.

C. L. LONGSDORF, Flora Dale:

Never lose any, as my poultry are securely locked in a comfortable house at night.

L. M. LIGHTY, East Berlin:

I was engaged largely and never lost worth mentioning, except by rats. They would sometimes kill chicks. All the other so-called enemies above mentioned never destroyed one dollar's worth for me.

DR. C. E. GOLDSBOROUGH, Hunterstown:

I do not think it would amount to more than ten dollars; chiefly from hawks and crows.

J. V. GARRETTSON, Flora Dale:

Very difficult to estimate. Considerable annual loss from foxes, rats and hawks. Hawks are the most destructive birds we have on poultry, and unless the fowls are very carefully protected our yearly loss is heavy.

PETER THORN, Gettysburg:

Think from five to ten dollars would be within the limit.

ROBERT H. CURRENS, Gettysburg:

Hard to tell, but the crows are the worst.

W. H. BLACK, Flora Dale:

We raise about five hundred chickens annually. As we use vermin proof coops, we lose few from night depredators.

Foxes, one dollar; hawks, five dollars; hawks and owls likely "pay their way."

J. M. BUSHMAN, Gettysburg:

My loss in poultry is at least fifty dollars a year from hawks, rats and weasels.

ALLEGHENY COUNTY.

J. S. BURNS, Clinton:

Our loss is usually from hawks and crows, and is done when the chickens are small; would amount to perhaps four or five dollars per annum.

ARMSTRONG COUNTY.

D. W. LAWSON, Dayton:

Our losses are comparatively small from above named animals—say from five to eight dollars per annum. As a rule, rats and crows are the most destructive; have but few foxes and owls in my vicinity.

G. A. NEIDLE, Parker Landing:

Have been troubled more from rats than any other animal; some seasons have lost eight to ten dollars in chicks.

BEAVER COUNTY.

HON. IRA F. MANSFIELD, Beaver:

We lose annually from above named from twenty-five to fifty dollars. Would place average loss two dollars to every farm in Beaver county. On my farm we keep flock of about two hundred chickens—Leghorns and Plymouth Rocks.

JEREMIAH BRITAIN, New Galilee:

Loss would not amount to over ten dollars annually; principally from hawks and rats.

BEDFORD COUNTY.

J. W. SMITH, Yellow Creek:

Cannot give estimate, but my neighbors and I lose considerable; mostly from minks, foxes and hawks.

DAVID HOLDERBAUM, Bedford:

A few by rats.

BERKS COUNTY.

FRED. B. HOSSLER, Hamburg:

At least fifty dollars' worth

OLIVER D. SCHOCK, Hamburg:

Rats and cats destroy ten dollars' worth annually.

A. H. ADAMS, Jacksonwald:

I have lost as high as twenty-five dollars' worth a year and as low as five dollars, or an average of fifteen dollars.

A. M. YOUNG, Womelsdorf:

Five dollars, through rats.

BLAIR COUNTY.

HON. GEORGE M. PATTERSON, Williamsburg:

Thirty dollars; mostly by hawks. Crows take many turkey eggs, and some chickens and young turkeys.

FRED JACKEL, Hollidaysburg:

Have never lost chickens by foxes or wildcats; a few by rats, through carelessness; a few ducklings by crows; chicks by hawks.

J. W. BRACKEN, Hollidaysburg:

I live in town and have some poultry. The only loss sustained is from rats taking the young.

BRADFORD COUNTY.

A. McCABE, North Rome:

I have inquired among the farmers who raise poultry, and they say they lose nearly forty per cent. every year from the above named animals.

C. S. DAVIS, Allis Hollow:

Breed high class poultry. Lost twenty dollars' worth of turkeys year before last. Last year about fifteen dollars by foxes and hawks.

JACOB L. BALL, Litchfield:

Twenty dollars on turkeys and ten dollars on chickens.

H. CHAMPLIN, Orwell:

I am raising some poultry each year. Several years ago was troubled some with rats among the young chickens; later, and the last pest, was skunks. For the past four years no loss from any animal depredations.

A. E. HAMILTON, Potterville:

Protect my poultry by wire netting and have no loss. Those who do not use this protection occasionally lose all their poultry by minks, skunks and foxes. Turkeys suffer mostly by foxes.

BUCKS COUNTY.

HON. H. W. RICE, Lumberville:

About the only damage done was by blue jays eating eggs of hens, and also the eggs of different kinds of wild birds.

JAMES L. BRANSON, Langhorne:

Our cats keep away the rats, but will dine on chickens for a change.

HON. EASTBURN REEDER, New Hope:

Ten dollars; rats, crows and hawks.

JACOB CLEMENS, Doylestown:

We raise from two to three hundred chickens; the loss from the above would be very low; about five per cent.

HARRY S. WALTON, Hartsville:

I would think at least per year, about twenty dollars; probably more. Hawks are the principal depredators.

WILLIAM SMITH, Richboro:

Not troubled with anything but rats, and not much with them. A few cats will keep them scarce.

H. W. COMFORT, Fallsington:

By care in shooting crows we lose but few.

ASHER MATTISON, New Hope:

About five dollars' worth.

BUTLER COUNTY.

EDWIN RAMSEY, Evans City:

Our loss does not exceed ten dollars per year.

W. H. H. RIDDLE, Esq., Butler:

I raise fancy poultry, but have no trouble with any of the pests you mention.

J. H. FAUBEL, Butler:

About fifty dollars. I raise several thousand annually.

R. G. GILFILLAN, Butler:

Damage sustained from hawks, about two dollars.

ISAAC H. CHRISTIE, Hooker:

About five dollars.

CAMBRIA COUNTY.

DR. P. J. MANCHER, Carrolltown:

Am not engaged in poultry raising, but know that the damage and losses sustained by those in that business runs into thousands of dollars annually by reason of hawk, mink, fox,

etc. Hope the members from Cambria county will support the scalp bill. Have written them to that effect

V. P. SANKER, Cresson:

I raise about one hundred dollars' worth of young poultry in connection with my farm. By strict account last year I lost seven dollars and sixty cents from minks and two dollars and forty cents from rats and skunks. Weasels do not trouble my poultry when they can get rats and mice, and the same is true of owls and crows, which I regard as my friends. Foxes are plentiful, but they live on rabbits principally.

JOSEPH A. GRAY, Carrolltown:

An average of sixteen dollars.

M. F. FARREN, Ebensburg:

Loss from foxes, from twelve to fifteen dollars; from hawks, fully five dollars.

P. J. DIETRICK, Carrolltown:

About fifteen dollars. There should be a bounty on foxes, hawks, owls, etc.

WM. FRED. PIERSON, Dysart:

Twenty-five per cent. lost by minks; four per cent. by hawks; about two per cent. in eggs, from rats and five per cent. in young chickens.

LEIGHTON ROWLAND, Vetsera:

One or two dollars' worth.

CENTRE COUNTY.

MRS. LOTTIE K. KELLER, Centre Hall:

On an average about fifteen dollars.

JACOB SHARER, Centre Hall:

I live near the mountains where these depredators are plentiful. I lose annually about fifteen dollars.

MISS EDITH M. SANKEY, Potter's Mills:

Minks, none; weasels, none, foxes, none; hawks, about two dollars, owls, none; rats average five dollars; crows do us more damage.

HON. LEONARD RHONE, Centre Hall:

From three to five dollars, at least.

M. L. RISHEL, Farmer's Mills:

About four dollars; mostly from hawks.

WILLIAM H. MILLER, Secretary Grange 109, Bellefonte:

Have one hundred and forty-one chicks. There are a few crows to contend with, and our loss is small.

CARBON COUNTY.

GEORGE T. WELLS, Rockport:

Thirty dollars.

CHESTER COUNTY.

EDWARD NORRIS, West Chester:

Do not raise enough to make any difference, although crows seem the most annoying to the young chicks.

SAMUEL MARSHALL, West Chester:

Lose some chickens from rats and a very few from crows.

JOHN L. BALDERSTON, Kennett Square:

I did lose seventy-five dollars' worth per year until I took effective measures to protect the half-grown birds.

HARRY WILSON, Gum Tree:

The Sharp-shinned Hawk does the most damage. One pair in nesting period will take about fifty to seventy-five chicks, of two and a-half to five dollars' value. Crows, likewise, very rapacious.

JAMES B. KEECH, Tweedale:

Eternal vigilance is the price or cost of poultry with us. Foxes and hawks cause us the most loss. We lose, I believe, annually twenty-five dollars' worth.

R. H. HODGSON, New London:

I lose annually more than fifty dollars, principally by rats; they become numerous periodically; foxes are hard on turkeys.

JOSEPH. S. WALTON, Ercildoun:

Twenty dollars' worth by minks.

EDWARD T. INGRAM, West Chester:

Formerly a few by foxes; some small ones and eggs by crows.

I. FRANK CHANDLER, Toughkenamon:

Very few, indeed.

FRANK L. BURNS, Berwyn:

Less than one dollar; generally rats.

JOHN H. HICKS, Avondale:

About ten dollars' worth last year (1896) by crows.

AUGUSTUS BROSIUS, Avondale:

Raise but few; am not troubled in any way suggested

CLARION COUNTY.

FRANK KELL, Kingsville:

Hawks, two dollars; rats, one dollar. Individually, hawks are a great pest in this county.

D. C. KERR, Kingsville:

I sustain a loss from above named animals of twenty dollars annually; principally from "brown hawks."

JAMES C. OGDEN, Limestone:

Estimated loss, chickens, twenty dollars; turkeys, ten dollars; ducks, five dollars.

CLEARFIELD COUNTY.

JOHN S. JURY, Butment:

We have lost two large turkeys in the last year by owls, and not less than twenty dollars' worth of poultry every year by foxes. We live on the river hills, sixteen miles below Clearfield.

HENRY DOTTS, Glen Hope:

Last year lost twelve turkeys, one-third grown, by a weasel. I lose by hawks, weasels, polecats, etc. A fair average for each year would be fifteen dollars.

JOHN W. LEONARD, Ansonville:

Our losses are chiefly from skunks, and have been from ten dollars to fifteen dollars per year during the past four years.

PHILIP DOTTS, Glen Hope:

Our loss is not less than five to ten dollars per year, principally from hawks, weasels and foxes.

A. JUDSON SMITH, New Millport:

In the past year have only lost by skunks; they troubled me considerably, but after losing a few dollars' worth I succeeded in shutting them out. Hawks, weasels and minks destroy quite a number of chickens in this neighborhood annually.

R. P. KESTER, Gramplan:

Minks, hawks and skunks are the most destructive agents to chicken raising in our locality. I keep my poultry well guarded, so sustain little loss.

THOMAS SHIPLEY, Clearfield:

I had no loss last year. I keep a good fox hound in my enclosure, a good cat in the barn and a good gun close at hand, which accounts for it.

HARRISON STRAW, Kerrmoor:

We raise some poultry; about ten or twelve dollars' worth,

mostly by hawks, skunks and weasels. The rabbit does much damage to farmers in this section. The repeal of the law protecting the rabbit would be a great benefit to farmers in this locality.

S. SAMUEL HALL, McGee's Mills:

We lose an occasional chicken by hawks.

CLINTON COUNTY.

L. M. CASTETTER, Greenburr:

I can hardly give an accurate estimate as to money loss annually sustained. I can, however, give you some idea of what money it does cost me to keep these animals from my property, and the best way to do this I find as follows: I feed and pay taxes for three good fox hounds, and have about twenty-five or thirty traps, and kill them, but to do this is expensive. I also lose some poultry, but not so much, as I keep on the watch for these animals. My loss is greatest from the otter, mink, muskrat and 'coon. They are hard on my trout, especially in the winter when ice forms over the ponds and streams. There should certainly be something done to exterminate them, the otter particularly, for he does great damage to the trout, as they spawn in the fall when the water is low and are easily caught. It costs me not less than fifty dollars, annually, to protect my poultry, trout, etc.

DAVID MAPES, Beech Creek:

Between five and ten dollars annually.

COLUMBIA COUNTY.

HON. W. T. CREASY, Catawissa:

From thirty to forty dollars' worth are lost from hawks. Crows do some mischief, but nothing in comparison to hawks.

R. G. F. KSHINKA, Berwick:

From hawks and owls the loss would probably amount to two dollars per annum. Since keeping collie dogs have lost no poultry by minks, weasels and foxes. Before my losses amounted to from fifteen to twenty-five dollars per annum from these animals.

A. P. YOUNG, Millville:

Minks, weasels, foxes, owls and rats do very little damage. Last year we lost probably ten dollars' worth of young chickens and turkeys from hawks and crows; most of it is chargeable to crows.

J. P. WELSH, Bloomsburg:

I am part owner of a poultry farm eight miles distant. Loss per year as above, about two dollars. Have special protection from rats and all nocturnal marauders.

THOMAS SEABORNE, Newlin:

Last year from minks, five per cent., from rats, two per cent.; hawks, none; foxes, none, and weasels one per cent.

HON. EDWARD M. TEWKSBURY, Catawissa:

Lose but little poultry. Hawks are somewhat troublesome; king birds keep hawks from our premises.

CRAWFORD COUNTY.

MRS. J. R. HEAD, Saegerstown:

The average poultry raiser probably loses two or three dollars' worth by hawks and a few more than that by rats. Do not believe that crows will take fowls; it is only imagination by those who say so, and that those supposed to be taken by crows are taken by hawks which the crows pursue.

HON. C. A. STRANAHAN, Spartansburg:

From twenty to fifty dollars. In our locality the loss is mostly from hawks, owls and rats.

LUTHER GATES & SON, Beaver Centre:

Have considerable poultry; rats do most damage; next hawks, then owls; a little from weasels. Think ten dollars would cover our loss.

HON. J. B. PHELPS, Conneautville:

Hawks and rats destroy the most poultry; rats are the worst. Amount destroyed at least five dollars per year.

SAMUEL A. MILLER, Linesville:

Minks, one per cent.; weasels, one per cent.; hawks, thirteen per cent.; owls, twelve per cent.; rats, twelve per cent.

I. B. BIDDLE, Saegerstown:

From six to ten dollars' worth by hawks, owls and rats.

W. H. SEWARD, Rundell:

Three dollars.

JAMES TURNER, Meadville:

Five dollars' worth.

H. J. TOWER, Beaver Center:

I am not extensively engaged in the business and meet with scarcely any loss except by rats, perhaps from two and a half to five per cent.

F. H. POTTER, Steamburg:

Only a small loss and that from hawks and owls.

F. L. LORD, Conneautville:

Some of my neighbors have lost nine-tenths of spring hatches from hawks and rats.

CUMBERLAND COUNTY.

HENRY S. RUPP, Shiremanstown:

Probably five dollars' worth.

ELK COUNTY.

W. H. JOHNSON, Benezette:

I keep from thirty to fifty fowls. Sometimes hawks take a few—one to five dollars' worth per year.

ERIE COUNTY.

ROBERT DILL, North East:

Twenty-five dollars worth from rats and hawks.

H. F. ARNOLD, Corry:

My loss is about five dollars from hawks per year.

A. A. HAMMOND, Corry:

I live on the flats of French Creek and keep one hundred and fifty hens. Depredations have not been over five dollars. Rats are not the worst things to fight.

F. E. FENTON, North East:

Once in a while one by hawk or rat.

H. C. HAYES, Godard:

Greatest loss is from rats; would say about twenty-five per cent. Crows do less damage than any of the animals named. Crows take some eggs, but they do more good than harm, and, like the skunks, destroy lots of mice and insects.

FAYETTE COUNTY.

LOUIS F. ARENSBERG, M. D., Heistersburg:

We lose about half of our poultry through foxes' depredations, and a few by hawks. Cannot raise any turkeys on account of foxes. We raise between three and four hundred chickens per year. Am unable to give estimate of money loss incurred annually.

HON. GEORGE W. CAMPBELL, Normalville:

I sustain a loss of probably twenty dollars annually. Hundreds of dollars are lost every year in our township from these animals.

WILLIAM W. PARSHALL, Uniontown:

Probably about ten dollars, by either minks or weasels.

T. J. STURGIS, Morris Cross Roads:

This depends largely upon location, as to your remoteness from creeks, rivers, mountains, etc. With me the percentage

of loss is quite low, owing to remoteness, as above noted. Five per cent. will cover all loss.

JESSE O. ALLEN, Uniontown:

Raised poultry for six years. No loss from minks, weasels foxes, hawks or owls, as there are none in our section. Lost four or five per cent. by rats.

FOREST COUNTY.

SAMUEL D. IRWIN, Tionesta:

Lost none myself; have an average flock of twenty chickens each year; neighbors have lost on edge of town. Foxes come down from their homes in rocks and kill chickens occasionally; hawks kill small chicks every season; would say that the annual damage in Tionesta borough, at low valuation, is one hundred dollars; country districts much larger, of course.

FRANKLIN COUNTY.

HON. W. W. BRITTON, Upper Strasburg:

Not worth mentioning; rats are about the only depredators that annoy us.

H. B. CRAIG, Welsh Run:

I farm and raise some poultry, but do not make it a special business. I would place my loss from above enemies at about fifteen dollars.

FULTON COUNTY.

W. L. MORELEY, Well's Tannery:

We lose about half of our young poultry by rats, skunks, owls, minks and cats; about fifty dollars' worth annually.

D. W. CROMER, Fort Littleton:

Am not engaged in poultry business, but the above named are very destructive to domestic fowls and game in woods.

GEORGE LEHMAN, Lashley:

We keep about one hundred hens; also several turkeys. Our money loss last year was about seven dollars, mostly from hawks. Our neighbors have sustained heavy losses. I consider the hawk a most destructive bird on poultry. In winter hawks will destroy whole flocks of quail.

W. C. BAUMGARDEN, Well's Tannery:

I lose a great deal each season; about ten to fifteen dollars' worth. Hope scalp bill will pass.

JOSEPH DARLTON, Warfordsburg:

Last year three dollars' worth of chickens by skunks and six dollars' worth of turkeys and settings of eggs by foxes.

PETER MOSTON, Pleasant Ridge.

Some in the vicinity lose considerable by hawks and foxes. My loss is small; will not exceed one dollar and a half.

GREENE COUNTY.

B. F. HERRINGTON, Waynesburg:

About two and a half dollars. There are 2,926 farmers in the county, and I think the average loss per farm would be, at a very low and conservative estimate, two dollars each.

J. A. HAPPEL, Waynesburg:

Hawks destroy about twenty-five dollars' worth of my poultry every year.

HUNTINGDON COUNTY.

GEORGE S. APPLEBY, Decorum:

I believe that ten per cent. of all the poultry owned and raised during any year is destroyed by the above named, but hawks are the most destructive to young poultry.

MILES BECK, Warrior's Mark:

Would average from five to ten dollars yearly; all done by hawks and foxes.

JOHN D. ENYEART, Shirleysburg:

Fifteen dollars; hawks are the worst; crows are also very bad.

J. PETER SNYDER, Huntingdon:

Would estimate my loss from above mentioned causes from twelve to fifteen dollars.

W. M. BENSON, Huntingdon:

Crows do serious damage by stealing eggs and taking the young of domestic fowls. They very frequently catch and destroy young chickens even more than the hawks. When hens nest out of doors the crows hunt for and feed on the eggs. The premium should be raised on hawks, minks, weasels, foxes, owls, etc., to double what it is. Few persons think it worth while to bother looking after such for the mean, paltry sum paid them for their trouble. Destroy the English Sparrow.

GEORGE W. OWENS, Birmingham:

Minks, foxes and wildcats are not numerous here and do us little damage; rats are sometimes very destructive; crows take some; one kind of hawk takes many and owls a few.

INDIANA COUNTY.

JOSEPH MOORHEAD, Blairsville:

Keep one hundred hens within borough limits, lost some ten dollars' worth by rats and cats last three years. Others have had greater losses.

P. M. HODGE, Blairsville:

Five dollars from rats and skunks on two farms with which I am connected. One near woodland of some extent.

J. R. BASH, Cookport:

About ten dollars annually.

W. P. LEAM, Cookport:

About five dollars annually.

GEORGE HENRY, Cookport:

About five and a half dollars.

PETER LEAM, Cookport:

Five dollars.

JEFFERSON COUNTY.

EMMA C. McGAREY, Stanton:

Have no trouble with any of the above named.

R. M. CORBITT, Corsica:

Our losses from the above named animals have been very slight in the last few years.

JOHN H. JOHNS, Brookville:

We lose a good many by hawks.

JUNIATA COUNTY.

W. H. KROUSE, Swales:

No loss last year other than a few turkeys killed, presumably by foxes, and a number of little chicks by rats and hawks. Amount of damage, possibly five dollars.

WILLIAM A. THOMAS, Millintown:

About ten dollars' worth.

DENNY M. MARSHALL, Walnut:

Five dollars.

WELLINGTON SMITH, Millintown:

Very little; not over five dollars.

H. C. HOWET, Millintown:

In the neighborhood of thirty dollars per year.

G. S. LUKENS, East Salem:

About ten dollars' worth annually.

J. W. MILLIKIN, Honey Grove:

I am engaged in raising poultry and lose a great deal every year by the above.

SAMUEL SCHLEYD, East Salem:

Four dollars.

J. T. AILMAN, Thompsontown:

Very little; possibly some from hawks and rats.

WILLIAM P. BELL, Reed's Gap:

About five dollars.

LACKAWANNA COUNTY.

F. L. BENJAMIN, Kizer's:

About one year ago I commenced to raise poultry on a small scale. Have suffered no loss from the above named animals to my knowledge.

MICHAEL FOLEY, Mount Cobb:

We are not in the business very extensively, but lose on an average about ten dollars' worth.

LANCASTER COUNTY.

JOHN H. EPPLER, Elizabethtown:

While farming my loss probably was twenty dollars every year. Here in town I raise but few and have no loss other than from rats, which we destroy as soon as we know of their presence.

M. BROWN, Wakefield.

From three to four dollars' worth; mostly from minks, foxes and opossums.

WILLIAM M. MAULE, Collins:

Our loss has been light of late years; probably has not exceeded ten dollars from foxes, minks, etc.

JOHN KREADY, Mt. Joy:

My loss is a few dollars; have my poultry confined generally.

HON. JOHN. H. LANDIS, Millersville:

I lose about ten dollars per year from rats.

J. G. RUSH, West Willow:

Rats and hawks destroy a good deal.

LAWRENCE COUNTY.

LEE McCOMB, Hillsville:

My loss would amount to about twenty dollars per year by weasels, hawks, owls and rats.

HON. A. L. MARTIN, Enon Valley:

My loss per year would not be less than five dollars.

JOHN MONTGOMERY, Planegrove:

We suffer more from the depredations of the ground hog and rats than all the others put together.

LEBANON COUNTY.

L. S. HOFFMAN, Schaefferstown:

Hawks, owls and rats probably destroy fully ten per cent. of my poultry annually.

JOHN BRENDLE, Schaefferstown:

About five per cent. from rats, weasels and long-tailed hawks.

E. BOMBERGER, Lickdale:

The most destructive of the above named are the hawk and the crow; cannot tell loss.

I. S. LONG, Richland:

No loss from foxes, minks or wildcats; some from hawks.

LUZERNE COUNTY.

D. K. LAUBACH, Fairmount Springs:

We generally lose about one-half or three-quarters that we get hatched. One year we had forty-five turkeys killed by animals. We weighed one that was killed and it weighed six pounds. They were all killed in one day but fifteen, the old hen among the killed. This was done by a weasel. My neighbor had twenty-seven little chicks carried off by small hawks one morning.

THOMAS O. ROBERTS, Freeland:

I breed fancy chickens worth ten dollars a pair. Weasel killed in one night twenty-one chickens and one duck. My neighbor, Lewis Young, lost by a weasel in three nights fifty-six common chickens. He killed the weasel.

LEWIS H. KOCHER, Ruggles:

My annual loss is not more than five dollars.

F. F. MORRIS, Dallas:

There are some minks, weasels and skunks, but the bulk of the damage sustained by me results from rats and an overproduction of cats. Annual loss, two dollars.

DAVID J. LINSKILL, Plymouth:

We lose some by rats and house cats.

P. SUTTON, Exeter:

Lose some by skunks; crows occasionally take eggs and young chickens. When a mink or weasel gets into a hen house he cleans out the whole "kit."

LYCOMING COUNTY.

HON. JOHN W. KING, Fairfield Center:

It is impossible to give you the exact figures, but would place my loss at not less than ten dollars per annum.

J. P. VANDINE, Lairdsville:

Yes, twenty-five dollars would not cover loss by minks, hawks, owls and skunks during last year.

A. C. HENRY, Hughesville:

Yes, by rats more than any other; some loss by hawks, but in the vicinity of Hughesville, Pa., there is very little loss.

PETER REEDER, Hughesville:

Losses are small; raise but little poultry.

JACOB HEIM, Hepburn:

Have never kept any account, but we lose some every year.

McKEAN COUNTY.

C. W. DICKINSON, Norwich:

Flock of about forty on an average. I lose about two dollars' worth of chickens annually; shut up poultry at night, so am not bothered with owls and foxes.

BURDETTE DICKINSON, Colegrove:

Do not raise poultry, but farmers in this vicinity lose from two to two and a half dollars annually. Hawks do most of the killing.

N. H. PARKER, Gardeau:

I keep dogs that protect my fowls from foxes and minks; the hawks I shoot. I hear complaints from my neighbors about foxes and minks.

MERCER COUNTY.

ROBERT McKEE, Mercer:

Ten per cent.

R. K. BAKER, Sandy Lake:

About two dollars.

JOHN P. ORR, Mercer:

Don't know of ever losing a chicken from any of the above causes; only raise about fifty a year.

MIFFLIN COUNTY.

H. A. SPANOGLE, Lewistown:

Last year about six dollars' worth by rats.

ANDREW SPANOGLE, Lewistown:

Perhaps eight or ten dollars; mostly by minks and rats.

HON. GRUBER H. BELL, Lewistown:

Not many, but the above never bother much, except minks and hawks on young chicks.

S. A. HERTZLER, Belleville:

Not engaged extensively, but being located close to woods I must keep a sharp lookout to save any on account of foxes and hawks.

JOHN A. CAMPBELL, Belleville:

In poultry, perhaps five dollars, but the expense and trouble of guarding against foxes, skunks and the big horned owl is considerably more.

MONROE COUNTY.

LUTHER MICHAEL, Shawnee:

My losses by hawks and owls are ten dollars yearly.

TOWNSEND PRICE, Canadensis:

My annual loss would average not less than ten dollars.

HON. R. F. SCHWARZ, Analomink:

Have lost none for some years, as I have wire yard near house and keep dogs.

MONTGOMERY COUNTY.

GEORGE W. RIGHTER, Abrams:

Ten dollars; mostly rats and crows.

WILLIAM W. POTTS, Swedeland:

I raise about one hundred chickens each year and do not lose any. I tie the hens to a box and shut them up at night.

E. M. TYSON, King of Prussia:

Crows are especially destructive of young poultry and turkey eggs; cannot estimate the amount.

MONTOUR COUNTY.

ELLA V. BITLER, Ottawa:

From depredations of hawks and crows, about five dollars; minks, weasels, owls and rats, about ten dollars, and we only raise poultry on the farm to a small extent.

W. M. GEARHART, Danville:

About ten dollars. An opossum destroyed twenty dollars' worth in 1895.

W. D. STEINBACH, Limestoneville:

Comparatively none.

NORTHAMPTON COUNTY.

A. L. SHIMER, Redington:

Crows and hawks ten dollars.

R. O. RITTER, Hanoverville:

About ten dollars' worth.

NORTHUMBERLAND COUNTY.

J. O. GIFFEN, Montandon:

Last year we lost a great many young chicks by rats—about three hundred, I should judge.

S. H. DEAN, Mt. Carmel:

About thirty dollars, chiefly from rats.

D. G. MOYER, Greenbrier:

I lose about fifty dollars' worth a year, or nearly one-half of all I raise.

C. M. SLEAR, Northumberland:

About ten dollars' worth, chiefly by hawks, owls and crows.

A. G. MARR, Shamokin:

The only loss I sustain in that line is through the depredations of human animals. Some scamps last Saturday stole the last two that were left.

JOHN C. FOULK, Schuyler:

Have no loss from hawks or any cause, but hear my neighbors complain a good deal about losing poultry by hawks.

PERRY COUNTY.

SILAS WRIGHT, Reward:

Estimated ten dollars' worth.

D. KISTLER, Kistler:

My loss is trifling. We keep our poultry in close houses at night, but the average loss to our farmers can be put down at five or ten dollars each.

MILTON ESHELMAN, Newport:

None. We are close to town.

R. M. ALEXANDER, New Bloomfield:

Our loss is chiefly from rats and cats; don't raise many; lose twenty-five or thirty chickens in a year from visits of rats, cats and hawks.

PHILADELPHIA COUNTY.

HON. SAMUEL CROTHERS, 1407 Filbert street, Philadelphia:

When I was a boy my trust was to watch the poultry. The Red-tailed Hawk used to carry away a good many young turkeys, etc. The crow also took some.

PIKE COUNTY.

NELSON DEWITT, Rowland:

Wildcats and raccoons are the worst enemies of the feathered tribe. My loss in money from them can easily be estimated on an average as ten dollars per year; some years it runs as high as twenty dollars. Wildcats also kill young deer, and around swamps are very destructive of rabbits and pheasants. My opinion on foxes destroying pheasants would be (taking into consideration eggs and young which they destroy), fifty pheasants per year, for each fox.

HON. LAFAYETTE ROWLAND, Rowland:

All the above are destructive; wildcats and raccoons are also noxious and should be exterminated (even if we admit that Noah had them along in his ride). When the female fox has her young she not only preys on domestic poultry, but eats eggs; also young and old birds. Foxes destroy thousands of pheasants here annually. My money loss in poultry annually is: fully five dollars.

JUSTIN NILES, Edgemere:

I had in the woods of my vicinity a pheasant's nest and was waiting for a bantam hen to be ready to take the eggs. When I sent yesterday for the eggs there was nothing left of the nest but a bunch of feathers. A fox had made a meal of the whole.

POTTER COUNTY.

SAMUEL HAVEN GLASSMIRE, Coudersport:

Skunks are my worst enemies. My fowls suffer from their invasions to the extent of about ten dollars annually.

E. O. AUSTIN, Austin:

Occasionally had chickens caught by hawks and owls. Probably two dollars annually.

CHARLES FRAUB, Germania:

Had a few ducks destroyed mostly by foxes and hawks. The money loss I cannot tell.

SCHUYLKILL COUNTY.

A. F. KIMMEL, Orwigsburg:

Lose annually fifty dollars.

W. H. STOUT, Pine Grove:

Had a few ducks destroyed by minks, and used the ducks to destroy the minks.

SNYDER COUNTY.

HENRY NOYES, Salem:

Not engaged largely in raising poultry. Think our loss is about twenty-five dollars annually.

SOMERSET COUNTY.

JEREMIAH S. MILLER, Husband:

At prices we get would say about five to eight dollars' worth, by hawks, crows and minks.

PETER MILLER, Somerset:

Keep less than a hundred fowls; lose probably twenty per cent. of the raising by minks and hawks.

DR. H. D. MOORE, New Lexington:

I raise poultry on a small scale. I have never lost any poultry except by skunks, and none by them for several years past. I guard against them by raising the coops over a foot from the ground.

SULLIVAN COUNTY.

A letter dated April 8, 1897, was received from Mr. M. J. Phillips, Muncy Valley, Sullivan county, Pa. He says: "I hope you will be able to help Hon. B. W. Jennings to get a bill putting a bounty on hawks, as they are very destructive to our young poultry. They will dive right down in the yard and take our chickens, turkeys and ducks. Weasels and foxes do the same, and they destroy the young of quail, and the pheasant and other birds and their eggs. We would have plenty of quail and pheasants around our fields and woods if these depredators were exterminated. I think the bounty should be fifty cents each on hawks, weasels and owls, and foxes, one dollar; then lots of people would hunt them.

There is a bounty now on foxes, and there are some men who

hunt them, but we suffer greatly from these animals. About all the income a man derives now from his farm is from his cows and poultry. We lost greatly last year from poultry-destroying animals, and our neighbors have suffered as we do from the visits of foxes, hawks and weasels. We lose ten dollars or more annually. Try and help us out. Don't forget the weasel as he robs the nest of the quail and the pheasant."

JOHN C. WITSON, Sonestown:

Foxes, one dollar; minks, one dollar and a half; hawks, one dollar.

T. S. SIMMONS, Sonestown:

I raise considerable poultry and lose from ten to twenty dollars' worth every year, principally by minks, hawks, weasels and owls.

L. B. SPEAKER, Hillsgrove:

Weasels, none; depredations of minks, eight per cent.; foxes, six per cent.; hawks, three per cent.; owls, one per cent.

SUSQUEHANNA COUNTY.

E. A. WESTON and E. L. WESTON, Brooklyn:

Sometimes none, sometimes considerable, according to other food supplies for these depredators; say ten dollars on an average.

DR. H. A. TINGLEY, Susquehanna:

Not a dollar.

TIOGA COUNTY.

M. SORNBERGER, Job's Corners:

I do not make a business of raising poultry, but hawks and crows take about twenty per cent. of the young of what I do have.

D. S. DOUGHERTY, Austinburg:

Only raise a small amount of poultry. Insect parasites and tame cats are more destructive to my poultry than the animals (which destroy about five dollars' worth annually) named in the postal you sent me.

W. H. WHITING, Wellsboro:

About ten per cent. of stock (young) from skunks.

A. J. DOAN, East Chatham:

I am engaged in raising poultry in a small way; lose a few chickens. They are taken by hawks and rats.

C. L. HOYT, Elkland:

The above commit very few depredations in this neighborhood, but gangs of boys and young men (so-called) steal and

"roast" chickens and turkeys from farmers. In some cases this loss is from three to five dollars each. This is a fad with a class, and we would shoot them, but are asleep.

UNION COUNTY.

JOHN A. CAMPBELL, Belleville:

Perhaps five dollars, but the expense and trouble of guarding against foxes, skunks and the big horned owl is considerably more.

GEORGE E. LONG, Lewisburg:

I have never lost any poultry by anything but rats and disease.

J. A. GUNDY, Lewisburg:

Think very few; mostly young birds.

WARREN COUNTY.

WALTER M. SHULER, Warren:

I lose some poultry every year; chiefly from hawks.

N. P. MORRISON, Tidioute:

I do not raise poultry to a very great extent; only about a hundred per year. Loss does not exceed five dollars.

W. B. HALE, Ackley Station:

About ten per cent.

CLINTON MILLER, Tidioute:

From two to five dollars' worth, mostly from hawks and owls.

P. N. ROBINSON, Scofield:

Yes, only by hawks; probably ten or twelve small chicks during the spring and summer. I am not in favor of bounties; the boys will kill them just the same.

W. W. WILSON, Ackley Station:

I do not lose any to speak of; not a dollar's worth in five years. Never heard of such a thing as crows stealing eggs and catching the young of domestic fowls. I think the crow is like some men, "he has got a bad name." The crow and the English Sparrow are both useful birds.

WASHINGTON COUNTY.

JULIUS LEMOYNE, Washington:

I keep flock of about one hundred chickens. Think the average loss annually will not exceed five dollars; most of that from hawks.

PRESSLY LEECH, Bulger:

From twenty to twenty-five dollars' worth

WAYNE COUNTY.

PETER COREY, Newfoundland:

I think twenty per cent. is a reasonable estimate of damage to poultry by minks, weasels, foxes and hawks for me and all people in this section of country. Skunks are also very troublesome.

WESTMORELAND COUNTY.

M. K. LAIRD, Livermore:

Loss during past year about two dollars; mostly from hawks.

T. RUTH, Scottdale:

Four dollars, by hawks.

WYOMING COUNTY.

N. P. STERLING, Meshoppen:

About five dollars, and that mostly from rats; we can guard against other animals by housing.

NELLIE LOVE, Meshoppen:

Minks, five dollars; skunks, two dollars.

W. N. REYNOLDS, Tunkhannock:

Am not in the business, but from inquiry learn that the loss is greater from hawks than any other source.

YORK COUNTY.

HON. GERARD C. BROWN, Yorkana:

Perhaps twenty dollars per year; chickens, ducks and turkeys.

JAMES G. PATTERSON, Stewartstown:

More than fifty dollars annually.

H. S. TYSON, York:

Hawks should be destroyed, as they devour much poultry and game.

SAMUEL SMALE, York:

Lose some from depredations of hawks.

OTHER STATES.

R. B. & C. H. DAYTON, Remsenburg, Suffolk county, N. Y.:

Principal loss by rats; one hundred to one hundred and fifty dollars (estimated) annually. Slight loss by hawks, minks and

opossums. Crows do good service in attacking and driving away hawks, doing more good than harm.

N. P. HARRY, Whiteford, Hartford county, Md.:

About ten or fifteen dollars yearly from minks, hawks and skunks. Mr. Harry adds as a foot-note: "This and the other questions you sent were submitted to the Pen Mar Farmers' Club, and the answers given fairly express the individual opinions of nearly all its members, as well as my own."

OBSERVATIONS OF FARMERS AND SPORTSMEN.

"Please give, if you can from personal observation, instances of where game, fish, poultry or song birds have been destroyed, and also name kind of animal committing the depredation."

In reply to this request, the following answers were received at the office of the Game Commission:

ADAMS COUNTY.

E. D. STOVER, Cashtown:

The hawks and foxes kill off the quail in winter. Skunks will kill more rabbits than the hunters. These animals destroy much poultry.

H. J. LEREW, Biglersville:

Much poultry is destroyed by hawks, owls, crows, minks, weasels, skunks, wild cats and foxes.

SAMUEL HALL, Trust:

Poultry and game, as well as the song birds, suffer from the wildcat, fox, red and gray squirrels, weasels, hawks and owls.

AARON SCHLOSSER, Arendtsville:

Depredations of a grave character are committed in our poultry yards by foxes, minks, weasels, hawks and owls.

J. P. TAYLOR, Arendtsville:

When I was hunting on South Mountain this winter ('96), I saw several rabbits that had been caught and killed by a fox, and some pheasants that had been similarly treated by, to my judgment, a hawk.

WILLIAM RUSHMAN, Gettysburg:

Have seen poultry, game and song birds destroyed by the crow, different species of hawks, minks and weasels.

JAMES BILLINGER, Parker's Landing:

Have seen where many rabbits have been killed by owls and hawks. Have known opossums to catch and kill full-grown pheasants, etc.

J. W. EICHHOLTZ, Gettysburg:

Have seen hawks commit considerable depredations in the poultry yard, catch quail and other birds.

S. McECHOLTZ, Arendtsville:

Have seen depredations among poultry, game and song birds, from fox, mink, weasel, hawk and the owl.

E. MORRIS BUSHMAN, Gettysburg:

Have seen crows sucking pheasants' and quails' eggs, weasels killing rabbits and Cooper's Hawk eating poultry.

J. M. KESSELRING, Biglersville:

Hawks and crows are very hard on young chicks; have often seen them catch them; also birds, and have seen them rob the nest of eggs.

Z. TIPTON, Biglersville:

Depredations of an extensive kind are committed upon poultry, game and song birds by the wildcat, fox, mink, weasel, hawk, owl, skunk and crow.

H. F. YOUNG, Gettysburg:

Hawks, owls, minks, weasels and skunks are a menace to our poultry, game and song birds.

JAMES LAURER, Cashtown:

Have seen poultry, pheasants and rabbits destroyed by foxes, hawks and owls.

J. CALVIN THOMAS, Arendtsville:

Many such depredations to poultry and game have been brought to my observation, but space will not permit me to narrate them.

C. A. REBERT, Cashtown:

Deer by dogs.

JOHN R. BITTINGER, Hanover:

All along the mountain regions generally these animals commit considerable depredations upon poultry and game.

L. H. MEALS, Gettysburg:

I have known a weasel to kill whole nests of rabbits in one night or day, also kill the old ones. Have shot hawks in the act of catching quail, larks and chickens.

ARMSTRONG COUNTY.

J. L. HELD, Neale:

Minks, weasels, skunks, foxes, crows and others.

WILLIAM CROSBY, Leechburg:

Red or pine squirrels and weasel.

DR. L. W. SCHNATTERLY, Freeport:

I know personally of foxes, minks and weasels destroying our game birds and game, and the polecat and ground hog destroying the eggs and nests of pheasants and quail.

DR. C. JESSUP, Kittanning:

Hawks are the most destructive on poultry, pheasants and quail, killing many; have caught them in the act. Foxes are also very destructive.

W. K. COLBER, Leechburg:

I have personally known of instances where the chicken hawk, bird hawk, hoot owl, weasel, mink, skunk and fox have destroyed poultry, game and song birds. The skunk destroys the eggs of pheasants and quail.

ALLEGHENY COUNTY.

JESSE B. JONES, Pittsburg:

Foxes are destructive to poultry and game. I know of two men who trapped from 25 to 30 foxes each year. They got 75 cents bounty and from 75 cents to \$1.00 for the hide. They went to considerable trouble and baited the traps with a whole chicken. After the bounty was taken off they stopped trapping.

D. P. CORWIN, Pittsburg:

Snakes destroy a great many birds which nest on the ground.

GUSTAVE A. LINK, Pittsburg:

I have only seen the hawk destroy Song Sparrow and Wood Thrush.

J. W. HAGUE, Pittsburg:

Hawks killing song and game birds, owls with rabbits, and have known weasels to kill chickens.

BUCKS COUNTY.

SETH WALTON, New Hope:

Hawks, weasels and minks destroy many chickens and pigeons.

H. H. RANATT, Pipersville:

Have seen crows take my chickens and minks catch my ducks.

A. J. SNYDER, Plumsteadville:

Have seen poultry taken by large and small or pigeon hawk; also saw hawk catch quail.

HARRY S. WALTON, Hartsville:

Poultry is largely destroyed by hawks and crows, and they destroy many small wild birds.

FRANK E. HESTON, Rushland:

The chicken hawk commits great depredations.

THOMAS SCOTT, Bristol:

Some Italians of this county are given credit for shooting warblers, robins, catbirds, or anything that will go in a pot.

ARTHUR CHAPMAN, Doylestown:

Instances are so numerous of such depredations that there is not room to particularize.

LEWIS H. CLEMENS, Doylestown:

The worst enemy the song bird has is the crow, who eats the eggs and the small birds when hatched; will destroy a whole nest. I have opened young crows and found the stomachs contained the feet of small birds, especially robins.

A. S. WEAVER, Hartsville:

Foxes and hawks commit numberless depredations on poultry and wild birds.

BRADFORD COUNTY.

CHARLES B. TAYLOR, Alba:

Skunks, weasels, minks.

J. F. AMMERMAN, Saco:

In this section the hen hawk destroys a large amount of poultry.

ASYLUM GRANGE, Duvall:

Have noticed instances where grouse and quail have been killed by foxes and owls. Domestic fowls are also often killed by these and other wild animals.

A. J. STACY, Leona:

The chicken hawk and crow steal young chickens, and rob the nests of birds soon after they hatch.

W. F. DITTRICH, Towanda:

Have seen hawks, skunks and the house cat destroy poultry, birds, etc.

W. W. McCAIN, Stevensville:

The occurrences are too frequent to admit of details. I have personal knowledge of many hawks, owls, skunks, weasels, minks, foxes, 'coons all do their share.

JAMES A. HAWTHORNE, Windfall:

Have known the hawk, mink and weasel to destroy poultry, etc.

C. B. WHIPPLE, LeRoy:

I have seen where foxes, weasels, minks, hawks and owls have caught poultry, pheasants and weasels.

D. F. LEWIS, Gillett:

Mink destroy quail. I have caught the fox with pheasant and rabbit, the weasel with rabbit and the owl with rabbit.

J. H. HAMAKER, Editor Daily and Weekly News, Athens:

Have seen foxes' tracks in the snow, in two instances, where they led to the remains of ruffed grouse.

GEORGE C. CORNELL, Col., Cross Roads:

Have seen poultry destroyed by hawks and skunks; birds by hawks and crows, and ground birds by skunks and snakes.

J. BENSON WRIGHT, East Canton:

I, on one occasion, followed a wildcat who dug up and ate two whole rabbits, rabbits that he evidently had killed and buried some time before.

S. W. CLARK, LeRoy:

Have seen hawks catching chickens, catbirds, robbing birds' nests and weasel killing rabbits.

N. A. WELLS, Wyalusing:

From tracks in the snow I have seen where foxes had pounced on rabbits and on grouse; have also seen hawks eat grouse.

THEO. PIERCE, Canton:

I have seen where foxes have eaten pheasants or grouse.

BUTLER COUNTY.

W. WATSON, Sarversville:

Foxes have made depredations on poultry.

C. B. McFARLAN, Argentine:

Have seen crows robbing the nests of song birds and quail; have known them to rob nest with eighteen eggs in it.

L. A. SCOTT, Sarversville:

Hawks kill large amount of quail; the mink and other animals kill rabbits.

J. C. SNYDER, West Liberty:

I have seen the fox kill poultry many times and carry the same away. Weasels will kill a whole nest of young birds.

F. D. COLBERT and Others, Butler:

The chicken hawk has been the greatest destroyer in my observation. Have frequently seen them catch quail and song birds.

ROBERT McBRIDE, McCandless:

The chicken hawk is the worst enemy we have to our poultry and song birds. I have also seen the Sparrow Hawk take a small bird on the wing.

BEAVER COUNTY.

WILLIAM M. BOYLE, New Brighton:

Have seen quail and other small birds caught by hawks.

W. N. McNAIR, Beaver Falls:

Chicken hawks, large owls, the fox, minks and weasels destroy poultry, game and song birds.

J. A. SNYDER, Beaver Falls:

I have seen the large chicken hawk catch and kill quail.

A. H. CLARKE, New Brighton:

Poultry, game and song birds are destroyed by minks, rats, foxes, skunks, weasels, snakes and the common house cat.

BLAIR COUNTY.

W. F. TAPPAN, Altoona:

Have seen blue hawk attack and kill pheasants; also have known foxes to have committed the same deed; have found their nests torn up, etc.

WILLIAM VAN ALLMAN, East Sharpsburg:

The skunk will hunt the eggs in the laying season of the quail and wild turkeys, but they suffer in winter from the fox and hawk.

DR. A. L. SPANGLE, Altoona:

Have seen red-tailed hawks with grouse in their claws, sparrow hawks with woodcocks, minks in a chicken coop, Butcher bird impale a Field Sparrow on a thorn bush, wildcat with rabbit, and where fox had caught rabbit; also where skunk and mink had killed rabbit.

FREDERICK JACKEL, Hollidaysburg:

Hawks, weasels and squirrels take eggs.

EDWARD KOTTMANN, Altoona:

Have seen the kingfisher on numerous occasions get trout; also seen the Red-tailed Hawk capture poultry, quail and grouse; witnessed the grouse caught by blue hawk also.

S. H. DEAN, Williamsburg:

I have frequently seen hawks catch partridges, poultry and song birds.

MATTHEW CALVIN, Hollidaysburg:

Polecats, minks and weasels destroy our poultry, song and game birds.

M. D. YOUNG, Hollidaysburg:

The foxes in our county destroy much game, both by killing the birds and driving them away while hatching

G. G. ZETH, Altoona:

Have seen instances too numerous to mention while afield, wild cats and foxes especially.

W. G. HICKS, Tyrone:

Many rabbits are destroyed here by foxes.

WILLIAM L. SANDS, Altoona:

I know of turkeys, chickens, pheasants and rabbits to have been killed by foxes, skunks and hawks.

H. M. LEIGHTY, Poplar Run:

The fox, weasel, hawk and owl destroy poultry, game and song birds.

BEDFORD COUNTY.

JACOB ZOOK, Saxton:

Foxes, skunks, minks, hawks and owls are very destructive to poultry, game and song birds.

GEORGE W. YONT, Osterburg:

Hawks after poultry; smaller birds, etc., and red squirrel after the gray squirrel.

SAMUEL J. KEITH, Woodburg:

Polecats are quite destructive on fowls; foxes hunt up and destroy various birds.

S. H. KOONTZ, Cessna:

Hawks and large owls after poultry, etc.

THEO. B. POTTS, Alum Bank:

I have seen owls catch and kill a wild full-grown rabbit, and hawks kill birds and chase gray squirrels. Foxes, minks, skunks and measles are very destructive to poultry night or day.

BERKS COUNTY.

EDWARD LAWRENCE, Reading:

Have seen hawks killing birds and poultry.

O. HINNERSHITZ, Blandon:

Reported instances of poultry being destroyed by minks, weasels, foxes and hawks.

CHARLES M. MINNICH, North Heidelberg:

Have seen hawks destroy poultry, etc.

PETER DEXTER, Reading:

Poultry, song birds, quails and pheasants destroyed by fox, hawks and owls.

C. W. KETTERER, Stouchsburg:

In my observations have seen the Cooper's Hawk destroy quail and pigeons; Red-tailed Hawk, poultry, mice and rabbits.

CYRUS J. RHODES, Kutztown:

Hawks destroying poultry, etc. The domestic dog running at large is a nuisance.

CHESTER COUNTY.

A. C. RAMSEY, Cream:

Skunks, opossums, weasels and minks destroy our poultry in large quantities.

ABRAM STOUTS, Lincoln University:

Have frequently seen hawks destroy much small game and killed them in the act; also foxes.

FRANCIS JACOBS, West Chester:

On the Brandywine, and through the country generally, game and poultry suffer from the ravages of polecats, weasels, minks and certain species of hawks.

JOS. E. GILL, Barnsley:

Have known hawks to destroy a whole covey of quail.

JEREMIAH PROCTER, Lincoln University:

Poultry, game and song birds are destroyed by the fox, opossum, raccoon, owls and hawks.

FRANK D. DURBOROW, Oxford:

Chicken hawks destroy poultry.

W. G. WEST, Sylmar:

Hawks and foxes destroy much poultry and game.

J. B. KEECH, Tweedale:

I have always regretted the repeal of the Act of Assembly paying a bounty for hawks' heads. I know they are extremely destructive to poultry. From personal observations I firmly believe that a few hundred dollars paid out for hawks' heads would prevent the loss of many thousands of dollars' worth of poultry in the southern end of Chester and Lancaster counties.

DR. ROBERT FARLEY, Phoenixville:

Have seen hawks kill rabbits and quail.

H. L. BUCKWALTER, Spring City:

Several varieties of hawks and the weasel destroy much poultry and game.

COLUMBIA COUNTY.

H. H. BROWN, Light Street:

Poultry, game and song birds are destroyed by fish and chicken hawk, sparrow, mink, weasel and skunk.

W. H. SNYDER, Bloomsburg:

Saw recently where fox caught a rabbit.

W. B. SNYDER, Roaring Creek:

Hawks, minks and weasels are destroyers of young poultry.

A. P. YOUNG, Millville:

Have known skunks and crows to rob the nest of the turkey, quail and pheasant.

MILES EVERHART, Secretary Waller Grange, Divide:

Skunks and minks destroy much poultry.

CHAS. E. RANDALL, Secretary Catawissa Fish and Game Protective Association, Catawissa:

Poultry by opossums and skunks; quails by hawks, owls and cats; pheasants by foxes and skunks; rabbits by foxes, weasels and cats, and quails' nests destroyed by red squirrels, the eggs being eaten.

J. T. WILSON, Millville:

Weasels, hawks and large owls destroy chickens, and the crow will kill young song birds and eat the eggs.

B. F. FRITZ, Divide:

The farmers lose much poultry by the depredations of certain hawks and some other animals.

R. G. F. KSHINKA, Berwick:

To my personal knowledge poultry and birds are destroyed by weasels, skunks, owls and hawks.

CRAWFORD COUNTY.

PERRY BIXBY, Spartansburg:

The mink and muskrat commit serious depredations on fish, and the hawk, owl, weasel and skunk are very destructive of poultry and birds.

ISAAC WHEELOCK, Townville:

Have seen hawks catch our song birds and also destroy their nests. Poultry is caught by hawks, owls, weasels and minks.

CHARLES DAY, Spartansburg:

Have seen wild birds and poultry destroyed by hawks, owls and weasels.

C. A. STRANAHAN, Spartansburg:

Many instances too numerous to mention by Sharp-shinned Hawk, Cooper's Hawk, mink, weasel, ferret and large owl.

H. E. BLAKESLEE, Spartanburg:

Poultry, game, etc., destroyed by the mink, weasel and ferret.

F. A. MARYOTT, Secretary Rudolph Grange, Guy's Mills:

Hen hawks bother our neighborhood to quite an extent; also mink, 'possums, skunks and weasels.

J. H. SEAVY, Hayfield Grange, Saegerstown:

Poultry, etc., destroyed by hawks, owls, etc.

C. F. EMERSON, Titusville:

Have observed minks carrying trout just caught; blue jays eating song birds' eggs. Have occasionally found remains of grouse which I judged to be killed by fox.

C. BROOKS, Conneaut Center:

Have seen the Cooper's and Sharp-shinned hawks many times catch small chickens.

GEORGE P. RYAN, Long's Stand:

Having always lived in the country and been a hunter, I might give hundreds of cases where owls, hawks, foxes, skunks, opossums, minks and weasels have killed game, most all kinds of birds and poultry. The crane destroys more fish than kingfishers, and the German carp more than all.

C. A. BURCHARD, Black Ash:

Hawks.

G. W. CUTSHALL, Guy's Mills:

We have had some chickens killed by hawks, but they have also destroyed many meadow mice and snakes.

W. G. SARGEANT, Meadville:

Owls and hawks destroy young game birds—have seen it—and also young chicks taken from the barnyard. Mammals do little damage to fish, except the mink, and they are rare.

SPRINGBORO ROD AND GUN CLUB, Springboro:

A number of cases where chickens were killed by weasels, skunks, foxes and muskrats; have also found the Meadow lark, pheasants and quail destroyed; also their eggs, by the above named animals.

A. A. GRAFF, Linesville:

Have seen crows destroy young rabbits in their nests.

JACOB HAGUE, Beaver Centre:

Hawks, owls and all fur-bearing animals prey on song and game birds, but they are also scavengers of mice, rats, snakes, etc.

CLEARFIELD COUNTY.

W. A. NELSON, Shawmut:

Weasel, minks and foxes destroy our poultry and game; crows eat the eggs and sometimes the young of other birds.

WILLIAM T. THORPE, Gramplan:

Foxes kill a great many rabbits.

JAMES CARNS, Clearfield:

The pine squirrel is probably the worst, as he destroys so many pheasants' eggs. The wildcat, hawk and owl commit serious depredations on poultry, game and song birds.

J. T. REITTER, Karthaus:

Much poultry and many song birds are destroyed by foxes, owls and hawks. Owls are getting very scarce.

G. W. DRESSLER, Rockton:

Pheasants, poultry, rabbits and fish destroyed by the fox, mink, weasel, skunk, owl and hawk.

W. J. STULL, Coalport:

Saw this winter where a fox ate a rabbit and grouse, and an owl caught and killed a rabbit.

W. F. WAGNER, Coalport:

I have seen where owls destroyed rabbit and where fox destroyed pheasant. Captured a mink after he had killed thirteen chickens.

HON. F. G. HARRIS, Clearfield:

Have known wild cats to kill deer and fawns and all kinds of wild animals. Foxes kill our poultry, rabbits and grouse. Weasels also kill grouse.

J. E. HARDER, Clearfield:

I saw a big blue heron that was killed here last summer near Trout Run in whose craw were thirty small trout. This tributary has been nearly cleaned out of trout by these birds.

AMOS KLINE, DuBois:

Have seen hawks catching birds and robbing the nest of the young.

J. F. GALLAHER, New Washington:

The crow and the Blue Jay destroy more song birds by eating their eggs than all the other birds in the vicinity.

JAMES B. GRAHAM, Grahamton:

I saw a large brown hawk eating a full grown pheasant which it had killed. A Cooper's Hawk carried away two or three dozen of my small chickens, until I finally put an end to him by setting a boy to watch the nest with a shot gun.

O. D. KRISE, Odessa:

Hawks, foxes and wildcats destroy much poultry; blue jays destroy our song birds.

R. J. BROCKBANK, Luthersburg:

I have seen a fox in one night kill three or four rabbits. They will also destroy all small game. So will the mink, as I have learned from observing him. Hawks and owls are very destructive to poultry and game.

G. W. BELL, Bell's Landing:

I have personally known foxes and skunks to kill pheasants and rob their nests. Have seen owls with pheasants, and hawks kill many chickens.

WILLIAM BUMGARDEN, Lick Run Mills:

Wildcats kill deer and small game; foxes kill small game; skunks kill grouse, birds, and destroy pheasants' eggs.

J. W. KIZER, Osceola Mills:

I have seen many instances where game birds and others have been destroyed by foxes, weasels, minks and wildcats, which also often devour poultry.

CAMERON COUNTY.

M. M. LARRABEE, Emporium:

Skunks, wildcats, foxes and some hawks.

J. A. McMILLAN, Driftwood:

The hen-hawk is the worst.

CENTRE COUNTY.

GEORGE K. BOAK, Pine Glen:

Wild cats, foxes, minks, crows, hawks, and owls destroying poultry, game and small wild birds.

W. J. KRAPE AND CHARLES E. BRESSLER, Fiedler:

Sharp-shinned and Cooper's Hawk kill pheasants, small birds and rabbits. Foxes kill rabbits and pheasants. Weasels rob the nests of birds.

CHESTER M. LINGLE, Philipsburg:

I saw one pigeon hawk kill four quail; in spite of my throwing clubs at it and driving it away it would return and invariably catch another quail.

R. T. CORNBY, Flemming:

Yes; principally by hawks.

B. F. SHAFFER, Nittany:

Red squirrel eating the brains of young robins.

A. A. DALE, Bellefonte:

Have known instances where wild cats and foxes have killed young deer. These same animals destroy many turkeys and pheasants.

JACOB SHARER, Centre Hall:

Have seen both fox and weasel attack coop and carry off poultry and eggs.

GEORGE D. JOHNSON, Mt. Eagle:

Have had foxes and minks destroy turkeys and chickens.

W. W. ROGERS, Centre Hall:

My personal loss of poultry has been by mink and weasel more than by hawks.

C. A. RACHAU, Madisonburg:

Last summer the crows destroyed a good many of my young chickens, and the neighbors also.

W. H. MILLER, Secretary Logan Grange No. 109, Bellefonte:

Hawks destroying poultry, et cetera.

J. DUNKLE HUBLERSBURG, Hublersburg:

The quail roost on the ground in broods and become the prey of the fox and skunk by the wholesale at night.

CLINTON COUNTY.

DR. J. M. DUMM, Mackeyville:

Have seen where foxes and hawks have killed turkeys, but they also kill many mice. If it were not for them our fruit trees would need more protection. Have also known of a mink killing a rabbit.

W. L. HAMILTON, Lock Haven:

In many instances, too numerous to mention, where poultry has been destroyed.

GEORGE H. WILSON, Westport:

Chickens are repeatedly destroyed by hawks, and a whole brood of twenty-four chickens was killed in one night by a wild cat.

C. H. RICH, Woolrich:

Have seen hundreds of English sparrows tear up the nests of other birds and eat the eggs. Hawks will also eat eggs and destroy young birds. Crows, too, eat eggs.

W. C. KEPLER, Westport:

Wildcats, foxes, hawks and crows commit great depredations on poultry and wild birds.

C. J. SIGMUND, Salona:

Have seen hawks, owls, etc., destroying game and poultry.

JOHN C. MERRILL, Lock Haven:

All kinds and at all seasons.

A. S. TRUST, Cedar Springs:

Have frequently seen where foxes caught wild turkeys and tear them up; they are ever on the alert to find the nests and destroy the young of both turkeys and pheasants.

CAMBRIA COUNTY.

J. J. WEAVER, Willmore:

The fox, mink and weasel kill poultry and game; skunks destroy the eggs and young, and the hawk and owl commit serious depredations to our song birds.

JOHN E. TOMLINSON, Loretto:

Skunks, foxes and minks destroy our game, poultry and song birds.

J. T. YODER, Johnstown:

The skunk has caused me considerable loss; young chickens especially. A few years ago they destroyed about fifty of my young turkeys and their eggs, this was all done in one season.

J. B. HOLSENGER, Johnstown:

Foxes, skunks, owls and hawks.

JOHN F. THOMAS, Patton:

Foxes, minks, hawks and owls destroy much of our poultry and game.

GEORGE W. GARRETT, Munster:

It is an every day occurrence, in the summer, for us to see hawks pick up young poultry and song birds.

W. F. CUNNINGHAM, Carrolltown:

The pigeon hawk does great damage among the poultry.

JOHN J. REDINGER, Nicktown:

Pheasants are killed by foxes and hawks; foxes also destroy rabbits; and our poultry suffers much by minks and hawks.

JOHN RICKETTS, Flinton:

Skunks, minks and weasels destroy our poultry, game and song birds.

BLAIR ALEXANDER, Conemaugh:

Grown rabbits and quail destroyed by weasels, minks, and foxes.

CLARION COUNTY.

J. T. FRAMPTON, Frampton:

Hawks and owls destroy much poultry.

J. H. MARTIN, Valley:

Foxes do much damage, and I have seen hawks carrying off young chicks and quail.

E. M. KISER, Elk City:

I have seen a weasel kill a rabbit; and have frequently seen fur and feathers lying about where an owl or fox had gotten in their work on a rabbit or grouse.

H. N. FENSTAMAKER, Clarion:

Have seen game destroyed by fox, mink and owl.

FRANK G. KEATLEY, Clarion:

Weasels caught a number of rabbits. Foxes caught pheasants and quail. Chicken and pigeon hawks are destructive to our song and game birds.

J. A. T. HOY, Clarion:

More poultry, grouse, and quail are destroyed by foxes than by any other means. Minks of course destroy some.

CARBON COUNTY.

S. M. DOWNS, Mauch Chunk:

Instances too numerous to mention from farmers over loss of poultry; and very often while out gunning I see where grouse and rabbits have been killed by these animals.

L. L. HULSHIZER, Mauch Chunk:

While out gunning I see where rabbits and pheasants have been destroyed by these animals.

B. F. KUEHUER, E. Mauch Chunk:

Have many cases here of foxes destroying rabbits, pheasants and poultry.

EDWIN F. PRY, Mauch Chunk:

The destruction of game in this section is very noticeable when we compare the protected to the unprotected sections.

PIERCE J. TAYLOR, Mauch Chunk:

In several instances I saw where foxes, minks, weasels, catamounts, and snakes destroyed a great deal of game and fish.

GEORGE T. WELL, Rockport:

Have often found where a fox had caught rabbits, quail and other birds.

CUMBERLAND COUNTY.

A. Z. HADE, Mechanicsburg:

Hawks and foxes kill rabbits. Hawks, owls and foxes kill quail, other birds and also considerable poultry.

JACOB B. MEIXEL, Boiling Springs:

Have on two different occasions seen the work of weasels killing poultry; the first time he got twenty-five, the second time fifteen. I once saw a blue darter hawk fly into a flock of quail, kill one and entirely scatter the rest.

DAUPHIN COUNTY.

W. L. WEAVER, Millersburg:

I have seen goshawks kill quail and grouse; duck hawks and

eagles kill ducks. Red-tailed kill poultry. Bass and salmon will kill all the fish they can catch.

H. M. F. WORDEN, Harrisburg:

Minks destroyed German hare on island at Cove Station; three old and seventeen young ones. Personally saw Red Squirrel destroy a robin's nest.

RICHARD V. FOX, Harrisburg:

Have known hawks upon my own farm to kill a quail or two a day, until the whole bevy was exterminated.

W. H. ETTLE, Hummellstown:

Space would not permit me to instance the numerous depredations of animals upon poultry.

DELAWARE COUNTY.

CHARLES P. GOODLEY, Hance:

Foxes destroy great quantities of poultry and ground birds.

JAMES NEELD, Concord:

Foxes after partridges.

THOMAS H. HUSBAND, Elam:

The opossum killing poultry.

GEORGE W. POOLE, Booth's Corner:

Foxes, raccoons, skunks, opossums, and minks.

ELK COUNTY.

G. C. T. HOFF, SR., Raughts:

In Elk county, and also in Forest county and in northern Jefferson county, fish, poultry, song birds and deer have to a great extent been destroyed by wildcats, foxes, hawks, skunks and weasels.

PHILO CHRISLER, St. Mary's:

Wildcats are increasing with us and are killing deer at a terrible rate. Foxes destroy poultry and kill more small game than all hunters.

J. M. HANSCOME, Ridgway:

Wildcats killing fawns, rabbits and pheasants, and foxes killing rabbits and pheasants.

C. H. LAW, Portland Mills:

In winter you can find places where foxes have destroyed rabbits and pheasants.

DR. A. MILLHAUPT, St. Mary's:

Wildcats destroy rabbits, deer and grouse, and I know of one instance where one was seen with a robin in its mouth. Foxes are very destructive to grouse and rabbits. Polecats destroy grouse and their eggs.

DR. J. D. FULLERTON, Ridgway:

Deer, rabbits, partridge, meadow larks and quail by wild-cats and foxes.

ERIE COUNTY.

I. E. TUTTLE, Union City:

Have frequently had my poultry yard invaded by the hen hawk and the chicks stolen; have seen the crow rob birds' nests frequently.

JAMES RICHARDS, Corry:

Hawk, owl, skunk and weasel.

W. T. RYMAN, Girard:

Have seen kingfisher catch fish and hawks catch chicks.

MANDRED HAYES, Edinboro:

A pheasant by a mink; pheasants and smaller birds supposedly by hawks.

FRANK BUTTON, Corry:

Have seen birds caught and nests broken up by hawks, and known of pheasants' nests being robbed by minks.

J. H. KIRK, Union City:

English sparrows are very destructive to nearly all birds when nesting and hatching their young.

G. H. CORNELL, Edinboro:

Pheasants killed by minks.

THOMAS STERRET, Sterretonia:

Hawks.

W. H. CORNELL, Wattsburg:

Hen hawks, owls, minks, weasels, etc.

H. E. DENNIS, Milesgrove:

Crow blackbirds destroy eggs of song birds.

W. T. ANDREWS, Milesgrove:

Crows, blackbirds destroy eggs of song birds.

F. C. FOSTER, West Greene:

The crow is the most destructive; hawks next; then the owl and mink.

FRANKLIN COUNTY.

J. B. McAFEE, Mercersburg:

A wildcat will climb a tree at night and kill a turkey, and a weasel will follow game into their retreat and kill.

MARTIN L. ROSENBERRY, Freestone:

I have seen instances of where birds have been destroyed by hawks, and two instances of where foxes entered our neighbor's coop and killed chicken; time to put bounty on.

DR. W. F. TEETER, Chambersburg:

I have seen hawks, foxes and crows kill poultry, quail, grouse and rabbits.

SOUTH MOUNTAIN HUNTING CLUB, Fayetteville:

Pheasants and rabbits are killed in our mountains by wildcat, weasel, and quail by the hawks.

W. H. STEWART, Secretary Game Association, Roxbury:

Hawks are very severe on birds; owls kill young game; foxes destroy poultry and wildcats turkeys while hatching their young.

FRANK HOCKENBERY, Concord:

Have known poultry, quail, pheasant and rabbit to be killed by fox, wildcat and skunk.

W. W. BRITTON, Upper Strasburg:

Some time last spring a mink in two nights killed forty chickens for Clayton Reed, near this place. Have heard of many other such instances, but cannot give figures.

J. H. LEDY, Marion:

I had sixteen quails which we fed in a thicket in 1895, and a hawk killed every one of them, one each day.

FOREST COUNTY.

FRED WEINGARD, Tionesta:

Have seen foxes destroying young birds and eggs.

S. H. HASLET, Tionesta:

I have seen where foxes, wildcats, owls and hawks have killed poultry, pheasants and rabbits.

G. S. TURNER, West Hickory:

Have seen in the woods where owls have eaten rabbits.

FULTON COUNTY.

JOE CHALTON, Wayfordsburg:

Hawks kill young turkeys, pheasants and quail; opossums suck eggs.

MRS. P. M. COOK, Webster Mills:

Minks and weasels are most destructive to poultry; hawks prey on song birds. By the use of hounds we keep the fox at a distance.

JERE SPROUL, Wells Tannery:

I have seen and found dead plenty of rabbits, pheasants, etc., killed by hawks, owls, wildcats and foxes.

DANIEL E. FORE, McConnellsburg:

Crows, hawks, minks, foxes and weasels destroy poultry, game, etc.

PETER KIRK, Big Cove Tannery:

Foxes, hawks and minks destroying poultry, game, etc.

M. B. HANKS, Emmaville:

Have seen rabbits destroyed by minks, owls and hawks, poultry by all the varmints; song birds by hawks and English Sparrow, fish by Fish Hawk.

PETER MORTON, Pleasant Ridge:

I have frequently seen where the hoot or big owls have killed rabbits, and the fox has, to my personal knowledge, taken lambs, poultry and pigs.

GEORGE LEHMAN, Lashley:

About twenty of our old hens were killed last year by large hawks; our neighbors also lost heavily by them.

D. W. ORONNER, Fort Littleton:

I have seen foxes destroy poultry and birds.

M. L. MOREBERG, Wells Tannery:

Skunks are the most destructive on quails' nests and poultry; foxes will kill a turkey on her nest; wildcats will kill many rabbits, but they can be spared; are so plentiful as to become a nuisance to the farmer.

W. H. PITTMAN, Big Cove Tannery:

Large hawks, minks and foxes are very destructive to poultry, game, etc.

W. L. McKIBBIN, Buck Valley:

Many cases by foxes, wildcats, skunks, minks, weasels, owls and hawks, on poultry, game, etc.

FAYETTE COUNTY.

L. D. WOODFILL, High House:

Your game is stolen when you are away from home or busy at work. I have seen the hawks carry off many a chick.

D. S. RICHING, Uniontown:

I have had a great many chickens and turkeys taken by hawks, owls and foxes.

GEORGE M. BAILY, Uniontown:

I have often found quails killed by hawks; at times have scared them off.

JESSE O. ALLEN, Uniontown:

Have heard from reliable sources where the fox and skunk have destroyed nests and young of both game and domestic fowls.

GREENE COUNTY.

SAMUEL DUNLAP, Mapletown:

The domestic cat destroys a wonderful amount of young chickens, young birds and also rabbits.

H. C. SPITZNAGLE, Brock:

Weasels and hawks destroying poultry, game, etc.

W. W. PARRY, Higbee:

I consider that the hawk and the crow are the most destructive to the song birds, and the red fox to the rabbit.

C. L. H. MESTSEZAT, Mapletown:

The hawks, foxes and weasels kill a great deal of game here, especially quail and rabbits.

CHARLES H. CHURCH, Waynesburg:

I have often found remains of rabbits in snow that foxes had killed, and oftentimes I have discovered quails' feathers when the snow remains for some time, and have occasionally seen the hawk making his meal off the game bird.

H. L. HOGE, Oak Forest:

All species of hawks are very destructive to game, poultry and song birds.

G. A. BARCLAY, Carmichaels:

Foxes destroying game, poultry, etc.

N. H. BIDDLE, Carmichaels:

Foxes destroy the quail, etc.

H. C. SAYERS, JR., Waynesburg:

Have seen chicken hawk catch quail and small chickens.

J. N. SCOTT, Khedive:

Cases too numerous to mention have come to my notice where hawks and owls have taken poultry.

A. L. RICH, Khedive:

Snakes kill some birds and foxes destroy our poultry.

HUNTINGDON COUNTY.

W. N. MILLER, McAlevy's Fort:

Wildcats, foxes, hawks and sparrows, on poultry, game and song birds.

E. B. HARENEAME, Norrace:

There is a great deal of poultry destroyed by the wildcat, foxes, hawks, etc.

D. B. WILSON, and Others, Huntingdon:

Have known skunks to steal pheasants' eggs; have seen hawks catch quail and other birds; have seen the homes of owls strewed with bones and feathers; have seen turkey and pheasant feathers around the dens of foxes.

J. W. MANG, Warriors' Mark:

Song birds suffer most from the pigeon hawk; the fox is the worst destroyer of rabbits and small game.

W. H. BOOTH, Maddensville:

I found the nest of the Great Horned Owl by observing a lot of bones under the tree—rabbit bones and kinds that I could not distinguish.

HON. T. O. MILLIKEN, Cornpropst's Mills:

I have seen where foxes destroyed rabbits and poultry in daylight. In one instance a mink killed nineteen out of twenty-five full-grown chickens in one night; have lost a great many chickens by them. In the fall we cannot let full-grown chickens roost on a tree on account of the large owls. I have witnessed on many occasions the small hawk we call chicken hawk kill and carry off small chickens. Once driving along the road in December saw hawk (small) kill a pullet three-fourth size and eat a hole in it before I came up to it.

D. M. SUMMERS, Entriken:

Foxes killing rabbits, hawks killing poultry.

T. S. YASHON, Gorsuch:

My opinion is that song birds are destroyed by hawks; my experience is that we lose more poultry from these bird depredations than by any other bird or mammal.

HUNTINGDON GUN CLUB, Huntingdon:

We regard the fox as the most destructive animal of our game, with the skunk next; hawks and owls are also very destructive.

WILLIAM W. STRYKER, Petersburg:

I am satisfied that the hawks and owls have killed one-half of my partridges.

G. M. DELL, Mapleton Depot:

Rabbits and turkeys destroyed by foxes, poultry and song birds by hawks and owls.

MILES BECK, Warrior's Mark:

Hawks, minks, foxes and skunks are the most destructive to poultry and game birds.

DAVID MONG, JR., Warrior's Mark:

Many times I have seen rabbits and pheasants killed by

foxes, foxes, minks, weasels are very hard on young wild turkeys, pheasants and poultry.

DR. THOMAS TOBIN, Warrior's Mark:

Last May a pheasant hawk seized a young chick not more than twenty feet away from me. I ran toward it and yelled and the hawk dropped the chick after it had raised ten or fifteen feet; in many instances they get away with them. A few years ago I heard a noise among a drove of chicks in a wheat field. I ran and saw a weasel catch a young chick by the throat, and in an instant it was dead. I sprang among them; they were trying to conceal themselves; the weasel running about my feet hunting another chick, and with all my striving and stamping I could not catch it.

INDIANA COUNTY.

JAMES N. STEWART, Indiana:

House cat killing rabbits; also song birds, such as robins and blue birds.

EVEN LEWIS, J. C. WELLS, D. D. GOOD, Smicksburg:

Hawks, owls, foxes and minks destroying poultry, game, etc.

DAVID BLAIR, Indiana:

The house cat is complained of considerably in this neighborhood, and the fox is destructive to poultry and game.

R. W. WEHRLE, Indiana:

To my own personal knowledge, I know of one tame cat killing upwards of one dozen wild rabbits this year. The fox, hawk and owl destroy poultry, game, etc.

KINTER FRY, Advance:

Hawks, owls, skunks, polecats and minks are a menace to poultry, game, etc.

G. W. EDWARDS, Davis:

I have known hawks, owls, foxes, minks and weasels to destroy considerable game and poultry; have known the crow and blue jay to kill, and destroy also, the nests of song birds.

JEFFERSON COUNTY.

CHARLES A. MORRIS, Oliveburg:

Pheasants and quail are destroyed more by foxes, wildcats and skunks than any other source. Song birds destroyed by hawk and sparrow.

IRA FELT, Brockwayville:

I have on two different occasions last December (1896), while killing, found where foxes had killed and eaten pheasants.

J. O. EDELBLUTE, Brookville:

Can go out any day on the snow and find evidences of foxes killing rabbits and grouse; and have seen quantities of grouse nests robbed, and young killed by skunks

H. V. TRUMAN, Brookville:

The sparrow hawk, night hawk, chicken hawk, fox, musk rat, weasel, mink, king-fisher, wild cat and pole-cat are the worst depredators on poultry, game, etc.

C. H. SHAWKEY, Sigel:

It is a common occurrence to see pheasants, rabbits, blue birds, robins and others killed by owls, foxes, minks, weasels, and chicken hawks.

D. D. GROVES, Brockwayville:

A good deal of poultry is picked up by skunks and foxes, and the farmers and all the sportsmen around here favor bounty on game-destroying animals.

JUNIATA COUNTY.

WILLIAM D. WALLS, Peru Mills:

The fox and wild cat are very destructive on all kinds of game in the mountains, except deer and bear; weasels and pole cats on rabbits; hawks and owls on rabbits, pheasants and quails.

J. T. ROBINSON, Waterloo:

Fish hawks, other hawks, minks and foxes on fish, poultry, game, etc.

HON. WILLIAM HERTZLER, Port Royal:

Depredations on poultry, game, too numerous to mention.

WELLINGTON SMITH, Mifflintown:

Mink, polecat, fox, and chicken on game, poultry, etc.

DR. AMOS W. SHELLY, Port Royal:

I know of game and poultry being destroyed by hawks, crows, foxes, skunks, and opossums.

T. S. MOREHEAD, E. Waterford:

Foxes, skunks and minks in this locality are destroying wild turkeys and pheasants when hatching.

LANCASTER COUNTY.

E. B. KREADY, Mountsville:

Have seen chicken hawks after partridges.

G. S. FRANKLIN, Lancaster:

In this vicinity there is absolutely no respect paid to the law against shooting insectivorous birds. I have even seen them exposed for sale in front of a restaurant.

DAVID L. DEEN, Lancaster:

I know of several cases where hawks have exterminated whole flocks of quail by staying around their feeding grounds and taking one at a time until the whole flock was destroyed.

JOSEPH H. BLACK, Columbia:

There are three kinds of small sparrow hawks very destructive to small birds.

H. N. HOWELL, Lancaster:

Cooper's Hawk, Sharp-shinned Hawk, Goshawk, Pigeon Hawk, Duck Hawk, Great Horned Owl and Barred Owl upon poultry, game, etc.

W. H. FENDRICK, Columbia:

Have seen instances of depredations on poultry, game and song birds too numerous to mention.

A. W. SPURRICO, Lancaster:

Saw quail's nest and female bird last summer evidently destroyed by a hawk.

LEHIGH COUNTY.

CHARLES W. GRAMMES, Allentown:

I have often seen hawks kill pheasants and rabbits, also seen minks kill rabbits.

O. R. B. LEIDY, Allentown:

Personally have seen hawks destroy game.

LOUIS N. ELLENBOGER, Allentown:

Have seen quite a number of both birds and fish destroyed by animals.

A. F. HORNE, Allentown:

Robbing of nests by malicious persons, wanton destruction by disgusted sportsmen and the depredations done by such animals as the ferret, weasel, and a few hawks.

FRANK B. SAEGER, Allentown:

The fox has killed game by the wholesale on the Lehigh mountain, such as rabbit, quail and pheasant.

JOHN T. WEILER, Allentown:

I have observed that hawks follow quail; also seen where hawks have caught rabbits.

L. B. GEIGER, Hoffman:

The mink, weasel, red fox and opossum sometimes. Also hawks and crows are sometimes seen after young chickens.

L. L. RONEY, Allentown:

Saw a fox have a pheasant that it had killed.

L. W. MAZURIE, Dillingersville:

Fox and the long-tailed hawk have done a large amount of damage here to quail, grouse, poultry, etc.

A. D. BERGER, Allentown:

Game birds by hawks.

J. B. RHOADS, Allentown:

Last fall I saw chicken hawk catch pheasant and a weasel catch a rabbit.

W. M. D. MEARS, Allentown:

Hawk devouring quail, fox devouring pheasant.

LEWIS F. GRAMMES, Allentown:

I have seen hawks destroy chickens, quail, doves, and other small birds and young squirrels, rabbits; ducks and the domestic cat destroy much fish and game in our county.

H. A. GRAMMES, Allentown:

Weasels, minks, wildcats, tame cats, and ferrets on poultry, game, etc.

M. G. ROTHROCK, Emaus:

Saw a kite and chicken hawk kill a quail and a red fox kill a rabbit.

E. P. MILLER, Allentown:

I only know of foxes killing rabbits.

LUZERNE COUNTY.

C. B. MILLER, Nanticoke:

I have come across a number of places where hawks and foxes have devoured pheasants, quail and rabbits this last open season.

JONATHAN P. LAUBACH, Fairmount Springs:

Skunks, weasels and crows do a great deal of damage in robbing hens' nests when they lay out away from buildings, and also pheasants' nests. The weasel, fox and mink kill young chickens and large ones, too. Hawks commit many depredations upon poultry, some are worse than others.

H. M. BECK, Wilkes-Barre:

Grouse and quail by hawks, weasels, skunks and foxes.

ELSWORTH L. RILEY, Ashley:

The owls, hawks, crows, foxes, cats, weasels and minks upon poultry, game, etc.

E. DANA SUTLIFF, Bloomingdale:

Have often found pheasants that had been killed by hawks, have often found where foxes have destroyed rabbits; one hunting party found where seven had been killed in one night by these animals.

PAUL A. OLIVER, Oliver's Mills:

Have seen weasel tracking and following rabbit; fox catching grouse and rabbit; hawk pursuing and catching domestic pigeons.

GEORGE R. WRIGHT, Wilkes-Barre:

Have seen foxes catching Ruffed Grouse and rabbits; hawks catching winged grouse and quail; skunks catching grouse and weasels rabbits.

M. B. WESTCOTT, Register:

The owl, fox, mink and weasel destroy rabbits, pheasant and poultry.

W. D. FRITZ, Huntingdon Mills:

I have tracked weasels when they killed rabbits and have known minks to kill young turkeys.

F. B. PARK, Fairmount Springs:

I find frequently the carcasses of rabbits killed by weasels; have often found where rabbits, pheasants and quail had been killed by foxes, and where nests had been robbed by skunks.

LYCOMING COUNTY.

R. H. GRIER, Oriole:

Chicken hawks, skunks and foxes destroying game and poultry.

GEORGE D. POST, Williamsport:

Foxes and skunks are quite destructive to grouse during nesting time.

C. W. YOUNGMAN, Williamsport:

On Little Pine creek in 1895 was a section teeming with grouse; it burned early in the spring of 1896 and in two days time was burned over, and hardly a bird was seen and they were old cocks.

AUGUST KOCH, Williamsport:

Grouse, killed by foxes; a skunk and also by red-tailed hawks; whole coveys of quail, in winter, by fox; nestings of birds taken by sharp-shinned hawks, crows, crane and black bird.

G. W. CLARK, Williamsport:

Foxes, weasels, skunks, hawks, owls and crows destroying poultry, game, etc.

C. J. DEWALT, Moreland:

I have had, as well as my neighbors, a great deal of poultry killed by foxes, minks, weasels, hawks and owls; have had poultry killed by skunks; have seen where rabbits and pheasants have been destroyed by foxes and minks and weasels by tracking them.

HENRY CODER, Williamsport:

Once saw a horned owl eating a pheasant.

C. W. YOUNGMAN, Williamsport:

Have seen grouse picked to pieces by owls and torn to pieces by foxes.

LAWRENCE COUNTY.

ARCHIBALD D. DAVIS, New Castle:

Have seen hawks killing poultry, quail and song birds.

DAVID HAMILTON, Plain Grove:

A long-tailed chicken hawk caught a quail in its talons in an open field by flying over it and taking it up as it flew.

WILLIAM ALEXANDER AND OTHERS, New Castle:

The polecat destroy eggs of poultry, game, etc.

W. L. McCONNELL, New Castle:

Hawks and owls are the only birds which prey on our game birds. I have numbers of quail killed by hawks; one instance under my observation, when I was afield my dog was pointing a covey of quail and before I could flush them, a hawk swooped down and picking a bird started off with it. Both hawks and owls are becoming more scarce and there are but comparatively few of them in our county.

LEBANON COUNTY.

JOHN G. STAUFFER, Palmyra:

Hawks destroy quail when young.

JOHN S. BRENDLE, Scheafferstown:

I have frequently noticed feathers of game and song birds lying on the ground, and the bones near to them, showing that they were killed by hawks; have seen hawks catching quail, robins, etc.

GEORGE W. ELLIS, Jonestown:

Hawks and foxes destroying poultry, game, etc.

DR. KREMERER, Lebanon:

Have seen quail destroyed by hawks and owls; also grouse killed by foxes.

P. H. REINHART, Lebanon:

Have observed foxes destroying pheasants and chickens; hawks kill partridges.

THOMAS T. LEBE, Shaefferstown:

Rabbits by weasels and quail by hawks.

E. R. ILLIG, Millbach:

I know of chicken hawks killing quail and the pheasant.

JOHN KISH and JOHN H. CILLY, Lebanon:

Hawks killing poultry, game, etc.

J. WESLEY MAZURIE, Lebanon:

I have often while hunting come across remains of quail and poultry which were destroyed by owls and hawks.

JOHN BEUSAN, Lebanon:

Have seen mink and foxes kill pheasants and partridges.

LACKAWANNA COUNTY.

W. TURNER, Spring Brook:

We have large fires here that extend over thousands of acres and destroy everything.

M. FOLEY, Mount Cobb:

The destruction in this line is incalculable.

J. F. REYNOLDS, Carbondale:

I have seen positive evidence of where rabbits and pheasants have been caught and killed by foxes.

DR. ISAIAH F. EVERHART, Scranton:

Foxes, wildcats and hawks destroy a large amount of grouse and rabbits; have frequently found when hunting where they have been killed.

J. D. MASON, Scranton:

Pigeon hawks catching quails; also where fox or wildcats have eaten grouse in the woods.

ZIBA SCOTT, Spring Brook:

Twice this winter I have driven the Goshawk off of pheasants; once he had killed it and eaten it about half up; the second time the hawk came over me and I let the pheasant go and shot him.

M. FOLEY, Mount Cobb:

I have, as well as my neighbors, lost ducks and chickens in large numbers by minks and skunks.

W. TURNER, Spring Brook:

Wildcats and foxes killing poultry, game, etc.

MERCER COUNTY.

J. A. HORNER, New Hamburg:

Have known poultry, game, etc., to be destroyed by mink, weasel, owl and hawk.

LEANDER OSBORNE, Indian Run:

Weasel destroying game, poultry, etc.

O. T. FETTERHOFF, Greenville:

Hawks destroying chickens.

S. STALLSMITH, New Lebanon:

Poultry, game, etc., destroyed by hawk, owl, mink and weasel.

C. A. JEWALL, New Lebanon:

Blue jays are most destructive to song birds and poultry;

minks and weasels destroy rabbits and game birds; have seen this in many instances.

W. V. McDOUGALL, Otter Creek:

The pigeon hawks kill young poultry and birds.

JAMES S. KENNEDY, Grove City:

Our song birds have no enemy as bad as the crow robbing nests; our game is destroyed by mink, weasel and horned owl. The greatest enemy of one of the best game birds in America, our woodcock, is the telephone and telegraph wires, as he is a night flyer and a night feeder.

C. C. McCONNELL, Milledgeville:

Minks sometimes kill our chickens.

McKEAN COUNTY.

F. K. WINSHIP, Annin Creek:

The owl, hawk, crane, crow, wild and domestic cats, mink, skunk, fox, weasel, coon, English Sparrow and Red Squirrel destroy poultry, game, etc.

C. W. DICKINSON, Norwich:

I know personally that the wildcat kills small deer, sheep and partridges, rabbits and all birds that nest on the ground; the fox destroys all the above except deer and sheep, but overreaches on poultry. Hawks and owls kill rabbits and all kinds of birds known here.

BURDETTE DICKINSON, Colegrove:

I have known of one hundred instances where hawks, owls, wildcats, foxes and weasels have killed all kinds of song and game birds, game and fish.

D. SIMPSON, Turtle Point:

Skunks and hen hawks destroying poultry, and wild cats destroying song birds.

JAMES BIGGINS, Eldred:

Foxes, weasels, hawks, minks destroying game, poultry, etc.

J. J. McCAREY, Turtle Point:

Hawks, owls, minks, foxes destroying poultry, game, etc.

A. W. COLEGROVE, Smethport:

Hawks, especially pigeon or sparrow, have an eye for all kinds of feathers. Have seen hundreds of instances of their depredations.

H. C. BANCROFT, Bradford:

Pheasants by foxes and weasels; any kind of a bird or fowl by mink, owls and hen hawks.

E. H. BARDEN, Eldred:

Fox destroying rabbits and grouse; minks destroying rabbits; hawks and owls destroying rabbits and grouse and song birds.

MIFFLIN COUNTY.

W. M. HEIMACH, Newton Hamilton:

The fox is destroying the wild turkey in this vicinity.

W. T. McEUEEN, Newton Hamilton:

Foxes, hawks, skunks, weasels and owls are very destructive on poultry, game, etc.

C. E. SHULL, Lewistown:

Have often seen, while gunning, where rabbits and grouse have been killed by foxes and hawks.

S. T. MOORE, Milroy:

In my mountain trips I often see where foxes have killed the turkey and pheasant while hatching and destroyed the nest.

HON. G. H. BELL, Lewistown:

Have seen foxes, minks and weasels destroying poultry.

JOHNSON MUTERSBAUGH, Lewistown:

I had been tracking a rabbit, and suddenly there was a small scuffle in the snow that proved to be the end of "bunny"—with the owl acting as the exterminator. I have seen a hawk chase a gray squirrel up a tree and catch him as he returned on his downward trip. Foxes and polecats destroy the nests of turkeys, pheasants and partridges.

SAMUEL SIGLER, Paintersville:

I am informed by farmers of this section that they lose chickens every year by foxes and hawks; also know of game being killed by same.

T. J. NOVINGER, Alfarata:

Foxes and minks are the principal animals; hawks and owls are also very bad among poultry and game.

DR. S. J. BOYER, Siglersville:

Owl killing hare at night; foxes killing pheasants and hens; hawks killing quail and robins.

A. T. HAMILTON, Lewistown:

Have seen poultry destroyed by minks.

J. P. TAYLOR, Reedsville:

The chicken hawk on poultry is the worst

DR. D. C. NIPPLE, Newton Hamilton:

I believe the fox destroys more game, such as turkeys, pheasants, quail, rabbits, than all the sportsmen combined.

ROBERT FORGY, McVeytown:

Have had personal observation of weasel, mink and hawk destroying poultry.

GEORGE E. CONNER, Lewistown:

Fox, owl, hawk, mink and weasel will all kill poultry, but I think while they do that they also kill a great many mice and rats that would do harm.

MONROE COUNTY.

E. E. HOOKA, JR., Mt. Pocono:

Ferrets, foxes and skunks have frequently killed our chickens.

JAMES M. ALTEMORE, Effort:

Minks, foxes, catamounts, fish hawks, cranes and Green Heron to poultry, game, etc.

H. T. FRANKENFIELD, Frutchey's:

Hunting catamounts and foxes, I have seen where they have destroyed grouse, quail and rabbits; weasels destroy the same.

DR. J. B. SHAW, Delaware Water Gap:

Foxes and skunks often found with game partly eaten.

JOHN M. NEIR, East Stroudsburg:

Snaring birds with wire:

L. D. ELLENBERGER, East Stroudsburg:

I frequently see, from their tracks in the snow, where foxes kill pheasants.

I. SELDON CASE, Tobyhanna:

I could give number of instances where foxes have killed pheasants; I have tracked them to the bird and found its bones remaining. They also kill poultry.

JOSEPH BROWN, Canadensis:

Hawks and owls destroying poultry; the weasel is the worst little animal to kill rabbits that we have.

TOWNSEND PRICE, Canadensis:

Wildcats are the most destructive of any animal in this section, killing all kinds of game, and poultry in large quantities.

J. H. GRAVES, Delaware Water Gap:

Foxes kill rabbits, young pheasants and quail.

MONTGOMERY COUNTY.

H. S. ROYER, Pottstown:

Have known hawks to clean up a covey of quail in a winter.

WHARTON HUBER, Hoyt:

Have seen several instances where the Cooper's Sharp-shinned and Duck hawks have killed birds and poultry, but they kill more vermin than anything else.

C. H. KOOKER, Flourstown:
Opossums.

HON. HORACE W. ESHBACK, Pennsbury:
Flock of quail partially destroyed, when fed by farmers during winter, by hawks.

JOSEPH C. SHOEMAKER, Blue Bell:
Skunks and opossums are our disturbers of poultry at night.

MONTOUR COUNTY.

C. W. ECKMAN, Howellville:
Pigeon hawks and nearly all hawks destroy poultry.

J. M. FORRESTER, Danville:
Pigeon hawks after poultry.

WILLIAM T. SPEISER, Danville:
Foxes will catch rabbits, quail, pheasants and poultry, weasels and red squirrels will rob the birds' nests while hatching.

NORTHAMPTON COUNTY.

B. FRANK REDINGTON:
Foxes, minks and hawks after poultry, game, etc.

THOMAS RICHARDS, Easton:
Hawks and crows destroy birds' nests.

BASIL G. BRASSINGTON, Easton:
Have seen hounds worrying and killing young rabbits during the summer.

HARRY C. RANDOLPH, Easton:
Hawks kill a great number of quail in winter; have seen them eating them; foxes, minks and weasels kill pheasants and rabbits.

J. L. FULMER, Easton:
Hawks kill lots of quail in winter; foxes, minks and weasels kill pheasants and rabbits. Have seen places where hawks have caught and eaten quail.

J. E. MESSINGER, Stone Church:
Hawks, foxes and fish hawk on poultry and game.

JONATHAN PETERS, Edelman's:
By skunks, minks and weasels destroying poultry, etc.

T. L. REIGEL, Freemansburg:
The mink, raccoon, skunk and hawk on poultry, game, etc.

H. A. SANTEE, Moorstown:

The hawks and owls are mean enough for anything, and so is the mink and fox.

J. J. EALER, Morgan's Hill:

I have seen chicken hawks catch birds and partly grown chickens. In my chicken house a year ago a weasel killed seven ducks about one-third grown, in one night. I have seen the common house cat kill, on many occasions, small rabbits in the field.

JOHN C. SNYDER, Middaghs:

Hawks, large owls, foxes, skunks, opossums, raccoons, minks and weasels are alike destructive to poultry and game.

E. B. MARKS, Easton:

An everyday occurrence.

W. G. BERCAW, Easton:

Hawks killing poultry, etc.

JAMES A. HARPER, Ackermanville:

Red squirrels robbing birds' nests; crows robbing nests and skunks robbing quail, pheasants' nests, etc.

GEORGE R. GROINS, Easton:

Find game, etc., torn to pieces; done by owls, hawks or foxes.

NORTHUMBERLAND COUNTY.

EZARIAH YOCUM, Bear Gap:

I have seen where rabbits and quail have been killed by owls; saw the track of the owl in the snow.

B. B. SMITH, Shamokin:

Have known gray and red fox to destroy eggs and young of pheasant.

J. W. BARTHOLOMEW, Sunbury:

Have seen hawks strike pheasants.

S. A. PECK, Northumberland:

Hawks do us more harm than hunters, as they hunt continually.

PERRY COUNTY.

E. A. SHEARER, New Germantown:

I have seen at the entrance to a fox den feathers of partridge, pheasant and wild turkeys, tame turkeys, chicken feathers and fur of rabbits. In this community foxes have become so bold as to come to the farmer's barn for chickens. I also know of wildcats killing the tame and wild turkeys in this township.

S. A. GUTSHALL, New Germantown:

I have known hawks, owls and foxes to destroy poultry and song birds.

R. M. ALEXANDER, D. D. S., New Bloomfield:

I have known hawks to fall upon a flock of quail until the last one was gone. Have frequently found the remains of pheasants destroyed by foxes and other animals.

PIKE COUNTY.

G. McKEAN, Shohola:

In hunting I saw where one wildcat caught three pheasants, and in going one-half mile further on I shot him with one in his mouth.

C. P. MOTT, Milford:

Had fox steal wounded grouse from before me before I reached it; tracking snow told the story; another occasion knew fox to catch rabbit that was being run by dog; dog took up the fox tracks and gave him a long run; fox did not give up the rabbit. Knew case where fox running before hound caught a grouse and carried it to hole; know cases of weasels destroying eggs in nest of grouse.

GEORGE SAWYER, Mill Rift:

Have seen in snow where numerous pheasants or Ruffed Grouse have been caught by foxes; rabbits also meet the same fate, as is easily seen by going through woods after a light snow; weasels are very destructive to rabbits. Have found hundreds of rabbits that had been killed by weasels.

I. W. CHAMBERLAIN, Rowland:

Have seen that a great many song birds are caught by the pigeon hawk, and poultry by the common chicken hawk.

GEORGE ANSLEY, Paupac:

Foxes are very destructive to turkeys and chickens.

CHARLES L. HELLER, Bushkill:

I have seen the feathers where foxes have destroyed pheasants; have seen in the snow where foxes have pursued rabbits and caught them. I have picked up both pheasants and rabbits killed by weasels.

R. VAN GORDAN, Dingman's Ferry:

The Wildcat kills more birds and young rabbits than all animals put together.

PHILADELPHIA COUNTY.

JOHN C. SHALLCROSS, Frankford:

On our farm we lost one hundred and thirty-two young chickens last spring, and I believe it was done by one weasel, as no more were killed after we caught him.

HON. MAHLON L. SAVAGE, Frankford:

In Luzerne county I have observed that the Great Horned Owl is very destructive to Ruffed Grouse, and in York county I have seen where Cooper's and Sharp-shinned hawks have destroyed quail and poultry.

HORACE ALBRIGHT, Girard Building, Philadelphia:

I have seen the chicken and pigeon hawks catch birds of different kinds.

POTTER COUNTY.

E. O. AUSTIN, Austin:

I have known owls to catch pheasants in winter snows; hawks catch poultry and song birds; rabbits are caught by weasels and wildcats, but most of these are good mousers, and insects and larvae are their principal food, with snakes and other reptiles; the house cat eats many song birds.

F. N. NEWTON, Shingle House:

Have seen several instances where grouse were destroyed by the Cooper's Hawk; also could name three instances where rabbits were killed by foxes.

DR. S. A. PHILLIPS, Coudersport:

Pheasants and woodcock, destroyed by hawks, owls, wildcats and foxes.

J. S. HULL, Conrad:

Have seen a number of instances where partridges have been killed by owls and foxes.

WILLIAM ARNOLD, Harrison Valley:

Skunk and weasel catching poultry, etc.

A. S. HECK, Coudersport:

Have many times seen places where Ruffed Grouse and rabbits have been killed by some kind of animal.

N. M. GLASSMIRE, Coudersport:

Have seen depredations committed by Fish Hawk and all kinds of hawks, all kinds of owls, fox, mink, wildcat, muskrat, coon and bear.

GEORGE A. FARNSWORTH, Ulysses:

Have noticed the fox destroying young rabbits.

DR. E. H. ASHCRAFT, Coudersport:

The Sparrow Hawk kills many song birds; large hawks take small poultry.

SULLIVAN COUNTY.

J. W. AUMILLER, Eagle's Mere:

I have had as high as forty or fifty chickens taken in one season by hawks.

R. W. WRIGHT, Eldredsville:

I had eight hens killed last fall by mink; have had hens killed at other times by the same animal.

E. S. CHASE, Eagle's Mere:

Have seen Fish Hawks in our lake killing lake trout and bass.

FRANK HANNAN, Forksville:

Have had seventeen hens killed in one night by minks, and many times six to eight at a time; foxes are death on rabbits and pheasants; owls are destructive.

E. J. STURDEVANT, Forksville:

I have seen foxes with pheasants, rabbits and song birds in their mouths; hawks kill pheasants and gray squirrels, and skunks all kinds of song birds.

H. B. KILMER, Shunk:

Wildcats kill young deer and rabbits; foxes, weasels and minks kill rabbits, pheasants and poultry.

MAYNARD J. PHILIPS, Muncy Valley:

Hawks, weasels, skunks, owls destroy poultry, game, etc.

FRANK W. BUCK, Dushore:

My dog retrieved two pheasants last season in less than one hour that a hawk had killed, full-grown birds; they just had the back part of the head eaten away and were still warm.

JOHN CORCORAN, Overton:

Fish hawks, blue hawks, hen hawks and foxes.

CARL F. HESS, Piatt:

Hawks, foxes and skunks, destroying poultry, etc.

J. L. NOAGLAND, Lincoln Falls:

Have seen hawks catching poultry many times.

H. W. OSLER, Lincoln Falls:

Foxes, minks, wildcats, destroying game, poultry, etc.

SOMERSET COUNTY.

W. H. H. BAKER, Trent:

Hawks kill pheasants and quail; foxes destroy pheasants and quail.

H. STEWART BOUCHER, Glade:

In traveling through woods I have frequently found pheasants and rabbits that had been killed by foxes and hawks.

JEROME STOFFO, Jenners:

Hawks are very destructive to pheasants, chickens and small birds, as all our farmers will testify.

WILLIAM ZREFALL and J. P. CASSELMAN, Somerset:

Chickens and rabbits by foxes, minks, and skunks; song birds by hawks.

J. P. BARCLAY, Bakersville:

Have known skunks, weasels and minks to go to barns and hen coops and kill poultry until caught and killed, and have known foxes to catch young lambs and carry them off.

HAY & HAY, Attorneys-at-Law, Somerset:

Pigeon hawks are very destructive to song birds; red fox is destructive to poultry.

DR. H. D. MOORE, New Lexington:

I see the Sharp-shinned Hawk destroy song birds every summer. Have knowledge of much poultry being destroyed by skunks and minks.

JOSIAH PILE, Barronvale:

The Sharp-shinned Hawk, owl and the mink have destroyed poultry to my knowledge.

F. K. MOORE, Trent:

My own and neighbors' poultry by foxes, skunks, minks and weasels.

SUSQUEHANNA COUNTY.

WILLIAM D. TURRELL, Birchardville:

Poultry by skunks and foxes.

JAS. M. KELLY, Montrose:

Have seen weasel and mink kill chickens, young turkeys and destroying partridges' nests. Hawks carry off grouse while fighting for their young, and foxes' habitations filled with skins of rabbits and grouse feathers.

W. OSTERHOUT, Harford:

Many instances by owls, hawks, foxes, minks, weasels and wildcat destroying poultry, game, etc (not barn owl.)

H. S. ESTABROOK, Harford:

February 27.—Saw to-day where an owl caught a rabbit and ate it, but instances are too numerous to especially mention.

G. C. HOWELL, New Milford:

Have found game birds and rabbits killed by foxes and owls.

A. B. BURNS, Montrose:

Foxes and owls destroying poultry, game, etc.

JAMES D. MACK, Lathrop:

Poultry destroyed by crows, skunks and foxes.

S. S. THOMAS, Lynn:

Have observed depredations committed by foxes, minks and weasels; other predatory animals are birds, and they do some good.

CHARLES A. MAIN, South Montrose:

Mink, weasel and skunk, on poultry, game, etc.

J. R. BEEBE, Montrose:

Have seen plenty of cases where foxes, minks, weasels and hawks had killed and eaten partridges, rabbits and poultry

E. M. SAFFORD, Montrose:

Skunks frequently make havoc with nests and young chicks; hawks and owls occasionally take a chicken, but farmers will invent their own means to drive them off, and they destroy ten mice to every chick.

SNYDER COUNTY.

J. G. SEILER, Selinsgrove:

It has come under my observation where the skunk had destroyed whole nests full of pheasants' eggs.

M. Z. STEINNIGER, Middleburgh:

In the last few years I know from personal observation that quail, whole flocks, from fourteen birds down, have been destroyed by hawks. When the snow comes that is what they seem to live on. Have seen where rabbits have been taken up by them, by the tracks in the snow, could see where the wings struck and a few hairs and drops of blood.

JOHN P. FISHER, Lowell:

This sheet is not large enough to hold all personal observations and instances where I have seen where game and poultry have been destroyed by the fox, mink, and weasel, all speices of hawks and all owls (except the Barn Owl). As you go traveling through the woods, you see where a sly fox destroyed a pheasant or a rabbit; a little further on another; here and there in the fields you can see where a fox has feasted on a quail. I say put a bounty on the above named and rid the country of them and the game will soon increase.

F. J. WAGENSELLER, Selinsgrove:

Know of a fox catching a turkey hen on her nest in the field and carrying her off; have seen their tracks in the snow where they caught rabbits; also pheasants. Saw a weasel once catch a quail; also saw one have possession of a full-grown rabbit.

SCHUYLKILL COUNTY.

H. D. ROEDER, Lock Haven:

Opossum, hawks and owls destroying game, poultry, etc.

H. F. DEIBERT, Cressona:

I know a fox to have killed three pheasants and seven rabbits in one night, and have chased him for four years, and he is still at liberty.

W. L. BRYANT, Schuylkill Haven:

Have found flocks of partridges destroyed by foxes.

F. C. PALMER, Schuylkill:

Frequently have noticed where foxes have killed grouse and rabbits in the snow; have noticed many cases in my twenty years of shooting experiences.

WILLIAM A. COCKILL, Lewellyn:

Hawks, minks, weasels and foxes have to live 365 days in the year on what they can catch; the damage they do is evident. Have seen hawks catch chickens and pigeons, song and game birds; also many evidences where foxes, minks and weasels caught rabbits in the snow.

TIOGA COUNTY.

M. V. JACKSON, East Charleston:

The fox gets our pheasants and the skunk our poultry.

C. H. WATROUS, Marshfield:

Have seen young chickens and birds taken by small hawks; wildcats and foxes take many hares and partridges.

JAMES VANDERGRIFT, Stony Fork:

Pheasants by foxes; minks and weasels destroy rabbits and squirrels; wildcats catch deer, pheasant and rabbits; raccoons kill young game.

A. B. DOAN, Little Marsh:

Hawks, owls and weasels destroying poultry, game, etc.

F. C. FIELD, Balsam:

I believe nearly all the owls and hawks will at times attack birds and small game, but they do more good than harm by catching mice.

F. B. SMITH, Tioga:

Fall of 1896, know of two Ruffed Grouse, full grown, killed by foxes.

W. C. BABCOCK, Blossburg:

The destruction caused by the fox, mink, skunk and weasel are too common.

C. E. GRAHAM, Lorenton:

Foxes, minks, skunks, hawks, owls destroying poultry and game.

J. M. WHITCOMB, Ogdensburg:

Skunk, fox and coon, on game, poultry, etc.

W. W. SEAMAN, Nauvoo:

Many instances to poultry, game, etc.

D. THOMPSON, Wellsboro:

Hawks are the most destructive to poultry, game, etc.

C. A. KENNEDY, Morris:

In May, 1896, I was going up Long Run on the log train, when I saw a fox not ten feet from the track jump into a brush heap, and when he raised up he had a partridge in his mouth. Upon investigation I found a nest with twelve eggs in it, and have often seen in the woods where foxes and catamounts have caught partridges and rabbits.

W. WAGNER, Academy Corners:

I have seen hawks kill song birds; one species, I think the long-tailed chicken hawk, destroys the young partridges.

W. E. CAMPAIGN, Wellsboro:

Have seen hawks catch song birds, and have seen in snow where foxes caught grouse.

W. WAGNER, Academy Corners:

In the summer of 1894 a fire burned about three thousand acres of land. This destroyed the game in that section. It was caused by a man burning a yellow jacket's nest. It destroyed several thousand dollars' worth of property.

VENANGO COUNTY.

H. C. DORWORTH, Oil City:

The foxes in this neighborhood are the greatest enemies of the grouse. I saw where, during a period of four weeks, eight grouse had been caught and eaten by the same old fox in one cove of about one hundred acres. I tracked him to his hole and tried to shoot him at different times; he was finally killed. This was very near Oil City. If the other foxes do as well on full-grown birds, you can imagine what they can do on young birds in the early summer. You cannot go a mile from here without crossing fox tracks.

R. G. LAMBERTON, Oil City:

Frequently find the remains of grouse and rabbits partly eaten by foxes and chicken hawks.

JOHN A. WILSON, Franklin:

Have shot a number of hawks, and each one was just at a meal of grouse.

WARREN COUNTY.

AL. ALBAUGH, Tidioute:

Weasels, minks, foxes, polecats, hawks, owls and raccoons destroying poultry, game, etc.

ELI S. KELLER, Warren:

I find in my hunting that minks, weasels, foxes, wildcats, owls and hawks are very destructive.

J. H. WILKINS, Cherry Grove:

Hawks, skunks, 'coons and weasels destroying poultry, etc.

F. F. WELD, Sugar Grove:

Rabbits killed by fox and mink, poultry by hawks, brooding partridges greatly pestered by foxes.

H. B. BLANDING, Barnes:

I have known of red squirrels taking small birds, skunks will take eggs from under a pheasant, and sometimes the pheasant, too; owls killed four of my hens in one night, and a skunk took ten young chicks of mine in one night also.

W. S. PEIRCE, Warren:

Frequently see during the early snow in the winter a bunch of grouse feathers on the snow with fox or wildcat tracks leading from them; eggs broken in the spring with the odor of the skunk still about the nest.

RICHARD B. STEWART, Warren:

Hawks killing young grouse and rabbits; foxes and wildcats leave nothing but the feathers.

W. P. HUNTER, Warren:

Hen hawks and fish hawks destroying game, poultry, etc.

T. J. H. IRWIN, Warren:

Poultry by owls and hawks.

E. D. EVERTS, Corydon:

Last fall I shot two fish hawks in the act of taking fish. I also shot about twelve kingfishers.

WASHINGTON COUNTY.

NORWOOD JOHNSTON, Canonsburg:

To see a hawk in this county is a sure sign that there is a covey of quail in the vicinity.

CHARLES G. McILVAINE, Monongahela:

Fox, hawk and owl are very destructive to quail, pheasant and rabbit. I have found feathers and tracks, and observed where large numbers of quail had been destroyed. The salt and sulphur water from mines hurt the fish.

J. T. PARKINSON, Sparta:

I believe the telephone and telegraph wires destroy more song birds than any other cause.

GEORGE MONTGOMERY, Washington:

The oil industry has been the cause of killing most of our fish in this section.

WAYNE COUNTY.

T. C. MADDEN, Newfoundland:

Chicken hawk, fox, mink and polecat destroying poultry, game, etc.

GEORGE M. DAY, Dyberry:

Mink in former years was very destructive to poultry, wildcats very destructive to rabbits; no personal loss in past two years. Higher prices for minks' fur have reduced their number to a minimum; wildcat fur very low, twenty to fifty cents, and they may increase in number unless bounty is raised.

TUNIS SMITH, South Sterling:

Have seen where pheasants, rabbits and birds have been killed by cats, foxes, skunks, minks and hawks.

WESTMORELAND COUNTY.

S. V. SPROUL, Derry Station:

Can give information to quail killed by minks; have seen many cases.

G. B. STRIPE, Bradenville:

Mostly by boys and foreigners.

J. B. FRY, Welty:

Rabbits killed by weasels and owls; poultry by weasels, and rabbits by polecates; song birds by hawks and English sparrows.

A. B. HABERLIN, Lycippus:

I have seen many rabbits killed by the night owl, many young birds killed by the crows, and nests and eggs destroyed; have seen many killed by fox and mink.

R. H. BUSH, Paulton:

Have seen hawks and foxes carry off young chickens and kill old ones.

J. F. HANGER, Donegal:

I have seen game fish, poultry and song birds destroyed by the pigeon and chicken hawk, owl, fox, mink and weasel.

JOHN Y. WOODS, ESQ., Greensburg:

Have often seen the evidences of pheasants and quail destroyed by hawks.

W. P. DIXON, Livermore:

Hawks, owls and foxes destroying game, poultry, etc.

HON. J. C. CAMPBELL, Derry Station:

I find the mink, weasel and the domestic cat are very destructive of rabbits, pheasants and quail when young.

JOS. M. CAHN, Derry:

I have seen chicken hawks kill quail and frequent cases where foxes have killed pheasants.

GEORGE F. AUSTRAW, Millwood:

Polecat, mink, weasel and fox destroying game, poultry, etc.

HON. AMOS TROUT, Armhurst:

Hawks and owls kill birds often in hard winters; the worst enemy to fish is the seine.

WYOMING COUNTY.

HENRY YOUNG, Centremoreland:

Foxes destroy more poultry, rabbits and pheasants than are sent to market.

O. O. BARNES, Lovelton:

Cannot raise ducks, geese or turkeys where I live; lose at least half our chickens; hawks take the chicks, and owls, minks, wildcats and raccoons take the birds when large enough to roam the fields and woodlands. I lose twenty-five to fifty young chicks every year, and have lost as high as thirty two-thirds grown turkeys in one season by minks, owls and 'coons.

C. A. OTTER, Bellasylva:

I have often seen hawks catch birds, and I saw an owl catch a large squirrel on a birch tree at midday.

T. D. SCHANTZ, Ricketts:

Have seen fox have a white rabbit.

E. D. ROBINSON, Forkston:

Saw tracks in snow where a wildcat caught one of my sheep; saw weasel killing poultry; saw were mink killed poultry and rabbits. Have frequently seen hawks carrying off poultry; owls are sure to get some of my poultry if they roost in the trees.

J. T. KETCHLEDGE, Tunkhannock:

The hawk, owl and fox are very destructive to every kind of game and fish, and also to poultry and song birds.

YORK COUNTY.

J. G. PATTERSON, Stewartstown:

I have had eighty chickens killed by minks in two successive nights; also eighteen young goslings in one night by minks, and many young ducks. Many of my neighbors have suffered from the depredations of minks, weasels, foxes and skunks.

CHARLES INES, York.

Have personal knowledge of hawks killing a whole covey

of quail during winter months, and hear such reports from all over country.

HON. GERARD C. BROWN, Yorkana:

The crow, jay, polecat and 'possum; also the blacksnake eat the eggs of birds; the hawk, weasel, fox and some owls eat the birds.

A. C. KRUEGER, Wrightsville:

The so-called pigeon hawk has come under my notice on several occasions as a poultry destroyer.

W. H. BURNHAM, York:

Quail by hawk.

MARSHALL F. JONES, Slate Hill:

I often see the carcasses of rabbits and the remains of the nest of quail, with eggs strewn around, which, in nine-tenths of the cases, was done without a doubt by the worthless crows which infest this community.

WHAT FARMERS SAY OF THE CROW.

In reply to the question, "Do crows commit serious damage to poultry in your locality by stealing eggs and catching the young of domestic fowls?" answers were received as follows:

ADAMS COUNTY.

DR. C. E. GOLDSBOROUGH, Hunterstown:

Yes, they are the most destructive of all birds, and cause more loss than all the other birds and animals combined. They are more audacious than hawks, and by hatching in our woods, "are always with us."

PETER THORN, Gettysburg:

Yes.

E. MORRIS BUSHMAN, Gettysburg:

Yes, they are very bold while raising their young; after that they cause no trouble.

L. W. LIGHTY, East Berlin:

No, I was largely in the poultry business for years, and the crow never did any damage to me worth mentioning. They are useful birds to the farmers. Of this I am sure from observations.

ROBERT H. CURRENS, Gettysburg:

Yes.

AARON J. WEIDNER, Arendtsville:

No serious damage; they often carry off little chicks.

C. L. LONGSDORF, Flora Dale:

Not where the poultry is properly cared for. Crows and blackbirds are destroyed only by persons who are too ignorant to recognize their friends.

W. H. BLACK, Flora Dale:

Crows commit some damages as indicated, but when we fire some blank shots when they appear too audacious, they keep off and are little trouble thereafter.

THEO. McALLISTER, Barlow:

The crow is one of the worst enemies to profitable poultry industry; they steal eggs and also young chicks.

R. WILLIAM BREAM, Gettysburg:

Yes; most emphatically.

ALLEGHENY COUNTY.

HON. JAS. M. B. ROBB, Oakdale:

No.

J. S. KEEFER, Braddock:

No; it is a rare sight to see a crow. I do not think I have seen one this spring.

ARMSTRONG COUNTY.

W. R. RAMALEY, Cochran's Mills:

Yes, but I think the good they do will overbalance the harm.

W. M. JACKSON, Kittanning:

Not much.

JACOB FISHER, Atwood:

Some times they steal a few eggs and pull a little corn, yet I think they are of benefit to the farmer by gathering worms and larvae that destroy our crops and small fruit.

BEAVER COUNTY.

HON. IRA MANSFIELD, Beaver:

Yes, very limited.

BRADFORD COUNTY.

J. W. KETCHAM, Minnequa:

No.

A. T. LILLEY, LeRoy:
No.

BLAIR COUNTY.

GEORGE M. PATTERSON, Williamsburg:
Very much.

FRED. JAEKEL, Hollidaysburg:
No.

HENRY S. WERTZ, Duncanville:
I have known them to carry away hens' eggs and young chicks.

BERKS COUNTY.

OLIVER D. SCHOCK, Hamburg:
The aggregate loss is not heavy. Years ago the loss was much greater.

FRED. B. HOSSLER, Hamburg:
Yes, but at the same time feed on grubs .

GEORGE D. FAHRENBACH, West Reading:
They destroy all the eggs in nests outside of building and catch young poultry.

JAMES MCGOWAN, Geiger's Mills:
Yes, they do; also many a farmer loses a corn crop by the crows pulling the corn out about the time it comes up; they are getting too plenty.

A. M. YOUNG, Womelsdorf:
They do.

FRANK B. BROWN, West Leesport:
Only with farmers or poultry raisers living near the Blue Mountains, or near some forest. In rare cases, isolated farms that are not near a woods are troubled in this way.

R. W. SCHERER, Manatawny:
No.

A. H. ADAMS, Jacksonwald:
Yes.

HENRY A. MILLER, Shoemakersville:
Yes, especially eating eggs and catching young chicks.

M. D. HUNTER, Stony Creek Mills:
No, not to my knowledge.

CYRUS T. FOX, Reading:
They are somewhat destructive, but compensate therefore by devouring insect pests.

CHARLES AMMARELL, Reading:

They do not.

BEDFORD COUNTY.

J. W. SMITH, Yellow Creek:

Very little; the most trouble we have with them is pulling up the young corn.

DAVID HOLDERBAUM, Bedford:

Not serious.

C. J. POTTS, Bedford:

Yes.

BUCKS COUNTY.

HON. EASTBURN REEDER, New Hope:

Crows are quite troublesome at times, stealing eggs, eating young chickens and pulling up corn.

JAMES L. BRANSON, Langhorne:

Not much.

H. W. COMFORT, Falsington:

Crows annually destroy many young chickens.

ASHER MATTISON, New Hope:

No.

LOUISE D. BAGGS, Bristol:

No.

HARRY E. GRIM, Perkasio:

No.

CLEARFIELD COUNTY.

SAMUEL HALL, McGee's Mills:

Crows do no harm to poultry in this county; the worst harm they do is to corn and grain fields.

W. S. GREENE, DuBois:

I have never known them to do so; crows are apparently becoming scarcer year after year.

HARRISON STRAW, Kermmoor:

The crows carry off a few chickens, but not many.

FRANK G. HARRIS, Clearfield:

Yes.

CARBON COUNTY.

G. T. WELLS, Rockport:

About the only damage crows do in this locality is in corn

fields; in the spring they pull up the corn and in the fall they destroy a great deal before it is harvested, and my opinion is they do more damage than they do good.

E. BAUER, East Mauch Chunk:

No.

CHESTER COUNTY.

FRANCIS JACOBS, West Chester:

Yes, they are a direct enemy to the farmer, damaging the corn crops to a great extent, and should be exterminated.

ALEXANDER HODGSON, Cochranville:

It occasionally takes eggs; they are decent birds compared with the sparrow.

JOSIAH HOOPES, West Chester:

Yes, far more damage than all the hawks, and yet he is exceedingly beneficial to the farmer.

JOHN H. HICKS, Avondale:

The crow will take the eggs of any fowl that don't have a protected nest away from buildings, and will carry off a good sized young chicken, turkey, etc.

W. H. BRINTON, Atglen:

It has been my experience that the crow does little damage, except in fields of corn that are late being harvested.

JOHN L. BALDERSTON, Kennett Square:

They do much damage in this way.

EDWARD NORRIS, West Chester:

Yes, they do; they are great robbers, of more than ordinary cunning, and will steal the eggs and young of nearly all birds as well as poultry. They are particularly hard on guinea fowls who have stolen their nests away from the barn buildings.

JOS. S. WALTON, Ercildoun:

No.

HARRY WILSON, Gum Tree:

Yes, much damage to turkeys and guinea fowl raisers. Have seen crow sit on stake of worm fence and wait for turkey hen to lay, and to follow guinea fowls about until laying time to ascertain the location of nest, and as they cannot break a guinea egg with bill, they catch it in claws, fly up and drop it on fence or hard ground to break it. Have seen crows eat four young chickens in succession; they are very bold and rapacious.

SAMUEL MARSHALL, West Chester:

Carry off a few young chickens and an occasional egg from nests in field, etc.

AUGUSTUS BROSIUS, Avondale:

Only occasionally does damage of this kind occur.

E. INGRAM, West Chester:

Sometimes a pair of crows having a nest near are troublesome to young chickens, but they readily fall a victim to a poisoned egg.

WILLIAM H. SHARPLESS, West Chester:

They do not.

R. F. COCHRAN, Cochranville:

Yes.

J. HIBBERD BARTRAM, Milltown:

They do considerable damage, particularly in catching young poultry; have lost several this spring, but have shot some of the crows.

S. E. PASCHALL, West Chester:

No; some complaints, but not many.

ADDISON L. JONES, Principal West Chester High School:

No.

I. FRANK CHANDLER, Toughkenamon:

They take eggs when laid from the buildings and destroy young poultry.

FRANK L. BURNS, Berwyn:

Not when properly looked after; when nesting in the open or wandering with small young in or near woods, it is a common occurrence to lose eggs and young frequently, but it is not always traceable to crows.

THOMAS SHARPLESS, West Chester:

Crows seldom molest my poultry, but are quite destructive to our native song birds by stealing the eggs from the nests.

DR. JOHN R. EVERHART, West Chester:

Have known crows to catch small chickens; also to take the eggs of other birds.

H. F. LEISTER, Superintendent of Schools, Phoenixville:

Yes.

CLINTON COUNTY.

W. A. SNYDER, Salona:

Rarely.

B. F. FLETCHER, Lock Haven:

No; they do not come into town, but in the country they steal eggs when possible.

DAVID MAPES, Beech Creek:

Crows have taken not less than fifty chickens from us this season, and two-thirds of the first laying of eggs from eight turkeys, six or seven dozen, and several young turkeys, besides pulling up corn to the amount of nearly an acre, which had to be replanted.

CENTRE COUNTY.

WILLIAM H. MILLER, Secretary Logan Grange, No. 109, Bellefonte:

They get away with all the eggs they can find, but do not interfere with the chicks. When my seed corn is coming out of the ground (I sow corn along the fences in the corn field), then they hunt for the cut worm and do not interfere with the planted corn.

CLARION COUNTY.

FRANK KELL, Kingsville:

They are somewhat addicted to catching young chickens and stealing eggs; are more shy than the hawk.

A. G. DAVIS, Clarion:

No.

ED. M. McEUTIRE, Frampton:

They do not.

CAMBRIA COUNTY.

DR. I. MANCHER, Carrollton:

No.

W. R. THOMPSON, Ebensburg:

No; not to any extent.

LEIGHTON ROWLAND, Vetera:

No.

CRAWFORD COUNTY.

HARRY C. KIRKPATRICK, Meadville:

Live in town, so have not seen them, but that they do sometimes, I know to be a fact, being told by farmers, and I have seen them destroying the nests and eggs and eating the young of wild birds.

JAMES TURNER, Meadville:

No.

MRS. J. R. HEAD, Saegerstown:

They do not.

J. M. BIDDLE, Saegerstown:

To no great amount; think they do as much good as harm in catching mice and grasshoppers.

W. H. SEWARD, Rundells:

No.

A. A. GALLUP, Dicksonburg:

No.

GEORGE T. WRIGHT, Meadville:

Have never known a crow to molest poultry. Formerly they were considered pests, but they have ceased to trouble poultry raisers in this immediate vicinity.

GEORGE SPITLER, Mosiertown:

Not much, only on small birds.

COLUMBIA COUNTY.

PROF. J. P. WELSH, Bloomsburg:

Not serious. They do steal some eggs and chicks; have noticed they are very likely to steal turkey eggs, as turkeys nest away from buildings.

HON. EDWARD M. TEWKSBURY, Catawissa:

Not very much; some crows do, however, destroy many of the nests of robins, orioles, etc. Let every man be a "law unto himself" as far as crows. Outlaw the hawks, etc., and let a bounty be put on their heads; hawks never die, but like Williams' cat, "must be shot." Hawks do not propagate rapidly, hence killing a few ends the chapter.

DR. McCREA, Berwick:

To some extent, but not seriously.

CUMBERLAND COUNTY.

HENRY S. RUPP, Shiremanstown:

No, crows do little damage to anything.

DAUPHIN COUNTY.

E. C. BRINZER, Middletown:

They catch young poultry when they get an opportunity.

ERIE COUNTY.

O. D. VAN CAMP, Girard:

They do but little damage in or about towns, but in the country I have known them to destroy many eggs and chickens.

ROBERT DILL, North East:

No; I think crows do more good than harm.

F. E. FENTON, North East:

No.

W. W. DERBY, Erie:

Never heard of any injury being done by crows in the manner named.

J. C. THORNTON, Avonia:

They dig up corn.

J. C. CAMPBELL, North East:

No.

C. W. PAGE, North East:

No.

FAYETTE COUNTY.

DR. LOUIS ARENSBERG, Heisterstown:

Crows steal eggs whenever they get a chance; they seldom take young chickens; the corn fields suffer more than the poultry.

FULTON COUNTY.

CLEM. CHESTNUT, Hustontown:

Yes.

FRANKLIN COUNTY.

HON. W. W. BRITTON, Upper Strasburg:

Not very serious. I do not believe all crows steal eggs and young fowls. I think there are certain individual crows that are expert in the business.

CHRISTIAN W. GOOD, Waynesboro:

They steal some eggs and sometimes take quite young peeps, but they are so easily scared off and kept away that I am rather inclined toward saying that the matter is not very serious.

H. B. CRAIG, Welsh Run:

Yes.

W. S. REED, Altenwald:

They do.

HUNTINGDON COUNTY.

E. B. HARENEAME, Norrace:

Sometimes.

GEORGE W. OWENS, Birmingham:

Not as a rule, yet occasionally a crow will learn the trick of stealing eggs and little "peep" chickens. If you succeed in

killing him that is the end of it. There is a certain hawk which is a very bad enemy to poultry.

J. PETER SNYDER, Huntingdon:

They mostly steal eggs.

INDIANA COUNTY.

P. M. HODGE, Blairsville:

Not serious; occasionally commit slight depredations; black-birds drive away crows.

A. M. HAMMERS, Indiana:

No.

HARRY LEARN, Cookport:

The crow is one of the most destructive birds in our locality at the present day; he destroys more corn in one day than would feed a thousand sparrows in one month.

I. D. SPICHER, Hillsdale:

They very often steal the eggs and young chicks.

JEFFERSON COUNTY.

EMMA C. McGAREY, Stanton:

No; they are no trouble, only as they bother the corn when coming through the ground.

H. C. HIMES, Centert:

Considerable.

JOHN H. JOHNS, Brookville:

No.

JUNIATA COUNTY.

S. E. RHINE, Pyleston.

Yes.

JEREMIAH KELLER, Mifflintown:

No crows are about here, but in the townships they very frequently catch and carry off the young of domestic fowls.

WELLINGTON SMITH, Mifflintown:

Yes, they do more to depopulate our native birds than all other agencies combined. Before the sparrow came the native bird was finding shelter near the dwelling; now there is no hope. Both the crow and the sparrow are great destroyers and ought to be exterminated if this is possible.

WILLIAM A. THOMAS, Mifflintown:

Yes.

H. C. HOWET, Mifflintown

They do serious damage to poultry; are noted for their fond-

ness for eggs, whilst they also carry off a great many young ducks and chickens.

J. W. MILLIKEN, Honey Grove:
They do.

DENNY M. MARSHALL, Walnut:
Yes.

SAMUEL SCHLEYD, East Salem:
Yes.

G. S. LUKENS, East Salem:
They do.

H. J. SHALLENBERGER, McAllisterville:
They do some damage.

J. W. McCAHAN, Walnut:
No.

J. C. LAUTZ, Thompsontown:
Yes.

W. P. BELL, Reed's Gap:
Yes.

LANCASTER COUNTY.

A. BOWMAN, Marietta:
No.

MONTILION BROWN, Wakefield:
Takes occasionally a few eggs and small chicks, but he is easily scared; a few shots will keep him at a distance.

JOHN CREADY, Mount Joy:
Yes, very much.

HON. JOHN H. LANDIS, Millersville:
No serious damage, to the best of my knowledge.

W. P. BRINTON, Christiana:
In a few instances, yes.

P. S. REIST, Lititz:
Crows are considered injurious to places where they can steal eggs and catch young chickens.

WILLIAM M. MAULE, Collins:
During nesting season, especially when they have young, crows do carry off a considerable number of young chickens and eggs.

GEORGE CRANE, Mountville:
Yes.

E. B. ENGLE, Marietta:

No.

H. JUSIN RODDY, Millersville:

No, except in more rural districts.

J. G. RUSH, West Willow:

No.

JOHN H. EPLER, Elizabethtown:

Not here in town, but close to their breeding places they are bad.

LACKAWANNA COUNTY.

DR. I. F. EVERHART, Scranton:

Occasionally he is a marauder, but his many good traits overbalance all the mischief he may do to early corn and in the poultry yard.

LEBANON COUNTY.

J. L. LONG, Richland:

They steal all the young chicks and eggs they can get.

JOHN W. SNOKE, Annville:

Yes, much havoc is committed by this bird.

H. C. SNAVELY, Lebanon:

The crow certainly has an appetite for eggs and spring chickens; their depredations would be serious if not restrained. About this time (April) it is not well to be too familiar with his crowship. A shot gun has a restraining influence.

LEHIGH COUNTY.

W. B. K. JOHNSON, Allentown:

I do not raise poultry. Some years ago, when with my father, I know crows took eggs, but do not remember that they disturbed the young chickens.

ALVIN RUPP, Allentown:

No.

LAWRENCE COUNTY.

JAMES M. WATSON, Fay:

No.

LUZERNE COUNTY.

D. K. LAUBACH, Fairmount Springs:

Yes, they are very troublesome in catching small poultry; if

a hen or turkey make their nest away from the buildings the crow will surely steal their eggs.

LEWIS H. KOCHER, Ruggles:

No.

DAVID J. LINSKILL, Plymouth:

No, but they fish along the Susquehanna river and shallow ponds.

W. P. KIRKENDALL, Dallas:

No.

LYCOMING COUNTY.

JACOB HEIM, Hepburn:

Yes.

P. J. VANDINE, Lairdsville:

Crows, while nesting, will sometimes carry away small chickens and steal eggs occasionally, but mostly get a good dose of shot from the farmer.

PETER REEDER, Hughesville:

Crows have always been thieves; they pull the newly planted corn, destroy the ears when ripening and commit serious depredations to poultry by stealing eggs and catching and destroying young fowl.

AUGUST KOCH, Williamsport:

Yes, more than hawks while chicks are small.

MERCER COUNTY.

ROBERT McKEE, Mercer:

No.

R. K. BAKER, Sandy Lake:

They steal the eggs, but do not bother the young fowls to any great extent.

L. R. ECKLES, Mercer:

They do not; they are destroyers of birds' eggs and their young.

DR. J. A. MORELAND, Jamestown:

Very little damage is done by crows except to the corn crops.

MIFFLIN COUNTY.

HON. GRUBER H. BELL, Lewistown:

No; they are very useful birds to the farmer.

JOHN A. CAMPBELL, Belleville:

They are one of our greatest pests. I have nothing good to

say for the crow; he is an all-round thief, will destroy poultry, eggs, grain, birds' nests, young rabbits, pheasants and wild turkey eggs.

M. R. THOMPSON, Lewistown:

The farmers say they will steal their young chickens; the crow is rather shy and keeps away from barns, but nevertheless is a noted thief.

S. A. HERTZLER, Belleville:

A slight loss.

MONTOUR COUNTY.

W. D. STEINEACH, Limestoneville:

Yes.

MONROE COUNTY.

M. LUTHER MICHAEL, Shawnee:

They do; destroying also much young corn, beans, peas, etc., and the fully matured ears by eating them when the kernels are in the milk.

HON. R. F. SCHWARZ, Analomink:

Never knew them to take eggs, but have seen them carry off young chicks.

RANDALL BISBING, Minsi:

No.

* MONTGOMERY COUNTY.

V. E. THOMPSON, Swedeland:

No.

WILLIAM W. POTTS, Swedeland:

No, it is very easy to protect against crows. I tie up a shingle, whitewashed on one side, to a limb or pole; by tying it on one end and a little out of centre, it will be constantly in motion. They are only bad when they have young in nest.

GEORGE W. RIGHTER, Abrams:

Bad on poultry if not watched.

E. M. TYSON, King of Prussia:

Yes.

GEORGE WALL, Norristown:

Crows are not very plentiful in this neighborhood. The only damage they do is in the spring and summer months by catching young fowls.

NORTHUMBERLAND COUNTY.

J. A. GIFFEN, Montandon:

Yes, by stealing eggs; have never observed them catching the young.

S. H. DEANS, Superintendent Schools, Mt. Carmel.
No.

L. A. BEARDSLEY, Milton:
No.

D. G. MOYER, Greenbrier:
Yes; they have done more damage than any other kind of
bird.

C. D. OBERDORF, Sunbury:
Not serious.

B. B. SMITH, Shamokin:
Yes.

IRA SHIPMAN, Sunbury:
Eggs, small chickens and young turkeys.

NORTHAMPTON COUNTY.

R. O. RITTER, Hanoversville:
Yes.

E. F. HEIL, Nazareth:
Yes, if they can find them away from habitation.

JOHN J. GABLE, Harper:
They do.

A. S. SHIMER, Redington.
Yes.

PERRY COUNTY.

R. M. ALEXANDER, New Bloomfield:
Yes, they steal, in the country, all kinds of young fowls and
eggs.

SILAS WRIGHT, Reward:
The damage to poultry from the common crow is about six
hundred dollars, and yet they destroy more than six hundred
dollars' worth of destructive worms, bugs and insects.

MILTON B. ESHLEMAN, Newport:
No.

SAMUEL E. ROBERTS, Newport:
They do.

GEORGE A. WAGNER, Alinda:
They do.

B. M. EBY, Newport:
None worthy of mention as to eggs, but they kill some young
chicks.

GEORGE L. BUCHER, Donnally's Mills:

Yes.

PHILADELPHIA COUNTY.

WILLIAM DORR CARPENTER, Philadelphia:

Have noticed them visiting pigeons' nests on several occasions.

HON MAHLON L. SAVAGE, Frankford:

To a very limited extent.

POTTER COUNTY.

E. O. AUSTIN, Austin:

No, they are too shy to come near enough.

PIKE COUNTY.

HON. LAFAYETTE ROWLAND, Rowland:

Very little damage is done.

EDGAR PINCHETT, Milford:

They do not; the damage they do is principally to corn.

SNYDER COUNTY.

HENRY NOYES, Salem:

They do. I am positive they eat about two hundred turkey eggs for us annually, and catch young turkeys and chickens.

H. J. HEISER, Shadle:

They catch a few young chicks.

JOHN F. BOYER, Mount Pleasant Mills:

No.

SCHUYLKILL COUNTY.

A. F. KINNARD, Orwigsburg:

Yes, sir; serious damage to poultry in our locality; destroy over one-half of the turkeys.

W. H. STOUT, Pine Grove:

They may occasionally get a few eggs or a young duck, but not to any extent.

SUSQUEHANNA COUNTY.

E. A. & E. L. WESTON, Brooklyn:

Not usually.

S. S. THOMAS, Lynn:

No.

DR. A. H. TINGLEY, Susquehanna:
No.

SOMERSET COUNTY.

PETER MILLER, Somerset:
Not much.

JEREMIAH S. MILLER, Husband:
Considerably; they become very bold if they find that they can get eggs and small chickens.

DR. H. D. MOORE, New Lexington:
No.

TIOGA COUNTY.

M. SORNBERGER, Job's Corner:
To quite an extent.

UNION COUNTY.

J. A. GUNDY, Lewisburg:
They carry off eggs when laid away from barns or buildings, especially turkey eggs, and perhaps a few very young chicks.

VENANGO COUNTY.

JAMES J. WILLS, Franklin:
To some extent; they will steal eggs.

JOHN F. BIGLER, Franklin:
No.

WARREN COUNTY.

WILLIS COWAN, Warren:
No.

WALTER SCHULER, Warren:
No.

WASHINGTON COUNTY.

HON. JOHN C. FRENCH, Prosperity:
If fowls nest away from barns, I think Mr. Crow will take all he can steal; but, being a shy bird, he does not come about our barns and chicken houses much.

H. P. MYERS, California:
No, we do not have enough crows.

J. P. HORN, Sunset:
No serious damage; they steal a few eggs occasionally.

E. B. ENOCH, Washington:

Yes.

B. E. McCRACKEN, Washington:

Yes.

WAYNE COUNTY.

JAMES LESHER, Avoy:

Yes; one crow will carry off a flock of little chicks in one day, as well as steal hen and turkey eggs; has done this for me.

WESTMORELAND COUNTY.

A. RUTH, Scottdale:

No serious damage done by them.

WYOMING COUNTY.

N. P. STERLING, Meshoppen:

They do some, unless especially guarded against.

YORK COUNTY.

HON. GERARD C. BROWN, Yorkana:

Yes, in common with their cousin, the grackle. The most damage they do is to the young corn as it comes up. I have had fields so raided that I had to replace the whole concern. Crows are hard on birds' nests (eggs and young), especially on the meadow lark and quail when their nests are uncovered by our mowers and reapers.

JAMES G. PATTERSON, Stewartstown:

The crow is a great thief; they will steal eggs of the domestic fowl, and will catch young chicks and turkeys and carry them off to their nesting places, not only when they have young, but when hatching.

M. S. TYSON, York:

The crow is a thieving robber, and will pull up corn about hatching time, and during the fall of the year they injure a great many wheat stacks.

OTHER STATES.

H. E. VAN DEMAN, Parksly, Virginia:

Not very often.

CHAPTER III.

BIRDS OF PREY.

Representatives of the order of Raptores are present in every part of the world, and with the feathered race they occupy a position quite similar to the carnivorous animals among the mammalia. All live on an animal diet. "Most of the smaller, or weaker, species, feed much upon insects; others more particularly upon reptiles, and fish; others upon carrion; but the majority prey upon other birds and small mammals, captured in open warfare."—*Coues*.

AMERICAN VULTURES.

In the Western Hemisphere there are eight representatives of the family Cathartidae, and of these but two occur in the Eastern United States. North Carolina, according to Dr. Coues, is about the northern limit at which the Black Vulture, or Carrion Crow, is seen to occur with any degree of regularity. The Turkey Vulture or Turkey Buzzard, as this species is usually denominated, is quite common as far northward as the southeastern section of Pennsylvania, where it is resident, but it, of course, is much more plentiful in the summer season than during the winter.

These cowardly, ignoble, gluttonous and partly gregarious birds are found in abundance in the warmer countries, where, frequently, they are protected by law and strong public sentiment because of their great value as scavengers. Vultures subsist largely on carrion. They often collect in considerable numbers around the body of a defunct horse, cow, steer or other large sized animal, and gorge themselves until they are scarcely able to fly. When, however, their uncleanly repast is finished, they usually perch on trees, rocks, fences, etc., where they remain in a quiet and sleepy attitude, with wings drooping. Frequently if these birds are wounded, or suddenly frightened when feeding, and sometimes when their nests or young are molested, they eject the foetid contents of the crop. Two species of the family occur in Pennsylvania.



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TURKEY VULTURE.

TURKEY VULTURE.

Cathartes aura.

DESCRIPTION.

Entire plumage brownish-black, and more or less glossy; quills paler on under surface; skin of head and neck naked and wrinkled, with scattering bristle-like feathers; head and neck red, bill whitish, legs and feet pinkish, iris grayish-brown, nostrils large and oval.

Nestlings.—Bare skin of head nearly white, body covered with white down. Length about thirty inches; extent of wings about seventy-two inches; wing about twenty-five; tail twelve inches.

Habitat.—Temperate North America, from New Jersey, Ohio Valley, Saskatchewan region and Washington Territory, southward to Patagonia, casually northward on the Atlantic coast to Maine.

This species is found in some sections of Pennsylvania at all seasons, but during the summer months is much more plentiful than at other times. The Turkey Buzzard usually rears its young in woods or thickets, mostly near streams of water. It makes little or no effort to construct a nest; the eggs—never more than two in number and occasionally only one—are deposited generally in a slight concavity in the ground protected by shelving or overhanging rocks. Sometimes, however, the nests of this bird are found in stumps and hollow logs. The eggs are yellowish white, spotted with different shades of brown and purple, and measure about two and three-fourths inches in length by nearly two inches in breadth. It is stated that this species sometimes breeds in Pennsylvania as early as the last week in March. I have found nine nests in Chester and Delaware counties during the past fourteen years; of this number seven were taken late in April or early in May, and all contained fresh eggs. The two remaining nests, found in June, contained

downy young. I am informed that these birds, in Lancaster and York counties, along the Susquehanna river, are annually to be found breeding in small communities of a dozen or twenty individuals. The species also breeds regularly in Adams and Cumberland counties; in Adams county it is reported to be quite plentiful as a summer resident.

Devoured Grasshoppers and Beetles.

This bird will resort for several consecutive seasons to a favorite nesting place, and occasionally when its eggs are taken will lay a second time in the same nest. The Turkey Vulture is very numerous in the southern states, where it resides all the year, but in the eastern United States, north of Pennsylvania, it is said to be quite rare. Two young which I took from the nest and kept in captivity until full grown became exceedingly tame. These birds often when feeding, and invariably if approached by a stranger, would utter a loud hiss, the only sound which this species, as well as other of the American Vultures, is known to make. They fed chiefly on fresh meat, and also devoured with apparent relish earth-worms, crickets, grasshoppers and other large insects; oftentimes they also ate pieces of bread, cake and particles of apples or pears which were thrown before them. The Turkey Buzzard, in its natural state, according to Audubon, sucks the eggs and devours the young of herons and other birds. Turkey Buzzards do not, as some persons affirm, disturb domestic fowls, and rarely are these cowardly birds seen to destroy the eggs of poultry. I have never known them to disturb either the eggs or young of birds, but have observed that they subsist almost wholly on carrion. The benefits which these scavengers render are too well known to need any comment.

A Useful Bird to Mankind.

Mr. Frank M. Chapman in his valuable little work entitled "Bird Life," a publication which every school child and a good many adults, too, could read with great profit, says:

The Turkey Buzzard is one of Nature's scavengers, and, as such, is one of the few birds whose services to mankind are thoroughly appreciated. There are others of equal or even greater value who daily earn their right to the good will which we stupidly and persistently refuse to grant them; but of the Turkey Buzzard's assistance we have frequent convincing proof, and the decree has gone forth that injury to this bird is punishable by fine. No other birds are so well protected, and as a result Turkey Buzzards and Black Vultures walk about the streets of some of our Southern cities with the tameness of domestic fowls. If we should similarly encourage our insectivorous birds, who can predict the benefits which might accrue?"

The following list, with names of observers, will give a very clear idea as to the distribution of the Turkey Buzzard in Pennsylvania:

Its Distribution in Pennsylvania.

<i>County.</i>	<i>Observers.</i>	<i>Remarks.</i>
Adams,	B. H. Warren,	Resident; common in summer.
Bradford,	B. H. Warren,	Saw one at North Orwell, Sept., 1896.
Berks,	Jonas Stern,	Breeds; rare.
Berks,	D. F. Keller,	Breeds in Blue Mountains.
Bucks,	Mrs. H. M. Rice,	Occasionally in flocks; August, September and October.
Bucks,	S. Edward Paschall,* ..	Decidedly rare.
Chester,	B. H. Warren,	Resident; very common in summer.
Clinton,	Dr. W. Van Fleet,	Straggler.
Cameron,	B. H. Warren,	Straggler; saw one in November, 1889.
Cumberland,	B. H. Warren,	Breeds.
Delaware,	Robert Townsley,	Resident; most numerous in summer.
Dauphin,	W. W. Stoej,	Resident.

*"Decidedly rare and absolutely unknown to most of our people. We are but a few miles from Chester county, where the bird is very common, but Bucks county is out of its range. I made note of having seen three (3) buzzards during the season."—S. E. Paschall.

<i>County.</i>	<i>Observer.</i>	<i>Remarks.</i>
Erie,	George B. Sennett,	Never seen here.
Franklin,	B. H. Warren,	Saw several in December, 1889; breeds.
Fayette,	G. W. Linton,	Breeds.
Junlata,	B. H. Warren,	Saw three in January, 1890.
Lehigh,	J. F. Kocher,	Breeds.
Lehigh,	Dr. John W. Detwiller,	Seldom seen.
Lancaster,	Dr. A. C. Treichler,	Resident.
Lancaster,	James Galen,	Resident.
Lancaster,	H. Justin Roddy,	Resident.
Lancaster,	W. H. Buller,	Breeds.
Lebanon,	J. G. Bohn,	Breeds.
Lebanon,	George R. Ross,	Resident.
Lycoming,	August Koch,	Straggler; got two in spring.
Lawrence,	B. H. Warren,	Saw one in October, 1888.
McKean,	James A. Teulon,	Never seen here.
Montgomery,	W. P. Bolton,	Breeds.
Montgomery,	Thomas S. Gillin,	Migrant.
Mercer,	S. S. Overmoyer,	Straggler; shot one September 1, 1884.
Northampton,	Dr. John W. Detwiller,	Seldom seen.
Northampton,	Edmund Ricksecker,	Straggler; spring and summer; does not breed.
northumberland,	Dr. W. Van Fleet,	Straggler.
Perry,	H. Justin Roddy,	Seen in May, 1886; breeds. (?)
Philadelphia,	H. Jamison,	Occasional visitor.
Pike,	B. H. Warren,	Saw one at Rowland, May 9, 1897.
Philadelphia,	Joseph Price Ball,	Resident.
Philadelphia,	Witmer Stone,	Seen mostly during migrations.
Philadelphia,	George Spencer Morris,	Straggler.
Schuylkill,	M. M. MacMillian,	Straggler, fall 1883.
Somerset,	Dr. H. D. Moore,	Breeds.
Sullivan,	Otto Behr,	Straggler; seen in 1884.
Union,	Dr. W. Van Fleet,	Straggler.
Warren,	H. L. Greenlund,	Not found here.
Westmoreland,	Charles H. Townsend,	Very rare; have seen several in adjoining county.
Washington,	James S. Nease,	Resident.
Washington,	M. Compton,	Occasional; flock of ten seen September, 1883.
Washington,	M. T. Warrick,	Occasional; flock of ten seen September, 1883.
York,	Hon. Gerard C. Brown,	Breeds.
York,	George Miller,	Breeds.
York,	Casper Loucks,	Breeds.

ITS NORTHERN BREEDING LIMIT.

The Turkey Buzzard breeds in many sections of Chester and Delaware counties. Alfred P. Lee has observed it as a common resident in the vicinity of Oxford; Harry Wilson, a prominent local naturalist, has found them breeding at different points about Doe Run, and also near Parkesburg. Within a radius of about six miles from West Chester, I have found them breeding—never more than one pair in a place—in seven different localities in the counties of Chester and Delaware. The records given in the preceding columns concerning the breeding of this species show that it has been found nesting in at least thirteen or fourteen counties of Pennsylvania, and that its northern breeding range is restricted to about the lower third of this State.

BLACK VULTURE.

Catharista atrata.

DESCRIPTION.

"Adult.—Entire plumage dull black, the quills grayish basally (heavy whitish on under surface), their shafts pure white; bill dusky with yellowish or whitish tip; naked skin of head and foreneck dusky. Length 23-27; extent about 54 inches."—Ridgway, Manual N. A. Birds.

Habitat.—South Atlantic and Gulf states, north to North Carolina and the Lower Ohio Valley, west to the great plains, and South through Mexico and Central America and most of South America. Straggling north to New York and Maine.

A specimen of the Black Vulture or Carrion Crow, as this bird is sometimes called, was taken in Dauphin county in 1892. Stragglers have been observed in Northampton county by Dr. John W. Detwiler and the late Edmund Ricksecker. In relation to the marked difference in the manners of the present species and the Turkey Buzzard Mr. Robert Ridgway* publishes the following:

"Both in their mode of flight and in their movements upon the ground this species differs materially from the Turkey Buzzard. The latter walks steadily while on the ground, and when it mounts does so by a single upward spring. The Black Vulture is ill at ease on the ground, moves awkwardly, and when it essays to fly upward takes several leaps in a shuffling side-long manner before it can rise.

"Their flight is more labored, and is continued by flapping several times, alternated with sailing a limited distance. Their wings are held at right angles, and their feet protrude beyond their tail-feathers. In all these respects the differences between the two birds are very noticeable, and plainly mark the species."—(Brewer.)

The following interesting account of this species is from the pen of **Thomas Nuttall**:†

FEEDS ON CARRION NOT POULTRY.

"This smaller black and truly gregarious species of vulture,

*The Ornithology of Illinois, Part I, Robert Ridgway, Springfield, Illinois, 1889.

†A Manual of the Ornithology of the United States and Canada, by Thomas Nuttall; The Land Birds; Cambridge, 1832.

in the United States, appears to be generally confined to the narrowest limits of the Southern States, being scarcely found beyond Wilmington in North Carolina, and seems to be most numerous and familiar in the large maritime towns of South Carolina, Georgia and Florida; thus, though abundant in Savannah, there are much fewer of this species at Augusta than of the Turkey Vulture. In the tropical regions of America they are also very common, and extend, at least, as far as Chili. Like the former species, with which they associate only at meal-times, they are allowed a public protection for the service they render in ridding the earth of carrion and other kinds of filth. They are much more familiar in the towns than the preceding; delighting, during winter, to remain on the roofs of houses, catching the feeble rays of the sun, and stretching out their wings to admit the warm air over their foetid bodies. When the weather becomes unusually chilly, or in the mornings, they may be seen basking upon the chimneys in the warm smoke, which, as well as the soot itself, can add no additional darkness or impurity to such filthy and melancholy spectres. Here, or on the limbs of some of the larger trees, they remain in listless indolence until aroused by the calls of hunger.

WELL TREATED IN THE SOUTH.

"Their flight is neither so easy nor so graceful as that of the Turkey Buzzard. They flap their wings and then soar horizontally, renewing the motion of their pinions at short intervals. At times, however, they rise to considerable elevations. In the cities of Charleston and Savannah they are to be seen in numbers walking the streets with all the familiarity of domestic fowls, examining the channels and accumulations of filth in order to glean up the offal, or animal matter of any kind, which may happen to be thrown out. They appeared to be very regular in their attendance around the shambles, and some of them become known by sight. This was particularly the case with an old veteran who hopped upon one foot (having by some accident lost the other), and had regularly appeared round the shambles to claim the bounty of the butchers for about twenty years. In the country, where I have surprised them feeding in the woods, they appeared rather shy and timorous, watching my movements alertly like hawks, and every now and then one or two of them, as they sat in the high boughs of a neighboring oak, communicated to the rest, as I slowly approached, a low bark of alarm or waugh, something like the suppressed growl of a puppy, at which the whole flock by degrees deserted the dead hog upon which they happened to be feeding. Sometimes they will collect together about one carcass to the number of 250 and upwards, and the object, whatever it may be, is soon robed in living mourning, scarcely anything being visible but a dense mass of these sable scavengers, who may often be seen jealously contending with each other, both in and out of the carcass, defiled with blood and filth, holding on with their feet, hissing and clawing each other, or tearing off morsels so as to fill their throats nearly to choking, and occasionally joined by growling dogs; the whole presenting one of the most savage and disgusting scenes in nature, and truly worthy the infernal bird of Prometheus."

HAWKS, FALCONS AND EAGLES.

Family Falconidae.

It is stated by reliable writers that there are at least three hundred and fifty species of this family of diurnal raptorial birds found throughout the world. Of this large number only fourteen occur regularly in this State, and of all the numerous species of bird-life occurring in this Commonwealth, few are better known to our people in general than are the Eagles and Hawks, some of which are common, at all times, or during some period of the year, in nearly every section of the State. With a few exceptions, these raptores, as well as most of the owls, particularly the smaller kinds, are highly beneficial to the farmers and fruit growers, because of the immense quantities of destructive mice and other injurious animals, also large numbers of noxious insects, etc., which they devour. The majority of these birds build large nests of sticks, twigs, etc., on trees; some, however, nest on rocky ledges. The Marsh Hawk breeds on the ground, and the little Sparrow Hawk, like the Screech Owl and Woodpecker, breeds in hollow trees. The eggs, usually two to five, sometimes more, are generally spotted and blotched, and never spherical and white, like the eggs of the owls. The adult males are usually smaller than the females, and with the exception of the Marsh and Sparrow Hawks, are quite similar in color. The young or immature birds, of most species, differ greatly from the old. These birds catch their prey with their talons. Their cries are loud and harsh. Occasionally they are seen in flocks—sometimes containing several species—but usually they are observed singly or in pairs. The bill is short, stout and strongly hooked, the head is completely feathered and without ear-tufts or "horns" like some of the owls; the tarsus, except in the Golden Eagle and Rough-legged Hawk, is naked. The feet have long, strong, large, sharp and curved claws; the outer toe, except in the Fish Hawk, is not reversible. The eyes are directed laterally.

A VALUABLE GROUP OF HAWKS.

Birds of the genus *Buteo*, especially *borealis* and *lineatus*, are the large hawks which we see, particularly in the late fall, winter and early spring, frequenting grassy fields, meadows, swamps, etc. These birds are the common "hen hawks" or "chicken hawks" as they are usually called; but such names are highly inappropriate, as a very small percentage of their food is poultry. Three species, (especially *borealis* and *lineatus*), are common residents in Pennsylvania. In order to give a clear idea of the great benefits these "hen hawks" render the agriculturist and fruit grower, the following extracts, relating to the stomach contents of 847, captured during all seasons of the year in various parts of the United States, are

copied from Dr. A. K. Fisher's Report:* Red-tailed Hawk (*Buteo borealis*):

"Of 562 stomachs examined, 54 contained poultry or game birds; 51, other birds; 278, mice; 131, other mammals; 37, batrachians or reptiles; 47, insects; 8, crawfish; 1, centipedes; 13, offal; and 89 were empty." Red-shouldered Hawk (*Buteo lineatus*):

"Of 220 stomachs examined, 3 contained poultry; 12, other birds; 102, mice; 40, other mammals; 20, reptiles; 39, batrachians; 92, insects; 16, spiders; 7, crawfish; 1, earthworms; 2, offal; 3, fish; and 14 were empty." Broad-winged Hawk (*Buteo latissimus*): "Of 65 stomachs examined, 2 contained small birds; 15, mice; 13, other mammals; 11, reptiles; 13, batrachians; 30, insects; 2, earthworms; 4, crawfish; and 7 were empty." The mammals mentioned here refer mostly to mice, shrews, moles, some few squirrels and a few other kinds of quadrupeds. These hawks in form are stout and heavy; the wings long, wide and somewhat pointed; third, fourth and fifth quills longest, the first shorter than eighth, the three outer primaries in *latissimus* emarginate on inner webs, and *borealis* and *lineatus*, the four outer quills emarginate on inner web. The moderately long tail, conspicuously barred or highly colored is quite broad and slightly rounded; the bluish black bill is short, wide at base and maxilla is lobed on edges. Legs and feet stout; tarsus feathered in front about one-third of length; thighs have long feathers that in some individuals reach nearly to the feet. Tarsi yellowish, cere yellowish or greenish; the eyes vary greatly, but are usually brown or yellow. Sexes similar in color; female larger than male; immature birds differ greatly from the adults; the flight of these hawks is quite vigorous, and that of *borealis*, in particular, is often long continued, but they do not fly with the great rapidity of the species of the genus *Accipiter*.

DETRIMENTAL SPECIES.

Birds of the genus *Accipiter* are rather long and slender in form, and they have small heads, short wings, long tails and legs. The bluish black bill is short and stout, maxilla being strongly hooked and sharp-pointed; the broad ovate nostrils are inserted in the greenish or yellowish cere.

The tarsi are feathered in front a little less than half in length. Tarsus, especially in *velox*, is slender; and in *atricapillus* rather stout; the toes are long and slender, the outer and middle united at base by a well-developed web. The black claws are very long, much curved and sharp; eyes in old birds are reddish-amber and in younger birds yellowish.

The tarsus is yellowish. Birds of this genus are exceedingly active and vigilant; they fly with great rapidity and frequently pursue and catch, when on the wing different species of wild birds, some of which are nearly as large as themselves. The Sharp-shinned Hawk I have seen capture quail when flying, and the fierce Goshawk has often been observed to pursue and overtake turkeys, grouse, blackbirds, wild pigeons, etc. These, and not, as some suppose, birds of the genus *Buteo*, are the hawks that usually commit depredations in the

*The Hawks and Owls of the United States; Bulletin, No. 3, U. S. Department of Agriculture, 1893.

poultry yard and destroy numerous wild birds, particularly grouse and quail. The ordinary plumage of these hawks is dark brown above, (very old birds, which are seldom taken, have upper parts bluish), darkest on head, and lower parts whitish, variously streaked and barred with dark brown, rusty and pale red. In old Cooper's and Sharp-shinned Hawks the breast, thighs and rest of under parts, except crissum and throat, which are chiefly white, are white transversely barred with light red. Full plumaged Goshawks have top of head black with light grayish blue and whitish under parts with numerous and irregular mottlings, streaks and lines of black, white and dusky.

The destructive nature of representatives of the genus *Accipiter*, which have been largely instrumental in bringing so much odium on the good name of all birds of the hawk kind in Pennsylvania is well illustrated by again turning to Dr. Fisher's admirable report where records of 320 postmortem examinations are made as follows: Sharp-shinned Hawk (*Accipiter velox*): "Of 159 stomachs examined, 6 contained poultry or game birds; 99, other birds; 6, mice; 5, insects; and 52 were empty." From this summary it will be observed that of 107 stomachs which had in them, when the hawks were killed, food materials, not less than 105 contained birds (chiefly sparrows of different species, warblers, thrushes, vireos, orioles, etc.) and poultry or game birds. This kind of evidence gives conclusive proof that the daring and sanguinary little Sharp-shinned Falcon does not merit the good will or protection of farmers, poulterers, sportsmen or naturalists.

THE COOPER'S HAWK.

Cooper's Hawk (*Accipiter cooperi*): "Of 133 stomachs examined, 34 contained poultry or game birds; 52, other birds; 11, mammals; 1, frog; 3, lizards; 2, insects; and 29 were empty." By these dissections last noted we see that of 94 stomachs containing foodstuffs, 86 or all but 8 had in them poultry and birds, game or other kinds. The reference to "poultry," in the summary last given, refers to chickens, both adult and young, pigeons, and probably to other kinds of domestic fowls not particularized by name. Under the head of "game birds" Dr. Fisher's tables show that in the Eastern and Southern states the Cooper's Hawk destroys many Quail (Bob-White) and Ruffed Grouse, while in Arizona Gambel's Quail is frequently captured by this audacious hawk. An examination of the columns headed "other birds" in Dr. Fisher's tables, gives the following species, which were identified:

Chewink,	Purple Grackle,
Tree Sparrow,	Snow-bird (Junco),
Song Sparrow,	Savanna Sparrow,
Meadow Lark,	English Sparrow,
Flicker,	Nuthatch,
Goldfinch,	Hermit Thrush,
Field Sparrow,	Dove,
Robin,	Orange-crowned Warbler.

The mammals which were found and identified in the

eleven stomachs previously noted, are mentioned by name in the order as appended:

Mouse.	Rocky Mountain Chipmunk.
Chipmunk.	Rabbit.
Red Squirrel.	Cotton Rat.
Gray Squirrel.	Cal. Ground Squirrel.

BUT FEW INSECTS.

The amount of insect-food consumed by this species, if these 133 examinations made of hawks captured during all seasons of the year in different sections of the United States, are to be taken as a safe criterion, must be very insignificant. Scrutinizing the tables, we see that on September 18, 1886, a Cooper's Hawk, at River Dale, New Jersey, departed this life and left in his stomach a single badly crushed grasshopper. The natural presumption is that this particular Cooper's Hawk became bewildered while in the land of "skeeeters and sand," otherwise he never would have condescended to take such humble quarry. Another example, taken May 20, 1877, in the township of East Goshen, Chester county, Pennsylvania, an old male Cooper's Hawk, was killed near the edge of a woods by a swamp, where he often watched for Red-winged Black-birds and Quail; his stomach, the records show, contained mice (perhaps arvicola) and beetles.

THE GOSHAWK.

Gcshawk (*Accipiter atricapillus*): "Of 28 stomachs examined, 9 contained poultry or game birds; 2, other birds; 10, mammals; 3, insects; 1, centipede; and 8 were empty." Of these 20 stomachs which contained food materials, 11 had remains of poultry (5 poultry only) Ruffed Grouse and quail or other birds; 7 contained only mammals as follows, 2, rabbit; 1, mouse and weasel; 1, Gray Squirrel; 1, squirrel, species not given; 2, red squirrels. One stomach showed remains of a Ruffed Grouse and two red squirrels; another a domestic fowl (not named), and with the remains of this fowl were 30 sphinx larvae and 3 centipedes; a Ruffed Grouse and a Gray Squirrel had satisfied the necessities of a third Goshawk; another of these fierce hawks had eaten a rabbit and a few locusts, and in the stomach of a Goshawk taken April 12, 1886, at Elmira, New York, some mice and beetles were disclosed by dissection.

SWALLOW-TAILED KITE.

Elanoides forficatus.

DESCRIPTION.

Bill rather small and moderately stout and narrow; feet small but stout; claws short but strongly curved; wings very long and pointed; tail long and deeply forked, the outside feathers being more than twice as long as the middle pair. On the wing this hawk looks and moves like a huge swallow. Head, neck, band across rump, basal portion of secondaries and entire lower parts pure white; interscapulars and lesser wing-coverts purplish black; rest of back, wings and tail slaty black. Bill blue black; legs and feet dull bluish-yellow; iris brown; length variable; a female before me measures 24 inches long; wing 17; lateral tail feathers $12\frac{1}{4}$ inches.

Habitat.—Southern United States, especially in the interior, from Pennsylvania and Minnesota southward, through Central and South America; westward to the great plains. Casual eastward to southern New England.

The Swallow-tailed Kite or "Wasp-hawk," as it is generally called in Florida, where it is common, is a very rare and irregular visitor in Pennsylvania. A specimen in the museum of the Linnaean Society, at Lancaster city, was captured many years ago in Lancaster county. Prof. H. J. Roddy obtained one May 27, 1885, in Perry county; and a straggler was also a few years since found in Allegheny county by Mr. R. C. Wrenshall, of Pittsburgh. In the stomachs of five of these Kites which I killed in Florida in March and April, 1885, there were found grasshoppers, beetles, toads and lizards. According to different writers they feed principally on grasshoppers, beetles, caterpillars, small snakes, lizards and frogs.

DOES NOT MOLEST POULTRY.

I have made many inquiries in the south where these Kites were plentiful and was invariably told by persons who had been familiar with the birds all their



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SWALLOW TAILED KITE.

lives that they never were known to disturb poultry or game of any kind. Testimony from all sides confirms this assertion. In post-mortem examinations of six stomachs of these Kites, recorded by Dr. A. K. Fisher,* the following insects, lizards, etc., were found:

Locality.	Date.	
Hawkinsville, Fla.,	March 31, 1885.	Lizard, grasshoppers, tree toad, beetles.
Hawkinsville, Fla.,	March 31, 1885.	Lizard, grasshoppers, beetles.
Dixon county, Neb.	June, 1865,	60 locusts, 5 other insects
Dixon county, Neb.,	June, 1865,	69 locusts, 3 other insects.
Sarpy county, Neb.,	Sept., 1873,	75 insects.
Woodville, Minn.,...	April 28, 1888.	Beetle, wasp.

VIEWS OF VARIOUS WRITERS.

Audubon speaks of often seeing these hawks with long slender snakes hanging from their talons, and he gives the following account (quoted from Dr. A. K. Fisher's Bulletin No. 3) of two stomachs collected in Texas:

"In the stomach (of one bird) are six snakes, of a very slender form and light-green color, one of them 22½ inches in length, together with one large larva, 3 inches long, and two coleopterous (beetles) insects. Some of the snakes have been swallowed whole, although bruised, the rest broken into large pieces several inches long. * * * * In another male shot in the same country, on the same day, the stomach contained a slender snake 19 inches long, six lizards, and four beautiful, very large coleopterous insects, with two eggs of reptiles 7½ inches long."—(Ornith, Biography, vol. v., pp. 372-374.)

This species rarely alights on the ground; Mr. H. W. Henshaw states that he found these Kites common on the Miami river, Florida, and frequently saw them

*The Hawks and Owls of the United States in Relation to Agriculture; Bulletin No. 3, Division of Ornithology and Mammology, United States Department of Agriculture, 1893.

in mid air feeding upon snakes, which appeared to be their favorite food in that locality. The writings of Dr. Fisher show very positively, that this Kite never disturbs poultry, birds or even small mammals, which last named animals are so often preyed upon by the smaller and weaker hawks. Dr. Fisher says:

"The principal food of this Kite is small snakes, lizards, frogs and various kinds of insects. It never molests small mammals or birds. Among insects it is especially fond of wasp larvae, grasshoppers and dragon flies, and its power to change the direction of flight is most markedly shown in capturing the latter insects, for its efforts to secure them is often necessary for it to turn almost completely over in its evolutions."

In Florida Dr. C. Hart Merriam often saw these Kites dart down and pick a wasp's nest from the under side of a leaf of some high palmetto and fly off with it, devouring while on the wing, the grubs it contained.—(Am. Nat., vol. VIII, 1874, p. 88.)

Mr. H. Nehrling speaks of these birds' food in Texas as follows:

"In August and September the birds are often seen in cotton fields, where they feed on cotton worms and other insects. They are particularly fond of small snakes, such as *Leptophis*, *Rhinostoma coccinea*, lizards (*Anolis carolinensis* and *Ameiva sex-lineata*.) I have never seen them take a bird or small quadruped."—Bull. Nutt. Ornith. Club. Vol. VII, 1882, p. 175.)

THE NEST AND EGGS.

"It probably breeds in suitable localities throughout its range, even to the northern limit. Its nest has been taken in Minnesota, and according to a very interesting note by Mr. Austin F. Park, it is very probable that a pair bred in Rennselaer county, New York, in 1886. (The Auk, Vol. III, p. 484.) In the southern part of the United States this species begins to breed about the last of April or first of May, while farther north it is past the middle of the latter month before a full complement of eggs is deposited. The nest is situated in the tops of the tallest trees and is placed among the smaller branches, where it is well hidden by the thick foliage. Occasionally it is built toward the end of a large limb, 20 feet or more from the main trunk, the supporting branch usually being not more than a few inches in diameter. The nest oftentimes is a rude structure, made of sticks only, and resembles closely in appearance that of some of the herons,

while others are more substantial, from the lining of Spanish moss or soft inner bark of the cottonwood which they contain; rarely a nest is composed almost entirely of Spanish moss.

"The number of eggs in a set is usually two, though three and four, and probably even more are sometimes deposited. Audubon found a nest near the Falls of the Ohio in 1820, which contained four young. The male is very attentive and assists the female in building the nest and incubating the eggs, as well as in collecting a large proportion of the food for the young. After the breeding season this Kite is more or less gregarious; families of four or five are usually found together, and occasionally flocks of fifty or more. This species is quite wary and difficult to approach, but if one of the flock is killed or wounded, the others will fly around it, and a number may be secured before they take alarm and move off.

ITS FLIGHT EASY AND GRACEFUL.

"The flight is smooth and protracted, and for grace and elegance is not excelled by that of any other species. To fully appreciate its superiority one must see the bird on the wing, for no language can describe the beauty of the ever-varying movements. No matter whether the bird is soaring far above the earth, skimming lightly over its surface, or following the different gyrations of some fleeting insect, the observer is surprised as well as charmed at the wonderful exhibition. Often it will stop in mid air, and with half closed wings and depressed tail, shake itself much after the manner of swallows while bathing. Although it often alights on trees, it rarely is seen on the ground, and even when capturing its prey it glides swiftly over the surface, reaching down at the proper moment to secure the quarry. It generally, if not always, feeds while in mid air, bending its head downward and toward the talons to tear the object in its grasp. It drinks while skimming rapidly over the surface of the water as do the swifts, swallows and many other birds."—(Dr. Fisher, Bull. 3.)

MISSISSIPPI KITE.

Ictinia mississippiensis.

DESCRIPTION.

"General form short and compact. Bill short, tip emarginated; wings long, pointed; tail rather short, emarginated; tarsi short.

"*Adult.*—Upper parts of body dark lead color, nearly black on rump; head and under parts cinereous, darkest on abdomen; quills and tail brownish-black; * * * tips of secondaries ashy-white; a longitudinal stripe on each web of primaries chestnut rufous." (Length of male about 14 inches extent about 26; female a little larger.)—B. B. of N. A.

Habitat.—Southern United States, southward from South Carolina on the coast, and Wisconsin and Iowa in the interior to Mexico. Rare straggler in Pennsylvania.

I have never met with it in this State. The only specimen that has been taken here, so far as I can learn, was shot in September, 1892, in Cumberland county. This specimen is in the museum of the Pennsylvania State College.

FEEDS ON INSECTS.

Dr. Fisher's examinations of the stomachs of this Kite, show that it subsists like the Swallow-tailed Kite, principally on grasshoppers, large beetles, katydids, crickets, etc. It does not visit the poultry yard and game birds or game mammals are never attacked by it. Lizards, small-sized snakes and frogs are sometimes preyed upon by this Kite when insect food is not readily secured.

Never having had the opportunity of studying this bird in life I take the following extracts from Dr. Fisher's Bulletin:

The Mississippi Kite, like the other American species, inhabits the more southern parts of our territory. It is distributed from Guatemala north through eastern Mexico and the southern United States east of the Rocky Mountains.



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MISSISSIPPI KITE.

occurring regularly as far north as Georgia, Southern Illinois, Indian Territory and Kansas, and casually to Iowa and Wisconsin. A few remain in the southern United States all winter, but the greater part pass on to Mexico during October, and return again in the latter part of April. * * *

"Three specimens which Wilson examined at Natchez, Miss., contained the remains of beetles, and he saw them flying about the trees feeding on cicadas. Dr. Coues mentions one shot at Bluffton, South Carolina, whose stomach was crammed with the same insects, together with a few katydids. It is wonderful at what a distance its keen eyes can detect a comparatively small insect. Mr. E. W. Nelson says: 'I saw them repeatedly dart with unerring aim upon some luckless grasshopper from an elevation of at least 100 yards.'—(Bull. Essex Inst., Vol. LX, 1877, p. 58.)

THE NEST AND EGGS.

"As regards the economic value of this Kite, much of the same statement may be made as of the previous species. It does little or no damage, but much good. Soon after arriving in its summer home it begins to remodel its old nest or the deserted nest of some other bird, and more rarely, when these are not available, it builds a new one. The remodeling consists in patching up the sides with a few sticks and adding a sparse lining of Spanish moss or green leaves. The nest is usually situated in the tops of the tallest trees, among the smaller branches, where it is well concealed by the foliage. The full complement of eggs, usually two or three in number, is deposited by the middle of May, though in some cases it must be much earlier, for the writer once secured a young bird in southern Louisiana the last of May which already had acquired nearly the adult plumage.

NOT A SHY BIRD.

"The Kite is not at all shy, and may be secured easily as it sits on some tall stub; in fact, Col. N. S. Goss tells of shooting a pair from the same tree, as the second one did not move at the report of the gun, but looked down with surprise on its fallen companion. It is said to be morose and irritable in captivity and very difficult to tame. A specimen which the writer once wounded was the very picture of rage as with flashing eyes and erect crest it threw itself on its back and prepared to repel the aggressor with its talons.

"This species is fully as gregarious as any of the other Kites, and oftentimes may be seen in flocks of twenty or more circling over a favorite hunting ground. It is observed most frequently around the border of woods in the vicinity of water, and is particularly fond of half cleared ground where dead trees still stand, these being used for perches.

"Its flight is as varied and graceful as that of the Swallow-tailed Kite, is long protracted, and the bird often ascends to so great a height as to be barely visible. While soaring high in the air its flight simulates that of the Turkey Buzzard very closely, and as the two birds often are seen together the Kite looks like a miniature of the other."

MARSH HAWK.

Circus hudsonius.

DESCRIPTION.

Face partly encircled by a ruff or imperfect facial disc of small stiffened feathers as in the owls; nostrils large; wings long and pointed; tail long; tarsus long and slender.

Male.—Light bluish gray above and on neck and breast; upper tail-coverts and most of under parts white; some under feathers under wings and lower part of breast and abdomen spotted with rusty. Female and young are dark-brown above, streaked on head and neck with reddish brown; below reddish-brown, much brighter in some specimens than others; upper tail-coverts white. Length of female about 18 to 20 inches; extent about 44; tail 9 or 10 inches; bill and claws blackish; legs, feet and eyes yellow.

Habitat.—North America in general, south to Panama.

The Marsh Hawk, known also as Harrier and Bog-trotter, is most frequently seen throughout Pennsylvania in the spring and fall, but it breeds often in different parts of the State, and in some of the southern counties it is found during all months of the year. Its nest, with eggs or young, have been found by the following gentlemen in their respective counties: Dr. John W. Detwiller, Northampton; R. C. Wrenshall, Allegheny; H. J. Roddy, Perry; Dr. Van Fleet, Clinton; Geo. S. Morris, Philadelphia; Hon. G. C. Brown, York; Otto Behr, Sullivan; W. W. Stoev, Dauphin, and J. L. Camp, Bradford. I have observed the Marsh Hawk to be most numerous in the fall, frequenting the extensive and grassy meadow-lands, chiefly about the large streams.

When flying this species can easily be distinguished from other hawks by the white upper tail-coverts, so conspicuous in the females and immature birds, or those usually met with. The old male, rare and seldom found in this section, can be recognized by the bluish-white plumage.



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MARSH HAWK.

THE NEST AND EGGS.

The nest of the Marsh Hawk differs from that of all others of the family which breed here, in being placed on the ground, and usually, it is said, in a swamp or meadow. The nest, according to different writers, is composed of sticks, grasses, hay, etc., or sometimes no nest is made, the eggs simply being deposited on a bed of grass, moss, etc., on the ground. "Eggs, three to eight, 1.80 by 1.41, white or bluish-white, usually plain, but often more or less spotted or blotched with pale brown."—Ridgway.

FEEDS ON MICE.

Notwithstanding the fact that these hawks rarely, if ever, prey upon any kinds of game except sometimes an occasional Reed bird, gunners, who so industriously search over the swamps never fail to destroy every Marsh Hawk which comes within range of their deadly weapons.

Marsh Hawks rarely disturb poultry, but subsist mainly on field mice, other small quadrupeds, frogs, large insects and sometimes, though seldom they catch small wild birds. In writing of the food-habits, etc., of this species Nuttall says: "It frequents chiefly, open, low and marshy situations, over which it sweeps or skims along at a little distance usually from the ground, in quest of mice, small birds, frogs, lizards and other reptiles, which it often selects by twilight as well as in the open day; and at times, pressed by hunger, it joins the owls, and seeks out its prey even by moonlight."

In fourteen examinations made by myself, seven hawks had only field mice in their stomachs; three, frogs; two, small birds (warblers); one, few feathers, apparently of a sparrow (*Melospiza*) and fragments of

insects; one, large number of grasshoppers with a small quantity of hair, evidently that of a young rabbit.

WHAT VARIOUS WRITERS SAY.

Concerning the food of this bird different writers speak as follows:

"When prey is discovered the hawk poises for a moment over the spot and then drops quickly on it, and if successful is sure to beat over the same place before leaving. It generally devours its quarry on or near the spot where captured, instead of carrying it away. Its food consists largely of small rodents, such as meadow mice, half-grown squirrels, rabbits and spermophiles or ground squirrels. In fact, so extensively does it feed on the last named animals that the writer rarely has examined a stomach from the West which did not contain their remains.

FEEDS ON REPTILES AND INSECTS.

In addition to the above it preys upon lizards, frogs, snakes, insects and birds; of the latter, the smaller ground-dwelling species usually are taken. When hard pressed it is said to feed on offal and carrion, and in the spring and fall, when water fowl are abundant, it occasionally preys upon dead and wounded birds left by gunners. It seldom chases birds on the wing, though the writer has seen it do so in a few instances."—Fisher Bulletin No. 3.

Audubon says:

"The food of the Marsh Hawk consists of insects of various kinds, especially crickets; of lizards, frogs, snakes, birds, principally the smaller sorts, although it will attack partridges, plovers, and even green-winged teals, when urged by excessive hunger."

Mr. H. W. Henshaw, whose extensive field experience in the West gave him abundant opportunity of thoroughly acquainting himself with the habits of this species, says:

"They were seen at all hours of the day * * * * in search of mice and gophers, which, when obtainable, constitute the major part of their food. When urged by hunger, it may attack birds, and I remember to have once been robbed of a widgeon I had killed and kept lying in the water, by one of these birds; but generally they confine their attacks to the humblest kind of game, which possess neither the strength to enable them to resist nor the activity to evade the sudden descent of their winged enemy."—Ornith. Wheeler Survey, 100 Merid., 1875.

Mr. Robert Ridgway found the stomachs and crops of these hawks which he obtained at Pyramid Lake, Nevada, "filled to their utmost capacity with the remains of small lizards, and nothing else."

PROTECTS THE CROPS.

There is another way in which it protects crops, albeit unconsciously, as appears from the following: 'It is also said to be very serviceable in the southern rice fields in interrupting the devastations made by swarms of bobolinks. As it sails low and swiftly over the fields it keeps the flocks in perpetual fluctuation and greatly interrupts their depredations. Wilson states that one marsh hawk was considered by the planters equal to several negroes for alarming the rice birds.'—(Hist. N. A. Birds, Vol. III, p. 218.)

"Dr Merriam bears witness to the truth of the foregoing, for while at Georgetown, South Carolina, he saw an immense flock of bobolinks driven from a field by one of these hawks, which simply passed over at a considerable height, and made no movement to molest them.

"Although the hawk occasionally carries off poultry and game birds, its economic value as a destroyer of mammal pests is so great that its slight irregularities should be pardoned. Unfortunately, however, the farmer and sportsman shoot it down at sight, regardless or ignorant of the fact that it preserves an immense quantity of grain, thousands of fruit trees and innumerable nests of game birds by destroying the vermin which eat the grain, girdle the trees and devour the eggs and young of the birds."—Dr. Fisher, Bulletin No. 3.

A FRIEND OF THE FARMER.

A study of this badly abused bird should convince any fair-minded person that it is one of the most beneficial of the birds of prey. It should be allowed to multiply and not be wantonly slaughtered by farmers and gunners, simply for no better reason than that it is a "hawk." It is a most persistent hunter of meadow mice, which in recent years have done so much damage in many parts of Pennsylvania. This surely entitles it to protection; and if farmers and others who destroy the Marsh Hawks which visit their premises were aware of the benefit these birds do, I am confident such cruel slaughter would cease, and great good

would soon follow in the decrease of destructive rodents, which commit such serious depredations in the vineyards, and in the grass and grain fields.

Consulting Dr. Fisher's tables on the food of the Marsh Hawk we find that "of 124 stomachs examined, 7 contained poultry or game birds; 34, other birds; 57, mice; 22, other mammals; 7, reptiles; 2, frogs; 14, insects; 1, indeterminate matter; and 8 were empty."



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SHARP SHINNED HAWK.

SHARP-SHINNED HAWK.

Accipiter velox.

DESCRIPTION.

Adult.—Upper parts uniform dark bluish-gray; top of head somewhat darker; tail is marked with several transverse blackish bands; lower parts white; the breast and sides being barred with brownish black or rufous. Iris, reddish-orange.

Immature.—Upper parts dusky; usually, with numerous lighter spots, and the feathers more or less conspicuously bordered with rusty; lower parts whitish, marked with brown and dusky streaks. Iris, light yellow.

A large female of this species measures about 14 inches in length by 26 inches in extent; the even or slightly notched tail measures about $8\frac{1}{4}$ inches; the male is smaller.

Habitat.—North America at large. Common in Pennsylvania, particularly in sparsely settled regions.

The Sharp-shinned Hawk is known in different sections of Pennsylvania by a variety of local names, the most common of which are, "partridge" or "little quail hawk," "pigeon hawk," and "brown hawk." Unfortunately much of this hawk's destructive work in the poultry yard and to game and small wild birds is wrongfully attributed to the beautiful and servicable Sparrow Hawk, which, on account of its size, is frequently mistaken by farmers, poultry-raisers and sportsmen for the Sharp-shinned Hawk which annually destroys a large amount of domestic fowls, quail and grouse.

This extremely daring and spirited little hawk is one of the most abundant of our North American species. It is found in Pennsylvania as a resident, but during the spring and fall migrations—March, April, September and October—it is plentiful, being frequently met with in the mountainous and heavily-wooded districts, as well as in the cultivated and rich agricultural regions. Although a native throughout the State, it is

much more numerous during the breeding season in thinly settled and wooded districts. The nests in this locality, according to my experience, are mostly built in low trees, and they are made up almost entirely of small twigs.

THE NEST AND EGGS.

I have taken two nests, both built in low cedar trees; these nests were entirely constructed of small twigs, and were loosely, but firmly made. The cavity of one nest was quite superficial, but that of the other was well formed. The eggs—each nest contained five—are deposited about the first of May. They are nearly spherical, white or bluish-white, marked with large and irregular splashes or blotches of brown, and measure about 1.46 by 1.16 inches. Gentry, a close observer and facile writer, remarks in his "Life Histories of Birds," that the "eggs, in some instances, are laid on consecutive days, but we have positive proofs that sometimes a single day is intermitted, and at other times, even two and three days intervene between each deposit." In one of my nests I found two days to intervene after the deposition of each of three eggs, and the fifth ovum was deposited after an intervention of three days. Gentry has found them breeding in the deserted nest of the common grey squirrel. Mr. J. Hoopes Matlack, of West Chester, informs me he found a pair breeding in an old crow's nest; such sites, however, Gentry advises us, are rarely chosen. It is said this species will sometimes build on a ledge of rock or on hollow and decaying tree limbs. One nest, which I had the opportunity of observing from its early commencement, was built by the united labor of both birds, which occupied a period of seven days. Gentry, who doubtless, has had a more extensive ex-



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SHARP SHINNED HAWK.(YOUNG)

perience, gives three and four days, according to style, as the time requisite for the construction of the nest.

Various writers assert that dry grass, leaves, moss, etc., aid in the make-up of the nests; such, no doubt, is the case, but as previously stated, I have found sticks and twigs to solely constitute the nests.

Incubation is alternately engaged in by both birds, which, while they show great solicitude for their offspring, repelling all bird intruders with the most determined zeal and pugnacity, will, when molested by man, show marked timidity, and leave to his desecration their nest and its contents. The young are carefully watched and fed by the parents, chiefly on a diet of small birds—sparrows principally—until, Gentry says, they are about six weeks old, when they are able to provide food for themselves.

FOND OF POULTRY AND SONG BIRDS.

This hawk occasionally feeds upon insects, mice and reptiles, but the greater portion of its food consists of wild birds and poultry, particularly young poultry. When a pair of Sharp-shinned or Cooper's Hawks nest in the neighborhood of a farm, where young chickens can readily be captured, they, if not speedily killed, will visit the place almost daily until the young chicks have all been destroyed, and if the hawks are not molested after a few visits to the coops, they seem to become more bold and daring every day.

KILLS GAME BIRDS.

This hawk does not by any means devote his attention exclusively to young poultry when he comes about the farm yard, but often may be seen to attack and kill chickens when two-thirds or even full grown.

Pheasants or Ruffed Grouse, both old and young, also quail, are destroyed in considerable numbers by the Sharp-shinned hawks. Young rabbits and squirrels are occasionally captured by these hawks, and on one occasion, a few years ago, a hunter of my acquaintance shot and presented to me a pair of these hawks which had killed several young wild turkeys, which he said were about one-third grown. I have known both the Sharp-shinned and Cooper's Hawks, which had probably been watching coveys of quail, to suddenly swoop down and seize a quail which had been shot, when the sportsman was only a few yards from the quail he had killed or wounded. Doves, which in recent years or since the wild pigeons have disappeared from this region, are eagerly sought after by sportsmen in many sections of the State, are very often destroyed by these hawks, and they also sometimes attack domestic pigeons.

According to Nuttall:

"This species feeds particularly upon mice, lizards, small birds, and sometimes even squirrels. In thinly settled districts this Hawk seems to abound, and proves extremely destructive to young chickens, a single bird having been known regularly to come every day until he had carried away between twenty and thirty."

The same writer relates a circumstance, where he was one day conversing with a planter, when one of these hawks came down and without any ceremony or heeding the loud cries of the housewife, who most reluctantly witnessed the robbery, snatched away a chicken directly before them.

Dr. Cones says:

"It preys chiefly upon small birds and quadrupeds, capturing in the dashing manner of all the species of this group, and, like its small allies, feeds to some extent upon insects."

Since the advent and alarming increase of the English Sparrow, it is not unusual for the Sharp-shinned Hawk to pay occasional visits to towns and villages where he should be heartily welcomed for the destruction he causes among these feathered pests.

Dr. A. K. Fisher very properly says:

"Little can be said in favor of this hawk, although its daring courage and impudence are to be admired. On this and the two following species (Cooper's Hawk and Goshawk) mainly rest the responsibility for the ill-favor with which the other hawks are regarded. A score of valuable species suffer because they belong to a class which includes two or three noxious kinds. However, like most villains, it has at least one redeeming quality, and that is its fondness for the English Sparrow, our imported bird nuisance."

SOME SMALL BIRDS IT DEVOURS.

The Sharp-shinned Hawk is known to kill and feed upon the following species of small wild birds which are common in this State:

Meadow Lark,	Red-headed Woodpecker,
Common Robin,	Cat Bird,
Crow Blackbird,	English Sparrow,
Cow Blackbird,	Song Sparrow,
Blue Bird,	Tree Sparrow,
Flicker,	Snow Bird,
Downy Woodpecker,	Fox Sparrow,
Goldfinch,	Chipping Sparrow,
Savanna Sparrow,	Orchard Oriole,
Baltimore Oriole,	White-throated Sparrow,
Chickadee,	Brown Thrush,
Hermit Thrush,	Myrtle Warbler,
Red Eyed Vireo,	Common Pewee,
Black Throated Green Warbler,	Oven Bird,
Red-winged Blackbird,	

This list could be considerably enlarged, as there are many other kinds of birds which different observers have identified among the stomach contents of this hawk. The list is, however, sufficiently large to give the general reader a very clear idea that the Sharp-shinned is ever ready to capture and prey upon almost

any bird he can master. The stomach contents of twenty-seven Sharp-shinned Hawks examined by the writer, are given in the following table:

No.	Date.	Locality.	Food Materials.
1.	September 7, 1878.	Chester county, Pa., ..	Song sparrow.
2.	September 14, 1878.	Chester county, Pa., ..	Quail.
3.	November 20, 1878.	Newark, Delaware,	Chicken.
4.	November 17, 1879.	Chester county, Pa., ..	Snowbird.
5.	May 3, 1879.	Chester county, Pa., ..	Field mice.
6.	September 10, 1879.	Chester county, Pa., ..	English sparrow and field mice.
7.	May 30, 1880,	Delaware county, Pa., ..	Chicken.
8.	June 2, 1880,	Chester county, Pa., ..	Chicken.
9.	June 3, 1880,	Chester county, Pa., ..	Chicken.
10.	August 23, 1881,	Chester county, Pa., ..	Grasshoppers and beetles.
11.	October 16, 1881, ...	Chester county, Pa., ..	Quail.
12.	October 29, 1881, ...	Chester county, Pa., ..	Quail and fragments of beetles.
13.	June 22, 1881,	Lancaster county, Pa., ..	Chicken.
14.	October, 1881,	Chester county, Pa., ..	Meadow lark.
15.	May 23, 1882,	York county, Pa.,	Warbler.
16.	December 13, 1882, ..	Chester county, Pa., ..	Song sparrow
17.	April 3, 1882,	Chester county, Pa., ..	Robin.
18.	September 21, 1884..	Chester county, Pa., ..	Field sparrow.
19.	October 3, 1886,	Chester county, Pa., ..	English sparrow.
20.	November 26, 1886..	Chester county, Pa., ..	Song sparrow and fox sparrow.
21.	August 15, 1887,	Lycoming county, Pa., ..	Mourning dove.
22.	September 19, 1887..	Dauphin county, Pa., ..	Ruffed grouse.
23.	November 17, 1887..	Delaware county, Pa., ..	Common pigeon, chickadee.
24.	June 20, 1888,	Lackawanna county, Pa., ..	Red-eyed vireo and chicken.
25.	October 1, 1890,	McKean county, Pa., ..	Downy woodpecker and snowbird.
26.	August 27, 1891, ..	Chester county, Pa., ..	Brown thrush and beetles.
27.	December 10, 1895.	Luzerne county, Pa., ..	Field mice and English sparrow.



COOPERS HAWK.

COOPER'S HAWK.

Accipiter cooperi.

DESCRIPTION.

Adult.—Above uniform bluish-gray, and top of head blackish; tail has several transverse blackish bands; lower parts white; breast and sides being barred with dusky or reddish-brown. Iris reddish amber.

Immature.—Above dusky, more or less spotted with white and reddish brown; tail banded; lower parts whitish with long brown spots. Iris yellow. A large female measures from 18 to 20 inches in length by 36 in extent; the long and rounded tail measures about 8½ inches; the male is smaller.

Habitat.—North America in general. Common in Pennsylvania, particularly in wooded and mountainous districts.

This much detested and commonly called "Long-tailed Chicken or Pheasant Hawk"—a native—is resident but it is not nearly so plentiful during the winter season as throughout the late spring, summer and early autumn.

THE NEST AND EGGS.

Nest building is commonly begun in this locality about the middle of April, and lasts for a period of from three to five days. Occasionally this bird will deposit its eggs in a deserted crow's nest. I believe they prefer to erect their own nests, and, from my observation, am quite positive they only appropriate the nests of other birds when their own have been destroyed. The building of the nest is the conjoint labor of both birds.

It is usually built in a thiek woods, and when a pair of Cooper's Hawks begin housekeeping in woodland near the farmer's poultry yard and they are not soon hunted up and killed or their nest and its contents destroyed, the chances are they will destroy a good many

dollars worth of poultry before they and their young leave the locality.

Externally the nest is built of sticks varying much in size. It is generally lined with the inner layer of bark, although, frequently, blades of grass, feathers and leaves enter into the construction of the interior. While certain writers have described the nest as broad, with but a slight concavity, I have invariably found the concavities to be well marked. The eggs measure about 1.92x1.50 inches and usually number from three to four, although it is not a rare occurrence to find five. In color they are a dull, bluish-white. Sets are sometimes taken with numerous and unevenly distributed brown or reddish spots. The period of incubation is given by Prof. Thomas Gentry (*Birds of Eastern Pennsylvania*), to be 18 days. Although in this particular my observation has been somewhat limited, I am fully convinced that the time required for this, likewise other of our birds of prey, is three weeks or over. The young leave the nest in about 25 days; when about 8 or 9 weeks old they are able to provide food for themselves; to this time, however, they are carefully guarded by the old birds and fed almost entirely on a diet of small wild birds, chickens, an occasional mammal and some few insects.

AN AUDACIOUS POULTRY THIEF.

While it is true that the Cooper's Hawk preys to a much greater extent on full grown poultry than does his daring little relative the Sharp-shinned Hawk, there is no doubt that at times individual Cooper's Hawks are equally as bad about destroying young poultry as are the Sharp-shinned Hawks. For impudent daring this present species, without doubt, ranks pre-eminent among the raptorial genera. Almost every



COOPERS HAWK. (YOUNG)

farmer or poultry raiser can recount instances of where he or she was the victim of pillage by this bold and audacious robber. In the spring of 1878 the writer was presented by a friend with a Cooper's Hawk which he had caught in a steel trap, but not until he and his mate had destroyed some fifty young chickens. In one day these two hawks killed twelve chickens.

A BOLD ACT.

Audubon says: "This marauder sometimes attacks birds far superior to itself in weight and sometimes possessed of a courage and strength equal to its own. As I was one morning observing the motions of some parakeets, near Bayou Sara, in Louisiana, in the month of November, I heard a cock crowing not far from me and in sight of a farm house. The next moment the hawk flew past me and so close that I might have touched it with the barrel of my gun had I been prepared. Not more than a few seconds elapsed before I heard the cackling of the hens and the war cry of the cock, and at the same time observed the hawk rising, as if without effort, a few yards in the air and again falling toward the ground with the rapidity of lightning. I proceeded to the spot and found the hawk grappled to the body of the cock, both tumbling over and over and paying no attention to me as I approached. Desirous of seeing the result, I remained still until, perceiving that the hawk had given a fatal squeeze to the brave cock, I ran to secure the former but the marauder had kept a hawk's eye upon me, and, disengaging himself, rose in the air in full confidence. The next moment I pulled the trigger and he fell dead."

A MIXED DIET.

Dr. Coues (Birds of Northwest) says, in speaking of this hawk: "Possessed of spirit commensurate with its physical powers, it preys upon game little if any humbler than that of our more powerful falcons. It attacks and destroys hares, grouse, teal, and even the young of larger ducks, in the state in which they are known as 'flappers,' besides capturing the usual variety of smaller birds and quadrupeds. It occasionally seizes upon reptiles or picks up insects. In securing its prey it gives chase openly and drives down its quarry with almost incredible velocity."

The following quotations from Dr. Fisher's Hawk and Owl Bulletin No. 3, page 39, show how extensively the Cooper's Hawk feeds on game and domestic birds. Nuttall says: "His food appears principally to be of various kinds; from the sparrow to the Ruffed Grouse, all contribute to his rapacious

appetite. His depredations among domestic fowls are very destructive." (Land Birds, 1832, p. 90.)

Mr. H. Nehrling says: "This very common and impudent robber is the most destructive of the Raptores to the barn-yard fowls; in a short time all the young chickens, turkeys and ducks are killed by it." (Bull. Nutt. Ornith. Club, Vol. VII, 82, p. 174.)

Mr Thomas McIlwaith says: "This is one of the chicken hawks, and it well deserves the name, from the havoc it makes among the poultry." (Birds of Ontario, p. 137.)

DESTROYS QUAIL.

"Mr. Henshaw informs me that the Cooper's Hawk is very partial to quail flesh in California and the southern territories, and that it undoubtedly secures many victims. He once saw a young female dart into a bevy of Gambel's quail and seize one with the utmost ease, though the birds were flying at full speed. In an instant the flock scattered in every direction and sought refuge in the bushes, from which it proved next to impossible to dislodge them. They had recognized their enemy and evidently knew that their only chance for safety lay in close hiding."

FEEDS ON DOMESTIC PIGEONS.

"Cooper's Hawk is very destructive to domestic pigeons, and when it finds a cote which is easy of approach, it is very troublesome. Dr. William C. Avery, of Greensboro, Alabama, informs us that during one year he killed and wounded at least a dozen of these hawks before the inroads among his doves ceased. Among the smaller birds, this hawk is very fond of meadow larks, robins and flickers. The writer, on several occasions, has secured specimens in hot pursuit of the last named bird, which gave expression to their alarm by loud and continued cries."

KILLS GROUSE AND OTHER GAME.

The common name of "Long-tailed Pheasant Hawk," by which this swift-winged plunderer is best known in the mountainous and sparsely settled regions, is given because of the great damage this hawk does by destroying Ruffed Grouse. For several years past the writer has every season visited different localities in Pennsylvania, for the purpose of hunting the Ruffed Grouse or Pheasant, and from personal observation is well aware that the Cooper's Hawk is a most destruc-

tive foe of this toothsome game bird. Hunters and woodsmen have often told me that these "pheasant hawks," referring to both the Cooper's and Sharpshinned, kill almost as many birds as the average sportsman, and judging from the way in which a good many sportsmen "shoot" when they are in the brush after the wily grouse it is very likely that this statement is correct. The Cooper's Hawk feeds upon the gray rabbit (common cotton-tail) and the mountain jack or white rabbit (Varying Hare); squirrels are occasionally killed and young wild turkeys also suffer considerably from the attacks of this bird. Besides destroying poultry and game of different kinds these hawks annually kill great numbers of small wild birds such as woodpeckers, sparrows, thrushes, etc.

The Cooper's Hawk has been known to kill and feed upon the following species of birds and mammals which are present in this State:

BIRDS.

Ruffed Grouse,	Meadow Lark,
Quail,	Screech Owl,
Common Dove,	Flicker,
Goldfinch,	Red-headed Woodpecker,
Robin,	White-breasted Nuthatch,
Shore-lark,	Song Sparrow,
Tree Sparrow,	Crow Blackbird,
Towhee,	Snowbird,
Red-winged Blackbird,	Field Sparrow,
Wild Turkey,	Savanna Sparrow,
Wood Duck,	Blue Bird,
Yellow-billed Cuckoo,	English Sparrow,

MAMMALS.

Opossum,	Chipmunk,
Gray Rabbit,	Red Squirrel,
Varying Hare,	Common Rat,
Field Mice,	Woodchuck (young).

The stomach contents of 43 Cooper's Hawks examined by the writer gave the following result: 18, chickens and pheasants; 12, small birds—sparrows;

warblers, meadow larks, woodpeckers, thrushes; 3, quail; 2, doves or domestic pigeons; 1, bull-frog; 3, mice, rats and insects; 1, opossum; 1, young woodchuck and remains of wood duck; 2, hair and other remains of small quadrupeds.

AT LEAST ONE GOOD TRAIT.

The Cooper's Hawk, sometimes like the Sharp-shinned species, visits yards and parks in towns and villages in quest of the English Sparrow, a bird which has by reason of its pugnacious habits driven many of our native and beneficial song birds from the habitations of man.



AMERICAN GOSHAWK.

GOSHAWK.

Accipiter atricapillus.

DESCRIPTION.

Adult.—Above dark lead color, with blackish shaft streaks; top of head black; white stripe over eye, and more or less indistinct about occiput (back of head); tail has four or five indistinct blackish bars; ends of tail feathers whitish; lower parts pale ashy white, with a faint leaden tint, sharply streaked with blackish and finely mottled or barred with white. Iris, reddish amber.

Immature.—Dark brown or grayish above, the feathers edged and spotted with whitish and pale reddish-brown; lower parts yellowish-white and marked with blackish spots or narrow stripes. Iris yellowish.

Length about 25 inches; extent, about 46; tail about 12½. The male is smaller.

Habitat.—Northern and eastern North America, breeding mostly north of the United States. Resident in a few of the higher and wooded mountainous regions of Pennsylvania.

The Goshawk is not common in this State. Usually this fierce, powerful and predatory bird confines himself to the mountainous and heavily wooded regions. It is rather exceptional for these birds to be found in the populous farming districts and when they are seen in such places it is generally during severe winters, when their favorite mountain retreats are visited by heavy falls of snow.

Hunters and woodsmen know the adults of this species by the name of "Big Blue Hawk." Audubon found the Goshawk breeding in the Great Pine Swamp in this State.

Some twenty-five years ago these hawks, it is said, were very frequently seen during all seasons in the counties of Cameron, Warren, Elk, Potter, Wyoming, Forest, McKean, and Sullivan, where they then, no doubt, bred regularly. Mr. M. M. Larrabee, of Emporium, Cameron county, says he always saw Gos-

hawks about the nesting places of wild pigeons, but when the pigeons left his locality these hawks also departed, and are now seen there chiefly as winter visitors.

BREEDS IN SULLIVAN COUNTY.

The Goshawk is a regular breeder on North mountain, Sullivan county, Pa. I have seen birds of this species in Clinton and Centre counties of this State in June and July, hence am inclined to think they may also breed in these counties. Messrs. Otto and Herman Behr of Lopez, Pa., have found, during the last five or six years, several nests of these hawks on North mountain. Within a radius of four or five miles of their home at least three or four pairs of these birds have bred regularly for many years.

In the latter part of May, 1896, Mr. Herman Behr found the nest of a Goshawk about three miles from his home; it contained three young birds. The nest was a very bulky structure, probably not less than three feet high by three feet in diameter, and made up almost entirely of sticks. It was built on a large beech tree.

During the present year (1897) the Messrs. Behr inform me they have found the nest of a Goshawk and secured the eggs.

GOSHAWKS AND WILD PIGEONS.

Mr. Behr informs me that some thirty-five years ago there was a wild pigeon roost or breeding ground fully seven miles square, on North mountain, which was annually resorted to by these birds every spring. On one occasion Mr. Behr counted forty-six pigeons' nests on a single beech tree. Wild pigeons, until within the last three years, bred regularly in small numbers on



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AMERICAN GOSHAWK. (YOUNG)

North mountain. The last wild pigeon observed in that region by Messrs. Otto and Herman Behr was taken in the spring of 1893. The Goshawk, also the Cooper's and Sharp-shinned species, in common with the Great Horned and Barred owls, destroyed great numbers of pigeons. Of all these raptorial birds the cruel, daring and blood-thirsty Goshawk was by far the most persistent and destructive enemy to the pigeons.

The owls, like other nocturnal marauders, such as the wild cat or bay lynx, the red fox, the mink and agile weasel, all preyed upon the pigeons. The weasels would frequently climb the tree to get the pigeons' eggs and young, or often to capture the old birds when at rest. The other mammals previously mentioned depended mostly on catching squabs which fell from the nests.

WHAT GOSHAWKS PREY UPON.

The Goshawk feeds upon chickens, turkeys, ducks, grouse, quail, robins, hares and squirrels and other small rodents. Although at times this bird is very destructive to poultry the greatest damage done by this species in the State appears to be to game, especially grouse.

The following paragraphs concerning this daring and destructive hawk are taken from Dr. A. K. Fisher's Report, Bulletin No. 3:

"This species is one of the most daring of all the hawks, and while in pursuit of its prey is apparently less concerned by the presence of man than any other. It will dart down unexpectedly at the very feet of the farmer and carry off a fowl."

The following from the pen of the late Dr. William Wood gives evidence of its boldness:

THE DESTRUCTION OF POULTRY.

"The Goshawk is one of the most daring and venturesome of any of our diurnal birds of prey. A farmer who resides a few miles from my office, wishing to perpetuate the old New England custom of having a chicken pie for Thanksgiving dinner, caught some fowls, took them to a log, severed the neck of one, and threw it down beside him. In an instant the Goshawk seized the struggling fowl, and, flying off some ten rods, alighted and commenced devouring his prey. The boldness of the attack so astonished the farmer that he looked on with blank amazement. Recovering from his surprise, he hastened into the house and brought out his gun, which secured him both the hawk and the fowl. Another instance of still greater daring occurred near East Windsor Hill, Connecticut. A Goshawk flew after a fowl near a dwelling house; the door being open, the hen flew inside; the hawk followed, and seized her in the room occupied by an old gentleman and his daughter. The old man hastened to the rescue, and struck the hawk with a cane before it released its grasp. The daughter caught the hawk as it attempted to fly out of the door, and killed it." (Amer. Nat. Vol. X, 1876, p. 134.)

Capt. Charles E. Bendire informed the writer that at Fort Klamath, Oregon, he once shot at a Goshawk and slightly wounded it with fine shot, and in the course of a few minutes it returned and attacked a chicken. Numerous cases are on record where it has flown through windows to attack canaries or other cage birds.

AN ENEMY OF THE WILD FOWL.

"In the general character of its flight, as well as the mode of hunting and capturing its prey, it closely resembles Cooper's Hawk, though it frequents the thick woods rather more than the latter bird. In the fall this hawk is common along the smaller water courses where it is very destructive to wild ducks and other water fowl, and is able to strike down a bird as large as a full grown mallard. If its prey is a bird of this size it rarely eats more than the flesh from the breast, leaving the rest of the carcass untouched. Scorning to feed upon carrion, another victim is secured when hunger returns.

A SUCCESSFUL GROUSE HUNTER.

"Of the upland game birds the Ptarmigan in the north and the Ruffed Grouse in the middle districts suffer severely from the attacks of this powerful hawk. Dr. William H. Dall, who found it common in the valley of the Yukon river, states that it feeds largely upon the White Ptarmigan, the flocks of which it follows from place to place. E. W. Nelson and L. M. Turner both corroborate its destructiveness among these birds. In some parts of the country the Goshawk hunts the Ruffed Grouse so persistently that it is known by the name of "Partridge Hawk," and this bird probably has no worse enemy except man. As Audubon was passing down the Ohio he observed one of these hawks dive into a flock of

grackles which was crossing the river, and kill four or five of them. After giving each victim a fatal squeeze the hawk allowed it to fall in the water, and at the close of the chase returned and picked all from the surface."

The fierce nature of this species is well shown in the concluding paragraphs from the pen of my friend, L. M. Turner:*

PTARMIGANS ARE EASY PREY.

"The tracts preferred by the Goshawk are the narrow valleys, borders of streams and the open tundra, which it constantly scans for Ptarmigan and small mammals; the Lemming forming a considerable portion of its food. It will sit for hours in some secluded spot, awaiting a Ptarmigan to raise its wings. No sooner does its prey rise a few feet from the earth than with a few rapid strokes of the wing and a short sail, the Goshawk is brought within seizing distance! it pounces upon the bird, grasping it with both feet under the wings, and after giving it a few blows on the head they both fall to the ground, often tumbling several feet before they stop, the hawk not relinquishing its hold during the time. During the mating season of the Ptarmigans many males suffer death while striving to gain the affection of the female, for as he launches high in the air, rattling his hoarse note of defiance to any other male of its kind in the vicinity, the Goshawk darts from a patch of alders or willows, or from the edge of the neighboring bluff, and with a dash they come to the ground, often within a few yards of the terror-stricken female, who now seeks safety in flight as distant as her wings will carry her. I have seen this hawk sail without a quiver of its pinions until within seizing distance of its quarry, and suddenly throw its wings back, when with a crash they came together, and all the vicinity was filled with white feathers, floating peacefully through the air. I secured both birds, and found the entire side of the Ptarmigan ripped open.

On another occasion I shot a fine individual as it rose from a small clump of willows, to which I had approached unobserved by the bird. It had been devouring a Ptarmigan, which it had secured but a little while before. The flesh of the bird was yet warm, though nearly all devoured. The Goshawk was only wing-tipped with shot and proved to be quite vicious, seizing my boot with its talons and striving to grasp my hand with its beak. The bird was so quick that I had to call the assistance of a native to detach the claws from my clothing. Upon skinning the bird I found its crop to be full of the flesh of the bird it was eating when I flushed

*Contributions to the Natural History of Alaska, results of investigations made chiefly in the Yukon district and the Aleutian Islands; conducted under auspices of the United States Signal Service, extending from May, 1874, to August, 1881, by L. M. Turner.

it. I am under the impression that the Goshawk is not able to fly with the weight of the Ptarmigan in its claws. It is a resident of the interior and comes to the coast quite early in spring."

The Goshawk can fly readily with an adult Ruffed Grouse or Pheasant in its grasp. Last November, one of my friends when hunting grouse, saw a large bird fly with great rapidity from a clump of shrubbery where he had gone to look for a Pheasant which he had a few minutes before flushed. He shot and killed the bird, which proved to be an adult female Goshawk and on going to pick it up he was surprised to find it had in its claws a Pheasant.



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RED TAILED HAWK.

RED-TAILED HAWK.

Buteo borealis.

DESCRIPTION.

The adult is easily recognized by its red tail. The tails of young birds are usually ashy-brown, with about ten darker bands. Tail in both old and young is generally tipped with white. Breast of adult mostly spotted or marked with reddish brown; in the young, breast is pure white enclosed by numerous dark markings. Length of male, 19 to 22 inches; extent of wings, 41 to 47 inches. Female, length, 22 to 24 inches; extent, 51 to 55 inches. From a careful examination of over one hundred of these hawks, I have found that they, like other of the raptores, not only vary greatly in the markings of their plumage, but also show marked differences in the color of the irides. The iris of the adult, though usually brown, is sometimes both brown and yellowish. In immature birds the iris is commonly straw color, but sometimes it is nearly white, and occasionally, though rarely, is brown; in other specimens I have seen one-half of the iris brown while the remainder would be white or yellowish.

In immature birds, light-colored irides with specks of brown are frequent.

Habitat.—Eastern North America, west to the great plains. Common and breeds generally throughout Pennsylvania.

This hawk, one of the most abundant of our raptorial birds, is the large "Hen Hawk" of the farmer. The Red-tailed Hawk is exceedingly shy and wary, and is taken with difficulty, unless approached on horse-back or in a sleigh or wagon. Red-tailed Hawks in their fall migrations are gregarious. One clear, cold autumn afternoon in 1876, I saw, near West Chester, a flock of these hawks. The sky was destitute of clouds, except a cumulus stratum directly beneath, and apparently about half-way between the hawks and the earth. In the center of this vapor was an opening of sufficient size to enable me to watch the gyrations of the birds; two of them suddenly separated from the main body, approached each other screaming, and apparently in great rage. They descended screaming,

and, to all appearances, clinched, to within about one hundred yards of the earth, when they parted. Evidently neither bird had received much injury, as they both, after taking short flights across the meadow, ascended in company with two or three of their companions that had accompanied them part way down to main body. Another individual closed his wings until the body presented a triangular outline, descended with almost lightning-like rapidity to the top of a sycamore, where it alighted, and remained for some seconds pluming itself. This party of hawks, after performing for nearly twenty minutes these and numerous other aerial antics, continued their southern flight.

THEY BATTLE IN MID-AIR.

Combats in mid-air are quite common among Red-tailed Hawks. I have repeatedly witnessed such battles, and am fully convinced that in the great majority of cases food is the incentive to such action. Illustrative of the superior vision of this hawk—and the same applies to other of the Rapacia—the following is given, as observed by the writer: A clear morning early in March, I saw a Red-tail circling over the meadows; every circle took him higher and higher in the air, until, at an altitude where he appeared no larger than a blackbird, he stopped, and with nearly closed wings, descended like an arrow to a tree near by me; from this perch, almost the same instant he had alighted, he flew to the ground and snatched from its grassy covert a mouse. The momentum with which this bird passed through the atmosphere produced a sound not very unlike that of the rush of distant water.

HANDLE A WOUNDED HAWK CAREFULLY.

This species when wounded, like all other rapacious birds, will defend itself with its claws and bill against all advances. A stick or gun barrel presented to it, when crippled, will be grasped, and the bird can be carried pendant from the same a considerable distance before it will loose its hold. With such tenacity do they hold on that a friend of mine who had winged one, in his endeavors to capture it alive, had the bird to fasten on his forearm with both claws; to relieve himself he was obliged to take out his penknife and sever the tendons of both legs.

WHEN RED-TAILS WERE ABUNDANT.

Fifteen years ago birds of the genus *Buteo*, especially the Red-tailed and Red-shouldered species, and the Rough-legged Hawk, likewise the handsome little Sparrow Hawk, were very numerous about the fields and grassy meadow lands in most of the farming districts of this State. The passage of the Scalp act of 1885 stimulated many persons to make a regular business of slaughtering these hawks, as well as other animals, and as a result thousands were killed during the active enforcement of the unwise law. In the winter of 1884 I took a drive along the Brandywine creek, and, in a distance of two miles above Chadd's Ford, Delaware county, saw five Rough-legged Hawks, nine Red-tailed, four Red-shouldered, and three Sparrow Hawks, or twenty-one in all. Several times, in winter, since 1885, I have driven over the same route and at no time have I seen more than two or three of these species, and generally the birds that were observed on these last trips were Sparrow Hawks.

The meadows along the Brandywine, in the locality

noted above, are favorite feeding grounds for birds of prey which subsist on meadow-mice.

MICE DESTROYED THE GRAPE VINES.

The experience of a farmer, Mr. Worth, who resided along the Brandywine a few miles above the place last referred to, shows the utter folly of destroying the mice-eating hawks and owls.

Many birds and mammals are, at times, destroyed with the consent of the farmer, who evidently does not realize that they come to his premises to prey upon insidious foes which attack his crops. In this connection it will not, perhaps, be out of place to give the experience of Ebenezer Worth, a farmer who resided in Chester county, Pennsylvania, along the Brandywine creek, a few miles from West Chester, where he owned a large vineyard.

The fields and meadow lands about his grape vines were frequented in the winter season by hawks and owls of different kinds. During the winter of 1886 and 1887 over a hundred of these birds were killed within a radius of two miles of his farm, and the following winter a hawk or owl was seldom seen about his premises. Field or meadow mice became abundant in that vicinity and before the winter was over several hundred grape vines were destroyed by these little rodents. Mr. Worth was convinced that the birds of prey had kept in check, during former years, the mice, and had the hawks and owls that had so faithfully guarded his possessions, both by day and night, been left unmolested his vineyard would not, in his opinion, have been almost ruined.

For generations the game-keepers of Great Britain have persistently destroyed the birds of prey, and as a

result we read of great invasions of voles (meadow mice) which ruin a vast amount of property.

If the persecution of the hawk and owl tribe in this country is not checked, we may expect such ruinous invasions of these sleek-coated rodents.

THE NEST AND EGGS.

Nest building generally occurs in March and lasts from eight to fifteen days. The nest is built in the woods, commonly on a large oak or hickory tree. A pair of these hawks resorted for five consecutive years to a large oak tree for nesting purposes, in a belt of timber adjacent to the far-famed Deborah's Rock, East Bradford township. The nest, a rather bulky structure, is made, externally, of sticks and twigs, some of the former being an inch in thickness; internally, it is lined with leaves and the inner layer of bark—usually from oak and chestnut trees. This lining of bark is frequently torn in shreds.

Certain ornithologists, Audubon among the number, have found five eggs in their nests. I have, however, mostly found two, and on no occasion have I found more than three to constitute the full complement.

The eggs, about 2.40 by 1.85 inches, vary much in their markings. Their ground color is a dull white or rusty white, marked with minute brown spots, or with large purplish dark-brown blotches, often covering the greater part of the egg. Incubation lasts about three weeks. Certain writers claim that this species will boldly defend invasion of its home on the part of man. Such may have been the experience of others, but such statement is the reverse of my experience. I have taken both eggs and young, and, as yet, I have encountered no opposition; but have found them cowardly, flying away, in fact, beyond gunshot at my ap-

proach, uttering cries of distress, and seemingly to engage in mutual condolence over their misfortune.

HOW THEY CATCH SQUIRRELS.

During the breeding season they frequently hunt together for food for themselves and young "and if, perchance, they spy a squirrel on a tree, one will drive it while the other poises itself ready to seize it if it dodges to the other side to evade the grasp of the first hawk. From the two there is no escape. Grasping it firmly by the neck, the assailant practically demonstrates the possibility of garroting its victim, when the ill-fated squirrel is carried to the eyrie and torn to pieces to satiate the cravings of their rapacious young."—Wood.

WILL TAKE CHICKENS.

Red-tailed hawks, when mice or other food supplies are not readily obtainable, unquestionably will catch poultry, and they do not, at such times, hesitate to attack full grown fowls. It may be that they prefer to make warfare on sick or weakly chickens, but, of this I am not convinced, as I have known of a number of instances where these hawks have attacked and killed chickens in full vigor of life. Observations of this bird, however, lead me to believe, that except in winter when its preferred and natural bill of fare—mice, shrews and insects—are hard to obtain, or, in the breeding period, when its young require so much food, it is rather exceptional for the Red-tailed to attack domestic fowls. A good many rabbits and squirrels are eaten by the Red-tail, yet the farmer should not complain as these mammals are no benefit to him.

RED-TAILS ARE GOOD MOUSERS.

In consequence of limited space it is impracticable to give in detail the results of dissections which I have made of this species, but would state briefly that my examinations of one hundred and seventy-three Red-tails captured in Pennsylvania, chiefly in Chester county, revealed, in one hundred and twenty-eight, principally field-mice (*Arvicolæ*) and other small quadrupeds, also some few small birds; in nine of these one hundred and twenty-eight hawks, small birds were present in addition to the quadrupeds. Fourteen had fed on chickens; six, small birds—meadow larks and sparrows; six, rabbits; three, quail; three, red squirrels; three, mice and insects; three, snakes; two, remains of skunk; two, carrion; one, ham skin; one, meat, probably beef. I have repeatedly found three and four mice in the viscera of one bird, oftentimes five, and in a few instances as many as seven of these destructive little rodents were obtained from the crop and stomach of one hawk.

RED-SHOULDERED HAWK.

Buteo lineatus.

DESCRIPTION.

Total length: Female, 21 to 23 inches; extent about 44 inches; wing 14; tail 9 inches. Male 18 to 20 inches; extent about 40 inches, wing, 12; tail, 8 inches.

Adult.—Shoulders rich reddish-brown; rest of upper parts blackish, spotted with reddish-brown, white and dusky; primaries blackish above and spotted with white; tail with three or four broad black bars, between which are narrow white bands; tip of tail whitish; under parts reddish-brown more or less streaked with dusky and barred with white.

Immature.—The upper parts brownish, varied with rusty and whitish. The shoulders in many specimens show considerable red, tail brownish white with several small blackish bars, lower parts white and yellowish-white, with stripes and large oblong spots of brown.

Habitat.—Eastern North America, west to Texas and the plains, south to the Gulf coast and Mexico. Tolerably common summer resident in mountainous districts of Pennsylvania.

Like the preceding species this bird is known to farmers and sportsmen as "Hen-hawk." During the summer season Red-shouldered hawks are quite plentiful in many of the mountains and wooded regions of the State.

In winter these hawks frequent principally the large water courses, meadow lands, and the vicinity of ponds, and not unfrequently an individual of this species can be observed on its perch overlooking a spring-head. When the streams and meadows are frozen I have noticed that they especially resort to such localities as last named. When disturbed from its perch it utters, in a plaintive and impatient voice, the note keeo, keeo. Its flight, generally short, is graceful and very owl like.

This Hawk, like its relative, the Red-tail, may be observed sitting by the hour on some favorite tree or stake adjacent to swampy or boggy ground, watching



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RED SHOULDERED HAWK.



RED SHOULDERED HAWK. (YOUNG)

for small quadrupeds and batrachians, which constitute its principal fare. Young birds, which are known to many as Winter Falcons, are, according to my experience, much more frequently met with than full plumaged adults.

THE NEST AND EGGS.

Like other birds of this genus, the Red-shouldered Hawk nests in trees, usually in April and May in this locality. The eggs, two to four in number, are very similar to those of the Red-tail, but smaller.

"The nest closely resembles that of the crow, except that it is larger and lacks the compact and neat appearance common to the nest of the latter bird. It is composed of coarse sticks loosely placed together with finer ones toward the central cavity, which is lined with the bark of the grape vine and other fibres, or, in some cases, with pieces of the rough outer bark of the oak and hickory, and not uncommonly, as with many of the other birds of prey, green twigs with leaves attached are used.

"Bottom lands grown up with large deciduous trees, or the neighboring hillsides, are the favorite nesting sites of this bird. The nest is placed in one of the larger trees 40 to 80 feet from the ground, and usually in the fork where the main branches diverge from the trunk. A pair will inhabit the same locality for years, and often occupy a nest for several seasons. * * * It is stated that this species remains mated through life, and that even during the winter months mates appear very much attached to each other, differing in this respect from the Red-tail."—Fisher.

DOES NOT PREY ON CHICKENS.

Although this hawk is frequently charged with destroying domestic fowls, observation in the field and numerous dissections of food-receptacles of this species do not by any means justify such a statement. My experience on this subject agrees in the main with that of Dr. A. K. Fisher, who says:

"Some authors insist that the Red-shouldered Hawk is destructive to poultry, but the writer in all his field experience has never seen one attack a fowl, nor has he found the remains of one in the stomachs of those examined. In making this statement, he does not include poultry which is eaten in

the form of offal, for in severe weather when the ground is covered with snow and when food is scarce, the Red-shouldered Hawk will devour dead chickens which have been thrown out from the yard, as well as other refuse found on the compost heaps or in the vicinity of slaughter houses. At such times the writer has often captured specimens of this hawk, as well as of crows, blue jays, red and flying squirrels, in steel traps set near a piece of chicken, rabbit or beef fastened in a tree "

EATS FROGS AND INSECTS.

Nuttall remarks that this hawk lives principally on frogs, and probably insects and craw-fish in the winter. Gentry tells us that the food of the young consists of fragments of quadrupeds, besides an immense number of young grasshoppers and beetles. In my examinations of fifty-seven of these hawks which have been captured in Pennsylvania, forty-three showed field-mice, some few other small quadrupeds, grasshoppers and insects, mostly beetles; nine revealed frogs and insects; two, small birds, remains of small mammals and a few beetles; two, snakes and portions of frogs. The gizzard of one bird contained a few hairs of a field-mouse and some long black hair which appeared very much like that of a skunk. The bird on dissection gave a very decided odor of skunk. In two of these hawks, shot in Florida, I found in one portions of a small catfish, and in the other remains of a small mammal and some few coleopterous insects (beetles).



$\frac{1}{3}$

BROAD WINGED HAWK.

BROAD-WINGED HAWK.

Buteo latissimus.

DESCRIPTION.

Length of female about 17; extent about 36; tail about 7 $\frac{1}{4}$ inches.

Adult.—Upper part umber brown and many feathers edged with rusty or whitish; tail crossed by three black and two white bands, and narrow white tip, lower parts white or yellowish-white, variously streaked and spotted with rusty. Immature birds are fuller and have showy dark cheek patches; tail grayish-brown, with white tips and crossed with five or six indistinct dusky bands; lower parts similar to adult, but paler and spotted or streaked with black and dusky. Iris brown; legs and feet yellow.

Habitat.—Eastern North America, from New Brunswick and southward to Central America, northern South America and the Saskatchewan region to Texas and Mexico, and thence the West Indies.

Of the genus *Buteo*, in this section, the Broad-winged is the least abundant. It is a native and resident. The movements in the air of this hawk are easy and beautifully graceful. When in quest of food, its flight is in circles. At times, when circling, like the Sparrow Hawk, it will stand for an instant beating the air, and then descend with great velocity upon its prey, which it secures, not in its descent, but as it is on the rise. I have on more than one occasion witnessed this species take aliment in the way described. I incorporate it, notwithstanding that it disagrees with certain good authority.

THE NEST AND EGGS.

Nest-building takes place from the first to the middle of May, and the four nests which I have found have all been located in high trees; three in hickory trees, the other in an oak. All of these nests were over fifty or sixty feet from the ground. The nest is

very similar to that of the Cooper's Hawk; it is made of sticks, twigs, leaves, rootlets, lined with feathers; one I have found lined with bark. The complement of eggs are somewhat larger than those of the Cooper's Hawk, with a dull white, grayish ground color, with brownish red spots, which vary in size from specks to large patches, frequently confluent.

IS AN UNSUSPICIOUS BIRD.

This hawk is generally easily captured, appearing quite tame and unsuspecting. To this fact, no doubt, is largely due the scarcity of the species in many sections of our State where in former times, or before hawks were hunted for bounty, these birds were quite plentiful. I have always found the Broad-winged Hawk to be cowardly, and never knew it to evince any disposition to repel an invasion, by man, of its nest.

It would seem, however, that the disposition of this bird, under certain circumstances, is very variable. Mr. A. G. Boardman, of Maine, who has found several nests and secured the eggs, finds it to be courageous and spirited. A man whom he had employed to obtain a nest, was attacked with great fury, while ascending the tree; his cap was torn from his head, and he would have been seriously injured if the bird had not been shot. Another instance is mentioned by Dr. Wood, where this hawk attacked a boy climbing to her nest, fastened her talons in his arm, and could not be removed until beaten off and killed with a club. In speaking of this bird, Dr. Wood says:

"Seldom, if ever, does it seize its prey on the wing, but secures it mostly on the ground, subsisting on frogs, snakes, mice and small birds, devouring the latter without removing the feathers. This hawk in its habits is not as neat in preparing its food as most of its genus; holding its prey with both feet, it tears and eats without much regard to cleanliness or feathers."

FOOD OF THE BROAD-WING.

Careful investigations in both field and laboratory demonstrate conclusively that this hawk does not disturb the farmers' poultry and that it rarely attacks small wild birds. Its dietary is made up principally of insects (different kinds of grasshoppers, crickets, locusts, beetles and larvae) the smaller species of mammals, reptiles, and batrachians. Occasionally, when other food supplies are not readily obtainable, this hawk will catch young or disabled birds. Toads, frogs and snakes are eagerly hunted and eaten by this species. Referring to its fondness for toads, frogs, snakes and injurious larvae (grubs), Dr. A. K. Fisher says:

"In spring, when toads frequent ponds to spawn, it devours large numbers of them, and later in the season it is not an uncommon occurrence to see an individual with a frog or snake dangling from its talons." Continuing, the same writer adds: "The only act of the Broad-winged Hawk which seems injurious to agriculture is the killing of toads and small snakes; the former of which are exclusively insect eaters, the latter very largely so. In one respect its enormous value ranks above all other birds, and that is in the destruction of immense numbers of injurious larvae of large moths, which most birds are either unable or disinclined to cope with."

In twelve specimens examined by myself, four revealed mice; three, small birds; four, frogs; one, killed the 22d of May, 1882, was gorged with crawfish, with which were traces of coleopterous insects (beetles).

WHAT OTHER WRITERS SAY ABOUT ITS FOOD.

Audubon says: "In the stomach of this bird I found wood frogs, portions of small snakes, together with feathers, and the hair of several small specimens of quadrupeds." (*Ornith. Biography*, Vol. I, p. 463.)

Mr. J. W. Preston says: "Their food consists of small squirrels, frogs, and, in fact, any small quarry easily captured. Never have I known them to molest the poultry." (*Ornith. and Oologist*, Vol. XIII, 188, p. 20.)

Mr. J. G. Wells, speaking of the bird in the West Indies, says: "Numerous; feeds on lizards, rats, snakes, young

birds, etc. and occasionally makes a raid on the poultry yard." (Proc. U. S. Nat. Mus., Vol. IX, 1886, p. 622.)

Dr. F. W. Langdon says: "The stomach of a specimen of this hawk taken in Madisonville, in April, 1877, contained the greater part of the skeleton and hair of a small wood mouse (*Arvicola austerus*), a lizard (*Eumeces*) about six inches long, and ten or twelve small beetles, with numerous elytra of the same." (Journ. Cincinnati Soc. Nat. Hist., Vol. I, p. 116.)



ROUGH LEGGED HAWK.

ROUGH-LEGGED HAWK.

Archibuteo lagopus sancti-johannis.

DESCRIPTION.

"Adult male and female: Too variable in plumage to be concisely described. In general the whole plumage with dark brown or blackish and light brown, gray or whitish, the lighter colors edging or barring the individual feathers; tendency to excess of the whitish on the head, and to the formation of a dark abdominal zone or area, which may or may not include the tibiae: usually a blackish anteorbital and maxillary area. Lining of wings extensively blackish; tail usually white from the base for some distance, then with light and dark barring. The inner webs of the flight feathers extensively white from the base, usually with little, if any, of the dark barring so prevalent among buteonine hawks. From such a light and variegated plumage as this, the bird varies to more or less nearly uniform blackish, in which case the tail is usually barred several times with white. * * Length of a female, 22.00; extent, 54.00; wing, 17.50; tail, 9.00; iris light brown; bill mostly blackish-blue; cere pale greenish-yellow; feet dull yellow; claws blue-black. This is about an average size; the male averages smaller."—Coues' Key.

Habitat.—Whole of North America north of Mexico, breeding north of the United States. Winter resident in Pennsylvania.

In any plumage this bird can easily be distinguished from other of our hawks by the tarsus, which is thickly feathered in front to the toes. I have found the Rough-legged or Black Hawk in Pennsylvania only as a winter sojourner, about the meadows and grass fields along or near large streams. In the winter of 1879, when hunting along the Brandywine creek I saw seven of these hawks at one time, perched about on trees in a meadow of some five acres in extent. In this locality the species is usually found singly or in pairs. Rough-legs generally migrate northward about the middle of March; I have, however, observed them here late in April.

"Its migrations appear to be quite regular and extensive—more so, perhaps, than is generally supposed—though prob-

ably it does not differ from hawks in this respect. Birds of this family must follow their prey, wherever this leads them, and only a few of the more powerful species, able to prey upon hares and ptarmigan, pass the winter in our highest latitudes. The Rough-legged is a rather northerly species, rarely, if ever, breeding within the limits of the United States, and becoming rarer towards its southern terminus."—Cooper.

AN ERROR CORRECTED.

I desire to correct here an error which was made, but through no fault of mine, in the first issue of the *Birds of Pennsylvania*, pp. 92-93, where I stated, on the authority of Mr. Samuel B. Ladd, of West Chester, Pa., that he (Mr. Ladd) had, April 5, 1886, found a nest and two eggs of this bird in a thick woods at Fite's Eddy, on the Susquehanna river. A description of the nest and eggs was published in my first report, as given to me by Mr. Ladd, but I have since learned from Mr. Ladd that he did not secure or even see the hawks, hence I am satisfied that this "record" was without doubt based on erroneous identification. Dr. C. H. Merriam, of United States Department of Agriculture, Washington, D. C., informs me that he is not aware of a single authentic record of the breeding of the Rough-legged Hawk anywhere within the limits of the United States.

SUBSISTS MAINLY ON FIELD MICE.

In the Rough-legged Hawk, we find another example of one of our larger feathered mouse hunters, which is often slandered by the name of "hen-hawk."

Since the Scalp Act was in force, and thousands of the most beneficial hawks were slain, this species has become, I might say, almost a rare visitor to marshy lands where in former years, I have found it frequently quite plentiful. The viscera of sixteen of these hawks which the writer has examined, contained only field mice and a few other small rodents. The food table,



ROUGH LEGGED HAWK.(YOUNG)

given by Dr. A. K. Fisher, of 49 stomachs, shows conclusively that meadow mice constitute almost wholly the food of the species. Prof. Samuel Aughey found the remains of a gopher, a small lizard, and seventy insects in the stomach of a Rough-leg killed in Nebraska, in September, 1872; however, such food materials according to most authorities, are seldom taken.

Of the 49 stomachs referred to by Dr. Fisher, 40 contained mice, chiefly meadow mice; usually, 2 or 3 in each stomach, sometimes 4 or 5, and in several stomachs, each contained 6 or 7 of these little animals.

DESTROYS ENEMIES OF THE ORCHARD.

"The Rough-leg is one of the most nocturnal of our hawks, and may be seen in the fading twilight watching from some low perch, or beating with measured, noiseless flight over its hunting ground. It follows two very different methods in securing its food, one by sitting on some stub or low tree and watching the ground for the appearance of its prey, as the Red-tail does; the other by beating back and forth, just above the tops of the grass or bushes, and dropping upon its victim, after the manner of the Marsh Hawk. Its food consists principally, if not almost exclusively, of the smaller rodents, and most prominent among these are the arvicoline mice and lemmings. As is well known, the meadow mice (*Arvicolæ*) are widely distributed over the North Temperate Zone, and often occur in immense numbers, overrunning certain sections of the country, and doing irreparable damage to crops as well as to fruit and ornamental trees.

"Repeatedly young orchards, consisting of hundreds of trees, and representing great money value, have been totally destroyed by these pests. The damage is done in winter, under the snow, where the mice eat the bark from the trees, often completely girdling them and causing their death.

"Usually meadow mice are fairly common, if not abundant, over a large part of the meadow and marsh lands of the central and northern United States and temperate Canada. To show how important meadow mice are to the Rough-leg as an article of food, it may be stated in general terms that the southern limit of its wanderings in winter is nearly coincident with the southern boundary of the region inhabited by meadow mice. In the north lemmings are abundant over the country in which the Rough-leg makes its summer home, and furnish a never-failing supply of food for old and young.

"The following statements indicate to what extent the Rough-leg feeds on meadow mice: "Mr. E. O. Damon, of Northampton, Massachusetts, informs the writer that he has killed hundreds of these hawks on the low meadows bordering the Connecticut river, and of the many stomachs he ex-

amined all contained the remains of meadow mice. He further states that he never found even a frog in its stomach or saw it attack anything larger than a rat or meadow mouse. Dr. Michaner (in U. S. Agr. Rept., 1863, p. 291), says of the Rough-leg: "The number of meadow mice which this species destroys ought, one would think, to insure it the protection of every husbandman." Dr. J. C. Merrill states that the stomachs of those killed at Fort Klamath, Oregon, usually contained field mice. (Auk, Vol. V, p. 145.) Mr. A. Hall, writing of this hawk in Nebraska, says: "This species is very abundant in winter, and subsists entirely upon mice, frogs and small rodents. It seldom, if ever, preys upon birds." (Forest and Stream, Vol. XX, May 10, 1883, p. 284.) (Dr. A. K. Fisher's Report.)



$\frac{1}{6}$

GOLDEN EAGLE.

GOLDEN EAGLE.

Aquila chrysaetos.

DESCRIPTION.

Tarsi densely feathered all around to base of yellow toes. Length about 3 feet; extent $6\frac{1}{2}$ to $7\frac{1}{2}$ feet.

Adult.—General color dark brown; the lengthened pointed feathers of hind neck golden brown; feathers of tarsi pale yellowish-brown; tail blackish and grayish.

Immature.—Basal two-thirds of all tail white, with a blackish terminal band, lower parts much lighter than adult.

Habitat.—North America south to Mexico, and northern parts of the Old World. A winter resident in Pennsylvania.

This large bird occurs in Pennsylvania as a winter visitant. The only species with which it is sometimes confounded is the Bald or White-headed Eagle in immature plumage. The two species can always be distinguished at a single glance, if you remember that the Golden Eagle has the tarsus densely feathered to the toes, and the Bald Eagle has a bare tarsus. One of the largest Golden Eagles I ever saw was captured in December, 1889, by a hunter in Cameron county. This bird, which was handsomely mounted by my friend, Mr. M. M. Larrabee, of Emporium, weighed, Mr. Larrabee informed me, twenty-five pounds. The species breeds in high mountainous regions and the Arctic countries.

There is a specimen of the Golden Eagle, in the Museum of the Pennsylvania State College, captured a few years ago in Clinton county, where for several days, when deep snow covered the ground, it lingered about a farm house and preyed upon chickens and turkeys, and when it was shot it had just swooped down on a favorite pussy which spent most of her time in a swampy, grassy thicket, near the barnyard, watching for small birds and rabbits.

THE GOLDEN EAGLE AS A PET.

The following mention of the peculiarities of the Golden Eagle in captivity I gleaned from conversation with Mr. B. M. Everhart, the well-known botanist of West Chester, Pa., who for several years kept one in his yard. This bird, in consequence of a gun-shot wound in the wing, was unable to fly off. All the yard situated to the north and east of the house was known as Nero's (bird's name) domain. Along the walk leading to my office was his perch, a dead tree stump some eight feet high. When satiated with food he would sit there for hours at a time. If at any time during the day a cat or domestic fowl happened to enter his ground, it had to make a speedy departure or be killed. The latter was mostly the case, for Nero seldom "went for" anything without his capturing it. When I neglected to give him his daily allowance (two pounds meat), as was sometimes the case, he wandered about the yard uttering a ventriloquial, guttural sound, which had the effect of bringing around him birds and chickens. Occasionally the former, and invariably the latter, would be killed. Towards people, other than myself, he displayed great animosity, this being particularly the case with children and timorous individuals. One day Joshua Hoopes, a school teacher at that time, brought a party of his boys to see the bird, and I noticed one of their number, a puny and delicate lad, the eagle continually eyed and several times endeavored to make at him. A female domestic, who had annoyed him by throwing water on him and poking at him with a stick, he showed great antipathy to; we were eventually obliged, for her personal safety and our own convenience, to discharge the girl, as she could not go into the yard without being attacked.

An Irishman one day slyly entered the yard, but in crossing Nero's province he was set upon by the bird. In the fleshy part of the man's thigh he imbedded his talons, and it was with considerable difficulty his hold was loosened. Erin's son declared that never before in his life had he met "sich a divil," and that nothing short of the eagle's life could appease his injuries.

Examination showed that although there were ugly flesh wounds, nothing of a serious nature would follow. This information being imparted, and a two dollar bill tendered to the Irishman, his sufferings were much relieved. He stated that although he looked upon the "critter" as a "bold, bad burd," still he deemed him a fit subject to "kape frum" any intrusion in the back yard, and that in the future, whenever he had any business with Bridget, he would enter the front gate and make known his wants at the front door.

HE DEVoured THOMAS CATS.

The strongest and largest tom cat he could manage with ease. When anyone had a specially objectionable cat which they wanted disposed of, they would bag it up and bring it to the eagle. As soon as he saw the bag the bird, which an instant before sat moping, ruffed-feathered and seemingly half dead, suddenly, as if by magic, changed, as it were, into a new being; body erect, feathers close to the body, tail expanded, the sunken eyes, with ten-fold increased lustre, followed with argus gaze every motion of the bag and occupant; soon as grimalkin was liberated the eagle swooped down and grasped it. If the cat was of ordinary size, Nero displayed little concern in dispatching it; but if it was a Thomas feline, of hugh dimensions, all the powers of the bird were brought into

requisition. Then the true nature of the eagle was seen. The eyes, before bright, now shone like balls of fire, the crest feathers standing up; his voice, before hushed, now added discord to the dying yells of his struggling victim, so inextricably fixed in his relentless talons. He could kill a cat in from two to five minutes.

WOULD SEIZE GRIMALKIN BY NECK AND BACK.

Commonly, the eagle would grasp the cat around the small of the back with one foot and with the other he encircled the neck, thus retaining his hold until the animal had ceased its struggles, which were soon over, as they were greatly augmented by fright and excessive violence of action. When the cat became quiet the eagle would raise his wings, which he had allowed to drop, draw his body up as high as possible from his prey, and proceed leisurely to tear off the skin from his captive's back and side, exposing the muscles and viscera, which he ate.

FOOD OF THE GOLDEN EAGLE.

Golden Eagles are rather rare in this State, hence their depredations to poultry, game and live stock occasion comparatively little loss within our State's boundaries. Domestic fowls, ducks and turkeys especially, are often devoured; different species of water birds, grouse and wild turkeys suffer chiefly among the game birds. Fawns are sometimes attacked and killed; occasionally it destroys young pigs, and frequently many lambs are carried off by this eagle. Many rabbits are preyed upon; in this State, the Varying Hare and common Gray Rabbit or "cotton-tail" form a portion of its menu.

Last winter a farmer residing near Harrisburg, shot

one of these eagles, which was feasting on a large gander, which he had just killed; but as the man sold the eagle, a fine male, for three dollars he lost nothing by the death of his goose. When other food is scarce it feeds on offal and carrion like many other species of the birds of prey are wont to do when deep snows cover the ground. When there is a paucity of wild game, its natural food, this powerful bird, it is asserted, often becomes very troublesome and frequently attacks the young of domestic animals, such as lambs, calves and pigs.

EAGLES DESTROYED MANY LAMBS.

To illustrate the damage which eagles sometimes do on sheep ranches, Dr. Fisher publishes the following letter to Col. Alexander Macbeth, of Georgetown, S. C., which fully explains how destructive eagles may occasionally become. This letter, as Dr. Fisher observes, "may refer in part to the Bald Eagle":

Rhems, Georgetown County, S. C., May 30, 1889.

Dear Sir:—Yours 22d instant at hand, and in reply will say that the eagles are more destructive to the sheep-growing industry in this section than dogs. On one ranch this spring one shepherd alone killed over forty himself, principally by using strychnine. They were worse than we ever knew of before. We lost fully 400 or 500 lambs, as they devour them as fast as they drop from the old sheep. * * * We frequently see during eagle or lambing season fifteen to twenty eagles in a covey (or bunch), which shows at a glance that they are very destructive. We have also a few wild-cats that devour the young sheep, but can manage them better than eagles.

Yours very truly,

T. RHEM AND SONS.

ADULT DEER ATTACKED.

Some years ago I saw the remains of a Golden Eagle hanging, with some pelts, on a hunter's cabin in the wilds of Clinton county, Pa., and on making inquiry, learned that the bird had been shot in the act of at-

tacking a small doe. Mr. C. F. Morrison writing of a similar case which had been called to his attention, says:

"The bird had captured and killed a good-sized black-tailed deer, and was hot while sitting upon its body. (O. & O., Vol. XIV, 1889.)

Dr. Fisher publishes the following paragraph by Mr. Henry Seebohm: "The Golden Eagle has been known on one highland sheep farm alone, in the course of a single season, to carry off as many as thirty-five lambs. * * * In deer forests eagles are of the greatest service; for although they sometimes take a sickly deer calf, they live almost entirely on blue hares, so troublesome to the deer stalker; and most certainly deer are better for the removal of the weak and sickly ones, which would only possibly live to transmit their disease to posterity. * * * The Golden Eagle (noble as he is thought to be) will eat carrion when pressed for food. * * * The Golden Eagle also preys upon various species of birds, notably the blackcock and red grouse, ptarmigan, curlews and plover, dropping upon them unawares or simply taking the young and weakly ones; for never does the bird pursue or strike them like the true falcon."



$\frac{1}{8}$

BALD EAGLE.

BALD EAGLE.

Haliaeetus leucocephalus.

DESCRIPTION.

Tarsi feathered only about half way down.

Male.—Length about 3 feet; extent of wings about 7 feet. Female larger, measuring sometimes 8 feet in extent.

Adult.—Head, neck, tail and upper coverts of latter, white; rest of plumage dusky-brown; bill, feet and eyes yellow.

Immature.—Entire plumage dark brown; some are grayish-brown, and tail more or less spotted with white; bill dark-colored; eyes brown.

Habitat.—North America at large, south to Mexico. Breeds sparingly in Pennsylvania.

The name "Bald" which is given to this species is not applied because the head is bare, but because the feathers of the neck and head in the adults are pure white. In Pennsylvania, as well as throughout the United States, we have but two species of eagles. The "Black," Gray" and "Washington" Eagles are all young of the Bald Eagle. Three years, it is stated, are required before this species assumes the adult plumage.

The Bald Eagle is found in Pennsylvania at all seasons of the year.

THE NEST AND EGGS.

A few of these birds annually rear their young along the Susquehanna river, and also in a few other localities in this State. The nest, a bulky affair, built usually on a large tree, mostly near the water, is about four or five feet in diameter. It is made up chiefly of large sticks, lined inside with grasses, leaves, etc. The eggs commonly two—rarely three—are white and measure about 3 by $2\frac{1}{2}$ inches. A favorite article of food with this bird is fish, which he obtains, chiefly by strategy and rapine.

THE BALD EAGLE AND OSPREY.

The Bald Eagle is quite plentiful in the vicinity of large rivers, where the Fish Hawk is common; unlike this last named bird, however, he cannot be called piscivorous, as he subsists largely on ducks, geese, and other aquatic birds. Referring to this eagle, Audubon says:

"No sooner does the Fish Hawk make its appearance along our Atlantic shores, or ascends our numerous and large rivers, than the eagle follows it, and, like a selfish oppressor, robs it of the hard-earned fruits of its labor. Perched on some tall summit, in view of the ocean, or of some water course, he watches every motion of the Fish Hawk while on wing. When the latter rises from the water with a fish in its grasp, forth rushes the eagle in pursuit. He mounts above the Fish Hawk, and threatens it by actions well understood, when the latter, fearing perhaps that its life is in danger, drops its prey. In an instant the eagle, accurately estimating the rapid descent of the fish, closes his wings, follows it with the swiftness of thought, and the next moment grasps it."

SOMETIMES FISHES FOR HIMSELF.

According to Audubon the Bald Eagle catches fish for himself.

"This bird now and then procures fish for himself by pursuing them in the shallows of small creeks. I have witnessed several instances of this in the Perkiomen creek, in Pennsylvania, where, in this manner, I saw one of them secure a number of red fins by wading briskly through the water and striking at them with his bill. I have also observed a pair scrambling over the ice of a frozen pond to get at some fish below, but without success. It does not confine itself to these kinds of food, but greedily devours young pigs, lambs, fawns, poultry and the putrid flesh of carcasses of every description, driving off the vultures and carrion crows or the dogs, and keeping a whole party at defiance until it is satiated."

KILLS LAMBS AND PIGS.

Dr. Fisher publishes the following notes from the Forest and Stream concerning the destruction of domestic animals:

A number of eagles have recently been shot in various parts of Pennsylvania. One, shot by John Hodman in North Coventry, Chester county, had carried off bodily a large lamb



BALD EAGLE. (YOUNG)

$\frac{1}{6}$

and returned the following day, after another." (Vol. V. 1875, p. 195.) "A large White-headed Eagle swooped down on a flock of sheep here (Hornellsville, New York) and made a breakfast on lamb chops before he could be driven off." (Vol. X. 1878, p. 319.) "It (the Bald Eagle) was killed by a Mr. Towry, near Smithville, Mississippi. When found by Mr. Towry it had killed two of his hogs and was dining on one of them." (Vol. VIII, 1877.)

Dr. Fisher also refers to an article published in the *Forest and Stream* (Vol. IV, 1875, p. 166) in which a Bald Eagle was seen to fly five miles with a live lamb in its talons.

HOW THEY CAPTURE GEESE.

Dr. Fisher reproduces from *Bulletin of the Nuttall Ornith. Club*, the following very interesting note from Mr. Wm. Brewster, and which refers to the manner in which the Eagles catch wild-fowl in the vicinity of Cobb's Island, Virginia:

"In the winter the eagles are much more numerous than at any other time of the year, and my informant has, on several occasions, seen as many as eight at once. At this season the neighboring bays and creeks swarm with wild fowl, and upon these the eagles principally live. He has never known them to catch fish of any kind, although they not unfrequently rob the Fish Hawk. Geese and brant form their favorite food, and the address displayed in their capture is very remarkable. The poor victim has apparently not the slightest chance for escape. The eagle's flight, ordinarily slow and somewhat heavy, becomes in the excitement of pursuit exceedingly swift and graceful, and the fugitive is quickly overtaken. When close upon its quarry the eagle suddenly sweeps beneath it, and, turning back downwards, thrusts its powerful talons up into its breast. A brant or duck is carried off bodily to the nearest marsh or sand bar, but a Canada goose is too heavy to be thus easily disposed of. The two great birds fall together to the water beneath, while the eagle literally tows his prize along the surface until the shore is reached. In this way one has been known to drag a large goose for nearly half a mile."

WILL SOMETIMES ATTACK MANKIND.

If newspaper and numerous written accounts are true (and unfortunately many are not) it would appear that even man is not exempt from the attacks

of these predaceous birds. I have repeatedly seen in newspapers, accounts of combats between men and eagles; frequently the bird would be the aggressor. While it is admitted that these reports are largely due to the imaginative reporter, it is believed that such occurrences do occasionally take place. Veritable instances are related of their carrying off infants. According to Wilson:

"An attempt of this kind was made upon a child lying by its mother, as she was weeding a garden, at Egg Harbor, New Jersey, but the garment seized upon by the eagle giving way at the instant of the attempt, the child's life was spared." Nuttall speaks of an instance said to have happened at Petersburg, Georgia, near the Savannah river, "where an infant, sleeping in the shade near the house, was seized and carried off to the eery, near the edge of the swamp, five miles distant, and when found, almost immediately, the child was dead."

DESTROYS POULTRY AND GAME.

This bird very often preys on birds and mammals. I have knowledge of at least two of these birds which have killed poultry (tame ducks and turkeys) along the Susquehanna river. Duck hunters assured me that they have, on several occasions, seen Bald Eagles attack and kill wild ducks and geese which are often quite numerous during migrations on the Susquehanna river.

Sometimes, like the Golden Eagle, this species will attack raccoons, and skunks; and on one occasion I found two or three spines of a porcupine in the body of an immature Bald Eagle which I secured in Clinton county. This led me to infer that the Bald Eagle might, sometimes, attack this animal which is so well able to defend himself, and which seems to be of no use in our hemlock forests but to ruin hunting dogs, and gnaw everything which is the least bit salty, that they find in their nocturnal ramblings about the lumber camps.



$\frac{1}{3}$
DUCK HAWK.

DUCK HAWK.

Falco peregrinus anatum.

DESCRIPTION.

Size as well as colors variable. A female before me is 20 inches long, and measures from tip to tip 46 inches; tail, 8. Male smaller.

Above blackish-brown or slaty-black, and many feathers with paler edgings; chin, throat, forepart of neck and upper breast yellowish-white, and sometimes nearly immaculate, but usually more or less streaked or spotted; showy black ear patches; frontal feathers whitish, rest of under parts barred and streaked with blackish and lighter colors. Immature birds are more brown and lower parts are much more spotted with dark and less barred. Bill bluish-black, except about base, like cere is yellowish; legs yellow; iris brown.

Habitat.—North America at large. Resident and breeds sparingly in Pennsylvania.

This bold and predatory hawk, the largest of the typical falcons found in this region, retires, usually during the summer time, to the mountainous districts, generally in the neighborhood of large streams, and in the winter season (fall, winter and early spring), it is found as an irregular visitor in nearly all sections of our Commonwealth.

THE NEST AND EGGS.

The Duck Hawk breeds in several localities in Pennsylvania, and in some parts of the state it is reported to be quite common. The late Judge Libhart, of Lancaster county, twelve or fifteen years ago, observed it as a "resident, common on the Susquehanna." Dr. Treichler, Mr. Roddy and other more recent observers, report the Duck Hawk in Lancaster county as a rather rare visitor, commonly seen in winter. The following gentlemen report this species as a native: Hon. Gerard C. Brown, Casper Loucks and George Miller all of

York county, state that it is a regular breeder on the high cliffs about the Susquehanna. Concerning the bird Mr. George Miller furnishes the following notes: "Found nest of Duck Hawk April 7, 1880. It contained four eggs slightly incubated; hawk on nest when discovered, along Susquehanna river near mouth of Codorus creek. Nest about one-third down from top of a high cliff on shelf with overhanging rock; nest made of rocky debris found lying about. Remains of birds, such as tame pigeons, flickers, blackbirds, etc., upon which the Duck Hawks had evidently been feeding, were found plentifully scattered over the rocks.

I shot the male soon after collecting the eggs, and have it now in my collection of birds." Dr. W. L. Hartman, of Luzerne county, says:

"The Great-footed or Duck Hawk breeds regularly in this locality (Pittston) in an almost inaccessible ledge of rocks." Mr. Thomas S. Gillin, Ambler, Montgomery county, says: "I have had many opportunities of observing them, having shot twelve inside of a radius of five miles of this place; in fact see them regularly, and know of two nesting places in this state." Dr. T. Z. Hazzard, Allegheny county; Mr. O. B. Hark, Northampton county, and W. P. Bolton, Montgomery county, also mention it as a breeder. Dr. John W. Detwiller and Mr. Samuel Mack, both residents of Bethlehem, have, on different occasions, found Duck Hawks' nests. With regard to their breeding in this State, Dr. Detwiller (letter November 2, 1889), says: "Duck Hawk; secured set of four eggs from the cliffs of Camel's Ledge, Pittston, 1880; 1886, secured two sets of four eggs in each set, one at Skinner's Eddy and the other at Buttermilk Falls, Susquehanna river (East Branch). 1887, secured a set of four eggs, and

another of three, at 'The Narrows,' Delaware river. Month of incubation, April." Reports which I have received from other naturalists and collectors, show that the Duck Hawk has been observed in other parts of the State as a straggler in the spring and fall, or as a rather rare and irregular winter visitor. I have never found the nest of this bird.

Dr. Coues states that it "breeds as far south as Virginia at least; eggs, 2-5, oftener 3-4, 2.10 to 2.35x1.60 to 1.75, averaging about 2.25x1.65; white or whitish, spotted, blotched, wreathed, clouded, etc., with the reddish-browns, from chocolate or even purplish to the ochres."—Key, N. A. Birds.

KILLS DOMESTIC FOWLS.

This hawk, like the Cooper's and Sharp-shinned species previously described, is detrimental, but fortunately for the farmer and fruit grower the Duck Hawk is a comparatively rare bird, and, except in winter, is found usually about the larger rivers. However, when a pair of these birds begin house-keeping on a high, rocky ledge in the neighborhood of farm houses, they frequently destroy a good many domestic fowls.

For several years past a pair of these hawks have nested in an inaccessible nook on a high rocky bluff along the Susquehanna river across from Northumberland, Pa., and several poultry raisers in that locality have had a good many of their fowls killed by them.

Two years ago, in mid-winter, a farmer living along the Brandywine creek near West Chester, brought to my office two of these hawks which he had killed one evening at his carp pond where, he stated, they went to watch and catch his ducks and chickens. He said that this pair of hawks had killed eight chickens and three ducks for him in about a week, and that they had also caught several of his pigeons.

PLAYED HAVOC WITH TERNS.

Dr. C. Hart Merriam (Birds of Conn., 1877, p. 82,) referring to a Duck Hawk which was shot on Falkner Island, Connecticut, says:

"During her brief visit she had made sad havoc among the terns, and her crop was greatly distended with their remains, which had been swallowed in incredibly large pieces; whole legs, and long bones of the wings were found entire and unbroken; indeed she was perfectly gorged, and contained the remains of at least two terns, besides a mass of newly-hatched young."

KILLS WILD FOWL.

I have seen this species catch the Coot (*Fulica*) and a Wood Duck on the Susquehanna river. Audubon says:

"He pursues the smaller ducks, water hens and other swimming birds, and if they are not quick in diving it seizes them and rises with them from the water. I have seen this hawk come at the report of a gun and carry off a teal not thirty steps distant from the sportsman who had killed it, with a daring assurance as surprising as unexpected. This conduct has been observed by many individuals, and is a characteristic trait of this species. The largest bird that I have seen this hawk attack and grapple with on the wing is the mallard.

"The Duck Hawk does not, however, content himself with water fowl. He is generally seen following the flocks of pigeons, and even blackbirds, causing great terror in their ranks, and forcing them to perform aerial evolutions to escape the grasp of his dreaded talons. For several days I watched one of them that had taken a particular fancy to some tame pigeons, to secure which it went so far as to enter their house at one of the holes, seize a bird, and issue by another hole in an instant, causing such terror among the rest as to render me fearful that they would abandon the place. However, I fortunately shot the depredator. They occasionally feed on dead fish that have floated to the shores or sand bars."—Audubon.

I have examined but three of these hawks; the stomachs of two were destitute of food materials, the other contained a few feathers of a domestic pigeon.

THEY PREY ON SONG BIRDS.

Dr. Fisher's report shows that of twenty stomachs of Duck Hawks examined, not less than four-fifths, or

sixteen, contained poultry (chickens or ducks), game birds (quail or wild ducks) and small wild birds of which the following species were identified:

Meadow Lark,
Warbler,
Robin,
Crissal Thrasher,

Gray-cheeked Thrush,
Catbird,
Mourning Dove.

The only mammal eaten as shown by these records were two mice which were taken from the stomach of one of these hawks killed at Elmira, N. Y., in December, 1887. Another of this series captured at Portland, Conn., in April, 1886, had the remains of a tame duck and some beetles in its stomach; "small bird's" remains, which could not be identified, with "dragon flies," were discovered in another hawk taken October 1, 1884, in Brookhaven, N. Y. The four remaining stomachs of the twenty last referred to were empty.

PIGEON HAWK.

Falco columbarius.

DESCRIPTION.

Adult Male.—Entire upper parts bluish-slate color, every feather with a black longitudinal line; forehead and throat white; other under parts pale yellowish or reddish white; every feather with a longitudinal line of brownish-black; tibiae light ferruginous, with lines of black; quills black, tipped with ashy-white; tail light bluish-ashy, tipped with a white and with a wide subterminal band of black, and with several other transverse narrower bands of black; inner webs nearly white; cere and legs yellow; bill blue; iris brown.

Younger.—Entire upper plumage dusky brown, quite light in some specimens, and with a tinge of ashy; head above, with narrow stripes of dark brown and ferruginous, and in some specimens many irregular spots and edgings of the latter color on the upper parts; forehead and entire under part dull white, the latter with longitudinal stripes of light brown; sides and flanks light brown; tibia dull white with dashes of brown; pairs of circular spots of white; tail pale brown, with about six transverse bands of white; cere and legs greenish-yellow.

Young.—Upper plumage brownish-black, white of the forehead and under parts more deeply tinged with reddish-yellow; dark stripes wider than in preceding; sides and flanks with wide transverse bands of brownish-black, and with circular spots of yellowish-white; quills black; tail brownish-black, tipped with white, and with about four bands of white; cere and feet greenish-yellow.

Total length, female 12 to 14 inches; wing 8 to 9 inches; tail 5 to 5½ inches. Male, total length, 10 to 11 inches; wing 7½ to 8 inches; tail 5 inches.—Baird's B. B. of N. A.

Habitat.—The whole of North America, south to the West Indies and northern South America.

This little falcon breeds chiefly north of parallel 43 degrees, though, as Dr. Fisher adds, "in the mountains it extends south of this latitude, and in the mountains of some of the West Indian Islands it is a summer resident." I have observed this hawk only as a visitor during the winter season; further investigations, however, may show that it, as some assert, occurs as a native in some of our higher mountainous districts. According to my experience this species is rather rare



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PIGEON HAWK.

in this State, and is oftener met with in the mountainous and wooded districts than elsewhere.

FEEDS PRINCIPALLY ON BIRDS.

Field observations and post-mortem examinations made by numerous naturalists show very conclusively that although the Pigeon Hawk will sometimes destroy poultry, tame pigeons, and even game birds as large as the Ptarmigan, it preys mainly on various kinds of small wild birds. It sometimes catches insects, and small quadrupeds.

The following is taken from my note book in relation to a pair of these hawks: Two Pigeon Hawks during the late fall lurked about the southern suburbs of the borough of West Chester, preying at regular intervals on the pigeons of a blacksmith. In one week the hawks killed or drove away fifty of these birds. The hawks would enter the boxes and take from them the pigeons.

DEVOURS MANY BENEFICIAL BIRDS.

An examination of Dr. Fisher's food-table of this species shows very conclusively that these birds prey on a great variety of birds, particularly those of the sparrow family. In the stomachs of fifty-one Pigeon hawks mentioned by Dr. Fisher, forty-one contained small birds and of these the following species were identified:

Song Sparrow,
English Sparrows,
Indigo Bird,
Field Sparrow,
Swamp Sparrows,
Chipping Sparrow,
Goldfinchs,
Thrush,

Swift,
Flicker,
Warblers,
Bobolink,
Tree Swallow,
Red-eyed Vireos,
Brown Creeper,
Blue-headed Vireo.

VIEWS OF DIFFERENT WRITERS.

The following paragraphs are quoted from Dr. Fisher's report:

"The food of the Pigeon Hawk consists mainly of small and medium-sized birds, especially the gregarious species, insects, and occasionally small mammals. Pigeons, flickers and grackles are about as large birds as it usually attacks, though Dr. Dall, in one instance, saw it kill a ptarmigan, and Dr. E. A. Mearns speaks of a specimen shot in the act of destroying a hen. Among the insects dragon flies are favorite morsels for this hawk, and the apparent ease with which it captures these nimble-winged insects demonstrates better than anything else its remarkable power of flight. The writer has also found grasshoppers, crickets and beetles among the stomach contents.

Like the Duck Hawk, the species under consideration occasionally captures small mammals when its ordinary food is scarce, though according to Dr. J. G. Cooper, it sometimes feeds quite extensively on them. He says: "Though small, the Pigeon Hawk has all the fierceness and courage of a true falcon, and captures birds fully as large as itself. It, however, chiefly follows the flocks of gregarious birds, such as black-birds, doves, etc., and preys much on mice, gophers and squirrels. I have not heard of its attacking domestic poultry, and those farmers who shoot every 'chicken hawk' that comes around the house would do well to observe them more closely, and will discover that these small species are not the young of the larger ones, and should rather be encouraged than destroyed. (Ornith. Cala., Land Birds, 1870, p. 461.)

Wilson sums up its food as follows: "When the reed birds, grackles and red-winged blackbirds congregate in large flights, he is often observed hovering in their rear, or on their flanks, picking up the weak, the wounded or stragglers, and frequently making a sudden and fatal sweep into the very midst of their multitudes. The flocks of robins and pigeons are honored with the same attentions from this marauder." (Am. Ornithology, Vol. I, 1831, p. 61, 62.)

Audubon speaks of its food as follows: "It seizes the red-breasted thrush, the wild pigeon, and even the golden-winged woodpecker on land, whilst along the shores it chases several species of snipes, as well as the green-winged teal." (Ornith. Biography, Vol. I, p. 467.)

Mr. John Murdoch mentions four Pigeon Hawks which, on September 5, came out to the vessel as it was crossing the Gulf of St. Lawrence, and says: "The first that appeared had a Leach's petrel, dead, in his talons. He alighted with this on the fore cross-trees, and proceeded to eat it." (Bull. Nutt. Ornith. Club, Vol. II, 1877, p. 79.)

Dr. Coues, speaking of the species in Labrador, says: "On the 25th of the same month (August), at Henley Harbor, another individual was seen foraging among the immense flocks of curlews (*Numenius borealis*) which then covered the hills in the vicinity." (Proc. Acad. Nat. Sci., Phila., 1861, p. 216.)

In Texas, Mr. George B. Sennett secured a bird whose crop

contained nearly the whole of a ground dove. Mr. Thomas McIlraith mentions seeing one of these falcons dive into a flock of blackbirds on one of the marshes of Ontario, and says: "I once saw him 'stoop' on a flock as they hurried toward the marsh for shelter. How closely they had huddled together, as if seeking mutual protection, but he went right through the flock and came out on the other side with one in each fist." (Birds of Ontario, 1886, p. 149.)

Occasionally the Pigeon Hawk is quite destructive to young chickens, as the following from the pen of the late Dr. William Wood will show:

"In May, 1860, a gentleman who resides some five miles distant, informed me that a small hawk came almost every day and carried off a chicken for him. * * * The next day the same little hawk returned and was shot, and is now in my collection, a beautiful representative of the Pigeon Hawk." (Am. Nat., Vol. VII, p. 342.)

SPARROW HAWK.

Falco sparverius.

DESCRIPTION.

"Small, wings narrow and pointed; top of head bluish-gray or dark slate, the crown with or without a rufous patch.

Male.—Tail chestnut rufous, crossed by a broad black band near end; wings grayish-blue, more or less spotted with black. Above: Rufous, with or without black bars or spots. Below: Varying from white to deep rufous, with or without black spots.

Female.—Tail, wings and back crossed by numerous narrow bands of dusky." (Fisher.)

Length, 10 to 12 inches; extent of wings 18 to 23 inches; tail $4\frac{1}{2}$ to $5\frac{1}{2}$ inches. Iris brown; legs and feet yellow.

Habitat.—Whole of North America, south to northern South America. Common and breeds generally throughout Pennsylvania.

The Sparrow Hawk is the smallest and most beautiful of the American hawks. During migrations in the spring and autumn and throughout the summer months the Sparrow Hawk is common in nearly all sections of this State, except perhaps in the heavily wooded mountainous districts where, according to my experience, the species is rather rare. In southern Pennsylvania, especially in Chester, Delaware, Lancaster and York counties, this bird is of frequent occurrence as a winter resident, but in the central and northern counties of our State it is regarded as a rather unusual winter sojourner.

NEST, EGGS AND YOUNG.

In southeastern Pennsylvania where this species was in former years a very common summer resident they begin nesting in April. The eggs, usually five in number, are deposited in hollow trees, generally the deserted hole of a woodpecker. The eggs measure about



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SPARROW HAWK.

1.33 by 1.13 inches and are of a whitish or pale-yellow brown color, blotched all over with dark brown.

When the young or eggs are disturbed the parent birds will sometimes defend invasion of their home with great temerity.

Some few years ago I was endeavoring to secure the young from a nest of this species. I had climbed the tree to the hole, about thirty-five feet from the ground, wherein were snugly packed five young, one of which I removed, when both old birds assailed me. They several times struck my head and arms with their talons and wings. So persistent were their attacks that I, desiring to obtain the young alive, directed a companion who stood nearby to shoot both birds. I have repeatedly taken the eggs and young of this bird but never, except in the above cited instance, encountered such determined opposition.

When reared from the nest the Sparrow Hawk will soon become attached to its master. I raised two, which were given their freedom. Both birds would come at my call and alight on my outstretched arm or shoulders, anxiously waiting for a grasshopper or piece of meat, which was always their recompense.

This hawk will resort for several consecutive years to the same tree for breeding purposes. From Doctor Wood's "Birds of Connecticut," the following remarks, with regard to the nesting of this bird, are taken:

"One of my collectors found a nest of four eggs in the top of a stump about ten feet from the ground. This nest was composed of grass, and was discovered by the grass protruding through a crack in the stump. Whether this hawk constructed this nest, or whether it had been made by some other bird, it is impossible to tell, but if this hawk constructs no nest, as asserted by Dr. Brewer and others, it must have obtained it piratically, as the nest was new. In another instance, which occurred in Granby, Connecticut, the nest was known to have been obtained in this way: A farmer made a dove house inside of his barn, with holes through the sides of the building

communicating with it. A pair of doves that had mated were attacked and killed by a pair of Sparrow Hawks, who took possession of their nest, laid four eggs and commenced incubating."

Incubation, which lasts for about a period of from twenty-one to twenty-four days, is engaged in by both birds, and while one is sitting its mate supplies it with food. When first hatched the young are covered with a white down. The food of young, while under parental care, I have found to consist chiefly of insects.

PROTECT THE SPARROW HAWK.

The farmer, fruit grower and sportsmen should learn the true value of this little hawk, as he is one of the most desirable feathered visitors and should not by even the most casual observer be mistaken for that destructive marauder the Sharp-shinned Hawk. The Sparrow Hawk preys to a very considerable extent on English sparrows.

Popular ignorance of the great service which this species does to the farmer and pomologist, by destroying myriads of noxious insects, together with the indisposition or inability to distinguish Sparrow hawks from the Sharp-shinned and smaller individuals of Cooper's hawk, which so many people have, have resulted in placing Sparrow hawks under ban, and they are destroyed by farmers and gunners in many sections with the same eagerness that they kill the destructive Sharp-shinned and Cooper's hawks.

This useless slaughter, which, of course, was materially aided by the inducement which a "scalp act" afforded, has brought about a very noticeable decrease in the number of Sparrow hawks one sees nowadays. Twelve or fourteen years ago I have often counted from the car windows in riding from Philadelphia to Harrisburg from twenty to twenty-five of these little

falcons; but in recent years, I have never observed at any season of the year, when going over the same route, more than four or five of these birds.

WHAT OTHER WRITERS HAVE OBSERVED.

Allen, in his "Ornithological Notes on the Birds of the Great Salt Lake Valley," says: "The Sparrow Hawk, however, was by far the most numerous of the Falconidae; thirty were seen in the air at one time near the mouth of Weber canon, engaged in the capture of the hateful grasshoppers, which seems at this season to form the principal food of this and other birds." Audubon mentions that he had one of these birds tamed. It was allowed its liberty. "In attempting to secure a chicken one day, the old hen attacked him with such violence as to cost him his life." Dr. Wood says: "When they cannot readily procure their favorite food, mice and small birds are greedily devoured; and, according to a writer in the American Naturalist, they are not wholly devoid of the piratical habits of the Bald Eagle. "A tame cat was crossing the street and bearing a large mouse in her mouth; a Sparrow Hawk came flying over, and seeing a mouse in her mouth, made a sudden swoop and tried to seize it with its talons, but did not succeed. The hawk continued its attempts until they reached the opposite side of the street, when the cat disappeared under the sidewalk.' If it catches a mouse that proves to be lousy and poor, it will leave it and seek another."

The following quotations from Dr. A. K. Fisher's work (Bull. No. 3, U. S. Agr. Depart.), shows the great fondness this hawk has for insect food:

"The subject of the food of this hawk is one of great interest, and considered in its economic bearings is one that should be carefully studied. The Sparrow Hawk is almost exclusively insectivorous, except when insect food is difficult to obtain. In localities where grasshoppers and crickets are abundant these hawks congregate, often in moderate sized flocks, and gorge themselves continuously. Rarely do they touch any other form of food until, either by the advancing season or other natural causes, the grasshopper crop is so lessened that their hunger cannot be appeased without undue exertion. Then other kinds of insects and other forms of life contribute to their fare; and beetles, spiders, mice, shrews, small snakes, lizards or even birds may be required to bring up the balance. In some places in the west and south telegraph lines pass for miles through treeless plains and savannas; for lack of better places the Sparrow Hawks often use these poles for resting places, from which they make short trips to pick up a grasshopper or mouse, which they carry back to their

perch. At times, when grasshoppers are abundant, such a line of poles is pretty well occupied by these hawks.

"A dozen or more stomachs collected by Mr. Charles W. Richmond, in Gallatin county, Montana, during the latter part of August and early part of September, 1888, * * * contained little else than grasshoppers and crickets."

GRASSHOPPERS A FAVORITE FOOD.

"Mr. W. B. Hall, of Wakeman, Ohio, writes: * * * 'The Sparrow Hawk is a most persistent enemy of the grasshopper tribe. While the so-called hawk law was in force in Ohio I was township clerk in my native village and issued certificates to the number of eighty-six, forty-six being for the Sparrow Hawk. I examined the stomachs and found forty-five of them to contain the remains of grasshoppers and the elytra of beetles, while the remaining one contained the fur and bones of a meadow mouse.'"

"Mr. W. E. Saunders writes from London, Canada: 'Sparrow Hawks are one of our best grasshopper destroyers; four out of every five I have killed contained grasshoppers alone.' The following from the pen of Mr. H. W. Henshaw substantiates what we have said in regard to its fondness for grasshoppers: 'It finds * * * an abundant supply of game in the shape of small insectivorous birds, but more especially does its food consist of the various kinds of coleopterous insects and grasshoppers, of which it destroys multitudes. In fact, this last item is the most important of all, and where these insects are abundant I have never seen them have recourse to any other kind of food' (Explor. West of 100th Merid., Wheeler, Vol. V, 1875, p. 414)."

"And subsequently the same author writes: 'The west side of Chewaukan Valley has suffered severely from a visitation of that scourge of the western farmer, the grasshoppers. Here in August Sparrow Hawks had assembled in hundreds and were holding high carnival, and although in instances like the present their numbers proved wholly insufficient to cope against the vast myriads of these destructive insects, yet the work of the Sparrow Hawk is by no means so insignificant that it should not be remembered to his credit and earn him well merited protection. His food consists almost entirely of grasshoppers when they are to be had, and as his appetite appears never to become satiated, the aggregate in numbers which are annually destroyed by him must be enormous.' (Appendix O. O., of Annual Report of Chief of Eng., U. S. A. for '79, p. 314)."

"In the vicinity of Washington, D C., remarkable as it may appear to those who have not interested themselves specially in the matter, it is the exception not to find grasshoppers or crickets in the stomach of Sparrow Hawks, even when killed during the months of January and February, unless the ground is covered with snow."

"It is wonderful how the birds can discover the half-concealed semi-dormant insects, which in color so closely resemble the ground or dry grass. Whether they are attracted by a slight movement or distinguish the form of their prey as it sfts

motionless, it is difficult to prove, but in any case the acuteness of their vision is of a character which we are unable to appreciate. Feeding on insects so exclusively as they do, it is to be presumed that they destroy a considerable number of beneficial kinds, as well as spiders, which they find in the same localities as the grasshoppers. However, examination of their stomach contents show the number to be very small compared with that of the noxious species, that it is hardly worth considering."

"After the several frosts of autumn and in winter, when insect life is at its lowest ebb, the Sparrow Hawks devote more time to the capture of mice and small birds. As a rule, the birds which they capture at this time are ground-dwelling species, which simulate the movements of mice by running in or about the dry grass and weeds. They are mostly sparrows, more or less seed-eating, and hence not among the species most beneficial to the agriculturist. At this season it is common to see Sparrow Hawks sitting on the poles over hay stacks or stationed where they can command a good view of the surroundings of a hay mow or grain crib, ready at any moment to drop upon the mouse which is unfortunate enough to show itself. In this way they manage to destroy a vast number of mice during the colder months."

"The following is an extract from a letter from W. P. McGlothlin, of Dayton, Washington: "There is a small hawk here called the Sparrow Hawk. It comes about the 1st of March and leaves with its young about August 1st. On their arrival they are in large flocks and seem hungry. I have had a number follow my team all day long, and even alight for a moment on the plow beam. When a mouse was unearthed it was captured in an instant and quickly killed. The hawks seem to know just when their victims are dead. They settle on something suitable to their fancy and commence eating the eyes and then soon finish. For two weeks this mouse catching goes on. I have sometimes seen them chase and catch small birds." (Bull. No. 3, Hawks and Owls, by Dr. A. K. Fisher, 1893.)

When breeding, the Sparrow Hawk has been known to capture young chickens; their depredations, however, in this direction are not worthy of consideration when compared with the great benefits the hawks do by destroying injurious insects and mice.

FED MAINLY ON MICE AND INSECTS

The stomach contents of forty-eight Sparrow Hawks captured in Chester county, Pa., and examined by the writer are given in the following table:

Date of Capture.	Birds.	Mammals.	Insects, Etc.
July, 1886.	.....	.....	Grasshopper and cricket.
July, 1886.	.....	.....	Grasshopper and cricket.
Apr. 3, 1886.	.....	Meadow mouse, ...	Caterpillars
Dec. 29, 1886.	.....	Mouse.	
Dec. 28, 1887.	.....	Mouse	Crickets and grasshoppers
Dec. 29, 1886.	Sparrow.		
Jan. 17, 1887.	Song sparrow,	White-footed mouse.	
Feb. 5, 1886.	Tree sparrow,	White-footed mouse.	
Dec. 1, 1886.	.....	Meadow mouse, ...	Grasshoppers and larvae.
Dec. 3, 1886.	.....		Beetles.
Dec. 9, 1886.	Feathers of small bird,	Meadow mouse, two shrews.	
Dec. 9, 1886.	Snow bird.		
Dec. 16, 1886.	Feathers of small bird,		
Nov. 26, 1886.	.....	Meadow mouse, ...	Crickets.
Feb. 7, 1887.	.....	Meadow mouse, ...	Crickets, caterpillars, spider.
Jan. 17, 1887.	Tree sparrow.		
Jan. 6, 1887.	.....	.....	Caterpillars, spider
March, 1887.	.....	Meadow mouse, ...	Grasshoppers, larvae.
Jan. 1887.	.....	Meadow mouse.	
Jan. 1887.	.....		§ larvae, spider.
Dec. 20, 1886.	.....	Meadow mouse, ...	Larvae.
Jan. 10, 1887.	Song sparrow.		
Feb. 9, 1886.	.....	.....	Grasshoppers, beetles, larvae
Jan. 13, 1887.	.....	House mouse,	Grasshoppers, larvae.
Jan. 13, 1887.	.....	Meadow mouse, ...	Grasshoppers, beetles, larvae.
Jan. 25, 1887.	.....	House mouse,	Crickets, larvae.
Jan. 25, 1887.	.....	Meadow mouse, ...	Grasshoppers, larvae, spiders.
Jan. 25, 1887.	.....	Meadow mouse.	
Jan. 27, 1887.	Tree sparrow,	Meadow mouse, ...	Caterpillar, crickets, spider.
Feb. 1, 1887.	.....	White-footed mouse.	
Feb. 1887.	.....	Two meadow mice.	
Feb. 1887.	.....		Caterpillars, grasshoppers, spiders.
Nov. 29, 1886.	.....	.....	Insects.
July 3, 1886.	.....	.....	Insects.
Dec. 30, 1879.	Meadow lark.		
Dec. 16, 1879.	Snow bird,	Mice.	
Jan. 17, 1881.	.....	Mice.	
Oct. 27, 1880.	.....	.....	Insects.
Dec. 23, 1880.	Meadow lark, .....	.....	Insects.
Jan. 12, 1881.	.....	Mice.	
Jan. 17, 1881.	.....	Mice.	
Sep. 24, 1880.	.....	.....	Grasshopper.
Feb. 16, 1880.	.....	Mice.	
Jan. 1, 1880.	.....	.....	Insects.
Aug. 25, 1876.	.....	Mice.	
July, 1879.	.....	Bat.	
Jan. 16, 1879.	Snow bird,	Mice.	
Feb. 7, 1887.	.....	.....	Caterpillar.



FISH HAWK.

FISH HAWK.

Pandion haliaetus carolinensis.

DESCRIPTION.

Wings long and pointed; second and third quills longest. Three first primaries emarginate on inner webs; bill stout with a very long hook and sharp end; feathers oily to resist water, those of head lengthened and pointed; thighs and little of the front parts of tarsi are covered with short feathers which lie close; legs, tarsi and feet very strong and robust; claws all same length, very large and sharp. The tarsus all round covered with rough scales; toes padded below and covered with numerous hard-pointed projections to aid in holding their slippery prey.

Adult.—Upper parts dark brown or grayish-brown; most of head, neck and under parts white (chest in female and sometimes in male, is spotted with brown), the tail usually paler than the back, is tipped with white, and has six or seven dusky bars. The immature, very similar to adults, have upper parts spotted with pale reddish-brown or white. Iris in some specimens reddish, but mostly yellow; bill and claws blue-black; tarsi and toes grayish-blue. Length (female) about 25 inches; extent about 52.

Habitat.—North America, from Hudson's bay and Alaska south to the West Indies and northern South America. Breeds sparingly in Pennsylvania.

The Fish Hawk, although most numerous about the sea coast, is quite frequently met with along our large rivers. This bird arrives in Pennsylvania generally about the last week in March, and remains sometimes as late as the first of November.

THE NEST AND EGGS.

Although the Fish Hawk commonly rears its young along the sea coast, it is frequently found breeding near the borders of large rivers or in the vicinity of large inland lakes. The nest, a particularly bulky structure (from four to eight feet in diameter) composed chiefly of sticks, and lined with sea-weeds, grasses, etc., is built usually on a large tree, near the water. In Florida I have found eggs and young of this bird early in March. This hawk is a regular but by no means common breeder in Pennsylvania. The nest of this bird may be found almost every year along

the Susquehanna river and about some of the larger lakes in the northeastern sections of the State.

A GOOD FISHERMAN.

During the spring, summer and autumn months these hawks, generally singly, but sometimes in pairs, if not disturbed, will regularly visit mill dams and fish ponds where they can secure their finny prey.

Hon. Hiram Peoples, of New Providence, Lancaster county, who devotes much attention to fish culture, raising large quantities of bass and gold-fish for the markets, informs me he loses a great many fish from visits of the Fish Hawk. In fact, he says the depredations of these hawks became so numerous that he offered a bounty of fifty cents each for every one which was killed on his premises.

Kingfishers also annoy Mr. Peoples by stealing his fish, but he easily disposes of these unwelcome visitors by setting steel traps on stakes or posts about his ponds. Last year he caught, by this means, twenty-four kingfishers.

THEY LIVE ON FISH.

The writer has examined the stomach contents of twenty-three of these hawks captured in Pennsylvania, New Jersey, Virginia, Maryland, Delaware and Florida, and found only the remains of different species of fish. It may be, as some writers assert, that the Fish Hawk when breeding subsists in part on reptiles and batrachians; however my opinion is that these birds never touch other food unless they are unable to catch fish. The Osprey, as this hawk is often called, does not, as some farmers believe, disturb domestic fowls, nor does it molest wild birds. Grackles sometimes build their nests in the interstices of the commodious nest of the Fish Hawk.

THE OWLS.

Ten representatives of the families *Strigidae* and *Bubonidae* are credited to the fauna of Pennsylvania.

Owls, like the eagles, hawks and other diurnal birds of prey, embrace numerous species of which, it is stated, about two hundred occur in different parts of the world.

The incalculable benefits conferred by this group of birds, particularly the smaller species, to the husbandman, are generally overlooked. This is largely due, perhaps, to the fact that these birds prey extensively on mice and insects which become most active at night time when the tiller of the soil is resting from the arduous labors of his calling.

Some are common residents in all parts of the State; others breed in boreal regions and are found with us as irregular or accidental winter visitants. The little screech owl, dressed in his coat of red or gray, or a mixture of both, is one of the most common and best known birds of this group. He is found in cities and towns, as well as in the rural districts. In the hollow limbs of trees in old apple orchards he delights to conceal himself in daytime, and also to rear his family. He is often found about barns and other buildings where he goes in the daytime to hide, or frequently at night to catch mice, one of his main articles of livelihood. The Great Horned Owl inhabits the woods, but on the approach of night he goes out in quest of food. His visits to the poultry yard are so common that he also is familiar to residents of the country, where he is usually known from his loud cries as "Hoot Owl." The Barn Owl, a southern bird, breeds sparingly and most frequently in the southern parts of our State. The Snowy, which rears its family in the Arctic wilds, is found here only as an irregular winter sojourner. Some persons not versed in ornithological matters, name both the Snowy Owl and Barn Owl "White" or "Snowy" Owls. Such local names used to designate the Barn Owl are confusing and should be discarded.

MICE DEVOURING SPECIES.

Owls, other than the Long-eared and Short-eared species, are usually observed singly; those that breed here, of course, are often during the breeding period seen in pairs and with their young. In winter Long-eared and Short-eared owls are found generally in flocks. Long-eared owls breed in many localities; in fact quite generally throughout the State, and owing to the circumstances that sometimes they roost in the daytime, in cedar trees, they are termed by many "Cedar" Owls. The Short-eared owls frequent meadows, swamps and grassy fields. Hunters who most frequently come across these birds in the fall and winter time know them as "marsh" or "swamp" owls. The Short-eared Owl is common in winter and is said to breed here in rare instances. Both the Long and Short-eared owls should be protected by the farmer and fruit grower, as these birds live almost exclusively on mice.

THE BARRED OR "RAIN OWL."

The Barred Owl is a resident and breeds generally throughout the State; it is most numerous in the mountainous and wooded districts. In different parts of Wayne, Susquehanna and Wyoming counties, where four or five years ago the Barred Owl was very common, it is called "Rain" Owl, as it was asserted its dismal cry was most frequently heard before a storm. To distinguish an owl from a hawk, remember the owl's eyes are situated in the front of the head and look forward, while the hawk's eyes are directed to either side. The extremely soft and downy plumage of owls is such that their flight is almost noiseless. During the daylight we usually find them concealed in hollow trees or dense foliage. While it is generally an accepted fact that owls are nocturnal in their habits, it is not true that they are exclusively so. The Snowy and Hawk Owls are of a decidedly diurnal nature, and in cloudy weather or in early twilight it is not unusual to see the Great Horned Owl sally forth in quest of prey.

PREFER TO KILL THEIR OWN FOOD.

Owls, unlike certain other birds of prey, never, it is stated, unless reduced to the utmost extremity, feed on carrion, but subsist on such food as they are able to kill. Their dietary, although variable with locality and circumstances, consists mainly of small quadrupeds (principally mice), insects, chiefly beetles and grasshoppers, and some few of the smaller kinds of wild birds. With the exception of the Great Horned Owl and perhaps the Barred, all the owls occurring regularly in this Commonwealth deserve the fullest protection which can be given to them by the farmer and horticulturist.

The owls, like many other birds of prey, eject from the mouth in small ball-like masses, the indigestible portions of their food, such as hair, bones, etc. These little balls or pellets are frequently to be found in great quantities about localities where these birds resort during the daytime. The eggs are white, nearly round, and commonly number from three to five. Owls deposit their eggs in hollow trees or in the deserted nests of hawks and crows. Their cries are loud and dismal.

The general form of owls is short and heavy; the head and eyes are usually very large; bill very much like a hawk's, but never toothed, and often almost hidden by long bristle-like feathers; eyes encircled by a ring of radiating bristly feathers; tarsi (shins), and in some species toes also, densely feathered.

In some species the heads are furnished with long erectile tufts of feathers, which are commonly called horns; ears in some species are remarkably large.



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BARN OWL.

BARN OWL.

Strix pratineola.

DESCRIPTION.

Length of female about 18 inches; extent of wings about 43. The male is rather smaller; no ear tufts; facial disc well developed but not circular; eyes black and rather small; lower part of long tarsus (shin) has short stiff feathers; toes nearly naked, but with some hair-like feathers; feathers of body downy. Colors brownish, ashy and white.

Habitat.—Warmer parts of North Carolina, from the Middle States, Ohio valley, and California southward through Mexico. Resident but not common in southern portions of Pennsylvania.

The Barn Owl because of its supposed resemblance to a monkey is frequently called "Monkey-faced Owl." This bird is highly beneficial to the farmer as it subsists chiefly on mice and rats. It never commits depredations in the poultry yard and rarely does it destroy insectivorous birds. Notwithstanding the good this bird does by devouring legions of voracious rodents, it, in common with other species of the owl tribe, is destroyed by farmers and sportsmen who believe they are doing that which will be a help to the poultry and game interests.

This species breeds regularly in Chester, York, Lancaster, Cumberland and Dauphin counties of this State; and no doubt in other counties also. However, from the best information I can obtain it is a rather rare visitor north of the southern part of Pennsylvania, where in some sections, it is resident.

THE NEST AND EGGS.

I have never found the nest of this species, concerning which Prof. Gentry writes as follows:

"In the selection of a place for nesting purposes, these owls
15--II

vary in different localities. In eastern Pennsylvania, generally a hollow tree, chiefly an apple or an oak is chosen, but occasionally a dilapidated and unoccupied barn; but more rarely, an occupied building in close proximity to man. When the former situations are chosen, the hollow is lined with a few dried grasses and feathers, although instances are not unfrequently met with where the eggs are deposited upon bare bottom. In the latter places a few rude sticks constitute a framework which is lined with a few fine grasses and feathers. It is deposited upon a short timber in a somewhat inaccessible part of the building. Nesting ordinarily takes place early in March, although we have observed newly-built nests in the latter part of February. Oviposition commences about the second week of March. The number of eggs laid varies from three to four, very rarely more. * * * The eggs are somewhat sub-spherical, scarcely more pointed at one extremity than the other, unless in exceptional cases; of a bluish-white color, and measure 1.67 inches in length, and 1.37 in width. They vary, however, in size in different localities."

FEEDS ON MICE.

Of fifteen stomachs of these birds examined by the writer, fourteen contained small rodents, principally mice, and some few insects: the feathers of a sparrow and bones of a small mammal were found in the other stomach. Dr. Fisher, in the summer of 1890, examined 200 pellets at the nesting place of a pair of these owls, in one of the towers of the Smithsonian Institution, Washington, D. C., and found a total of 453 skulls of the following mammals, and one Vesper Sparrow: "225 meadow mice; 2, pine mice; 179, house mice; 20, rats; 6, jumping mice; 20, shrews; 1, star-nosed mole."

Such evidence as this certainly proves the importance of protecting these owls about our premises.



$\frac{1}{3}$
SHORT EARED OWL.

SHORT-EARED OWL.

Asio accipitrinus.

DESCRIPTION.

Ear-tufts very short and inconspicuous; entire plumage varying from buff to buffy-white; every feather on the upper parts with dark brown stripes; under parts paler; often nearly white on abdomen; bill and claws dark. Iris yellow.

Female measures about 17 inches in length; extent about 43 inches.

Habitat.—North America at large; nearly cosmopolitan. Common winter resident in Pennsylvania.

The common name of Marsh Owl is quite appropriate, as this species frequents principally during its sojourn in this region marshy districts and grass fields. Oftentimes small parties of five, eight or ten individuals will be found in grassy retreats, where meadow mice are abundant. Occasionally flocks of these owls, numbering twenty-five or thirty each, congregate in a locality where food is abundant to spend the winter; commonly, however, colonies of this size are seldom met with in this State. Possibly this species occurs as a rare breeder in favorable localities in Pennsylvania, but so far as my experience goes it is found here simply as a winter resident, arriving from more northern latitudes early in November and departing in April.

KILLED TO SATISFY VANITY.

This species is of the greatest benefit to the farmer and fruit grower, as it subsists during its residence here almost wholly upon destructive rodents, especially mice. A colony of Short-eared Owls, if left unmolested, will in a short time destroy all the mice in a large meadow. Dr. Fisher has found as many as six mice in the stomach of a single owl, and the writer

has taken four mice from the stomach of one of these birds. Some few years ago when stuffed owl-heads were fashionable ornaments for ladies hats, many of these owls were slain by hunters in the employ of milliners and taxidermists, on the farms of some of my acquaintances, who afterwards informed me they were convinced that the marked increase of field mice on their premises was due to the destruction of these and other birds of prey, such as hawks (Sparrow, Red-tailed, Red-shouldered and Rough-legged), which were killed by hunters for the bounty at that time allowed by this State.

The stomach contents of thirty-five Short-eared Owls examined by the writer during the past ten years revealed chiefly field mice, a few birds (sparrows) and some insects, beetles and grasshoppers.

These owls were captured in Pennsylvania during the winter season. Two had remains of sparrows in their stomachs and three contained the insects above mentioned in conjunction with the hair and bones of small rodents; the remaining thirty owls had only mice or shrews in their stomachs. Dr. Fisher states that it is quite exceptional for this owl to feed upon birds, and further adds that of ninety stomachs examined at the National Department of Agriculture but ten contained the remains of birds.

THEY DEVOUR LEGIONS OF NOXIOUS RODENTS.

The following important evidence of the economic value of the Short-eared Owl is from the fourth edition of Yarrall's *British Birds* (Vol. IV, p. 165): "Undoubtedly, field mice, and especially those of the short-tailed group or voles, are their chief objects of prey, and when these animals increase in an extraordinary and unaccountable way, as they sometimes do, so as to become extremely mischievous, owls, particularly of this species, flock to devour them. Thus there are records of a 'sore plague of strange mice' in Kent and Essex in the year 1580 or 1581, and again in the county last mentioned in 1647. In 1754 the same thing is said to have occurred at Hilgay, near Downham Market, in Norfolk, while within the pres-

ent century the Forest of Dean, in Gloucestershire and some parts of Scotland have been similarly infested. In all these cases owls are mentioned as thronging to the spot and rendering the greatest service in extirpating the pests. The like has also been observed in Scandinavia during the wonderful irruptions of lemmings and other small rodents to which some of the districts are liable, and it would appear that the Short-eared Owl is the species which plays a principal part in getting rid of the destructive horde." (From Fisher's Bull. No. 3.)

The information contained on the preceding pages concerning the food habits of the Short-eared Owl certainly cannot fail to show that this species is highly serviceable and justly merits the good will of the farmer and orchardist.

LONG-EARED OWL.

Asio wilsonianns.

DESCRIPTION.

Ear tufts of eight or ten feathers, are long and conspicuous; eyes yellow and quite small. Upper parts dusky, mottled with gray, fulvous and brownish black; abdomen white; under parts generally grayish-white, with transverse and longitudinal stripes of black, brown and reddish-brown; feet and legs reddish-brown and upspotted; bill and claws black.

Female measures about 15 inches in length; extent of wings about 33. Male rather smaller.

Habitat.—Temperate North America. Resident in Pennsylvania.

Owing to the fact that these birds oftentimes conceal themselves during the daytime in cedar trees, the local appellation of "Cedar Owl" has arisen. The Long-eared owl is a resident and one of the most abundant of the owl tribe in this State. While most owls, in this region at least, usually lead a solitary life or associate in pairs, we find the subject of this sketch to be social and gregarious, associating often in parties of from twelve to twenty-five individuals. In winter if not molested they frequently take up a residence in the dark retreats furnished by the numerous coniferous trees growing around the habitations of man.

DESIRABLE VISITORS.

In relation to a party of these owls Dr. Wm. R. Stavely, Lahaska, Pa., says:

"For over twenty years I have had congregated in my lawn from fifty to seventy-five owls. They are peaceable and quiet; only on rare occasions would you know one was about. On dull days and foggy evenings they were flying about in all directions. Never in all that time have I missed any poultry or have they inflicted any injury on anything of value. The first I noticed of their presence was the discovery of quite a pile of what appeared to be mice hair and bones, and on investigation found the Norway fir was the roosting place of to me



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AMERICAN LONG EARED OWL.

at that time a vast number of owls. They had ejected the bolus of hair and bones apparently of an army of tree-eating destructive mice, aiding the fruit grower against one of the worst and most inveterate enemies. * * * Their merits would fill sheets; the demerits nil."

THE NEST AND EGGS.

Although it is true that Long-eared owls at times do construct their own nests, I am inclined to believe that these birds, in this region at least, prefer to occupy the deserted nests of other birds. I have on several occasions found these owls breeding and always observed that they occupied the abandoned nests of crows or hawks.

Audubon says:

"The Long-eared Owl is careless as to the situation in which its young are to be reared, and generally accommodates itself with the abandoned nest of some other bird that proves of sufficient size, whether it be high or low, in the fissure of a rock or on the ground. Sometimes, however, it makes a nest itself; and this I have found to be the case in one instance near the Juniata river, in Pennsylvania, where it was composed of green twigs, with the leaflets adhering, and lined with fresh grass and wool, but without any feathers."

The eggs of this bird vary considerably in size; a small example in my possession measures about one and one-half inches by one and one-fourth inches. From three to five eggs are usually found in a nest.

A BENEFICIAL SPECIES.

Like the two previously described species this owl is particularly servicable to the farmer and horticulturist as it preys almost entirely on field mice. It never disturbs domestic fowls and but a small percentage of its diet is made up of small birds.

Notwithstanding the great amount of good which this species does in keeping in check the hordes of destructive rodents which do so much damage in the

grain fields and orchard, there has, unfortunately, during recent years been a great decrease in the number of these birds in many localities in Pennsylvania. This diminution, I judge, is, to a considerable extent, due to the fact that the stuffed heads of these harmless and beneficial owls have been extensively used to decorate ladies' headgear. Great numbers of these owls were also killed for bounties; I knew one hunter who shot in one week over twenty of these birds when the bounty act was in force. The stomachs of thirteen of this lot of owls were examined by the writer and they all contained only the remains of mice.

WHAT DIFFERENT WRITERS SAY OF ITS FOOD.

Dr. A. K. Fisher says:

"The Long-eared Owl is one of our most beneficial species, destroying vast numbers of injurious rodents and seldom touching insectivorous birds."

Audubon writes:

"It preys chiefly on quadrupeds of the genus *Avicola*, and in summer destroys many beetles."

Mr. H. W. Henshaw remarks:

"Their food consists almost exclusively of field mice, of which they kill vast numbers, a fact which should earn them the protection of the farmer."



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BARRED OWL.

BARRED OWL.

Syrnium nebulosum.

DESCRIPTION.

"Large size; no ear tufts; general color deep umber-brown and buffy-whitish. The plumage everywhere barred transversely except on the belly, where the stripes run lengthwise: bill yellow; eyes brown-black. Length 19 to 24 inches; extent about 46 inches."—Fisher.

Habitat.—Eastern United States, west to Minnesota and Texas, North to Nova Scotia and Quebec. Resident in Pennsylvania.

The Barred Owl is readily distinguished from other species by its large size, yellow-colored bill and its black eyes. Barred Owls are exceedingly abundant in many of the southern States, where they are known by the names of "Hoot and Swamp Owls." In Pennsylvania this owl is found all months of the year, and in many of the mountainous and heavy-wooded regions it is the most common of all the owls.

THE NEST AND EGGS.

The Barred Owl lays its eggs in a hollow tree, or in a deserted nest of a hawk or crow; the white eggs are a little under two inches long by about one and three-quarters wide. The Barred and Great Horned Owls are the only species, in this locality, whose depredations in the poultry yard bring them to the notice of the farmer. Unfortunately, however, the hatred towards these two birds and particularly the enmity against Great Horned Owls, has brought all our owls in bad favor; the farmer's boy and sportsman, with few exceptions, let no opportunity pass to pillage an owl's nest or slay its owners. In this way, there are annually destroyed large numbers of the Screech.

Long-eared and Short-eared species, simply because the popular idea is that owls, large and small, prey only on poultry and game.

MICE AND SMALL GAME.

Wilson says, although mice and small game are the most usual food of Barred Owls, they sometimes seize on fowls, partridges and young rabbits.

"The Barred Owl subsists principally upon small birds, field mice and reptiles. He is frequently seen, in early twilight, flying over low meadow lands, searching for the mice that dwell there; he usually takes a direct course, and sometimes flies so low that the tips of his wings seem to touch the grass. When he discovers his prey he drops on it instantly, folding his wings and protruding his feet, in which his quarry is always secured; he often captures frogs that are sitting on the shores of ponds and rivers; but I am inclined to think that the statement, quoted by Audubon, that he often catches fish, is incorrect."—Samuels.

FEEDS ON FISHES.

The Florida Barred Owl—a local race—is exceedingly abundant about the almost impenetrable swamps and heavily-timbered regions along the St. John's river. In the winter of 1885, I was informed by two residents of Florida, both gentlemen whom I consider thoroughly trustworthy, that this owl frequently preys on fish, which it secures, while sitting close to the water's edge, by a dextrous movement of the foot. The stomach contents of five of these Florida Owls, which I examined, consisted only of the remains of small birds and coleopterous insects.

Referring to this species, Nuttall says: Their food is principally rabbits, squirrels, grouse, quails, rats,

mice and frogs. From necessity, as well as choice, they not unfrequently appear around the farmhouse and garden in quest of poultry, particularly young chickens. At these times they prowl abroad toward evening, and fly low and steadily about, as if beating for their prey.

In the stomachs of 89 of these owls which Dr. Fisher examined, 5 contained poultry or game; 13, other birds; 46, mice; 18, other mammals; 4, frogs; 1, a lizard; 2, fish; 14, insects; 2, spiders and 9, crawfish.

GREAT GRAY OWL.

Ulula cinerea.

DESCRIPTION.

"A very large round headed owl, without ear tufts; although much larger, resembles somewhat the Barred Owl, but can be easily distinguished from the latter. Length (female) 28; extent about 56; tail 12; bill and eyes yellow; claws long and very sharp and dusky. Above dark-brown, feathers variously spotted, mottled or barred with fine grayish-white markings; lower parts similar but more grayish, with longitudinal streaks on breast, and cross bars of white and dusky on flanks; face grayish-white with numerous narrow rings of dusky; a patch of black about eyes on either side of bill."

Habitat.—Arctic America, straggling southward in winter, to the northern border of the United States. Straggler in Pennsylvania.

This owl, one of the largest, if not the largest in North America, is found in Pennsylvania only as a very rare and irregular straggler in winter. Twenty or more years ago a specimen was captured in Chester county in midwinter by H. B. Graves. Dr. Isaiah F. Everhart, of Scranton, Pa., has a specimen in his collection which he found some years ago in the mountains in Lackawanna county. A specimen was also taken some years ago from a smoke stack of a steam boat at Erie city. I have also heard of two or three more specimens of this species being taken in this State.

ITS DIETARY.

From personal observation I know nothing of the habits of this bird, never having seen one alive.

Concerning this species Dr Fisher says: "The food seems to consist principally of hares, mice and other of the smaller mammals as well as small birds. Whether it destroys many grouse or pfarmigans is not stated by authors who are most familiar with the bird.



GREAT GRAY OWL.

Dr. W. H. Dall took no less than thirteen skulls and other remains of red-poll linnets from the crop of a single bird. * * * Dr. Dall considers it a stupid bird and states that sometimes it may be caught in the hands. Its great predilection for thick woods, in which it dwells doubtless to the very limit of trees, prevents it from being an inhabitant of the barren grounds or other open country in the north. It is crepuscular or slightly nocturnal in the southern parts of its range, but in the high north it pursues its prey in the daytime. In the latter region, where the sun never passes below the horizon in summer, it is undoubtedly necessity and not choice that prompts it to be abroad in the daylight.

It is stated that the flight is heavy and somewhat labored, and has not the bouyancy noted in that of most of the owls.

ACADIAN OWL.

Nyctala acadica.

DESCRIPTION.

"Small; wings long; tail short; upper parts reddish-brown, tinged with olive; head in front with fine lines of white, and on the neck behind, rump and scapulars, with large, partially concealed spots of white; face ashy-white; throat white; under parts ashy-white, with longitudinal stripes of pale reddish-brown; under coverts of wings and tail white; quills brown, with small spots of white on their outer edges, and large spots of the same on their inner webs; tail brown, every feather with about three pairs of spots of white; bill and claws dark; irides yellow.

"Total length about $7\frac{1}{2}$ to 8 inches; extent about 18; wing $5\frac{1}{2}$; tail $2\frac{3}{4}$ to 3 inches. Sexes nearly the same size and alike in colors."—B. B. of N. A.

Habitat.—North America at large; breeding from Middle States northward. Resident in Pennsylvania.

The Acadian is the smallest owl found in the United States east of the Mississippi river. Although apparently larger, it is in reality smaller, than our common robin. This pigmy mass of owl-life is, I suppose, the species which was regarded as not destructive to poultry and game, by the author of the "scalp act," when he introduced therein a clause exempting "The Acadian Screech or Barn Owl." From the fact, however, that the decapitated heads of pheasants,* night-hawks, chickens, cuckoos, shrikes, and doubtless other birds, were cremated and paid for as the heads of destructive rapacious "hawks" it is but reasonable to sup-

* In December, 1886, Prof. S. F. Baird informed me that he had received for identification from several counties in Pennsylvania, the heads of pheasants, English sparrows, cuckoos, robins, a gull and other birds. These heads were called by the parties sending them to Prof. Baird "Hawk heads," and as such they had been presented for the fifty-cent bounty, which had been paid. Prof. Baird also examined some Pennsylvania "wolf scalps," on which premiums had been given, and ascertained that the so-called "wolf scalps" had been fashioned from pelts of the common Red Fox.



SAW - WHET OWL.

pose that our little Acadian Owl, when found by the eager scalp hunter, was generally slain and the bounty of fifty cents given "for the benefit of agriculture and for the protection of game."

HIDES IN ROCKY PLACES.

The name Saw-whet is applied to this bird because, at times, its squeaky voice resembles the whetting or filing of a saw. Owing to the small size of this owl, together with the fact that during the daytime it remains secreted in hollow trees, thick foliage or in the dark and secluded rocky retreats, it is seldom met with, hence is regarded as one of our rarest residents. The young of this bird, taken in the vicinity of Philadelphia, have been seen by Prof. Gentry, and in E. A. Samuel's work, "Our Northern and Eastern Birds," the following interesting account is given by Richard Christ of a nest that he found April 25, 1867, at Nazareth, Pennsylvania: "This, the smallest of all our owls, is also the most rare, but a single specimen being seen in a period of several years. It is very tame when found, permitting one to approach very close to it before flying away. I am inclined to think that it sees less in the daytime than any other species of our owls, for one can touch it without being noticed, the bird taking flight more from alarm to its sense of hearing than any other cause.

THE NEST AND EGGS.

"It generally frequents stone quarries or piles of rocks, beneath which it takes shelter; and it is from this habit that the bird here is known by the name of 'Stone Owl.' On the 25th of April, 1867, I was so fortunate as to find the nest of one of these birds. It was placed or located in the hollow of a tree, about

twenty feet from the ground; the entrance to the hole was very small, scarcely two inches in diameter. On climbing the tree and looking in the hollow, I discovered sitting on the bottom what I supposed might be a small owl. Uncertain as to the truth, I introduced a small stick into the hole, and turned the bird over upon her side, she making no struggle whatever, but remaining perfectly still as if dead. I discovered that she was sitting upon a single egg. Supposing that she had but just commenced laying I left her, and did not molest her for several days; on the fifth day after I again examined the nest, and found the bird on her egg, none other having been laid. I enlarged the hole, and took the egg, leaving the owl quietly sitting on the rotten chips which formed the bottom of the nest.

"The egg was white with a bluish tint, like many of the other owls' eggs, nearly globular in form, and considerably smaller than the egg of the Red or Mottled Owl."

THEY LIVED IN HARMONY.

Dr. Elliot Coues, in his "Birds of the Northwest," says: "Mr. Gentry informs me of a curious circumstance in regard to this owl. Referring to the association of the Burrowing Owl of the west with the prairie dog, he continues: 'In the hollow of an oak tree, not far from Germantown, lives an individual of the common chickaree squirrel (*Sciurus hudsonius*), with a specimen of this little owl as his sole companion. They occupy the same hole together in perfect harmony and mutual goodwill. It is not an accidental, temporary association, for the bird and the squirrel have repeatedly been observed to enter the same hole together, as if they always had shared the apartment. But what benefit can either derive from the other?'"

Mr. Otto Behr writes me as follows of this species: "The Acadian Owl is quite common here (Lopez, Sullivan county), though not often seen; the young leave the nest about the first week in May. They make a noise which sounds like a dog "sniffing" the air. The noise gave me quite a scare the first time I heard it. It being at night in heavy timber, and as it seemed to come from overhead somewhere, I supposed it was a bear or some such animal up a tree near by."

This little owl preys chiefly on small quadrupeds, principally mice. It also devours many insects and occasionally catches small birds. In the stomachs of 19 of these owls which Dr. Fisher examined 17 contained mice; 1, a sparrow, and 1, a moth.

SCREECH OWL.

Megascops asio.

DESCRIPTION.

"Toes more or less distinctly feathered or bristled on upper side; ear tufts conspicuous; plumage presenting two totally distinct phases, having no relation to sex, age or season; one grayish-white, the other bright rufous. * * * A more or less conspicuous bright colored stripe runs along each side of the back, and a blackish line along the shafts of the feathers, sometimes throwing out transverse bars. Length, $6\frac{1}{2}$ to 10 inches; extent 20 to 24 inches."—Fisher.

Habitat.—Temperate eastern North America, South Georgia and west to the plains. Common in Pennsylvania.

This handsome little owl is one of the most common of all owls found in Pennsylvania. It is resident, but, unlike the long-eared species, is not gregarious. Its almost spherical and white eggs—four to six in number (mostly four)—are deposited in a hollow tree. A tree in an apple orchard is frequently made use of for breeding purposes, as well as a common diurnal resort, at all seasons. The eggs measure about 1.33 by 1.18 inches. This bird, when taken from the nest and raised, makes a very interesting pet, one that not only becomes attached to its master, but which is also capable of rendering him most efficient services in the destruction of mice, whose vexatious ravages are frequently so annoying. Some few years ago an acquaintance of mine placed two of these birds in his cellar which was overrun with mice, and in a few weeks the place was depopulated of these little four-footed pests.

AS A PET.

A Screech Owl which I kept for several months in captivity fed eagerly on grasshoppers and pieces of



SCREECH OWL.

fresh beef. When a mouse was given to this bird it would seize it with its claws, and after severing with its bill the skin about the head and neck, would swallow the whole mass, always, I think, head foremost. When it fed on small birds—which were frequently shot and placed in the box, but which it would seldom touch—I noticed that it generally tore open the skull and ate the brain substance. This owl would never drink water.

FACTS ABOUT ITS HABITS.

"The flight of the Mottled Owl is smooth, rapid, protracted and noiseless. It rises at times above the top branches of the highest of our forest trees whilst in pursuit of large beetles, and at other times sails low and swiftly over the fields or through the woods in search of small birds, field mice, moles or wood rats, from which it chiefly derives its subsistence. Sometimes on alighting, which it does plumply, the Mottled Owl immediately bends its body, turns its head to look behind it, performs a curious nod, utters its notes, then shakes and plumes itself, and resumes its flight in search of prey. It now and then, while on the wing, produces a clicking sound with its mandibles, but more frequently when perched near its mate or young. This I have thought was done by the bird to manifest its courage and let the hearer know that it is not to be meddled with, although few birds of prey are more gentle when seized, as it will suffer a person to touch its feathers and caress it without attempting to bite or strike with its talons, unless at rare intervals.

"The notes of this owl are uttered in a tremulous, doleful manner, and somewhat resembles the chattering of the teeth of a person under the influence of extreme cold, although much louder. They are heard at a distance of several hundred yards, and by some people are thought to be of ominous import.

"The little fellow is generally found about farm houses, orchards and gardens. It alights on the roof, the fence or the garden gate, and utters its mournful ditty at intervals for hours at a time as if it was in a state of great suffering, although this is far from being the case—the song of all birds being an indication of content and happiness. In a state of confinement it utters its notes with as much satisfaction as if at liberty. They are chiefly heard during the latter part of the winter, that being the season of love, when the male bird is particularly attentive to the fair one, which excites his tender emotions, and around which he flies and struts much in the manner of the common p'geon, adding numerous nods and bows, the sight of which is very amusing."—Audubon.

FIXING BREEDING PLACES FOR OWLS.

The following interesting account of the methods employed by an enthusiastic oologist is taken from a letter written to me, October, 1889, by Mr. O. B. Hark, of Bethlehem: "Have you ever heard of fixing holes for Sparrow Hawks and Screech Owls? Mr. John Mack, the best climber I ever met, every spring cleans out old holes, enlarges such as are too small, etc., and finds it pays him well; this spring he got ninety Sparrow Hawk eggs and every one was taken out of holes fixed by him; at one time he put the leg of an old rubber boot in a hollow tree and several weeks later took a batch of Screech Owl's eggs out of it. Another singular experience he had with owls is, he made a hole in a willow tree; when he came to look after it again he found owls had taken possession of it and had nearly filled it with field mice; he said there were enough mice in it to fill his derby hat. This happened just before a heavy snow storm and about ten days later every mouse was gone."

EATS BEETLES AND GRASSHOPPERS.

Mr. L. M. Turner informs me that he has made a number of examinations of Screech Owls captured in Illinois, and very generally found their food consisted of such insects as the larger beetles and grasshoppers, also many mice. Grasshoppers and other orthopterous insects are devoured in large quantities by these birds.

During the summer months and at other times when insect life is abundant Screech Owls subsist mainly on an insect diet. These birds also prey on mice, shrews, other small quadrupeds and small birds.

Investigations have clearly demonstrated that few, if any, of the owl tribe are more servicable to the farmer and fruit grower than is the Screech Owl, subsisting, as

he does, principally on insects such as grasshoppers and beetles in the summer, and in winter, when insect food is scarce, on mice of different kinds, and small wild birds, particularly sparrows.

KILLS THE FEATHERED PRIZE-FIGHTERS.

The English Sparrow has, perhaps, no more relentless a foe among the feathered tribe than is the much abused and persecuted Screech Owl. At night, when the sparrows are sleeping about buildings, the owl noiselessly wings his way to their retreats and captures them with apparently but little effort. Last winter I knew a pair of Screech Owls to regularly visit, every night, for about a week, an ivy covered building where a large colony of sparrows had taken up their abode. The owls appeared perfectly satisfied with their work, and to all outward appearances thrived on a diet of sparrows. The sparrows, on the other hand, which escaped the owls' sharp claws, after nearly ten days or nights experience, evidently came to the conclusion that it would be more conducive to their nocturnal slumbers and safety to hunt another roosting place, and they did so.

For a period of nearly a month the sparrows were not observed to return to the ivy roost. One evening a boy threw a stone at one of the owls and killed it. Its mate disappeared about the same time, and in a short time, probably a week, after the owls had gone, the sparrows returned to their old roosting place in the ivy.

The farmer or fruit grower who will allow Screech Owls to be destroyed, is certainly standing in his own light, and the sooner he familiarizes himself with the true economic relations of these birds, the better it will be for his interests.

GREAT HORNED OWL.

Bubo virginianus.

DESCRIPTION.

Length (female) 21 to 24 inches; extent about 5 feet; tail about 9 inches; male 19 to 23 long; extent about 50 to 53 inches; can be distinguished by its large size and long ear tufts; plumage blackish, brownish, dusky, grayish and whitish in mixture; throat and middle of breast white; eyes yellow; bill and claws blackish.

Habitat.—Eastern North America, west to the Mississippi valley, and from Labrador to Costa Rica. Resident in Pennsylvania.

This well-known and rather common inhabitant of the forests can easily be recognized by its large size, the conspicuous white feathers of the throat and the long-ear tufts which measure two and one-half inches or more in length.

THE NEST AND EGGS.

The Great Horned, the largest of all our native owls, is the first to commence nesting. I have found its eggs in February, and am told that it occasionally lays in January. In this locality the Great Horned Owl seldom breeds in hollow trees; sometimes it constructs a rude and bulky nest of sticks, lined with grasses and feathers, on the large horizontal limbs of trees in its favorite wooded retreats. Its eggs, measuring about two and one-fourth inches in length by two inches in width are mostly deposited in the deserted nests of hawks and crows. Although it is stated by different writers that this species lays four or more eggs, I have never found, in seven nests examined, over two eggs or a like number of young. Mr. Thomas H. Jackson, of West Chester, Pa., writing in the *Ornithologist and Oologist*, June, 1886, says: In



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GREAT HORNED OWL.

thirteen nests of this bird that have come under my personal notice, twelve contained two eggs, or young, and only one contained three eggs. All the nests referred to above were placed in branches of trees and were generally those of hawks or crows, renovated or enlarged. Occasionally a hollow tree is used for the purpose. Upon one occasion I replaced the owl's eggs taken from a nest with those of the common hen, and upon visiting them at the expiration of three weeks, found that both the latter had been hatched and had fallen from the nest, about twenty feet from the ground, and that the owls had deserted the locality. The Great Horned Owls are liberal providers for their young. I have frequently found full grown rabbits lying in the nest beside the young, and scarcely a nest visited did not have a strong odor of skunk, while bones and feathers were scattered around attesting to the predacious habits of the proprietors."

ITS FLIGHT AND WIERD NOTES.

"The flight of the Great Horned Owl is elevated rapid and graceful. It sails with apparent ease and in large circles, in the manner of an eagle; rises and descends without the least difficulty by merely inclining its wings or its tail as it passes through the air. Now and then it glides silently close over the earth with incomparable velocity, and drops, as if shot dead, on the prey beneath. At other times, it suddenly alights on the top of a fence stake or a dead stump, shakes its feathers, arranges them, and utters a shriek so horrid that the woods around echo to its dismal sound. Now, it seems as if you heard the barking of a cur dog; again the notes are so rough and mingled together that they might be mistaken for the last gurglings of a murdered person striving in vain to call for as-

sistance; at another time, when not more than fifty yards distant, it utters its more usual hoo, hoo, hoo-e, in so peculiar an undertone that a person unacquainted with the notes of this species might easily conceive them to be produced by an owl more than a mile distant. During the utterance of all these unmusical cries it moves its body, and more particularly its head, in various ways, putting them into positions, all of which appear to please it much, however grotesque they may seem to the eye of man. In the interval following each cry it snaps its bill."—Audubon.

These owls, like the preceding species, are not migratory and when not engaged in breeding lead a solitary existence. Although chiefly nocturnal in habits, Great Horned Owls are often seen in cloudy weather and in the early twilight searching for food. On one occasion, when the sun was shining brightly (about 10 A. M.), I saw one of these owls make two attempts to catch a hen and her young chicks.

WHAT THEY LIVE UPON.

Audubon says: "Its food consists chiefly of the larger species of gallinaceous birds, half-grown wild turkeys, pheasants and domestic poultry of all kinds, together with several species of ducks. Hares, young opossums and squirrels are equally agreeable to it, and whenever chance throws a dead fish on the shore the Great Horned Owl feeds with peculiar avidity on it."

Nuttall tells us they usually prey on young rabbits, squirrels, rats, mice, quails and small birds of various kinds; and when these resources fail or diminish, they occasionally prowl pretty boldly around the farm-yard in quest of chickens, which they seize on the roost.

My own records of sixteen examinations of the Great Horned Owl, which, with one exception, were all

taken during the winter months, revealed in eleven individuals only remains of poultry; two others, portions of rabbits, and of the three remaining birds of this series it was found that one had taken two mice; another showed small amount of hair, apparently that of an opossum. The sixteenth and last bird contained a mouse and parts of beetles.

The investigations of Dr. Fisher show that of 110 stomachs of this bird which contained food materials, that 31 contained poultry or game birds; 8, other birds; 13, mice; 65, other mammals (rabbits, squirrels, rats, muskrats, skunk, etc.) From such records it will be seen that this species does a good deal of damage to the poultry and game interests. While it is true that mice and some other destructive mammals are devoured by this owl, there is little doubt that the damage he does is much greater than the benefit he confers.

SNOWY OWL.

Nyctea nyctea.

DESCRIPTION.

Length from 20 to 24 inches; extent $4\frac{1}{4}$ to 5 feet; tail between 9 and 10 inches long; tarsi and toes densely covered with long hair-like feathers; black bill almost hidden by long feathers; plumage white, with brownish or blackish spots and bars; throat, face, feet and middle of breast whitest. The female is larger and much darker than male; eyes rather small and yellow; no ear tufts.

Habitat.—Northern portions of the Northern Hemisphere. In North America, breeding mostly north of the United States; in winter migrating south to the Middle States, straggling to South Carolina, Texas and the Bermudas.

The Snowy Owl rendered so conspicuous by its large size and white plumage is a native of the Arctic regions. This owl is found in Pennsylvania only as a winter visitant. Although specimens are taken nearly every winter, this species is most frequently observed during excessively severe winters. Usually solitary birds are observed, but sometimes parties of six, eight or even a dozen are seen together.

ITS MANNER OF HUNTING.

Wilson says: "Unlike most of his tribe he hunts by day as well as by twilight, and is particularly fond of frequenting the shores and banks of shallow rivers, over the surface of which he slowly sails, or sits on a rock a little raised above the water watching for fish. These he seizes with a sudden and instantaneous stroke of the foot, seldom missing his aim." Nuttall writes: "He ventures abroad boldly at all seasons, and like the hawks, seeks his prey by daylight as well as dark, skimming aloft and reconnoitering his prey, which is commonly the White Grouse, or some other



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SNOWY OWL

birds of the same genus, as well as hares. On these he darts from above, and rapidly seizes them in his resistless talons. At times he watches for fish, and condescends also to prey upon rats, mice and even carrion."

This species is never sufficiently numerous in this State to do any serious damage to either the poultry or game interests. In the northern counties where these birds are plentiful they devour great quantities of small rodents which, with fish, seem to be favorite articles of diet for them.

HAWK OWL.

Surnia ulula caparoch.

DESCRIPTION.

"No ear tufts; tail rounded at tips, and indistinctly barred with white; top of head and back of neck spotted with white and black, or dark brown; a patch of uniform blackish or dark brown on each side of hind neck; upper parts brown, more or less spotted with white; lower parts regularly barred with brown. Length, 14.75 to 17.50 inches; extent 31 to 33 inches."

Habitat.—Arctic America, migrating in winter to the northern border of the United States. Rare straggler in Pennsylvania.

This curious bird partakes of the general appearance, and also the habits, of both a hawk and an owl, and is said to be principally diurnal, in fact writers assert that it is as active in daytime as any of the hawks. This species occurs in Pennsylvania only as a rare and irregular winter visitor.

ITS FOOD AND HABITS.

Having never had an opportunity of studying this bird in life I quote the following from Dr. A. K. Fisher's Bulletin:

"The food of this owl varies considerably at different times of the year. In summer it feeds on the smaller mammals, such as mice, lemmings and ground squirrels as well as insects of various kinds, while in winter, when the snow is deep and its favorite food is hidden, it follows the large flocks of ptarmigans and subsists on them. Dr. Dall seldom found anything but mice in the crops of those he dissected in Alaska, and the following from Dr. Coues mentions the same food: "It feeds chiefly upon field mice (*Arvicolae*) which swarm in the sphagnous vegetation of arctic lands; also upon small birds, grasshoppers and other insects." (*Birds of the Northwest*, 1874, p. 312.)

"Mr. Henry Seebohm speaks of its food as follows: "The principal food of the Hawk Owl is mice and lemmings, and the bird follows the migratory parties of the last named little mammal to prey upon them. From its indomitable spirit, however, few birds of the forest are safe from its attack. In addition to the smaller birds which it captures, Wheelwright mentions the fact that he has seen the Hawk Owl strike down the



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AMERICAN HAWK OWL.

Siberian jay, and has also disturbed it feeding on an old willow grouse. The same naturalist has also taken insects from its stomach." (Hist. British Birds, Vol. I, 1883, p. 184.)

"The species is tame and unsuspecting, and may be approached easily without being alarmed; in fact, specimens have been known to return to the same perch after being shot at two or three times. It is a courageous bird, and will defend its nest against all intruders. A male once dashed at Dr. Dall and knocked off his hat as he was climbing to the nest; other similar accounts show that the courage displayed on this occasion was not an individual freak, but a common trait of the species.

"Although the flight is swift and hawk-like, it has nevertheless the soft, noiseless character common to the other owls. When starting from any high place, such as the top of a tree, it usually pitches down nearly to the ground, and flies off rapidly above the tops of the bushes or high grass, abruptly rising again as it seeks another perch.

"The note is a shrill cry which it utters generally while the bird is on the wing."

CHAPTER IV.

SOME OTHER BIRDS.

RAVENS, CROWS, JAYS AND SHRIKES.

Five species of the family CORVIDAE are found in Pennsylvania, and of these the Common Crow and Blue Jay are by far the best known. Indeed, probably no two representatives of our bird-fauna are more familiar to persons who are at all acquainted with rural life than are the gaudy, garrulous Blue Jay, and his suspicious, pilfering relative, the Common Crow.

THE RAVEN.

The northern Raven is a sub-species, that was first recognized and described by my friend, Prof. Robert Ridgway, the eminent Ornithologist of the Smithsonian Institute, Washington, D C. This bird possesses peculiarities which entitle it to be particularized by the technical specific *principalis* to distinguish the new form from that of its near kin the Common Raven, (*Corvus corax*), of the older authorities. It ranges from "Greenland to Alaska, south to British Columbia, Canada, New Brunswick" and Pennsylvania. In this State it is found as a resident in a number of counties, particularly such as are mountainous and which contain large areas of sparsely settled and extensively forested lands.

A WARY POULTRY THIEF.

The Raven is very shy, yet he will occasionally come around farm buildings, in the neighborhood of his favorite haunts in the mountain wilds, to catch young poultry or hunt a hen's nest, especially that of the turkey which so often wanders some distance from her owner's building to hatch. The damage, however, to domesticated fowls by Ravens in Pennsylvania is, I am sure, very insignificant.

THEY DESTROY EGGS AND NESTLINGS.

From evidence in my possession I am fully convinced that Ravens, like their dark-coated relations, the Crows, do devour the eggs and young of many wild birds. Game birds, such as the Ruffed Grouse and Wild Turkey, woodsmen say, suffer considerably, during the periods when they have eggs and broods of young, from sly and unexpected visits of these cunning and able-bodied corvine birds. If a Turkey or Pheasant, with her children, remains in the locality and the fact becomes known to a pair of Ravens, the chances are, hunters say, that the Ravens will watch the place almost constantly, day after day, until they have destroyed or driven away the mother and her family of youngsters.

CAPTURE RABBITS AND GROUSE.

Ravens unquestionably kill a good many young Hares and they also sometimes attack and overpower the old ones, particularly when the latter are enfeebled by disease or wounded by human hunters or other animals which prey on them. Rabbits and Pheasants entrapped in snares, (which, by the way, cannot legally be used in Pennsylvania) if found by

the sharp-eyed Raven, will be attacked and eaten by him after he has convinced himself that the mammal or bird, suspended from the cord or fine copper wire, has not been placed there as a lure to his own destruction. In this State Ravens are generally seen singly or in pairs, but often, a pair with their family of inquisitive and noisy children, of the year, may be observed together.

WILL SPEAK AS THEY PASS BY.

I have known two or three pairs of Ravens to remain for two or three years in the same locality, i. e., in a district, of perhaps eight or ten miles square, and each pair of birds, as well as the young ones, appeared to evince no disposition to be on intimate relations with their neighbors. Of course the whole Raven clan, no doubt, had a speaking acquaintance, because their hoarse voices could always be heard when they came within hailing distance, as was often the case.

ATTACK LAMBS AND FAWNS.

Ravens, like the Common Crow, will sometimes attack young lambs and peck out their eyes. It is also asserted by hunters that these birds have been known to attack very young Fawns when their watchful mothers were not near at hand.

RAVENS A QUARTER OF A CENTURY AGO.

I have been told, by old hunters and woodsmen, that twenty-five or thirty years ago when the Virginia Deer was abundant in many sections of Pennsylvania, that Ravens were then rather numerous in the romantic wilds since made barren through the woodsmen's axe and devastating forest fires. In those

days farmers who resided in the vicinage of virgin-timbered areas in the mountainous districts suffered considerably from the spying, argus-eyed Ravens which seemed ever on the alert to pounce down from some carefully chosen hiding place and rob the turkey or the chicken of her eggs or brood. Then if the parent sheep did not keep a very close guard over their young offspring the omnivorous and flesh-loving Ravens would attack and kill them; they also, it is affirmed, were known to pounce upon, in at least two instances, within the recollection of aged mountaineers, calves, but a few days old; and on another occasion, one of my informants states that a band of hungry nomadic Ravens attempted to make a meal of an old sow's litter of pigs that were only a few days old, and so persistent were their onslaughts that the owner of the pigs was compelled to shoot two of the Ravens before they would leave the place.

WOULD ATTACK THE DEER.

Deer enfeebled by old age or reduced from disease, and also when wounded by human huntsmen, Panthers, Wolves, Wild-cats or other predatory animals which possessed sufficient courage and prowess to attack them, were beset at times by Ravens which would peck out their eyes and other soft parts, particularly portions of the poor deer's anatomy that had been opened by a bullet or lacerated with teeth or claws of some cruel carnivorous beast.

These observations showing the fierce and sanguinary nature of Ravens which, with labored but quick flight, and loud harsh cries, over a quarter of a century ago, are reputed to have brought so much misery into

the happy homes of many of their neighbors—co-dwellers in the mountain wilds—I cannot confirm from personal observations in the field in recent years or since Ravens have become very much less numerous.

RELIABLE INFORMANTS.

The statements, however, come from sources which I deem thoroughly trustworthy. They are here recorded, substantially as given to me by aged informants, men, whose vocations of hunting, trapping, wood-chopping or bark peeling compelled them to live almost continually, the year 'round, in dense forests and other wild, uninhabited places. These places, however, were ideal localities for a careful observer to learn the life histories of wild animals which the Wise Maker designed should find suitable abodes in dark sylvan shades or along the banks of the cool, healthful waters of mountain streams, and by rocky and mountainous pathways, vestiges of which still remain in many regions of the Keystone Commonwealth, as if to remind us of the bloody struggles that our ancestors, a century or two ago, were so often forced to engage in with the Indians who made these "trails."

ARE ENEMIES OF SMALL BIRDS.

From the fact that I have often observed different kinds of small birds, which build their summer homes in regions selected by the croaking Raven for his abiding place at all seasons of the year, always show great concern whenever a solitary Raven, or worse still a pair of them, came near their nest of young, it is safe to infer that the solicitude they manifested was due to a knowledge obtained, perhaps, by bitter

experience that, if the Mephistophelean-like eyes of the powerful marauder, attired in his funereal coat, discovered their precious treasures they would soon be "gobbled up" to help supply Mr. Raven's gastronomic needs, which are great, and likewise most varying, as is the case with all omnivorous animals.

THEY CONSUME MANY INSECTS.

The Raven will consume annually a good many insects, particularly the numerous ground-inhabiting and wood-destroying beetles; crickets, grasshoppers and "grub worms" he eats with great gusto.

Beetles and grubs he generally finds about old stumps and dead logs. On two occasions I have seen Ravens hunting in newly plowed ground for larvae, beetles and mice. They feed on different kinds of small mammals, besides young Hares, as previously mentioned; and they have been known to attack and kill Flying Squirrels and Chipmunks, but their usual articles of food in the way of mammals are the different species of mice which abound in woods and fields.

EAT BERRIES, NUTS, FROGS AND SNAKES.

Ravens will eat, with great relish, different kinds of berries which grow wild, and often in great abundance, in the mountainous districts. Cherry, peach and apple trees, which are not uncommon in many wild mountainous places remote from human habitation, are often visited by Ravens to feed on the ripe or ripening fruit. In the Autumn or Winter season, like the Ruffed Grouse, Ravens may be seen at times hunting about apple trees for the seeds of the fruit which they collect from the ground, or by pecking into the

rotten and frozen apples which hang on the twigs; and, like their saucy relations, the Jays, dressed in jaunty plumed hats, white vests and bright blue coats, they eat chestnuts, beechnuts, acorns and other seeds known as "mast." They catch frogs and sometimes kill and devour small sized snakes. They will go in shallow water to catch fishes which they consume. Most flesh eating animals, either birds or quadrupeds, which obtain their livelihood by open warfare, do not show an inclination to feed upon carrion and offal unless compelled to do so by reason of the scarcity of normal food supplies.

THEY SOMETIMES PREFER CARRION.

The Raven, however, has the habit of subsisting, in part at least, on such a menu, even when other food could be obtained with the usual cunning and activity displayed by this race of pilferers. Of this I was fully convinced some three years ago, when visiting at Glen Union, Clinton county, Pa., where two or three families of Ravens had their headquarters in rocky cliffs, some four miles in the interior. At irregular intervals some of the meddlesome tribe would come down to dwellings, along the Susquehanna river, and steal a young chicken or rob a hen's nest; and, on one occasion, I noticed two of them in a vine, along the road near the railroad station (Glen Union), eating "frost" or chicken grapes, a common article of diet, by the way, for the Pheasant or Ruffed Grouse. These Ravens daily came to the places where the woodsmen ate their dinners and fed the horses, and in a short time after being allowed to pick up, unmolested, pieces of bread and meat about the camp, they became quite tame, unless they saw a stranger

appear about the place, when they flew off in, apparently, great anger. By some accident a horse was killed and its body hurled into a deep ravine. By this mishap I learned that Ravens were very partial to horse flesh, as they daily visited the decaying carcass, and seemingly made little or no efforts to obtain other kinds of food.

When deer are shot and eviscerated Ravens come around and feed on the refuse matter. At such times they generally are seen in pairs, but sometimes several are together.

THE FISH CROW.

The Fish Crow, smaller than the Common Crow, glossy black with green and violet reflections, occurs chiefly about maritime districts of the Atlantic Coast, from Long Island to Florida. In Pennsylvania the Fish Crow is found, in the summer season, along the shores of the Delaware river and about the Susquehanna river from Columbia, Lancaster county, southward. The Fish Crow has the same bad habit which has made such a blot on the good name of its near kinsman, the Common Crow, namely, that of robbing, Audubon tells us, other birds of their eggs and young. However, such deeds of rapine, on the part of the Fish Crow, are, it is believed, much less frequent than is the case with the Common Crow.

Some observers, however, assert that Meadowlarks, Clapper Rails, Terns, Quails and other smaller species of birds suffer the loss of many of their eggs and young through the thieving propensities of Fish Crows, which are common about the sea coast regions.

THE COMMON CROW.

This well-known species is common, during all seasons of the year, in Pennsylvania. At times, other than when breeding, these birds are gregarious and often collect in large flocks. Dr. C. Hart Merriam, Chief of the Biological Division of the U. S. Department of Agriculture, Washington, D. C., in briefly summarizing the food habits of the Crow, in a letter of transmittal that appears in Bulletin No. 6, prepared by his assistants, Messrs. W. B. Barrows and E. A. Schwarz, whose exhaustive report, entitled, "The Common Crow of the United States," is based on nearly a thousand stomach examinations of Crows taken during all seasons, and careful field notes, says:

WHAT THE CROW IS CHARGED WITH.

"The most important charges brought against the Crow are: (1) That it pulls sprouting corn; (2) that it injures corn in the milk; (3) that it destroys cultivated fruit; and (4) that it feeds on the eggs and young of poultry and wild birds.

"All of these charges are sustained by the stomach examinations, so far as the simple fact that Crows feed upon the substance named. But the extent of the injury is a very different matter.

RESULTS OF CRITICAL ANALYSES.

"In order to ascertain whether the sum of the harm done outweighs the sum of the good, or the contrary, the different kinds of food found in the stomach have been reduced to quantitative percentages and contrasted. The total quantity of corn eaten during the entire year amounts to 25 per cent. of the food of the adult Crow, and only nine and three-tenth per cent. of the food of young Crows. Leaving the young out of consideration, it may be said that in agricultural districts about one-fourth of the food of Crows consists of corn. But less than 14 per cent. of this corn, and only 3 per cent. of the total food of the Crow, consists of sprouting corn and corn in the milk; the remaining 86 per cent. of the corn, or 97 per cent.

of the total food, is chiefly waste grain picked up here and there, mainly in winter, and is of no economic value.

DO TRIVIAL DAMAGE TO FRUIT.

"In the case of cultivated fruits the loss is trivial. The same is true of the eggs and young of poultry and wild birds, the total for the year amounting to only one per cent. of the food.

"As an offset to his bad habits, the Crow is to be credited with the good done in destroying noxious insects and other injurious animals. Insects form 26 per cent of the entire food, and the great majority of these are grasshoppers, May beetles, cut worms and other injurious kinds. It is shown that during the May beetle season, in May and June, these beetles form the principal insect food of the Crow. Only a few stomachs do not contain them, and stomachs are often filled with them. The fact that the May beetle season coincides with the breeding season of the Crow is of special importance, the principal insect food of nestling Crows consisting of these beetles.

DEVOUR LEGIONS OF BEETLES AND GRASSHOPPERS.

Mr. Schwarz also finds that grasshoppers occur in the stomachs throughout the year; during May beetle season they occur in the vast majority of stomachs, but usually in moderate numbers; that with the disappearance of May beetles towards the end of June they increase in numbers until in August and throughout the fall they constitute by far the greater part of insect food, often occurring in astonishing numbers, often forming the only insect food.

"To the same side of the scale must be added the destruction of mice, rabbits, and other injurious rodents by the Crow.

"In the summing up of the benefits and losses resulting from the habits of this bird, it is clear that the good exceeds the bad and that the Crow is a friend rather than an enemy of the farmer."

THE CROW DESTROYS ARMY WORMS.

During the months of July and August, 1896, when the writer was engaged in studying the Army Worm, (*Leucania unipuncta*), which preyed upon cereals, (particularly oats) grass, etc., in this State to the ex-

tent probably of \$300,000 (estimated) abundant opportunity was afforded to learn what species of birds and other animals subsisted on the voracious larvae.

While conducting these investigations, in different parts of Pennsylvania, several hundred birds of various species were shot and examined. These post-mortem examinations, as well as observations in the field, demonstrated conclusively that Crows and Crow Blackbirds were, perhaps, the most useful of all birds in devouring army worms.

CROWS AND BLACKBIRDS.

The viscera of twenty-three Crows, old and young, which were captured in different counties of the State, and in localities where army worms were abundant, were in many instances, found to be gorged with the remains of these larvae. Crows also ate large numbers of pupae. I noticed Crows or Blackbirds, especially the Common Crow Blackbird, to be quite numerous in nearly all fields where the crawling hosts were abundant, and these dark-colored and badly abused birds, by their constant warfare on the worms, did much to keep in check the damage to cereal and other crops. Crows were generally to be observed singly or in pairs, sometimes in parties, five or seven individuals, but the Blackbirds were often noticed in good sized flocks. One flock of Blackbirds numbered fully seventy-five individuals and they all seemed to be intently engaged for a considerable time in the morning or evening, as well as at intervals in mid-day, destroying the Army Worm. A Crow would eat a handful of the worms at a single meal; the number which a single bird would devour in a day was immense.

FARMERS PRAISED THEM.

Several farmers whose premises I visited when investigating the ravages of the Army Worm expressed great surprise when they were informed that Crows and Blackbirds fed almost wholly on the voracious insect-pests which were devastating the oats, barley, corn and grass fields. When specimens of these birds were shot and the contents of their stomachs exposed, they admitted that the birds were not as bad as it was commonly supposed.

SOME BAD HABITS.

The Crow's fondness for eggs and young of domesticated fowls, as well as his penchant for despoiling the nests of numerous wild birds of their eggs and young, is well known; then again the Crow visits the cornfield in the springtime and in the Autumn he often does considerable damage. These carnivorous tastes and grain-eating habits of the Crow have caused, it seems, a great many of our farmers to place Mr. Crow under ban.

The Crow Blackbird, like the Common Crow, destroys the eggs and young of different species of beneficial birds which nest in orchards, parks and gardens, and he also often, like the Crow, visits the cornfield or cherry tree. However, if farmers would take the trouble in the Spring when Crows and their bright-eyed relatives—the Blackbirds—are at work in cornfields to carefully investigate, they would find, no doubt, as the writer has, that these birds are not there for the purpose of destroying corn, but to save it from crawling foes which hide beneath the soil.

THEY EAT GRUBS AND "BUGS."

Reader, if you doubt this statement take the trouble, sometime in the Spring, when you see Crows and Blackbirds in a cornfield when the corn is an inch or two above the ground, to shoot some of the birds, open their stomachs, and the chances are ten to one you will discover that these "corn-pulling" birds have nothing but "cutworms," other larvae, and beetles in their food receptacles.

SOMETIMES STEAL THE CORN.

The Crow, undoubtedly, at times, particularly in the fall when the farmer is slow about taking corn in from a field, sometimes does considerable damage. In the Spring this bird also occasionally does a good deal of mischief in cornfields. This same statement may likewise be made concerning the Blackbird. However, notwithstanding the fact that both species of birds just mentioned destroy more or less corn, the great amount of good they do by destroying innumerable insect foes which prey constantly, during the summer season, on grain, fruit and garden crops, is, according to my judgment, considerably in excess of losses incurred from casual predatory visits which these omnivorous birds make to the growing or ripened corn.

THEY DEVOUR EGGS AND NESTLINGS.

If it was not for the bad habit which the Crow has of destroying eggs and young of both poultry and wild birds, and the same is true of the Crow Blackbird which has acquired quite an appetite for eggs and nestlings of different species of small wild birds,

there could be no possible reason for doubt in the mind of any naturalist about both of these well-known species being far more beneficial than harmful to the farmer and fruit grower. Sportsmen also view the Crow and Crow Blackbird, especially the former, in an unfavorable light because they will often destroy the eggs and sometimes the young of game birds. Grouse and Quail, Meadowlarks, etc. Along the salt water marshes of the Atlantic Ocean, when collecting specimens with my genial and gifted friend, the naturalist, Mr. C. M. Busch, we have observed Crows pillaging the nests of Terns and Mudhens, or Clapper Rails, as ornithologists call them.

THE JAYS.

Two species of Jays—that is, feathered Jays—included in the sub-family GARRULINAE, are attributed to the fauna of Pennsylvania.

One of these, the Canada Jay, a native of the distant north, is seldom found as far south as this State, where it has only been taken as a rare straggler in winter.

THE BLUE JAY.

This bird, of bright color, saucy, independent ways and mimicking voice, is common and well-known to every farmer's boy, woodsman and hunter. While all admire him, because of his showy coat and cunning habits, he is, nevertheless very generally regarded with disfavor because of his mischievous traits of character.

Blue Jays, like some school boys, seem to go out of their way to hunt trouble, and usually they get it,

but, often, not until they have caused a good deal of bother or suffering to others about them.

DISTRIBUTION.

The Blue Jay has an extensive range, being found over the whole of the United States east of the Great Plains, from the warm climate of the Gulf of Mexico northward to the dreary wilds of the Fur Countries.

In Pennsylvania, and, it is said, in most parts of their range, they remain throughout all seasons of the year. These beautiful birds commonly resort to forests to breed, yet they do not live like hermits in the woods, for when searching for food they frequently come about orchards, gardens, meadows and farm buildings. In the cold winter season when the ground is covered with snows these birds will visit the farmer's corn crib, and like the Crow Blackbird, and Red-headed Woodpecker, peck at corn which can be reached from the outside through the slats.

SOMETIMES SEEN IN FLOCKS.

Jays when breeding commonly are seen in pairs, but in the late summer and fall it is not unusual to find them in small flocks; on different occasions I have seen twenty or twenty-five of them feeding in beech, chestnut or apple trees. Blue Jays, as is the habit of other members of their family, will feed on different cereals, but of all the grains, corn or maize is the one most preferred. A pair of Jays will pilot their young ones, when able to fly, to a cornfield to feed; and sometimes a good-sized flock of these sprightly birds may be observed at work in a corn field, particularly if located along the edge of a dense woods.

ITS ECONOMIC RELATIONS.

Mr. F. E. L. Beal, Biologist, U. S. Department of Agriculture, has recently prepared and published a very interesting and valuable paper relative to "The Blue Jay and its Food." This paper, based on about 300 examinations of "stomachs collected in every month of the year from 22 States, the District of Columbia and Canada," places the Jay in a most favorable light.

MR. BEAL'S SUMMARY OF ITS FOOD.

"The most striking point in the study of the food of the Blue Jay is the discrepancy between the testimony of field observers concerning the bird's nest-robbing proclivities and the results of stomach examinations. The accusations of eating eggs and young birds are certainly not sustained, and it is futile to attempt to reconcile the conflicting statements on this point, which must be left until more accurate observations have been made. Most of the predaceous beetles which it eats do not feed on other insects to any great extent. On the other hand, it destroys some grasshoppers and caterpillars and many noxious beetles, such as SCARABAEIDS, click beetles (ELATERIDS), weevils (CURCULIONIDS), BUPRESTIDS, CHRYSOMELIDS, and TENEBRIONIDS.

The Blue Jay obtains its fruit from nature's orchard and vineyard, not from man's; corn is the only vegetable food for which the farmer suffers any loss and here the damage is small. In fact, the examination of nearly 300 stomachs shows that the Blue Jay does far more good than harm."

WHAT AUDUBON LEARNED.

The field observations of Audubon, made many years ago, prompted this great naturalist and truthful authority, to write in no complimentary words of the manner in which Jays delight to kill birds and pillage the nests of pigeons and domesticated fowls.

HE HUNTS METHODICALLY.

It is no unusual sight, in the summer time, to see a Jay quietly slip from tree to tree in a woods and starting from the lower limbs of each tree he performs a cork-screw-like inspection tour around the trunk and along the limbs until he has inspected the whole tree, when he flits to another leafy retreat to look for eggs or young birds, or perhaps some observers may say, on such occasions, he is only looking for beetles, caterpillars, "bugs," wasps or flies. Of course, Mr. Jay would doubtless, when on these foraging excursions, pick up such forms of insect-life which would please his palate, but my belief is that at these times he is bent on mischief and wants eggs or nestlings, and this same belief, it seems, is shared by Tanagers, Orioles, Flycatchers, Warblers and others of the beneficial feathered kind which build their fragile summer domiciles in trees, for as soon as a meddlesome Jay comes around, the other birds show great agitation and promptly proceed to give him battle.

WHY DO THEY DO THIS?

Possibly some observers believe insect-devouring forest birds such as the Scarlet Tanager, Red-eyed Vireo, the numerous kinds of Warblers and other sweet-voiced songsters, which make war on the Jay that comes about their homes, do so because they are prompted by jealousy, and fear the unwelcome visitor, attired in his showy coat of blue, with whitish waistcoat, black cravat, and high, peaked hat, will catch too many palatable insects around their dwelling places. From careful field observations of fully twenty years, I am strongly of the opinion that these gaudily dressed, and saucy, inquisitive Jays make

stealthy raids in trees, etc., with murderous designs in their hearts, and of this the other birds are well aware, hence their cries of distress and defensive actions in order to save, from ruin, their fragile eggs and half-fledged young.

THEY KNOW THEIR ENEMIES.

These several species of tree-inhabiting and insect-devouring birds, previously referred to, certainly are not prompted by the Jay's superior size to give him battle when he visits their domiciles. If they are why is it that they do not pitch into the Turkey Vulture which often comes in their midst? It is, kind reader, because years of experience has proven that the Jay, like some members of the genus homo, arrayed in fine dress and with insinuating ways, is a despoiler of homes, while, on the other hand, the life of the Turkey Buzzard is one of honesty, though extremely disgusting and filthy.

IS MR. JAY A FEATHERED JEKYL AND HYDE?

I am disposed to believe after learning how naturalists—all of whom are undoubtedly thoroughly honest and sincere—differ in their statements of the good or harm which the Jay does, that this bird may be like the changeable Dr. Jekyll and Mr. Hyde, or perhaps he is sometimes not unlike the servant of that hunted Huguenot refugee Sier de la Tournoire, Blaise Trepault by name, in the play entitled "An Enemy to the King." This lackey at times, as the plot goes, fairly overflows with honeyed words, kind acts and godly sayings, to the great pleasure and benefit of his hearers; but at other times, he suddenly changes, as it were, into a hideous monster attired in showy

dress, he becomes violent, rude of speech, sanguinary in acts and profane in utterance.

“MORE LIKE HIS DAD EVERY DAY.”

When such versatility of words and deportment are questioned by the fair French maid Jeannotte of the beautiful but faltering Julie de Varion—he answers:

“My dear, I have two hearts and dispositions. When I speak kindly or am modest and so good it is because I am following the dictations of mother’s heart and teachings; but when rude and bloodthirsty, or wicked in my wants, my words and deeds are inspired by a plutonian father’s heart, which impels to acts black as Cimmerian gloom.”

The thought has occurred to the writer that perhaps Jays are two-hearted animals, for some observers seem to have studied principally Jays with good dispositions and mother’s hearts, while on the other hand investigators, it would appear, have been able to find Jays chiefly of bad thoughts, and deeds of violence, transmitted, of course, from vicious sires, for, most happily, it is rare to find a loyal wife and mother, true and pure, who would teach her offspring to do ill.

THEY ARE OMNIVOROUS.

The Jays, like other birds of the family, are omnivorous in their food-habits. They consume much vegetable food, such as cereals, mast, berries and fruits; their animal food comprises numerous insects and their larvae, with spiders, snails, lizards, fish, tree frogs, mice, birds and eggs. Considerable mineral matter, sand, gravel, etc., is often found in their stomachs.

SHRIKES OR BUTCHER-BIRDS.

Two species and one "geographical race," of Shrikes are found in Pennsylvania. The name of Butcher-bird is applied to these birds because of the habit they have of impaling prey—insects, mice, small birds, etc.,—on thorns or sharp projecting twigs of bushes or trees. The insects, mice or birds, which they catch and impale were supposed, by some old writer, to resemble the wares of the butcher on the market shambles, hence the popular appellation.

THE NORTHERN SHRIKE.

This species, the largest of the three Shrikes occurring in Pennsylvania, is found with us only as a winter sojourner. During its residence in this region from November to April, it frequents briery thickets, thorn hedges, and grassy fields near trees and shrubbery. The Northern Shrike breeds beyond the Northern United States. This bird as well as the species called Loggerhead Shrike, and its very intimate relation, (specimens of which are so nearly alike the typical Loggerhead that experts are unable at times to distinguish the "race" from the species) the "geographical race," styled in common ornithological parlance, the White rumped Shrike, are known, in some sections of our State as the little "Gray Hawk."

AN IMPROPER NAME.

This name, of course, is highly inappropriate, as Shrikes are not related to the Hawks. The name, however, is given by farmers and gunners, who see these birds catch small birds, mice, etc. During recent years, or since the English Sparrow, our imported bird nuisance, has become so alarmingly abundant in the

cities and towns, Shrikes—particularly the Northern Shrike—have learned to visit lawns, parks and gardens, and ivy-covered buildings, to prey on these passerine pests, which before many years will become a serious menace to our farmers and pomologists.

This sparrow-devouring habit which the Shrike has developed in recent years, has, fortunately, won for him the good will of many, who, in former years, through ignorance destroyed this bird, because it was alleged, and generally believed that the Shrike preyed on domesticated fowls.

A BENEFICIAL SPECIES.

The poor Shrike, which gains a livelihood principally by catching destructive beetles, grasshoppers and mice, was placed on the black-list by farmers and poultry-raisers, who, because of insufficient knowledge, mistook this gray-coated benefactor, when he came about their premises to devour insidious foes, for one or the other of the two or three smaller species of Hawks which are fully described on preceding pages of this volume.

THE LOGGERHEAD SHRIKE.

This bird is noticeably smaller than its cousin, the Northern Shrike, which is so named because it rears its young in boreal regions where at the close of the fleeting arctic summer it is compelled, with its progeny, to migrate southward where it can find a sufficient supply of desirable food.

A SUMMER BIRD HERE.

The Loggerhead is a common summer bird in many parts of Pennsylvania, particularly in the northwest-

ern end of the State in the vicinity of Lake Erie, a short distance from the busy city of Erie.

FEEDS ON INSECTS.

This species feeds chiefly on insects, particularly grasshoppers and ground-inhabiting beetles. They destroy a good many May beetles, mice, and some small birds. Occasionally they kill, I have been told, English Sparrows; but their attacks on sparrows and other small birds are much less frequent than is the case with the Great Northern Shrike.

SOMETIMES TRY TO KILL CHICKS.

I have on two or three occasions been informed by farmers that Butcher-birds (said to be the Loggerhead species) had been seen to make attempts to catch young chickens but a few days old. It is, however, a rare thing for one of these birds to make an attack on young chickens, and I think, it can be stated, with absolute safety, that all the Shrikes that have been in Pennsylvania during the past ten years have not committed depredations in the poultry yards which would amount to five dollars.

NORTHERN RAVEN.

Corvus corax principalis.

DESCRIPTION.

Size large; entire plumage of glossy black with purplish reflections; feathers of throat lengthened, disconnected and pointed; bill large, and like the feet and legs its color is black. The eyes are dark brown; length, about 2 feet; extent 4 feet or more.

Habitat.—Northern North America, from Greenland to Alaska, south to British Columbia, Canada, Pennsylvania, Maryland, West Virginia, etc.

This, the largest bird of its family occurring in Pennsylvania, is found here as a resident. In the summer season Ravens rarely leave their native heather where, in a region abounding in stately forest monarchs and precipitous rocky cliffs, they can rest in comparative safety from enemies, especially man whom they dread the most of all.

MUST WATCH THE FOX.

Sometimes when Ravens nest on rocky ledges or in caverns in the mountains, as they do very often, their eggs or young are taken by Foxes or Wildcats. If Ravens build in a locality which they find is accessible to the cunning Fox or sneaking Wildcat they abandon the place, and if no suitable nesting site can be found on some high rocky place inaccessible to these and other carnivorous animals, they build high up in tall trees, selecting usually the white pine.

THE NEST AND EGGS.

The nest of the Raven is a rude structure composed largely of sticks, twigs, moss and bark.



NORTHERN RAVEN.

When built under the shelter of overhanging rocks much less effort is made to construct a nest than is done when their home is placed high up in some tall pine or other large forest tree. The eggs are usually 4 or 5 in number; they measure about 2 inches long by 1.30 inches in width. Their color is "greenish, dotted, blotched and clouded with neutral tints, purplish and blackish-browns."

THEY RAISE ONE BROOD.

Ravens, like other birds of their family, raise but one brood of young in a year. However, if, by some mishap, their nest or eggs are destroyed they will nest again.

LIKE ONE NESTING PLACE.

The Raven, like the piratical Bald Eagle, will return year after year to the same nesting place.

There is near Zerby station, in Centre county, a section, by the way, which is noted for the number and high degree of excellence of the brainy Governors it has produced, a high point on one of the mountain ranges, which is made up of immense bowlders which weigh tons and tons. The place is practically inaccessible. Here, for fifteen years past, a pair of croaking Ravens have annually raised their families.

LEFT IN SORROW AND DISGUST.

At Glen Union, Clinton county, a pair of very foxy Ravens, for three or four consecutive years to my knowledge, every spring reared a nestful of young on a high rocky bluff along the Susquehanna river. About two years ago, a venturesome boy, after considerable hard work, climbed to the nest and got a

pair of the young birds, which were about ready to fly.

When the old Ravens saw their home invaded they flew off and gave vent to their sorrow by harsh cries. After the daring boy with his feathered captives reached the river bank, the old birds came back to the nesting site in the lichen covered rocks, where doubtless for many generations their ancestors had bred, and both the birds with evidences of sorrow, anger and disgust such as only childless Ravens can show, tore up the nest, dropping sticks, etc., over the hanging cliff, and after making a few circles over the place and saying a whole lot of bad things in Raven dialect, they retired and no Ravens have since been seen about the ill-fated place.

“QUOTH THE RAVEN, NEVERMORE.”

This pair of ebony-colored croakers were evidently not of the common every-day plebeian type of Ravens which one is accustomed to see in the mountain fastnesses. They were, no doubt, direct descendants from the wise plutonian bird which years ago perched on the bust of Pallas over the doorway of the atelier of Edgar Allen Poe, and prompted that talented and gifted writer of weird poetry and tales to pen the famous stanzas on “The Raven.” That these birds were lineal descendants of this Raven there can be little room for doubt, as a venerable woodsman who was thoroughly familiar with Raven dialect attested with great assurance to the fact that he had distinctly heard these sorrowing and angry birds as they tossed the dead sticks, faded mosses, etc., over the dizzy height repeat the word that Poe, fifty years ago, had placed in the mouth of their famous ancestor—“Nevermore.”

ITS DISTRIBUTION IN PENNSYLVANIA.

The Raven occurs regularly in the following counties where it breeds in suitable localities.

Bradford,	Forest,
Blair,	Franklin,
Columbia,	Lycoming,
Cambria,	Lackawanna,
Clinton,	Luzerne,
Cameron,	Pike,
Clearfield,	Potter,
Centre,	Sullivan,
Elk,	Tioga,

Wayne.

This bird probably may also breed in some other counties, where it undoubtedly is found as a casual visitor or straggler.

COMMON CROW.

Corvus americanus.

DESCRIPTION.

Bill, legs and feet black; iris brown; plumage glossy black with violet reflections, brightest on wing-coverts, tail and back; top of head frequently without metallic tint—young usually dull black. The male is larger than the female, and measures about nineteen inches in length and thirty-eight inches in extent.

Habitat.—North America from the Fur countries to Mexico.

The Crow readily recognized by its large size and glossy black plumage is a common resident of Pennsylvania during all months of the year.

This species ranges throughout different portions of North America, but is found chiefly in the eastern United States. In this locality the Crow commences nest-building in the latter part of April; both sexes engage in this work which is completed in from three to five days.

THE NEST AND EGGS.

The nest, a very bulky structure, measuring about twenty inches in diameter and ten inches in depth, is made up of sticks, twigs, bark, leaves, etc. It is built usually in an oak, chestnut or other tree in an unfrequented woods; nests are sometimes placed in low trees or bushes in cedar thickets. The eggs vary greatly in size and color; four to six in number; length about 1.65 by 1.19 inches in width; light-greenish, spotted brown and black with purplish tints. The note of this well-known bird is a loud harsh caw. During the early spring, fall and winter months this species is gregarious; flocks numbering from fifty to several hundred individuals are frequently observed scat-



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AMERICAN CROW

tered over the fields, meadows, along the highways, or in the woods searching for food. At night these birds resort in great numbers to favorite roosting places, such as pine forests, cedar thickets, etc.

WILL EAT EGGS AND POULTRY.

In the late spring and summer, Crows are particularly destructive to young poultry, and the eggs and young of small wild birds; frequently nests of domesticated fowls, especially guineas and turkeys that often wander to a considerable distance from the farm house to lay, are also pillaged. These birds, as every farmer is well aware, commit more or less mischief in corn fields.

Although the Crow will rob the nest of any small bird which he can get at, the nests of the Robin, Wood Thrush, Catbird, Meadow Lark and Dove are the ones I have usually seen disturbed. The injury which the Crow occasions by his egg-sucking, bird-devouring habits is, it is affirmed by eminent authorities, more than compensated by the large numbers of noxious insects and mammals which he devours.

There is no doubt, however, that when a pair of Crows, in the breeding season, get in the habit of visiting the farm yard to catch young chickens and steal eggs, they will do considerable damage. Such visitors, like bad individuals of the human race, which are found in nearly every community, should be checked in their evil careers. So far as the Crows are concerned, this can be best accomplished by the use of either a good shot gun or an egg dosed with a little strychnine. Their nest, which is usually to be found in a woods near the place where the thieving practices are carried on, should also be destroyed, particularly if it contains young.

FISH CROW.

Corvus ossifragus.

DESCRIPTION.

Smaller than the Common Crow. Glossy black with green and violet reflections; the gloss of head, neck and belly green; bill and feet black; iris brown. Length fourteen to sixteen inches; length of extended wings about thirty-two inches.

Habitat.—Atlantic coast, from Long Island to Florida. Along Delaware and Susquehanna rivers.

The Fish Crow is a common and abundant resident during all seasons about the maritime districts of most, or, perhaps, all the southern states. According to Audubon this species migrates northward in April and ascends the Delaware river in Pennsylvania, to nearly its source, but on the approach of cold weather returns to its southern winter quarters. This bird is also found in summer along the Susquehanna river from Lancaster county southward.

BREEDS NEAR PHILADELPHIA.

Mr. Thos. Gentry, writing in 1877, says he has observed the Fish Crow nesting along the water courses in the neighborhood of Philadelphia. The nest and eggs of this bird, although smaller, cannot with absolute certainty be distinguished from those of the Common Crow. Small-sized eggs of Crows like skins of under-sized Crows can be labelled "Fish Crow" and few people will recognize the difference. The Fish Crow, like the preceding species, builds in trees.

ITS VOICE.

The voice of the Fish Crow, as Wilson says, is very different from that of the Common Crow, being more

hoarse and guttural, uttered as if something had lodged in the throat. Audubon describes the common note of this bird with the syllables ha, ha, hae, frequently repeated.

WILL TAKE DUCKLINGS.

The Fish Crow will sometimes pick up young ducks of both wild and domesticated kinds, and they also pillage the nests of Mudhens and other aquatic birds. They visit shallow waters and feed on small-sized fish which they capture. They eat mussels and sometimes when endeavoring to extract the flesh of the bivalve from its hard enclosure, the bird is caught by the bill and held a helpless prisoner.

WHAT AUDUBON SAYS OF ITS FOOD HABITS.

In referring to the food of this bird Audubon writes substantially as follows:

While searching for food, these birds hover at a moderate height over the water; but when they rise in the air, to amuse themselves, they often reach a great elevation. Like the Common Crow, the Fish Crow robs other birds of their eggs and young. They also prey upon the Fiddler-crab, which they pursue and dig out of the muddy burrows into which they retire at the approach of danger. Small fry are easily secured with their claws as they fly close over the water's surface, from which they also pick up, like Gulls, any sort of garbage suited to their appetite; sometimes they will pursue and attack the smaller Terns and Gulls to force them to disgorge the small fish that they have captured. Fish Crows are able to capture live fish with considerable dexterity, but cannot feed on the wing. During the winter and spring the Fish Crows are very fond of feeding on many kinds of berries. As spring advances, and the early fruits ripen, Fish Crows become fond of the mulberry, and select the choicest of the ripe figs, more especially when they are feeding their young. A dozen are often seen at a time, searching for the tree which has the best figs, and so troublesome do they become in the immediate vicinity of Charleston, that it is found necessary to station a man near a fig tree with a gun. They also eat pears, as well as various kinds of huckleberries.

BLUE JAY.

Cyanocitta cristata.

DESCRIPTION

Head crested; bill rather slender; length about twelve inches; extent about seventeen; bill and legs black; eyes brown; crest and upper back a light purplish-blue; wings and tail bright blue; lower parts whitish and grayish white, crossed on lower throat by a black collar which unites with black feathers on sides of head and crest; narrow frontal line and lores back.

Habitat.—Eastern North America to the plains, and from the Fur countries south to Florida and eastern Texas. Resident in Pennsylvania.

The Blue Jay is found in Pennsylvania during all seasons of the year, but in the autumn and summer months this species is more plentiful than at other periods. This beautiful bird is an inhabitant chiefly of the forests. During the breeding season Jays usually associate in pairs, but in the late summer and autumn it is not unusual to find them in small flocks.

THE NEST AND EGGS.

Both sexes engage in nest-building, which, in this latitude, is begun about the 20th of April. A nest which I saw the birds building was completed in about five days. The nest, a strong bulky structure, composed chiefly of twigs and fine roots, is placed commonly in a tree in the woods; sometimes, though rarely in this locality, nests are built in low bushes. The eggs, four to six in number, mostly five, are greenish or brownish gray, spotted with brown. Length about 1.15 inches, width .84 of an inch. In Florida the Blue Jay nests some five or six weeks earlier than in this latitude; at least I suppose this to be the case, as I have



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BLUE JAY.

seen these birds collecting sticks, etc., as early as the first week in March.

SUCK HENS' EGGS AND KILL BIRDS.

The Blue Jay and also the "Scrub Jay" (*Aphelocoma floridana*), are in bad repute among the Florida farmers, from the fact that they, (particularly the "Scrub Jay") suck the eggs of chickens. They also eat the eggs of many kinds of wild birds and whenever a good chance offers they will attack and kill the young of their feathered neighbors.

WHAT A MASSACHUSETTS NATURALIST SAYS.

In reference to the food of the Blue Jay, Mr. E. A. Samuels writes as follows:

"Its food is more varied than that of almost any other bird that we have. In winter the berries of the cedar, barberry, or blackthorn, with the few eggs or cocoons of insects that it is able to find, constitute its chief sustenance. In early spring the opening buds of shrubs, caterpillars and other insects, afford it a meagre diet. Later in the spring and through the greater part of summer, the eggs and young of the smaller birds constitute its chief food, varied by a few insects and early berries. Later in the summer and in early autumn, small fruits, grains and a few insects afford it a bountiful provender; and later in the autumn when the frosts have burst open the burs of chestnuts and beechnuts and exposed the brown ripe fruit to view, these form a palatable and acceptable food, and a large share of these delicious nuts fall to the portion of these busy and garrulous birds."

STATEMENTS FROM OTHER OBSERVERS.

Mr. F. E. L. Beal in his paper on "The Blue Jay and Its Food," publishes the following paragraphs from three reliable field observers which show plainly that the Blue Jay delights to suck eggs and carry off young birds:

"Mr. Henry M. Berry, of Iowa City, Iowa, claims to have seen Blue Jays suck the contents of four eggs of the wood thrush while the old bird was only a few feet distant doing its best to drive them away."

"Mr. B. F. Goss, of Pewaukee, Wis., declares that they are the worst robbers of all, and that their destruction of the eggs and young of small birds is appalling."

"Mr. T. J. Bull, of Hot Springs, Ark., writes: While standing on the observatory on Hot Spring Mountain, I saw beneath me a pair of Red birds chirping in great distress, and also noticed a Blue Jay fly away. Upon looking more closely, I discovered a nest with one young bird in it. * * * In about half an hour the jay returned to the nest, picked up the young bird, and flew away with it."

Mr. F. E. L. Beal, Biologist of the U. S. Department of Agriculture, Washington, D. C., has examined the stomachs of nearly 300 Blue Jays, with a result which justifies him in stating that this species "certainly does far more good than harm."

The careful investigations made by Mr. Beal showed that in "292 stomachs collected in every month of the year from twenty-two states and the District of Columbia," the food consisted "of 24.3 per cent. of animal matter and 75.7 per cent. of vegetable matter or a trifle more than three times as much vegetable as animal." The animal food Mr. Beal states

Chiefly made up of insects, with a few spiders, myriapods, snails and small vertebrates, such as fish, salamanders, tree frogs, mice and birds * * but remains of birds were found in only two, and the shells of small bird's eggs in three of the 292 stomachs * * * Shells of eggs which were identified as those of domesticated fowls, or some bird of equal size, were found in eleven stomachs."

Mr. Beal also found that

"The great bulk of the insect food consists of beetles, grasshoppers and caterpillars, with a few bugs, wasps and flies, and an occasional spider and myriapod."

ITS VEGETABLE FOOD.

Mr. Beal found the following vegetable substances in the stomachs of Blue Jays:

Grain and mast.—Corn, wheat, oats, buckwheat, acorns, chestnuts, beechnuts, hazlenuts, sumac (*Rhus*), knotweed (*Polygonum*), sorrel (*Rumex*).

Fruit and miscellaneous.—Apples, strawberries, currants (*Ribes rubrum*), blackberries (*Rubus*), mulberries (*Morus*), blueberries (*Vaccinium*), huckleberries (*Gaylussacia*), wild cherries (*Prunus serotina*), choke-cherries (*Prunus virginiana*), wild grapes (*Vitis cordifolia*), service berries (*Amelanchier canadensis*), elderberries (*Sambucus canadensis*), sour-gum berries (*Nyssa aquatica*), hawthorn (*Crataegus*), chikeberries (*Aronia arbutifolia*), poke berries (*Phytolacca decandra*), oak galls, mushrooms, tubers.

THE SHRIKES.

These birds, included in the family *Laniidae*, on account of their curious habits are so often mistaken for the smaller species of hawks. This error frequently leads farmers and sportsmen as well as poultry raisers to slay these beneficial birds when they come about their premises to hunt mice, insects, etc. As previously stated, although Shrikes have been known to attack and kill the young of domesticated fowls, the damage they do in this line is very trivial. They kill various kinds of wild birds, but the species which they destroy are chiefly those of the Sparrow family.

Concerning these birds Dr. Elliott Coues, one of the most able ornithological authorities in America says: "Shrikes are bold and spirited birds, quarrelsome among themselves, and tyrannical toward weaker species; in fact, their nature seemed as rapacious as that of the true birds of prey. They are carnivorous, feeding on insects and such small birds and quadrupeds as they can capture and overpower; many instances have been noted of their dashing attacks upon cage-birds, and their reckless pursuit of other species under circumstances that cost them their own lives. But the most remarkable fact in the natural history of the Shrikes is their singular and inexplicable habit of impaling their prey on thorns or sharp twigs, and leaving it sticking there. This has occasioned many ingenious surmises, none of which, however, are satisfactory."



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GREAT NORTHERN SHRIKE.

GREAT NORTHERN SHRIKE.

Lanius borealis.

DESCRIPTION.

Length about ten and one-half inches; extent about four-teen; tail about four and three-fourths; above pale bluish-gray, whitening on upper tail-coverts and scapulars; and some specimens have upper parts faintly tinged with pale rusty; below whitish (sometimes tinged with pale brown), breast and sides "waved" with dusky or grayish lines; lores and a broad streak back of eye black; wings and tail blackish; the primaries (large wing quills) are white from base to about half their length; nearly all tail feathers have white tips and outer webs of lateral ones are white.

Habitat.—Northern North America, south in the winter to the middle portions of United States (Washington, D. C., Kentucky, Kansas, Colorado, Arizona, etc.).

This species although recorded by Dr. W. P. Turnbull, as a summer resident "on the mountain ridges of the Alleghenies," does not, I am quite positive, ever breed within our limits. The Shrike or Butcher-bird which rears its family in Pennsylvania, and is common, particularly in the northwestern section of the Commonwealth, is the Loggerhead which in many instances is mistaken for its larger and more powerful relative, which in the summer season retires usually beyond the northern United States to rear its young.

The Northern Shrike is more frequently met with in the upper than the lower half of Pennsylvania where it is found as a winter sojourner from November to April. It frequents briery thickets, thorn hedges, and grassy fields near trees and bushes. Birds of this species sometimes visit towns and prey on English Sparrows. Shrikes feed chiefly on grasshoppers and beetles, and when these are not easily obtained they

subsist on mice, moles and small birds. The Northern Shrike, assassin-like, will conceal himself in bushes and imitate the cries of other birds in distress, and when they come sufficiently near his ambush he will, to their great consternation, fly into their midst and seize one of their number. He has been known to capture Robin, Snow-birds (*Juncos*) and other kinds of Sparrows in this way.

LOGGERHEAD SHRIKE.

Lanius ludovicianus.

DESCRIPTION.

Length, about eight and one-half inches; extent, eleven and one-half; tail, four; above slate-colored; scapulars, rump, and upper tail coverts lighter. Below white; pale grayish on sides; Some specimens have lower parts partly waved with dusky lines, but others, especially full-plumaged adults, lack these lines; feathers about nostrils, lores, broad streak back of eye, and below the eye also, likewise bill and legs (old birds), are black. The wings and tail are black; tips of secondaries (second size quills of wings) and basal half of primaries (large wing quills) white. Tail feathers as in the Northern Shrike are marked with white.

Habitat.—More southern portions of Eastern United States; north regularly to Southern Illinois, Central Ohio, Northwestern Pennsylvania, etc. In Eastern and Central Pennsylvania, this species and also the variety called White-rumped is seldom met with.

The Loggerhead Shrike is a common summer bird in Erie and Crawford counties. It is said to breed also in Lawrence, Mercer and some other of the counties in Western Pennsylvania. The following remarks concerning this Butcher-bird, as it is best known to farmers and poultrymen in the Erie region, are taken from my note book.

"Erie City, May 20, 1889. To-day Mr. Geo. B. Sennett and I drove out about three miles east of the city; and on the road shot three adult Shrikes (two males and female), and secured their nests and young.

THE NEST, EGGS AND YOUNG.

Both nests were built in thorn trees. One nest in a field near the edge of a woods contained four young, two or three days old, and two eggs. The other nest was situated about four and a half feet from the ground, directly over a cow-path in a meadow; it had evidently been disturbed as it was

insecurely placed, being partly turned over. This nest, containing two half-fledged males, was composed almost entirely of plant-fiber and chicken feathers; a few small twigs only being on the outside. It measures inside of cavity four and one-half inches wide and two and a half inches in depth.

"Erie, May 21, 1889. To-day Mr. Sennett and I found three nests of Shrikes east of this city. They all were built in thorn or wild crab apple trees along the roadside and were from ten to twelve feet above the ground. One nest contained five fresh eggs; parent bird sitting on nest. When I was securing this nest and eggs the old birds flew near me uttering sharp, rasping cries. The eggs four, five or six in number are white spotted with light brown, purplish or olive; they measure about .97 long by .72 of an inch wide.

THEY SQUEAK LIKE MICE.

"The notes of young Shrikes are not unlike the squeak of a mouse. Indeed, my friend, Mr. Sennett, yesterday, when I was killing the young we had captured, stepped on a strap, and hearing the squeaky voices of the birds in my hand thought at first that he had trod on a mouse. When taking the nests which contained young the old Shrikes were quite bold, and when the squeaky cries of their children were heard they flew directly at my head, but on finding it impossible to drive me away by these attacks they alighted close by, and remained silent witnesses to the despoliation of their treasures, which were soon secured by me for the State Museum, and then both the parent birds were shot."

WHERE THEY WATCH FOR PREY.

When feeding these birds repair to fence-rows or hedges, bushes in fields and along the margins of woods and thickets; they also frequent grass fields and meadows and perch on fences, dead branches of trees and bushes, or on tall weeds. From these commanding and elevated watching places they readily discover grasshoppers, large ground inhabiting beetles and small mammals which form the chief part of their menu. Shrikes, like Blackbirds and Crows often visit plowed grounds in quest of insects, mice, etc.

THE WHITE-RUMPED SHRIKE.

The race known as the White-rumped Shrike, (*Lanius ludovicianus excubitorides*), is very similar to the Loggerhead, from which it differs chiefly in being paler above, more like the Northern Shrike, and with more whitish on rump and upper tail coverts; and it is stated that the wings, tail and tarsus (ankle) average a little longer, and the bill is a trifle smaller than in the Loggerhead.

BLACKBIRDS.

Crow Blackbirds belong to the family *Icteridae* which includes also the Orioles, Bob-o-link, or Reed bird, Cow Bunting, Rusty Grackle, Red-winged and Yellow-headed Blackbirds and Meadow Lark. In Pennsylvania we have only nine species and one geographical race of this family, which is a sort of connecting link between the Crows and the Sparrows. The Cow Bunting or Cow Blackbird is the only species in the State which builds no nest or makes no effort to look after its young. It is a veritable feathered parasite, with no musical ability. Cow Blackbirds never mate; they are polygamous, and are at all seasons of the year seen in flocks. Like the Cuckoos of the Old World the Cow Blackbird drops her eggs in the nests of other birds, such as Orioles, Warblers, Scarlet Tanager, Song Sparrow, Chippy, Vireos, etc.



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CROW BLACKBIRD.

COMMON CROW BLACKBIRD.

Quiscalus quiscula.

DESCRIPTION.

Bill stout and about as long as head; bill and feet black; iris yellow. In life may be recognized by the V-shaped tail, so conspicuous when flying. Head and neck all well defined steel-blue, the rest of the body with varied reflections of bronze, golden, green, copper and purple, the latter most conspicuous, especially on tail, the tail coverts and wings.

Female.—Similar, but smaller and duller, with more green on the head.

Young.—Very similar to female. The eyes of young birds are brown.

Male.—Measures about thirteen inches long and eighteen inches in extent.

Habitat.—Atlantic States, from Florida to Long Island. Common summer resident in Pennsylvania.

It can safely be said that of the numerous representatives of the avian tribe abounding throughout this great Commonwealth, no species is more abundant or familiarly known than is the subject of this article. Early in the month of March this species arrives in Pennsylvania in large-sized flocks from their wintering resorts, viz: Virginia, the Carolinas, Georgia and other of the southern states.

During mild winters, however, I have frequently observed them, in limited numbers, in Chester and Delaware counties; also in the county of New Castle, Delaware; correctly speaking, however, we cannot properly regard these birds as winter residents of the Keystone State.

LEAD A NOMADIC LIFE.

For a period of about one month following their vernal arrival they roam over the country, frequenting

chiefly meadows, low lands and plowed fields. On the approach of night they collect in large numbers in some favorite roosting place, such as cedar or pine trees, thick woods or dense thickets.

THE NEST AND EGGS.

Nest-building is usually begun about the middle of April, although on two or three occasions I have found nests, with full complements of eggs, as early as the first week in April.

In colonies of from ten to twenty, seldom more, they locate themselves for the purpose of nidification and reproduction. In this locality (Chester county) their favorite breeding resorts are apple orchards, the fruit and other trees commonly about the habitations of man. The nest is bulky and rudely constructed externally of rootlets, small twigs, dry plants, bits of corn-blades, etc., somewhat loosely but quite firmly bound together. Mud or mudded materials frequently enter into the construction of the nest, but this is not always the case; the interior is lined usually with fine grasses; occasionally I have seen leaves and feathers constituting the internal lamina. The construction of the nest occupies about one week; both sexes engage in its erection. It is built at the junction of two or more large-sized limbs, or among the sprouts and matted twigs. The nests vary somewhat in size, but the one now before me—about the average—gives the following dimensions: Height $6\frac{1}{2}$ inches; diameter; 7-8 inches; depth of cavity, 3 inches. Gentry observes that the female begins to deposit her eggs, one ovum per day, the day following the completion of the nest. Such may be the case, but my observation has been that oviposition does not often take place until three or

even five days subsequent to the completion of the nest. The complement of eggs is commonly spoken of as six; generally, however, I have found five, and regard this number as the full quota. The eggs are light greenish (sometimes pale rusty brown), spotted, blotched and lined with black and dark-brown; they measure about $1\frac{1}{4}$ inches long and about .90 of an inch wide. The period of incubation is from fourteen to fifteen days. The parent birds evince marked solicitude for their nest and its contents.

SELECT DIFFERENT NESTING SITES.

It is evident from the writings of various authorities that the nesting sites of this species vary considerably. By Nuttall and others we are informed that they sometimes build in bushes. From the works of Audubon it is learned that in the south they build chiefly in hollow trees. I have found these birds building in common house ivy (*Hedera helix*) but never in bushes, and only on two occasions have I discovered their nests in hollow trees; both of these nests were built in apple trees. One was constructed in a limb about seven feet from the ground, the other was placed about twenty feet from the earth; neither of these differed materially in their make up from the average nest.

FOOD.

To the agriculturist this is a subject worthy of much consideration. It appears to be the prevailing opinion among many farmers—the majority in fact—that Crow blackbirds are in many ways detrimental, and in no particular are they beneficial. This belief, evidently handed down from one generation to another, is taken in its full meaning, widely at variance with

positive fact. Among the first of our vernal migrants come the Crow Blackbirds in large flocks which disperse themselves over the country, frequenting, principally, as previously stated, meadow lands and humid grounds in quest chiefly of an insect diet, that is only occasionally diversified by a grain of corn, wheat or oats, and such seeds as may be found in seeking the hidden insect.

THEY HUNT BEETLES AND GRUBS.

In the wake of the plowman as he turns the crumbling earth, the argus eyed Blackbirds follow closely ever on the alert to seize the wriggling worm, the agile beetle, and the numerous larvae thrown out as each furrow is turned. Certainly at this season our sable acquaintances are engaged only in that which will prove of utility to the cultivator when his crops are growing. We repeatedly heard of how the Blackbirds tear up and devour the young and growing corn. This, unquestionably, is sometimes the case but I am confident that the destruction thus done is much exaggerated. I am aware that on more than one occasion I have seen the tender blades of corn lying on the ground where there were actively at work Crow Blackbirds, a number of which were shot, and on post mortem dissection their stomachs revealed almost entirely insects. Some ten years ago I was visiting a friend who had thirty odd acres of corn (maize) planted. Quite a number of "blackies" as he styled them, were plying themselves with great activity about the growing cereal. We shot thirty-one of these birds feeding in the cornfield. Of this number nineteen showed only cut-worms in their stomachs. The number of cut-

worms in each, of course, varied, but as many as twenty-two were taken from one stomach. In seven some corn was found, in connection with a very large excess of insects, to wit: Beetles, earthworms and cut-worms. The remaining five showed chiefly beetles.

THEY EAT SOME FRUIT.

Comment is frequently made with regard to the Purple Grackles, as these birds are sometimes called, pillaging the cherry trees. To some extent this is true, but certainly the amount of fruit taken is small, far less than that injured by the Cedar or Cherry Bird.

Strawberries, blackberries and other fruits are fed upon, but to a very limited extent, by this species. The diet of the young birds, while under parental care, is almost exclusively insectivorous, consisting mainly of caterpillars and grubs.

It is a well established fact that they are given to stealing the eggs of other birds, especially the common Robin; and sometimes they kill and devour the young of other birds.

In referring to this species, Wilson very aptly remarks:

"As some consolation to the industrious cultivator, I can assure him that were I placed in his situation, I should hesitate whether to consider these birds most as friends or enemies, as they are particularly destructive to almost all the noxious worms, grubs and caterpillars that infest his fields, which, were they allowed to multiply unmolested, would soon consume nine-tenths of all productions of his labor and desolate the country with the miseries of famine."

Attention is called to several series of stomach examinations, made at different periods during the past twelve years, and from such work the reader can draw his own conclusions.

March. Twenty-nine examined. They showed chiefly insects and seeds; in five, corn was present, and in four wheat and oats were found. All of these grains, however, were in connection with an excess of insect food.

April. Thirty-three examined. They revealed chiefly insects, with but a small amount of vegetable matter.

May. Eighty-two examined. Almost entirely insects, cut-worms being especially frequent.

June. Forty-three examined. Showed generally insects, cut-worms in abundance; fruits and berries present, but to very small extent.

July. Thirty-eight examined. Showed mainly insects; berries present in limited amount.

August. Twenty-three examined. Showed chiefly insects, berries and corn.

September. Eighteen examined. Showed insects, berries, corn and seeds.

October. During this month (1882), the writer made repeated visits to roosting resorts, where these birds were collected in great numbers, and shot three hundred and seventy-eight, which were examined. Of this number the following is the result of examinations, in detail of one hundred and eleven stomachs:

Thirty, corn and coleoptera (beetles); twenty-seven, corn only; fifteen, orthoptera (grasshoppers); eleven, corn and seeds; eleven, corn and orthoptera; seven, coleoptera; three, coleoptera and orthoptera; three, wheat and coleoptera; two, wheat and corn; one, wheat; one, diptera (flies).

The remaining two hundred and sixty-seven birds were taken from the 10th to the 31st of the month, and their food was found to consist almost entirely of corn.

A THOUSAND STOMACHS EXAMINED.

Within the past fifteen years the writer has made, during the different months of the year, examinations of nearly one thousand stomachs of Crow Blackbirds, taken in Pennsylvania, Delaware, Maryland and Florida.

In brief, it can be stated that these examinations showed that in the fall when insect food was scarce corn was largely eaten by these birds, but during previous periods of their residence in Pennsylvania different forms of insect-life constitute by far the larger portion of their diet.

THEY ARE FOND OF LARVAE.

Blackbirds are very partial to grub worms, cut-worms and other larvae, which they find in newly-plowed ground, corn fields and pasture. As stated elsewhere this species as well as the Bronzed Grackle, a subspecies of the Crow Blackbird which is the common form in the western part of Pennsylvania, was found to feed with great eagerness on the destructive Army Worm which was so numerous and very generally dispersed throughout this State in 1896, when this crawling and voracious pest destroyed grain and other crops to the amount of about \$300,000 (estimated).

THEY CATCH GRASSHOPPERS.

Blackbirds love to catch and eat the frisky grasshoppers which often do so much damage to the farmer's crops; and they also devour numerous kinds of ground beetles. They will eat the destructive plum curculio, and likewise devour its larvae.

WILL EAT WHEAT, OATS AND CORN.

They visit the oat and wheat stubble or the corn field

and feed on the grain they find scattered over the ground, and they frequently make a meal on the cereals when in the milky state, or when it is cut and shocked.

WILL EAT BIRDS AND EGGS.

Crow Blackbirds destroy the eggs and young of a number of species of small wild birds which nest in parks, lawns and gardens. Like the Crows, they will visit the meadows and grass fields and steal the eggs or nestlings of Meadow-larks, Quail and other ground-nesting species. They sometimes will catch young chickens soon after they are hatched, and it is affirmed that they will also eat the eggs of domesticated fowls. The damage, however, which Blackbirds do in the poultry yard is very insignificant.

THEY SOMETIMES EAT FISH.

In Florida, the Blackbird, according to my investigations, takes most kindly to a fish diet. In the spring of 1885 I collected seventeen Blackbirds in Florida, along the St. John's river. These seventeen examples, obtained at various periods from March 1 to May 7, showed generally an insect food preference—beetles, principally. Six of the number, however, revealed unmistakable evidences of having taken as nourishment fishes, as will be seen by this table:

$\frac{\delta}{\%}$	Date	Locality.	Food Materials.
1	March 3, 1885.	Volusia county, Fla.	Five small fishes; beetle and grub.
2	April 21, 1885.	Orange county, Fla.	Three fishes; beetles and mulberries.
3	April 10, 1885.	Orange county, Fla.	Remains of fishes; beetles, small seeds, etc.
4	March 14, 1885.	Volusia county, Fla.	Remains of fishes, beetle, oats and corn.
5	April 29, 1885.	Volusia county, Fla.	Cray-fish, minnow and different insects.
6	May, 1885.	Volusia county, Fla.	Remains of fishes and green colored beetle.

A Florida fisherman, during the early part of April, 1885, caught a number of "perch" which spoiled before a market could be found for them. The decaying carcasses were tossed into the river, to float away or to be "gobbled up" by the voracious "catties." Several of these defunct fishes lodged among the shell rocks lining the banks. Probably an hour after the castaways had lain along the riverside, three Crow Blackbirds were seen—quoting the phraseology of a "cracker" who was present at the time—"to jine de fish and feast 'emselves to plum fulness." After the departure of the sable visitants, inspection of the feeding place revealed that the birds had picked out the eyes of seven, or all but one, of the fishes, three of which were considerably torn about the abdominal regions. The mutilated condition of the belly muscles is mainly attributed to the fact that the fish had been eviscerated before having been thrown away, hence these incised parts were more accessible to mandibular action than other and unbroken parts of the scaly anatomy. Certainly there is no obvious reason why the abdominal and neighboring pectoral portions of a "perch" should be more palatable to the sprightly "White-eyed Jackdaw," as the native Floridians are accustomed to term the species.

THE BRONZED BLACKBIRD.

The Bronzed Grackle (*Q. quiscula aenus*, Ridgw.) is the common Crow Blackbird found in Pennsylvania west of the Allegheny mountains. In eastern Pennsylvania this bird is rather rare. This variety differs from the typical *quiscula* chiefly in having a uniform brassy-colored body, and wings and tail purplish or violet, never bluish.

THE HERONS AND BITTERNS.

The family *Ardeidae* contains, it is said, about seventy-five species which are very generally dispersed throughout all parts of the globe. A few species wander to cold countries but the great majority of these waders inhabit the lower temperate and tropical countries. In different localities throughout the United States about eighteen species and varieties (local or geographical races) are recorded by modern writers: and of these nine species have been taken during recent years in Pennsylvania. Some species occur with us as regular summer residents, while others are observed here only as transitory visitors in the spring and fall migrations.

These birds frequent muddy banks of rivers, creeks, lakes and ponds; they are also found about swampy meadows and marshy places, particularly if the latter are well supplied with pools of shallow water, protected by trees or bushes. Birds of this family often remain quiet or inactive in daytime, but as evening approaches, or in the night, they go out, like the Owls, in quest of food, which they secure by rapid and dexterous thrusts of their long, spear-like bills.

Birds of this family subsist chiefly on various kinds of fishes, frogs, snakes; and they also eat other kinds of animal food, such as large insects, field mice, lizards, toads, cray-fish, leeches, etc., and some of the birds of this group eat rats as well as the young of birds of other species which breed about their favorite feeding resorts. The Great Blue Heron, the Night Heron and the Great Bittern all, it is asserted, have been observed to catch ducklings of both wild and domesticated species. Last year a farmer near Harrisburg shot a Great Blue Heron which he said had killed several young chickens which were about a carp pond near his spring house.

The damage which Herons or Bitterns do to wild birds or domesticated fowls is very insignificant; indeed, it is very seldom that a Heron or Bittern attempts to capture the young of any feathered animals.





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GREAT BLUE HERON.

GREAT BLUE HERON.

Ardea herodias.

DESCRIPTION.

Adult.—Bill about six inches long, chiefly yellow; dusky on culmen; eyes yellow; legs and feet blackish, yellowish about toes; lores greenish-yellow or bluish. The color of bill, legs and lores vary greatly not only with age and season but also with individuals. The male, larger than female, is about four feet long and about six feet from tip to tip. Forehead and central portion of crown white, surrounded on sides and behind with black; long occipital feathers black; neck chiefly brownish-gray; feathers on middle (in front) of lower two-thirds of neck, with a showy streak of black, white and rusty, chin and upper part of neck in front white. Tibiæ ("thighs") and edge of wing reddish brown; upper parts and tail light bluish slate color; long scapular feathers and long straggling feathers on lower neck. The young are different in many respects from the above, but can always be known by their large size and a general resemblance to the adult.

Habitat.—North America, from the Arctic regions southward to the West Indies and Northern South America.

This bird, the largest of our Herons, is a summer resident in various localities in this State. During the last ten years, however, several favorite breeding resorts in eastern Pennsylvania, which were annually visited by this and other species, have been broken up by boys and men who destroyed the birds, old and young, simply because their feathers would bring a few dollars, and, as they remarked, "there's no law to stop it."

I have no doubt that the time will soon come when this beautiful Heron will be known in this Commonwealth only as a rare straggling visitant.

THE NEST AND EGGS.

The nest is made of large sticks and twigs, and placed on the larger limbs of trees which grow usually

near the water. The eggs vary in number from three to five; they are light blue in color, and about the size of those of our common domestic fowl.

DANGEROUS WHEN WOUNDED.

This bird, and the same is true of other Herons, when wounded and unable to escape, is one which cannot be handled with too much caution, as it frequently, with its sharp and powerful bill, inflicts severe, dangerous, and sometimes even fatal wounds. In Florida I met a hunter who had an eye destroyed by one of these birds which he had winged and carelessly attempted to pick up.

ITS FLESH IS QUITE PALATABLE.

By some, particularly residents of certain of the southern states, the flesh of the Great Blue Heron is considered quite a delicious morsel. Some few winters ago, when camping in the cypress swamps of Florida, I, more from necessity than choice, eat the breast meat of this bird and also that of the Water Turkey (*Anhinga anhinga*), which preys exclusively on fish, and although I did not especially relish the dish, I must admit that to a hungry man it was in no way disagreeable.

WHAT NUTTALL SAYS OF ITS HABITS.

The following interesting observations on the food-habits are given by Nuttall:

"Fish is the principal food of the Great Blue Heron, and for this purpose, like an experienced angler, he often waits for that condition of the tide which best suits his experience and instinct. At such times they are seen slowly sailing out from their inland breeding haunts, during the most silent and cool

period of the summer's day, selecting usually such shallow inlets as the ebbing tide leaves bare or accessible to his watchful and patient mode of prowling; here, wading to the knees, he stands motionless amidst the timorous fry, till some victim coming within the compass of his wily range is as instantly seized by the powerful bill of the Heron * * * * If large, the fish is beaten to death, and commonly swallowed with the head descending, as if to avoid any obstacle arising from the reversion of the fins or any hard external processes. On land our Heron also has his fare, as he is no less a successful angler than a mouser, and renders an important service to the farmer in the destruction he makes among most of the reptiles and meadow mice. Grasshoppers, other large insects, and particularly dragon-flies, he is very expert in striking, and occasionally feeds upon the seeds of pond lilies, contiguous to his usual haunts. Our species, in all probability, as well as the European Heron, at times preys upon the young birds which may be accidentally straggling near their solitary retreats."

In the months of March and April, 1885, I examined the stomachs of twenty-three of these birds which had been killed by plume-hunters in Orange and Volusia counties, Florida. Twelve birds had fed entirely on fish; three had taken fish and cray-fish; two, small snakes; one, frogs and fish; one, fish and a few feathers; one, traces of beetles; three birds were destitute of all food materials.

GREEN HERON.

Ardea virescens.

DESCRIPTION.

Length about eighteen inches; extent of wings about twenty-six; bill rather stout, about two and a half inches long, and about half an inch longer than tarsus (ankle).

Adult in Summer.—Top of head, and lengthened crest glossy green; sides of head and neck, except a dusky streak in front, bright chestnut or maroon; wing coverts and upper surface of wings and tail feathers glossy green, wing coverts edged with brownish and whitish; inner primaries with narrow white tips; long scapular plumes bluish-white glossed with green, lower parts grayish, darkest on sides. Bill greenish-black, except mandible on lower surface, also lores and eyes yellow; legs greenish yellow.

Young.—Head less crested and dull greenish black, back and upper parts generally greenish; long scapular plumes absent; wing coverts much more broadly bordered with brown and whitish than adult; many of larger wing feathers have snowy white tips; chin, throat and front neck, whitish with dusky streaks; sides of head rather pale raddish-brown; lower parts, whitish with dusky stripes; edge of wing as in adult white; color of eyes, legs and bill, very similar to old bird.

Habitat.—Canada and Oregon, southward to northern South America and the West Indies; rare or absent in the middle province.

The Green Heron is known by a variety of local names, some of which are much more expressive than elegant. This bird, the most common and abundant of all our Herons, is found throughout the State, frequenting rivers, streams and ponds. It arrives in this section occasionally as early as the first week in April, from the southern states, where it resides when the chilling blasts of winter have frozen over our streams and marshes. This species sometimes breeds in small companies; generally, however, but two or three pairs are found nesting together.



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GREEN HERON.

THE NEST AND EGGS.

The nests, built of sticks and twigs, are placed in low bushes or small trees adjacent to a stream or pond. The nests frequently are built in apple orchards. Indeed, the largest number of nests that I ever found in one locality was in an apple orchard along the Brandywine, where for several years some twenty-five or thirty of these birds annually resorted. While it is true that I have found these Herons breeding in small numbers with the Night and Great Blue Herons in Pennsylvania, and also in Florida in company with the Little Blue, Louisiana and Snowy Herons, and even sometimes in the colonies of Water Turkeys and Cormorants, I think, as a rule, they usually prefer to remain by themselves during the season of reproduction as well as at other times. Various writers state that the eggs are four in number. I have examined many nests and considered the usual complement to be not less than five; frequently six eggs are laid. The eggs are pale blue and larger than those of our common pigeon.

EATS FISH, INSECTS, FROGS, ETC.

This species feeds much more frequently on insects than other of the herons that reside with us. Nuttall writes of the Green Heron in the following language:

"He is also particularly attracted by artificial ponds for fish, not refraining even to visit gardens and domestic premises when any prospect of fare may offer. He is, at the same time, perhaps as much in quest of the natural enemy of fish, the frog, as of the legitimate tenants of the pond. These bold and intrusive visits are commonly made early in the morning, towards twilight, and he not unfrequently, when pressed by hunger, or after ill-success, turns out to hunt his fare by day

as well as dusk, and at such times, collects various larvae, particularly those of the dragon-fly, with grasshoppers and different kinds of insects. At other times he preys upon small fish, crabs and frogs, for which he often lies patiently in wait till they reappear from their hiding places in the water or mud, and on being transfixed and caught, which is effected with great dexterity, they are commonly beaten to death, if large, and afterwards swallowed at leisure."

STOMACH EXAMINATIONS.

Nineteen birds, examined by me, were found to have fed on the different materials named below:

Date.	Locality.	Food Materials.
June, 1879,	Barnegat, N. J.,	Beetles and other insects.
Oct. 10, 1879,	Chester county, Pa., ..	"Fall-fish."
April 29, 1880,	Chester county, Pa., ..	Frog and minnows.
April 29, 1879,	Chester county, Pa., ..	Fragments of insects and small quantity of hair probably that of a field mouse.
May 12, 1880,	Chester county, Pa., ..	Beetles.
July 3, 1880,	Delaware county, Pa., ..	Frog.
June 30, 1881,	Chester county, Pa., ..	Remains of small fishes.
Aug. 17, 1881,	Chester county, Pa., ..	Beetles and other insects.
May 14, 1882,	Lancaster county, Pa., ..	Fishes and frogs.
May 29, 1882,	Chester county, Pa., ..	Remains of small fishes.
July 29, 1882,	Chester county, Pa., ..	Remains of small fishes.
July 29, 1882,	Chester county, Pa., ..	Remains of small fishes.
July 29, 1882,	Chester county, Pa., ..	Remains of small fishes.
Sept 4, 1883,	York county, Pa.,	Dipterous and other Insects.
Aug. 9, 1892,	Lancaster county, Pa., ..	Dragon-fly and young Rail (Sora)
Aug. 12, 1892,	Chester county, Pa., ..	Frog and beetles.
May 28, 1894,	Chester county, Pa., ..	Hair of small mammal.
June 3, 1896,	Dauphin county, Pa., ..	Remains of fish and beetles.
July 3, 1896,	Sullivan county, Pa., ..	Feathers and beetles.



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BLACK-CROWNED NIGHT HERON.

BLACK-CROWNED NIGHT HERON.

Nycticorax nycticorax naevius.

DESCRIPTION.

Bill very stout and thick; maxilla slightly curved; bill and tarsus each about three inches long; head and neck large, the latter quite short; body short and heavy.

Adult.—Length about twenty-five inches; alar extent, about forty-four; bill black, lores greenish-yellow; eyes, red, legs yellowish; top of head and middle of back glossy-greenish black (sometimes dull black with little or no greenish); a narrow stripe on forehead reaching to eye; sides of head chin, head, throat and under parts white, often tinged with a faint yellowish or a very delicate light purple color; wings and tail ashy-blue; neck, except in front, similar but paler. The adults frequently have three long and white occipital feathers, which when rolled together, appear as one thick round feather.

Young.—Bill (dried skin) black and yellowish; iris light yellow; legs yellowish, upper part light brown, spotted or streaked with whitish; tail about same as adult; sides of head and neck, and under plumage generally, striped with whitish and dusky. A young bird before me differs from the last chiefly in having top of head and large space between shoulders dull brownish gray, without spots.

Habitat.—America, from the British possessions southward to the Falkland Islands, including part of the West Indies.

Next to the Green Heron the Night Heron is unquestionably the most abundant of the family in this State. The adult birds are easily distinguished from other Herons by the black feathers on top of head and back, red eyes, and frequently three long white feathers, which grow from the base of the head. The appellation, Night Heron, is highly appropriate, as this bird is mainly nocturnal in its habits. During the day-time the Night Heron is inactive, and generally is found perched on a log or the limb of a tree in a quite nook about the swamps and streams. As twilight approaches this drowsy wader becomes, as it were, a new being—impelled, no doubt, by the pangs of hunger—he

stands erect, the loose and shaggy plumage, which before seemed ill adapted to his body, now fits neatly and closely as he carefully walks to the extremity of the dead and decorticated limb on which he has been dozing and suddenly, with a loud squawk, launches himself into the air, uttering at short intervals his harsh note, and rising above the trees of the forest, he speedily visits some favorite mill-dam. These birds arrive in Pennsylvania about the 25th of April and remain until the latter part of September. They seem to repair at once on their arrival in spring to localities where they are accustomed to breed. After the breeding season, i. e., about the middle of August, when the young are amply able to take care of themselves, these birds forsake their nesting places and become quite plentiful along the rivers, streams and bushy marshes.

THEY BREED IN COLONIES.

The Night Heron rarely, if ever breeds singly, but always in large companies. I have visited, on different occasions, two of these breeding resorts and found from twenty-five to seventy-five nests, which like those of the other species, were built of sticks and placed usually in high trees. The eggs three or four in number are a pale sea-green color and measure about 2 by $1\frac{1}{2}$ inches. In Berks county, near Blue Rock, for many years, this species annually reared their young in the edge of a large woods along the margin of which was a good-sized stream. In this place many of the nests were built in a bunch of saplings, some fifteen or twenty feet high and so small in diameter that it was impossible to climb them. Wilson has very properly said that the noise of the old and young in one of these

breeding places would induce one to suppose that two or three hundred Indians were choking or throttling each other. The same writer, in referring to examinations which he made, states that the teeth of the pectinated claw were thirty-five or forty in number, and as they contained particles of the down of the bird, showed evidently from this circumstance that they act the part of a comb to rid the bird of vermin in those parts which it cannot reach with its bill.

FOND OF GOLD FISH.

A gentleman residing near West Chester, some years ago, had large numbers of gold-fishes in a pond near his residence. One day he caught twenty-five of these fish and placed them in a small pool, intending to remove them the following morning. "About bedtime," he said, "I heard a loud squawking, and going out saw two Night Herons actively engaged in catching these fish. I shot one of these robbers, and on making an investigation found only one of the fish remaining." The late Isaac G. Darlington of West Chester, informed me he on one occasion shot a Night Heron in the act of killing his young ducks on a pond near his house.

"An incident may illustrate the habits of the Night Heron, and perhaps of the whole family. A Night Heron had been noticed for several days sitting on a tree near a branch of White Clay creek. It was at length shot and brought to me, with the tail of a large fish projecting four inches beyond its bill. On removing the fish (a sucker *Catostomus*, which must have been twelve inches long), its head and shoulders—except the bony portions—were eaten away by the gastric liquor of the stomach."—Michener.

THEY SUBSIST MAINLY ON FISH.

I have examined the stomachs of twenty odd of these Herons, adults and young, which have been shot

in June at the breeding-grounds, and found in all only the remains of fishes. In two or three immature birds taken in August and September, I have discovered a few grasshoppers and portions of insects.

Hon. Hiram Peoples, of New Providence, Lancaster county, Pa., who devotes much attention to fish culture, raising large quantities of Bass and Goldfish for the markets, says he is bothered a great deal by Fish Hawks, Night Herons and Kingfishers. He states that the depredations of these birds in his fish ponds became so numerous that he offered a premium of fifty cents for each Fish Hawk or Night Heron, and ten cents for every Kingfisher which was killed on his premises. This offer induced several neighbors' boys to make particular efforts to destroy the feathered fishermen. Mr. Peoples estimates that he lost annually from fifty to seventy-five dollar's worth of fishes through the visits of these birds before he began killing them and paying bounties for their heads.

AMERICAN BITTERN.

Botaurus lentiginosus.

DESCRIPTION.

Adult.—Bill yellowish, dusky on ridge; bare space in front of eyes greenish-yellow; legs and feet greenish-yellow; eyes yellow. Length, about twenty-six inches; extent, about forty-five inches. General color brownish-yellow, top of head dull brown; upper parts finely freckled and variegated with different shades of brown, blackish and whitish; chin and throat white with brown streak; a broad and glossy black stripe about three inches long on upper part of neck.

Habitat.—Temperate North America, south to Guatemala and the West Indies.

This as well as other species are very commonly but erroneously called Cranes. The American Bittern is known to nimrods and fishermen in many sections of the State as "Green-legged Crane;" the name of "Indian Hen" is likewise applied to this bird as well as the Yellow-billed Cuckoo.

HAS A LOUD VOICE.

This Bittern is a summer resident in Pennsylvania, arriving early in April and remaining sometimes as late as the early part of November. Its notes are loud and quite remarkable and under favorable circumstances they may be heard at a distance of at least three quarters of a mile. These notes are of two kinds. One known as the "pumping" call is described as follows: pump-er-lunk, pump-er-lunk, pump-er-lunk, and the other is so like the sound made by driving a stake in the mud, that it has given rise to one of the common names of this bird, namely "Stake-driver."

With us this species is seen singly or in pairs frequenting chiefly the thick swampy places about meadows, rivers and lakes.

THE NEST AND EGGS.

The frail nest of this bird is on the ground. The eggs, three to five in number, are brownish-drab, unspotted and about two inches long by about one and one-half inches broad.

ITS FOOD.

The Bittern feeds on fish, cray-fish, frogs, tadpoles, snakes, snails, different kinds of insects, particularly grasshoppers and beetles. It catches mice and other small-sized quadrupeds which it chances to come across in its secluded retreats, and sometimes it will kill the young of ducks and Rails.

CHAPTER V.

MAMMALS.

Nearly fifty well defined species, and a number of subspecies, varieties or races of four-footed wild animals are found in Pennsylvania. The Bison or Buffalo has long since been exterminated; the last American Elk or Wapiti was taken about thirty-five years ago in Elk county, and the Beaver, a valuable and harmless fur-bearing animal, is also extirpated. There seems to be little room for doubt that the North American Wolf, the Canada Lynx, or "Loup Cervier," as it is called by the French Canadians, and the Panther are no longer to be found in this State.

"NEW FACES WILL MEET US."

Future investigations of our modern naturalists, some of whom delight to discover and name new "races," will, no doubt, if instituted with proper industry, materially augment the number given above. A Seal taken two years ago in the Delaware river at Chester City, Delaware county, was an accidental straggler. Two Leopards, a Tiger, several Wolves, Coyotes, Prairie Dogs, a Badger, and Hares, which have been captured, according to different reports received during the past four or five years, were, of course, escaped captives, and they cannot properly be included in the mammalian fauna of Pennsylvania.

VALUABLE FUR-BEARING SPECIES.

The mammals which occur with us are permanent residents, but birds, or many of them, on the other hand, reside here only during certain periods of the year.

The most important and valuable fur-bearing animals at present found in this State are the Black Bear, Minks, Skunks, Muskrats, Otter, Raccoon, Opossum, Fisher and Marten. Of this list the two last mentioned are restricted to a few sparsely settled districts, and even in such remote and uninhabited wilds they are seldom seen.

Some mammals, for example the Wildcat, Black Bear, Foxes, Minks, Meadow Mice, Muskrat, Woodchuck and a few others, when present in a locality in any considerable number, do much damage and should be destroyed. It is not, however, wise or just to wrongfully condemn certain of the common animals found about the farmer's cultivated enclosures, or in the forests, when it is known, at least to naturalists, that the good they do far outweighs their depredations to poultry, game or vegetable crops.

DISTURBING NATURE'S BALANCE.

Widespread misconception of the true relation which mammals, birds and insects have to man's interests have done much in recent years in this and other countries to militate against the welfare and comfort of mankind.

The truth of this can be shown by briefly referring to some mistakes made by the introduction of species with a view to naturalization or otherwise, and the cruel, useless slaughter of others, thus disturbing the

Balance of Nature, and resulting in an enormous loss that falls, especially, on farmers and horticulturists.

GREAT ERRORS.

The English Sparrow, twenty-five or thirty years ago, was brought to Pennsylvania because it was believed he would destroy insect pests which defoliated shade and fruit trees, and attacked cultivated crops. Since this bird has become established, not only in Pennsylvania, but generally throughout the United States and Canada, it has been learned he is a most undesirable addition to our fauna. He devours cereals, fruits, buds and blossoms of fruit, shade and ornamental trees, as well as different kinds of garden produce. He loves the tender buds of grape vines and their ripe fruit. In the famous Erie grape belt of this State, it is estimated that English Sparrows annually destroy from \$30,000 to \$35,000 worth of grapes.

INSECTIVOROUS BIRDS DRIVEN AWAY.

These little feathered pests, great fighters that they are, live continually about human habitations from which they drive away numerous kinds of beneficial birds that formerly did great service to the human race by aiding to repress pestiferous insect foes that the pugnacious, grain-eating Sparrow disdains to touch. It is stated that not less than seventy-two kinds of birds which are found throughout the wide area of this continent, where this imported bird nuisance is now ensconced, have been driven by English Sparrows from their old-timed nesting haunts about the habitations of man.

The people now want the English Sparrow destroyed, and many favor a bounty for his mischievous head. But such a method of exterminating this bird

will never do, because popular ignorance of birds, together with man's greed for pecuniary gain, would bring about the extermination of great numbers of beneficial song and other birds which would be called "English Sparrows."

HAS AGRICULTURE PROFITED?

With a view of "benefiting agriculture" and protecting poultry and game in Pennsylvania bounty acts have been enacted which allowed hunters to slay with indiscriminate hand many of the most useful birds and mammals. This legislation, brought about by popular prejudice and a deplorable ignorance of the habits of animals placed under ban, has cost thousands and thousands of dollars in cash paid out of the county funds. While it is true the original money outlay was great (indeed, it proved a serious burden to taxpayers in some sections of the Commonwealth) the loss or fruit of such folly will be much more from a money standpoint to our farmers than the large sums first expended. Even during the past three or four years, as an echo of the odious scalp act of 1885, we hear, from different sections of this State, of the great damage done by Meadow Mice, Rats and Rabbits. Strange is it not that many people who now complain of rodents and insects doing so much harm to their property, were, and are even yet, firm believers in paying bounties?

When a man goes to the shop or market place to make a purchase, it is a common saying, "He pays his money and makes his choice;" so it is with the bounty question. Continue to pay premiums for beneficial birds of prey and mammals which live largely on detrimental forms of animal life, and we will have more

mice and insects, but the farmer and horticulturist will, in many instances, have considerably less ready cash to purchase insecticides, spraying machines and other insect destroyers that are now necessary for almost every successful farmer and fruit grower to possess.

DANGER OF IMPORTING FOREIGN SPECIES.

The importation of foreign species of insects as well as other forms of animal life often results disastrously. Nature aims to restrain the over development of one species by means of another;

"Small fleas have smaller fleas to bite 'em,
And these have smaller fleas ad infinitum."

and as Mr. Gerald McCarthy* states:

"When a species is transported to some distant locality it is apt to leave behind its correlated restraining species, and hence in its new home it is enabled to multiply more rapidly and do more damage than in its native home."

SOME TROUBLESOME PESTS.

The Gipsy Moth, introduced by accident into the Bay State, has ravaged a portion of Massachusetts, and over \$750,000 have been spent to eradicate this destroyer of foliage, thus far with only partial success. Investigations proved that many kinds of birds (some of which were called poultry and game destroyers) devoured the larvae of the Gipsy Moth. When this became known and it was learned that great numbers of these feathered benefactors were being de-

*The diseases and insects affecting fruit trees and plants, with remedies for their destruction, by Gerald McCarthy, Botanist and Entomologist, published Aug. 22, 1893, as chapter 11, Bulletin No. 92, of the North Carolina Agricultural Experiment Station.

destroyed in large numbers for millinery and other decorative purposes a popular clamor arose against such practices and the Massachusetts lawmakers recently showed much good sense by enacting a law prohibiting the killing and use of song and insectivorous birds for the millinery trade.

The Elm-leaf Beetle, an exotic, is another costly example of meddling with Nature's plans.

Rabbits were introduced in Australia. They increased with prodigious rapidity, and so abundant and destructive did they become that for a time their ravages threatened to ruin the country.

German Carp have been placed in many of the best fishing grounds in Pennsylvania. This mistake is discovered when it is too late, perhaps, to prevent them from depopulating the waters in which they live of desirable and valuable fishes.

MOTHER EVE AND HER SUCCESSORS.

When Mother Eve started the first sewing society over which she ruled supreme in the Garden of Eden, and began to make wearing apparel she was, so records say, content to dress in plain and abbreviated garb. Women of the present age, particularly some who "stride the wheel," pattern after Eve's short skirts; and lovely woman also delights to adorn her shapely form with Nature's beauties of both plant and animal kind. Of course, no one would dare to believe that women of this generation could ever be induced to employ the primitive fig leaf dress of her ancient and renowned ancestor, even if the demands of fickle fashion should eventually revert to the days when Eve did all her own house work, spanked, and otherwise cared for the babies, and besides all this, made her own hats.

bonnets and clothing without the aid of a single fashion plate; for history does not show that Adam even once applied to Worth, of Paris, or any other costumer, to get his faithful spouse guides to aid in adorning her person.

Women's vanity and the requirements of fashion have, within the past twenty years, brought about the destruction of millions and millions of bright-coated song and insectivorous birds. These beneficial feathered creatures—servants and friends of the human race—inhabit chiefly the cultivated possessions of man, where myriads of destructive insects and larvae breed so prolifically and do inestimable damage. Since the wearing of insectivorous birds on hats has become popular, it is learned that many crops that, prior to this barbarous custom, were grown without much difficulty, cannot now be successfully raised to maturity without the employment of insecticides which, fortunately, modern economic entomological scientists have discovered to aid the husbandman in suppressing insect enemies.

EXPERT IN ELUDING OBSERVATION.

Mammals are shy and wary, which, with the fact that most of them do not move about during the broad daylight, enables these creatures to readily elude observation. With the exception of Red Squirrels, Chipmunks, Gray Squirrels, Foxes, some of the Mice, Cottontails, the Woodchuck, Muskrat and an occasional Deer, the average sportsman, or fisherman, seldom sees any of our mammals. This is chiefly due to the fact that they so often remain hidden during the daylight in secure retreats where only those who are acquainted with their habits and haunts can discover them with any degree of certainty.

Mammals are both nocturnal and diurnal. The Gray Squirrel, Chipmunks, Woodchuck and Red Squirrels seem to move about more in the daytime than any others; and Dr. Merriam says the Gray Squirrel and Chipmunk are the only two "that have not been seen after nightfall."

The Raccoon, Skunks, Bats and Flying Squirrels are decidedly nocturnal in their habits; but, as Dr. Merriam states:

"Even these are occasionally seen abroad during cloudy days, and do much of their hunting in the twilight. The truth of the matter seems to be that very few mammals range about much during the brightest part of the day, or darkest part of the night, these being the times when most of them do the greater part of their sleeping. It is between the dark and the daylight, before sunrise in the morning and in the dusk of evening, when the faint light obscures their outlines and hides their movements, that the larger number do their hunting. Many of them are also out during cloudy days and moonlight nights; and in winter, when the ground is white with snow, they apparently circumambulate all night long."

SOME ARE SOUND SLEEPERS.

"The phenomenon of hibernation, which enables many mammals to endure a climate to the severity of which they would inevitably succumb were they to remain active throughout the year, and to thrive in regions where they would starve during certain seasons but for their ability to become dormant when scarcity of food prevails, is well exemplified in a number of our species. The following are known to pass a greater or less period of the winter season in a condition of lethargy: The Bear, Raccoon, Bats, Gray Squirrel, Chipmunk, Woodchuck, and Jumping Mouse. Of these the Woodchuck (Ground Hog) affords the most remarkable example. With astonishing regularity and precision, and utterly regardless of the state of weather or condition of his food supply, he sinks into his burrow about the 20th of September,* and is rarely seen again be-

*In some sections of Pennsylvania this animal does not retire to winter quarters, it is said, before the middle of October, and he is often seen in the early part of March and sometimes in February.—E. H. Warren.

fore the middle of March. It frequently, indeed usually, happens that the time chosen for entering upon the execution of this singular proclivity is during fine, warm weather and at a time when the fields are clothed with a luxuriant growth of his favorite food, clover. In fact the Woodchuck retires to the cold dark recesses of his cheerless subterranean abode to commence a period of voluntary seclusion, to enter upon a state of complete oblivion and absolute lethargy, at the very time when one would naturally suppose he would most enjoy himself above ground.

"The Gray Squirrel, on the other hand, remains out nearly the entire winter, and withdraws to its nest in some hollow tree only during the severest weather. The Raccoon and Bear furnish examples of animals whose dormant periods are intermediate in duration between those above cited.

"Hibernation is, after all, merely a profound sleep, intensified and protracted. During ordinary sleep respiration is slackened and the temperature of the body is lower than when the animal is awake. The longer the sleep continues the less frequent do the respirations become and the lower does the temperature fall, till finally the condition of deep and continued sleep—the true lethargy of hibernation—is attained. This apparent phenomenon, then, is a genuine physiological process, differing in degree only from ordinary sleep. It is the result of conditions of environment, and has become an hereditary habit, enabling certain mammals to exist during a period when their usual food supply is cut off. The dormant state is sometimes brought on by extremes of temperature, but this is not often the case."—From *The Vertebrates of the Adirondack Region, Northwestern New York*, By Dr. C. Hart Merriam, pp. 28, 29.

Animals like the Minks, which often make long journeys to good hunting grounds, or others such as the Foxes, Weasels, Wildcat, etc., which frequently range over large areas of territory, have no difficulty to obtain necessary food supplies, consequently hibernation with them is not a necessity to maintain existence.

ABUNDANCE OF SOME MAMMALS.

In many sections of Pennsylvania, mammals—particularly species which are readily disposed of to fur

traders—appear to be very much more abundant than has been commonly supposed. The plentitude of some of these species which destroy annually large numbers of domesticated fowls, game, etc., accounts, in a large degree, for the great loss which is every year sustained by farmers and poulterers.

About three years ago the writer began to collect statistics and data concerning the fur-bearing and poultry-destroying mammals which are found in Pennsylvania. Efforts in this direction were eminently successful and a large amount of interesting and instructive material was obtained from fur dealers, hunters, trappers and naturalists throughout the State.

Unfortunately, however, the fire which burned the State Capitol building in February, 1897, destroyed this material which, with everything else in the office of the writer, was consumed. At first, when the reports from some sources showing great numbers of animals taken yearly for the pelts or bounty began to reach the office, they were looked upon with doubt and it was thought they were sent without proper inquiry or by mistakes, unwittingly made. The figures given, in some cases, were so surprising, that after consultation with the Secretary of this Department, who in common with the Zoologist, was desirous of publishing for public use no misleading statistics, special efforts were made to verify a number of the returns where there was any possible room for doubt as to reliability. These efforts showed—barring a few reports from professional scalp hunters and over-zealous fur-buyers—that the returns made to this Department were correct, and where defective, it was because the persons preparing them had been so cautious as to underestimate rather than exaggerate. In chapter IX of this document a number of "bounty rec-

ords" are published. While some of them, are perhaps, not entirely accurate they nevertheless show plainly that large numbers of poultry and game consuming animals are present in nearly every section of the State.

From a few reports, received from several reliable sources, and which luckily were not destroyed by the flames, extracts as follows are made: In the populous and rich agricultural county of York, Mr. J. G. Patterson, of Stewartstown, says:

"The fur—chiefly Muskrats, Skunks, Opossums, Raccoons, Minks and Foxes—obtained in 1895, sold for about \$20,000."

Hon. Jas. G. Mitchell, of Hamilton, Pa., a gentleman who is esteemed by all who are acquainted with his legislative career, to be one of the most loyal advocates the farmers and laboring classes ever sent to the Pennsylvania Senate, writes that:

"From the township of Perry, where I reside, there was, in the winter of 1895 and '96, at least \$1,000 worth of fur shipped to New York. These raw furs, many of which I purchased, consisted chiefly of Skunks, Muskrats, Minks and Foxes. A good many Opossums and some Wildcats are taken in our county. I consider \$12,000 a very conservative estimate to place on the fur-bearing animals annually taken in Jefferson county."

THE WORK OF TWO TRAPPERS.

In the county of Huntingdon, so ably represented in our Legislative halls for many years, by Hon. P. M. Lytle, who has won distinction for his rare oratorical ability and persistent advocacy of all matters which would benefit farmers and the workingman, there resides an individual named John P. Swope, who has won great local prominence because of his thorough knowledge of the habits of undomesticated mammals,

which, with his marvelous skill as a trapper and hunter, enables him to make a good yearly income. In relation to this trapper's work for the years 1895 and 1896 the following paragraphs are clipped from two reliable newspapers of Central Pennsylvania:

"John P. Swope, the noted trapper of Alexandria, takes the premium for scalps during the year 1895. Following is the record of payments to him each month by the county treasurer: February, \$8; March, \$25.50; April, \$37.25; May, \$14.50; June, \$38.50; July, \$85.00; August, \$49.00; September, \$48.25; October, \$101.50; November, \$81.00; December, \$100.75. Total for eleven months, \$590.25.

"The whole amount paid to all persons for scalps during the year was \$1,157.00, of which Mr. Swope received more than one-half. He was in town on Thursday last and received money on the following: 12 foxes, 13 minks, 1 wildcat—\$27.26 for January, 1896."—Huntingdon Globe.

The Bellefonte (Centre county) Democrat, of December 3, 1896, publishes the following relative to Mr. Swope's record during ten and a half months for 1896:

"John P. Swope makes a handsome living at gunning and trapping. Gunners and trappers in Huntingdon county are displaying considerable activity at the present time, but peculiar interest centres in the success of John P. Swope, of Alexandria, who is without doubt king among trappers in central Pennsylvania. Mr. Swope does nothing but trap the whole year round, and he makes more money at this business than the majority of men receive in individual salaries; in fact, he gets each year from Huntingdon county an amount that few of the "big" men of the community would refuse to accept as an annual stipend. Mr. Swope is well up in the art of trapping. He has many imitators, but none of the latter meet with any great degree of success. It is said that Swope has about fifty traps set nearly all the while, and his time is pretty much occupied in making inspections at certain intervals. It is known that he can trap on the same ground where others fail. This has been demonstrated. His success has inspired jealousy on the part of imitators. On one occasion, at least, he was warned by White Cap notices to keep off the premises of those who have vainly tried to achieve a measure of his success.

"Mr. Swope's record in trapping and killing animals for which a premium is allowed by legislative enactment and the amount he has received from Huntingdon county in the ten and one-half months of the present year, are shown in the following statement: 739 foxes, at \$1.00 each, \$739.00; 13 wildcats, at \$2.00 each, \$26.00; 1,290 minks, at 25 cents each, \$322.50. Total \$1,087.50."

A WYOMING COUNTY TRAPPER.

The note books of Mr. G. F. Smith, a trapper and hunter of Mill City, Wyoming county, Pa., show that he has taken the following mammals in his neighborhood:

"In 1889 and 1890, 23 foxes; 43 raccoons; 37 skunks; 19 minks; 2 wildcats; 31 muskrats; 1 bear. 1891, 17 foxes; 21 raccoons; 42 skunks; 7 minks; 3 wildcats; 3 muskrats; 1 bear. 1892, 19 foxes; 33 raccoons; 60 skunks; 3 minks; 5 wildcats; 18 muskrats. 1893, 21 foxes; 61 raccoons; 58 skunks; 7 minks; 4 wildcats; 1 muskrat. 1894, 18 foxes; 17 raccoons; 44 skunks; 4 minks; 3 wildcats; 2 muskrats. 1895, 20 foxes; 30 raccoons; 51 skunks; 1 mink; 3 muskrats. 1896, 28 foxes; 52 raccoons; 26 skunks. Total, 146 foxes; 257 raccoons; 318 skunks; 41 minks; 18 wildcats; 58 muskrats; 2 bears."

In 1896 Mr. Smith captured an opossum which is reported to be a rare visitor in that region.

REPORTS FROM SOME FUR DEALERS.

MR. BUSH, of Mercer County:

Mr. Charles Bush, of Greenville, Mercer county, Pa., writing under date of May 10, 1896, says:

"In reply to your circular can only say that I have not been in the fur business during the past ten years, but from ten to fifteen years previously, I handled a great many furs in this section of northwestern Pennsylvania. The following is the list and about the number handled: red foxes, from five to six hundred (I should judge perhaps not more than one-fourth of the number handled at present); gray foxes, from 200 to 300, at present one-fourth the number; raccoons, 1,000, at present one-half the number; mink, 400 to 600, at present one-half the number; otter, 20 to 25 pelts, they are scarce and rare at present;

opossums, 200 to 300, quite plentiful at present; skunks, 2,000, and they are about the same at present.

"The above figures are, to the best of my recollection, the number of furs I handled. At the same time there were several others buying furs through this section."

MR. LEWIS, OF JEFFERSON COUNTY.

Mr. E. C. Lewis, of Reynoldsville, Jefferson county, states that the number of skins he annually handles is about as follows:

"Twenty bears; 125 minks; 150 skunks; 25 red foxes; 10 gray foxes; 200 raccoons; 250 muskrats; 8 otters; 15 wildcats."

Mr. Lewis also adds the following lines:

"I consider foxes, weasels, wildcats and the mink detrimental to both farmers and sportsmen; am earnestly in favor of a bounty on these last-named animals. I have seen where wildcats killed deer from one to two years old."

MESSRS. JORDAN & SON, OF LUZERNE COUNTY.

Messrs. N. P. Jordan & Son, extensive hatters and furriers, of 46 West Market street, Wilkes-Barre, Pa., in a letter of April 21, 1896, say:

"In reply to your letter of the 15th inst., we beg to state that during the past few years we have obtained from hunters and trappers, in this region, pelts as follows: 1 otter, 61 minks, 25 red foxes, 4 gray foxes, 372 skunks, 29 'coons, 6 opossums, 486 muskrats. This represents a very small portion of the animals captured in this vicinity, as a large majority of the hunters send the pelts direct to the market or sell them to representatives of different firms, who have men out continually during the fur season, scouring the country to buy up raw furs. We have no record of our purchases during previous year, but the above is about the average annually. Our books show about the same amount each year for several years in the purchase of skins, which, of course, indicates an equal number of pelts."

MESSRS. WEIL, OF CHESTER COUNTY.

The Zoologist is indebted to Messrs. Morris and Moses Weil, fur dealers of West Chester, Pa., for the

following data concerning the number of pelts they handle yearly, and which they buy in Chester and neighboring counties, territory which embraces many of the most productive and valuable farms in this Commonwealth:

"There are from 300 to 500 persons in Chester county (which, by the way, ranks as the third agricultural county in the United States) whose chief occupation is trapping. The average yearly catch of a skillful trapper of skunks is about 100, but some industrious and skillful trappers secure considerably more than this number. Except along the Brandywine and its large tributaries few muskrats are taken in Chester county. Experienced 'rat' trappers along the historic Brandywine average about 100 'rats' a season. One individual last year caught between 200 and 300. We obtain about 200 minks annually. These animals by reason of their aquatic habits, are found chiefly along the Brandywine and its large feeders, and they also frequent mill dams, where stone and rubbish are plentiful. We have handled annually for the last five years not less than 5,000 skunks, of which 75 per cent. were taken in Chester county. Our books for the last five years show that we have purchased on an average each year, the following additional fur-bearing animals: 8,000 muskrats, 2,000 opossums, 25 red foxes, 500 raccoons. We never got a gray fox in Chester county, from which, at least, three-fourths of all the pelts we obtain come. We are the largest buyers of raw furs in Chester county, and in our opinion it would be a fair estimate to say we buy one-half of the skins taken in this region, so by doubling the figures given you can form a good idea of the number of fur-bearing animals which yearly are marketed from Chester and a few districts of the neighboring counties."

SKUNK.

Mephitis mephitica.

DESCRIPTION.

A heavily-built animal, about the size of the house cat, although its body is shorter and more bulky; weighs about eight pounds; its legs are short, ears low, eyes brown, with a long bushy tail. Color black (some examples maroon and white). The white markings vary greatly in extent and detail; some examples of the genus have a small white head spot only, but the common pattern has narrow white frontal (head) stripe, a broad nuchal (neck) white patch, from which diverge on either side of back, and extend to or near the two stripes of white. The tail may be black, but oftener it is marked with white especially terminally.

Habitat.—This species, including its varieties or subspecies, occurs generally throughout temperate North America.

This familiar animal generally hides in some dark retreat during the daylight although occasionally on cloudy days he is seen abroad and he also hunts in the twilight. The species technically known as *mephitica* and a form or subspecies called the Carolinian Skunk, *Mephitis mephitica elongata* as defined by Mr. Baugs, with perhaps other subspecies, are in Pennsylvania, where many thousands of these animals are annually killed for the fur trade. Indeed, the long and heavy coat of this mammal is so valuable in the fur markets that Skunk farms are conducted on an extensive and profitable basis in New York, Ohio and other states. The Skunk, in different shades of dress, which, for the purposes of this article, it is not necessary at this time to discuss, is one of the common mammals of our State.

SOME OF ITS COMMON NAMES.

Many persons know the animal by the name of Polecat, a term applied to a small, brownish-black, ferret-



like creature—a member of the Weasel group—which inhabits the temperate zone of Europe and Asia. The common domesticated Ferret, so frequently employed to hunt Rabbits and Rats, is, it is believed, a descendant of the Polecat of the Old World. Some furriers sell Skunks—those lacking the white stripes on backs—under the name “Alaska Sable,” and many ladies wear these pelts and never know they once covered the backs of vile-smelling and insect-devouring animals of the genus *Mephitis*.

SOME OF ITS ENEMIES.

This well-known quadruped, it matters but little whether called Canadian Skunk, Carolinian Skunk, Polecat or “Alaska Sable,” has numerous enemies to contend with, notwithstanding the wise provision nature has made to enable it to prevent their near and dangerous approach. The Skunk has great confidence in its battery and is often enabled, when acting on the defensive, or, if aroused by either anger or fright, to protect its life from preying animals, by discharging from the anal glands a yellowish fluid of most penetrating and sickening odor. This, however, is not always the case, and the slow-moving Skunk often becomes a victim of its own temerity inspired, doubtless, by too much confidence in the repelling powers of the contents of its perfume reservoirs.

Among carnivorous mammals, the Wildcat, Red Fox, Mink and Weasel will attack and kill Skunks. Large Hawks, particularly the Red-tailed species and the powerful Goshawk, also capture them. The Snowy Owl, when pressed by hunger, will, it is stated, sometimes make a meal on a Skunk which happens to cross its path; and the Great Horned Owl often attacks

Skunks. On two occasions I have known that remains of recently killed Skunks were discovered in nests occupied by Great Horned Owls; and at different times I have secured owls of this species which were so strongly scented with odor that there was no room to question what they had been feeding upon or meddling with. Mr. Thomas H. Jackson, of West Chester, Pa., writing in the "Ornithologist and Oologist," June, 1886, says:

"Great Horned Owls are liberal providers for their young. I have frequently found full grown Rabbits lying in the nest beside the young, and scarcely a nest visited did not have a strong odor of Skunk, while bones and feathers were scattered around attesting to the predaceous habits of the proprietors."

Chief among all the enemies which the poor and well-disposed *Mephitis* has to guard against is man, who should often protect rather than persecute this animal.

THEY DO MUCH GOOD.

Of all our mammals this species is probably the most valuable to the farmer and fruit grower. The insect eating habits of this nocturnal prowler are so generally known to the farmers of the hop-growing districts of the Empire State that local laws have been enacted for the protection of the much abused and persecuted Skunks, which Dr. C. H. Merriam very truly says, is

"Pre-eminently an insect eater; he destroys more beetles, grasshoppers and the like than all our other mammals together, and in addition to these devours vast numbers of mice."

From numerous reports received at the Department of Agriculture from farmers, poulterers and sportsmen in Pennsylvania it is quite evident that the odoriferous Skunk is not regarded with much favor; in fact,

but a small number of our correspondents appear to know that he possesses any especial inclination to eat insects and destructive larvae. The general impression seems to be that this animal reaches the acme of bliss when he can gain an entrance to a hen coop and devour chickens or suck eggs; and it matters but little how old the latter may be.

SPORTSMEN GENERALLY DESPISE SKUNKS.

A number of sportmen who spend considerable time every year in the woods and fields give the Skunk a record blacker than the pelt of the most marketable Polecat.

With few exceptions the testimony from sportsmen is that the main thing the Skunk lives for in this region is to devour the eggs of Grouse, Quail and other birds which nest on or close to the ground. Such opinions concerning the Skunk are wrong, yet they are, unfortunately, quite generally entertained by a large class of our citizens who become unjustly prejudiced against this useful mammal and destroy him and his family. when in reality these animals are of great benefit on the farm where detrimental insects and sleek-coated rodents are almost continually at work preying on the crops.

DR. MERRIAM'S OBSERVATIONS.

Concerning the food habits of the Skunk, Dr. C. Hart Merriam, of Washington, D. C., a gentleman who is universally regarded as one of the most eminent and reliable economic zoologists in America, says:

"He preys upon mice, salamanders, frogs, and the eggs of birds that nest on or within reach from the ground.

"At times he eats carrion, and if he chances to stumble upon a hen's nest the eggs are liable to suffer; and once in a while

he acquires the evil habits of robbing the hen-roost. Still, as a rule, Skunks are not addicted to this vice, and it is with them very much as it is with dogs and cats; for every now and then a dog will get into the habit of killing sheep, and a cat of killing chickens and sucking eggs, and yet we do not wage a warfare of extermination against them, collectively, on account of the sins of a few of their number.

"He is of the greatest practical value to the hop-grower, for he frequents the hop-yard with great regularity, and greedily devours the insect pests that, from their numbers and destructiveness, always injure, and sometimes ruin the crop. *

* * Indeed, the benefit that accrues to the farmer from the occupancy of his premises by a family of these useful animals can hardly be over-estimated. They are large eaters and subsist almost exclusively upon his greatest enemies, mice and insects.

"Of the truth of this assertion he may easily convince himself by merely taking the trouble to examine any bit of 'Skunk Sign' that he happens to come across; for in the summer season, their dejections consist wholly of the indigestible chitinous coverings of beetles, grasshoppers and other insects.*"

These statements from the facile pen of the genial and able Merriam, together with such information as any one can readily gain by devoting a little study to the Skunk in his native haunts should cause the thoughtful farmer's boy to hesitate before destroying every Skunk and its family which he may come across.

SOMETIMES DISTRESSES OTHER NIGHT TRAVELERS.

Of course we know it's very trying on a "fellow's felins'" when he goes out, "as the shades of night are falling," in a nice clean buggy drawn by a well kept trotter, to run over a clumsy prowling Skunk when he is hurrying to see his best girl; but always bear in mind it might have been much worse if that best girl

*The vertebrates of the Adirondack region, N. E. New York, Dec. 1883.

had been with you. Yet, under such circumstances, the Skunk should not be too severely censured; the chances are he would suffer more from the unexpected meeting than you.

Remember, also, the Skunk tribe should not be persecuted because you may on one occasion have been unfortunate enough to have gotten a good supply of perfume when "a wooing you would go."

INTERESTING AND VALUABLE CONTRIBUTIONS.

The information on succeeding pages of this paper under the caption, "What Farmers, Poulterers and Sportsmen Say About Skunks," is both interesting and instructive, although it shows a wide difference of opinion as to the good or evil which these mammals do.

While it is true that many of these contributors, who have kindly taken the trouble to send their views on the food-habits of Skunks, condemn them, it is a fact worthy of note, in this connection, to observe that no one of these correspondents who has examined the stomachs of any considerable number of Skunks is found denouncing them. According to my experience Skunks, either alive or dead, are very disagreeable to handle, and to this fact, no doubt, must be largely attributed the censure so many persons heap on them. Furthermore, Skunks are most active in the night time and the many good deeds they do about the farmer's possessions are not nearly so easily seen as are the results of their occasional predatory visits when they kill chickens or suck eggs.

THE SNEAKING CAT AND CUNNING RAT.

I am a lover of birds—game, song, insectivorous, and raptorial kinds—and with the exception of a few, en-

deavor, in my feeble way, to protect these beautiful creatures which a thoughtful Maker placed on earth to assist mankind. I certainly would have a much higher regard for Skunks if they evinced less industry in seeking the eggs and young of ground-nesting feathered tenants of the fields, clearings and forests, when they go in search of May beetles, larvae, Mice and other enemies of agriculture. However, I am inclined to the opinion that Skunks are often blamed for robbing nests that have been visited by other pilfering animals.

The common house cat—concerning which Dr. A. K. Fisher truly says:

“That gigantic * * * fraud, is petted and fed and given a secure shelter from which it may emerge in the evening to spread destruction among the feathered tribe”—

does a great deal of mischief in the poultry yard and devours all the wild birds, both old and young, it can catch. It is a sly robber and frequently its depredations are charged to other animals.

Rats, likewise, are cunning and vexatious pests, and their deeds of rapine are often unjustly placed to the discredit of Skunks, Hawks, Owls, Weasels, etc.

THEY CATCH BENEFICIAL INSECTS.

It is unquestionably true, as intimated by my friend Dr. Thornton (see page 359), that Skunks consume beneficial insects, particularly predaceous ground beetles which, with their larvae, catch Army Worms, Cut-Worms, etc., yet the painstaking investigations of economic entomologists and mammalogists, prove beyond all doubt that the noxious forms of insect pests which they feed upon are the ones which in the great

majority of cases so often distend the stomachs of Skunks they dissect.

THESE FARMERS DEFEND SKUNKS.

The very instructive paragraphs (see page 344) from the pen of Hon. F. N. Moore, a loyal friend, and one of the best and most successful advocates of the agricultural interests that ever represented Bradford county in the Pennsylvania Legislature, explains in a very succinct manner the good habits of Skunks. The terse communication from Mr. Moore's pen shows that the Patrons of Husbandry of his locality have, by a little careful observation, learned the great worth of these animals which are of so much service in protecting their potato and corn crops from "white grubs" that in recent years have been doing a great amount of damage in many parts of this Commonwealth.

SKUNK FARMING.

This industry, when properly conducted, is said to be a very profitable business. The writer is unable either from personal observation or practical experience to give any information on this matter. In view of the fact that a number of requests have come to this office from farmers and others who desired to learn some facts about Skunk farming, the following extracts are made from an interesting paper written by Mr. Arthur D. Warner, and published in the "Rural New Yorker," Feb. 13, 1892:

"One of the pioneers in the Skunk-breeding industry is Mr. Henry Gurnsey, of Lima, N. Y. Mr Gurnsey has been for a number of years a dealer in Skunk and other furs, and about six years ago determined to attempt the breeding of Skunks in confinement. He first inclosed a portion of his backyard by a tight board fence, and sank planks in the ground below the

fence. Then he trapped or bought a few pairs of Skunks, and placed them in the inclosure. The experiment was a success from the first. The Skunks increased so rapidly as to become at length somewhat of a nuisance within the corporate limits of a village, and Mr. Gurnsey decided to remove them to some point in the country where he could engage in Skunk farming on a scale worthy of the name. He found a suitable location about three miles east of Lima village, and formed a partnership with Mr. W. Shaddack, who owns a part of the land now occupied by the farm and who assists in caring for the animals.

THE FARM.

"About five acres were inclosed. A trench was dug in line with the proposed fence, and planks were sunk in it a depth of two feet; then it was filled in on both sides of the fence with small stones, which were covered with earth. The part of the fence above ground is tight and four feet high. On a recent visit to this farm a faint but characteristic odor warned us of the proximity of the "ranch." On arriving, it became evident at once that a steep sidehill, underlaid by a tenacious clay subsoil and which would be worthless for other purposes, is the proper thing for Skunk breeding. It is only on steep land that the burrows can be made with ease, and all of them have good drainage. The hill rises to a height of perhaps 150 feet above the road which runs along the base.

"The face of this incline is honeycombed all over its surface by hundreds of Skunks' "nests," but during the greater part of the day a casual passer-by will see little of interest within the inclosure at any season. Only occasionally will a Skunk, driven out by hunger, make its way to a portion of some freshly slaughtered animal that has been placed there for food. But about six P. M. on summer days, and somewhat earlier in the spring and fall, the colony begins to show signs of activity, black heads appear, then bodies emerge and make their way down zig-zag paths of their own making toward the point where food is placed; from this time on during a considerable portion of the night the hillside may be said to be literally alive with Skunks.

THEIR FOOD.

"The question of obtaining food for them is the all-absorbing one with the proprietors of the ranch. During the Woodchuck season they are out day after day scouring the country for

these animals, and other hunters are also kept busy. But Woodchuck, 'coons and other small game are not found in sufficient numbers, and a large supply of meat is obtained in the shape of domestic animals which have outlived their period of usefulness, or have met an untimely death. The wants of the Skunk breeders are pretty well known all through this section of county, and they are often summoned by telephone, letter or verbally to go and relieve a man of a decrepit horse, a dead cow, or abandoned sheep. When the supply of meat becomes too great for immediate use, it is cut from the carcasses and salted down in barrels in the cellar of one of the buildings which are attached to the ranch. Later on this meat is taken up and boiled in a large cauldron, meal is added, and the mixture as well as water for drinking, is placed in a series of troughs along the base of the hill. As Skunks become semi-dormant, they consume but little food during the coldest parts of winter. In spring and fall, carcasses are left out for several days until consumed. As this can not be done in hot weather, the cooked ration is fed largely. The Skunks breed in early spring, eight or ten making a litter. By fall the young ones are full-grown, and cannot be told from the old. Overfeeding must be guarded against, as it reduces the size of the litter.

THEIR NESTS.

"Recently I visited the farm during the annual killing, which begins about December 1. Six or eight men were at work on the steep hillside digging out the Skunks, which are placed in sacks, held by helpers. These holes or nests are made by the proprietors with spade and shovel, by digging downward into the bank for three or four feet. As it is hard to dig under it without causing it to cave, an earth roof is not generally made; instead, the large cavity is nearly covered with rails and boards, and dirt is thrown over.

"Skunks burrow but little, and in a wild state appropriate the holes of Woodchucks and other burrowing animals. New holes are made as fast as the colony seems to require them. There is no regularity as to the number inhabiting a hole; not less than two or three were found, but in some cases fifteen or twenty had crowded together in one hole.

IN SLAUGHTERING SEASON.

"The males also were found collected in one portion of the grounds. At the "Skunk harvest" the roofs are thrown off the holes, and a little digging brings out all that are inside.

When a bag is filled, the man throws it over his shoulder and carries it down to the skinning room. Here the animals are sorted. The best marked are saved for breeding, one in ten being a male. They will be kept in the building until all have been dug out, when they are turned into the inclosure. Those to be killed are taken outside and dispatched by a blow on the head, and skinned as soon as dead. Only rarely do they throw scent at this operation. The skins are hung up to dry with the flesh side out. The building contained many Fox, 'Coon and Muskrat skins, besides hundreds of Skunk pelts. The output of the ranch will be about 800 skins this year, as many live Skunks will be kept for the next year's breeding. Before the carcasses are removed after skinning, the fat is cut off and tried into oil. Good black skins are worth in the neighborhood of \$1.50 each."

WHAT FARMERS, POULTERERS AND SPORTSMEN SAY ABOUT SKUNKS.

ADAMS COUNTY.

DR. C. E. GOLDSBOROUGH, Hunterstown:

Polecats are an abomination: they kill chickens, rob hens' and birds' nests, bee nests; but they are supposed also to destroy much vermin. We have Skunks or Polecats very common. Woodchucks or Groundhogs rare in lowlands, tolerably common in highlands. Rabbit or Cottontail numerous everywhere. Wildcats common in the mountains of the county; field or meadow mice very common; Minks, Moles and Weasels common, Foxes common, Muskrats very common; Squirrels, Raccoon and Opossum common.

ALLEGHENY COUNTY.

JOHN NELSON, Talley Cavey:

They will not let us get an egg if they can have their way; have caught them in the act of stealing eggs of fowls.

ARMSTRONG COUNTY.

Dr. L. B. SCHNATTERLY, Freeport:

They are a great enemy to the farmers' poultry and very destructive to nests of Partridge (Quail) and Pheasant. Mr.

James Harblson tells me that he caught a Polecat destroying a nest of eggs of Quail that was just ready to hatch out. The Groundhog will do the same.

BRADFORD COUNTY.

E. M. ANGLE, Potterville:

Skunks are destructive to Rabbits, Pheasants and Quail. I have known them, with the Red Fox, to be the most destructive to the above-mentioned game. Proof—localities where the Skunk and Fox are nearly extinct you will find said game in plenty and vice versa. They are also injurious to the farmer's fields; in the absence of game, poultry, etc., they will take to the meadows and pastures and if the land be sidehill or sloping will commence at the lower side and turn over every movable stone that is not too large for their strength, in search of ants, tumble-bugs, eggs and crickets, and some certain grubs and worms. This, some may say, is beneficial; if so, the damage done is so much greater than the little good, that the good sinks into insignificance. I had a meadow of about three acres sloping to the northeast about two years ago, well seeded to timothy and clover, and when mowed of a splendid stand; directly after mowing they commenced in the aforesaid way at the bottom and turned the stones over a few rods of ground every night (for like all evil doers they work at night) until they reached the top; by that time there had accumulated the same food under the stones again and they would overturn every stone, placing the stone on new grass after having left it just long enough to kill the grass where it lay, the sun, wind, and covering having destroyed the grass until the field was ruined until taken up and newly seeded. Having witnessed the aforesaid charges against this animal I have no hesitation in saying they are one of the farmer's foes. Yes, sir, they are worse than a mortgage on your farm drawing compound interest, for they increase faster and in a greater ratio, and I am in favor of a light bounty, say, with the present price of furs, twenty-five cents per head, but please don't give a larger one to the justice unless the law be so amended that the said justice of the peace must skin them.

I consider the Skunk very injurious for the following reasons: In localities where farmers do not have good protection for their poultry they will destroy both old and young that roost low enough for them to reach. They are cunning fellows and show great wisdom. If a young turkey or guinea fowl are

apt to wander to a distance that they may hide their nesting place, the Skunk, keen of scent, soon locates the nest and eats the eggs; should the birds be lucky enough to lay their quota and commence setting, of course, the odor is still stronger and the Skunks can scent at a greater distance; they will drive off the birds and eat the eggs, being careful to save the birds that they may keep them supplied with such toothsome food and will not kill "the goose that lays the golden egg," until they see they are not likely to get any more or are driven by excessive hunger to attack the mother bird. This same being true should they come upon the mother bird while with their young they will destroy the young by piecemeal as they will have need, not like the Mink or Weasel, destroy for the blood and leave several dead in a pile.

HON. F. N. MOORE, North Orwell:

Skunks are quite plentiful in my locality, but twenty years ago they were much more numerous, and at that time we did not experience the great losses we now sustain in our meadows through the ravages of white grubs which are the larvae of the May beetle or tumble-bug. In this region we grow potatoes extensively for the eastern markets and experience material losses to the potato crops as well as to corn by reason of the white grub eating them. These inroads made by the white grub became of such a serious character that it brought out discussion among our farmers at local grange meetings, when it was learned that the potato and corn fields, most adjacent to sections where Skunks harbored, were least damaged by these larvae. Observation proved that the Skunks, to get the grubs, dug small round holes in the hills and rows of the potatoes. The testimony of our observing and intelligent farmers is that the Skunk is the greatest enemy to these noxious pests, for he not only seeks them in the plowed ground, but will dig for them in the meadow and pasture lands.

Skunks, as is well-known to every one, will turn over flat stones, pieces of wood, etc., which serve as harboring places for crickets, ants, grasshoppers, army worms, may beetles and other forms of insect life which subsist on the farmer's crops. While it is true the Skunk occasionally will visit the hen roost or get under the barn to the dismay of the farmer's dog, and the disgust of the farmer's boy, yet the damage which he does in the poultry yard is light when compared with his beneficent services, rendered in destroying insects, mice and other vermin which attack the farmer's crops by day and night. The

Skunk is the most profitable source of revenue of any of the fur-bearing animals captured by the juvenile trappers and hunters in our section. Many a boy is made happy with a new pair of skates, and a cheap shotgun, secured by barter at the country store in exchange for pelts of this highly perfumed animal.

My observation as a practical farmer is that these animals are certainly friends, not enemies of agriculture, and that the indiscriminate slaughter of them or a bounty which will encourage their extermination would be prejudicial to the farming interest.

J. S. GAY, Terrytown:

Skunks are very injurious; they are very plentiful and will catch all the chickens that they can find; also suck eggs.

W. R. PARK, Athens:

Injurious; destroy eggs, game and eggs of game birds. Being a sportsman I desire to protect game and favor the killing of Skunks.

BUTLER COUNTY.

JOHN F. WEAKLY, Slippery Rock:

I think Skunks are a benefit as they live almost entirely on bugs and worms.

CARBON COUNTY.

M. E. KEMERER, Weissport:

Skunks kill chickens and other kinds of poultry.

CENTRE COUNTY.

T. H. HARTER, Bellefonte:

I think the Polecat is the most destructive to our game as it does its work at night and catches the birds while hatching. In my opinion Skunks are injurious because they feed upon game when they can get it. I consider them next to the Hawk in destructiveness to game.

CAMBRIA COUNTY.

MR. PIERSON, Dysart:

Skunks eat eggs of the ground birds (the kind that are beneficial to the farmer, such as Thrush, Catbird and native Sparrow). They have killed a great amount of chickens around here; have lost some myself and set traps and caught them in my hen house. They are injurious.

JOHN F. THOMAS, Carrolltown:

While the Skunk devours many insects and other vermin, it is obnoxious to the farmer and sportsman. They are invariably abroad on wet nights, when they may be found prowling about the barn or hen coop, and have even been killed in cellars of inhabited houses. Their methods of procuring insects manifests much cunning. I have seen them go about a field in the evening overturning all small flat stones in their way, and quickly gather up all the surprised bugs and beetles. It is unsuspecting and may be taken with a steel trap very easily.

CHESTER COUNTY.

THOS. B. DARLINGTON, West Chester:

The Skunk or Polecat is a frequent visitor to the poultry yard, for poultry or eggs, or both, and breaking up setting hens.

A. SHARPLESS, West Chester:

The Skunk has been pretty plentiful here in years past. I think it is more beneficial to the farmer than otherwise. True, old ones sometimes destroy young chickens when exposed at night, but their food seems principally to be noxious insects; I long since forbid their destruction on my farm. There will be no danger here of any surplus of these animals, as the value of their pelts is such that trappers will keep their numbers down.

HARRY WILSON, Gum Tree:

In my opinion are one of the most beneficial animals; their principal food as shown by their stomachs and excretions are insects, such as beetles and grasshoppers. I had an illustration of their food habits shown to me a couple of years since. I had been hunting Groundhogs one summer evening and returning through a clover field near a woods I saw a small black

animal moving about in the grass near my intended path. I soon found on nearer approach it was a half-grown Skunk; so coming to a stand I watched its methods of getting a liveli- hood; it wandered first one way and then another until it came within a few feet of me standing quite still; it never took the least notice of me. It was searching for grasshoppers as was evident from its actions. Walking with its short steps it made a sort of stiff, wrigglelike progress; when it came across a grasshopper, stiffened by cold and dew after night-fall, which would hop but two or three inches, it gave a short spring placing both paws on the 'hopper which it proceeded to eat at leisure. I watched this Skunk until too dark to see its opera- tions any longer and his method of capturing was always the same—catching the insect with his paws first. When a Skunk however, acquires a taste for hen eggs and young chickens, death alone, I believe, will stop his ravages in the poultry yard, and I have had annoyance given me by them; but the death is easily affected; an egg containing strychnine proves very tempt- ing and he commits suicide. I believe that could the Polecat be educated to abandon the habit of using perfumery and eating a chance chicken (which might afterwards die of gapes) which might come in his way, he would become a highly beneficial and useful animal to mankind.

DR. WALTER VAN FLEET, West Grove:

Skunks beneficial; stomach usually filled with insects.

CLEARFIELD COUNTY.

J. BLAIR READ, Clearfield:

Injurious. Destroying poultry.

JAMES THOMAS, Curwensville:

I had forty young and an old turkey killed in three succes- sive nights by a Skunk. I trapped it and it was not a very large one either.

ABRAHAM NEVELING, Coalport:

Skunks are injurious; they destroy poultry and eggs.

E. GARD EDWARDS, Ramey:

Skunks are more injurious than otherwise on account of dep- redations on poultry.

W. J. STULL, Coalport:

Skunks injurious; destructive to poultry.

ENOS BLOOM, New Millport:

The Skunk or Polecat is very common and very destructive to poultry and eggs. They are so bold that they will enter a poultry house or anywhere else that they can, in broad day light. They are very destructive to Pheasants and Partridges, eating both eggs and young.

CLINTON COUNTY.

L. M. CASTETTER, Green Burr:

Some people think Skunks harmless, but they are the most destructive animals to birds that build their nests on the ground, such as the Lark, Quail and Pheasant, as they are fond of such food as birds' eggs and young birds. They visit the poultry yards very often in our section and kill lots of poultry; they are very plentiful because not every one will kill them on account of the offensive musk they will discharge when pursued. Our Quail are very scarce, and I blame nothing but the Skunk for it.

CRAWFORD COUNTY.

W. G. SARGEANT, Meadville:

Skunks do no especial harm; many are taken for their fur.

HON. J. B. PHELPS, Conneautville:

The Skunk is the farmer's friend. I have watched them hunting grasshoppers and digging out grubs in the field.

H. C. KIRKPATRICK, Meadville:

The Skunk destroys poultry and eggs; and in my opinion is injurious, but to what extent I cannot tell.

COLUMBIA COUNTY.

E. H. DAVIS and JOHN M. BUCKALEW, Fishing Creek:

Would estimate that about 1,000 skins of Skunks are obtained annually in this section.

Polecats catch a few mice, bugs and insects when they cannot get a meal of Quail, Pheasants or their nests of eggs or

young, or rabbits or their nest of young. We sometimes offer a local bounty to the boys—to the one producing the most scaips—and always see beneficial results in Quail and Pheasant increasing, as well as Rabbits thereafter.

CUMBERLAND COUNTY.

JACOB MEIXEL, Boiling Springs:

Skunks are injurious; they destroy young chickens and leave a disagreeable odor. I have known Skunks, Opossums, Weasels and Mink to kill much poultry and game; they generally destroy all that are at one place.

FAYETTE COUNTY.

N. W. MILLER, Uniontown:

Skunks are valuable; they exterminate field mice and rats. Some of our farmers have forbidden the trapping of Skunks on their farms, because they keep their meadows free from rats and mice.

FRANKLIN COUNTY.

HON. A. NEVIN POMEROY, Chambersburg:

Skunks are injurious; destroy poultry.

GREENE COUNTY.

B. F. HERRINGTON, Waynesburg:

Skunks beneficial; they destroy a great many meadow mice.

HUNTINGDON COUNTY.

GEO. S. APPLEBY, Decorum:

Skunks injurious; they destroy poultry.

INDIANA COUNTY.

WM. D. ROMBACH, Saltsburg:

Skunks are very injurious to all game, while they destroy many moles and mice; their pelt is big premium to kill them.

L. C. OBERLIN, Smicksburg:

Last winter I believe I handled over 1,000 Skunk skins besides

hundreds of other kinds. Skunks are plentiful all over the country; I am sure that they are beneficial to the farmer; they kill mice, destroy bee, wasp and yellow jacket nests. Very little harm to poultry. On the other hand their hides are very valuable.

SAMUEL BOTHELL, Shelocta:

I think they destroy quantities of bugs, grasshoppers and bumble bees, grubs, etc., that are more of a pest than they.

R. W. WEHRLE, Blairsville:

Injurious.

JUNIATA COUNTY.

W. H. KNOUSE, Swales:

I am firmly convinced that Skunks are beneficial. I have known them to harbor in buildings and have not heard of a single instance in which they destroyed poultry or eggs of which they are sometimes accused. To the contrary, they destroy large numbers of field mice, bugs and worms. My boys catch them sometimes and upon examination we find that the contents of their stomachs verify this statement.

MR. WELLINGTON SMITH, Mifflintown:

The Skunk is the boldest and most plentiful of all poultry destroyers; I have really killed as many as six in one season right in my barn. Last summer I shot one in broad daylight in the feed entry. It is surprising how nicely they can eat your eggs for a long time before you know what becomes of them and eat your chickens too. His depredations will always be saddled somewhere else.

LANCASTER COUNTY.

Messrs. H. M. ENGLE & SON, Marietta:

The Skunk is quite common and the damage done by them is not very great. I know they destroy eggs and poultry; whether they destroy field mice, as it is claimed, I do not know.

LACKAWANNA COUNTY.

F. L. BENJAMIN, Kizers:

Skunks occasionally kill chickens and eat their eggs.

A. C. SISSON, La Plume:

Skunks occasionally destroy poultry and eggs in a small way, but subsist principally upon bugs, worms, ants, etc., and are a benefit rather than a damage to farmers. The Skunk is one of the farmers' best friends, and should be protected to the fullest extent. He lives largely upon insects that are detrimental to the farmer. The May beetle and its larvae, that are so rapidly becoming destructive to many of our crops, are especial favorites with him, and unless the wholesale trapping and killing of these useful animals is prohibited by stringent legislation, strawberry growing will soon become entirely unremunerative in many localities, for it is generally believed that if the Skunk could be let alone, he would keep this pest in check to a very great extent. The damage to the potato crop by the white grub is rapidly increasing, and calls loudly for prompt action to suppress this evil.

In these days of agricultural depression, when new industries are eagerly sought that offer profitable results, we would recommend Skunk farming. It has been demonstrated that these little animals can be grown to an almost unlimited extent, and at the same time afford a pleasant and lucrative employment. Our American ladies delight in wearing the excellent fur of these little animals, although usually under the assumed name of expensive furs of animals now nearly extinct. The pelt of a black Skunk will bring from \$1.50 to \$2.00 each, and the oil of a fat Skunk \$1.00. They are as prolific as swine; they usually breed twice in a season, and drop from six to twelve at a litter; they are easily domesticated and become as gentle as kittens, and can be handled with impunity, if the tail is used as a handle. Unlike our farm stock, they require no feeding in winter; they hibernate, only making their appearance at rare intervals when the weather is mild; their food is refuse meat and bones from the butcher's shop, mush made of wheat bran and cows' milk. When they are ready for slaughter, they are first chloroformed, and when the oil is extracted they can be fed to the rest of the herd. The Ithaca Fur Company, of Ithaca, N. Y., have perhaps the most extensive Skunk farm in the United States, situated about seven miles from that city, where several thousands of these useful animals may be seen at any time during the summer months by those who care to investigate this comparatively new and unique enterprise.

ZIBA SCOTT, SPRING BROOK:

The Skunk is a very mischievous animal, he is not a fast runner, but sneaks around the chicken coops at night and

sucks all the eggs he can find. If a hen or turkey steals its nest in the field and sets there he is pretty sure to get the eggs. He serves the Quails and Pheasants the same way.

LEHIGH COUNTY.

W. B. K. JOHNSON, Allentown:

Skunks. In a poultry yard I should not want them; they love eggs too well and have often come from the woods to steal eggs in our barns during winter and were caught entering a square hole for cats to enter; after feasting on eggs were not able to repress and were caught.

LUZERNE COUNTY.

JOHN E STOCKER, Ashley:

Skunks are injurious and dangerous. I know of a family by the name of Bergers, who lived along what is known as the middle road between Ashley and Buttonwood, about a mile from here, who had a very nice flock of ducks and chickens. There is a running stream about a stone's throw from the house, and on the side of a small hill they had built a coop to house their flock; it was not long before Mr. Berger noticed the number of his flock going down; his idea was that they were stolen. One night he had occasion to go out on a bright moonlight night; he noticed what he thought were two dogs playing in the road; he moved a little closer and soon found they were Skunks; he was attacked by them and it was all he could do to get away. Had it been a child instead of a man, the result would have been the child would have been killed or nearly so. Mr. Berger's suspicion was aroused and he made a hunt around his premises; the nest containing five young was found under the pen; of course they were all killed, as was one adult.

M. B. TRESKOTT, Harveyville:

The Skunk is injurious. It is a great destroyer of eggs, robbing hens' nests, particularly those "setting," and destroying whole broods of young chickens in a night and sometimes killing an old one. I have known a number of instances where they have got into out kitchens and cellars, and spoiled by their "scent," nearly everything stored there. I do not know of any good they do.

LAWRENCE COUNTY.

HON. A. L. MARTIN, Enon Valley:

Preserve the Polecat.

McKEAN COUNTY.

C. W. DICKINSON, Norwich:

I certainly think the Skunk does more good than harm for he is an enemy to the grasshopper, the cricket, the white grub, and nearly all kinds of beetles. The Skunk lives on the above named insects, and only when they are scarce will he make a raid on the farmer's poultry or eggs. I have known Skunks to kill chickens and devour a whole nest of eggs.

NOAH H. PARKER, Gardeau:

The Skunk never does any damage except he gets into the chicken coop and then he will sometimes kill several in one night and often will repeat his visits if left undisturbed.

G. R. BROWNELL, A. P. POPE and W. R. PAGE, Smethport:

Kill chickens and furnish material for fur capes.

A. P. BREWER, Norwich:

Skunks are quite plentiful in this county and are considered a great nuisance on account of their unpleasant perfumery, and because they are destructive to eggs and young chickens.

J. B. OVIATT, Norwich:

Consider the Skunks a benefit to the farmer as they catch mice, beetles, larvae, etc.

MERCER COUNTY.

A. D. McCracken, New Lebanon:

We have had young chickens killed and so have our neighbors, as many as fourteen at one time; supposed it was a Skunk or Polecat, for when a Skunk was captured we lost no more chickens that year. Skunks are considered by some beneficial to the farmer; I think they are injurious. They are becoming scarce which I believe will be beneficial to the farmer and poultry raiser.

M. C. OSBOURN, Henderson:

The Skunk I think is a friend to the farmer in many ways; he sometimes may kill a chicken, but this is overbalanced by the good he does in the field by killing mice and other harmful forms of animal life.

ARTHUR MARTIN, Sandy Lake:

We have the Skunk; they are the farmer's friend; they destroy more mice than any animal we have; we have a great many mice in our clover fields; we will notice late in the fall when a small skiff of snow falls, the clover field is travelled over and a great many mice killed in a single night by a Skunk.

MIFFLIN COUNTY.

JOS. W. KYLE, Milroy:

Injurious.

MONROE COUNTY.

H. T. FRANKENFIELD, Frutcheys:

I would consider Skunks beneficial to the farmer, as they catch the Meadow or Field Mice.

MRS. ALMA S. WILLISTON, Frutcheys:

Last April my boy of ten years trapped a Skunk in our next neighbor's chicken yard and wanting to sell her to a "Skunk Park" on the Delaware, about five miles from here, he put her in a box and kept her until he had a chance to send her to the park; he had her two days when she gave birth to a litter of seven; of course he was more anxious than ever to keep her until the little ones were large enough to sell, so he tried giving her fresh eggs, one three times a day; she liked them well and the whole family throve nicely; she would take the egg between her front feet and bore a small hole in the end with her teeth and suck the contents. We kept them three weeks and then took them to the park. In the meantime the mother became so tame my boy could handle her with impunity, take out the little ones when he liked and look at them without the mother interfering at all. I was sorry he did not keep them until they grew large for at the park they had poor success in raising the young. They said the old ones ate them; I do not know why, as the one we had seemed very fond of the little ones.

EMIL ULRICH, Stroudsburg:

If it were not for his odoriferous propensities I should think the Skunk a great friend of the farmer. He may occasionally destroy a nest, eat some young birds, but his delights are ground hornets' nests and grubs and worms, after which he will dig in the field. I have noticed the numerous small holes made by skunks when searching for grubs.

MONTOUR COUNTY.

J. L. BRANNEN, Exchange:

Skunks are injurious to poultry and game.

PERRY COUNTY.

F. M. McKEEHAN, Ferguson:

Skunks are tolerably common in our parts; more numerous than they were a few years ago. They are certainly destructive of game, destroying the eggs and brood; they also destroy young rabbits. They seldom now approach farm buildings to molest young poultry as they did fifty years ago, for as the country is improved they are destroyed.

C. R. NOYES, Westport:

Skunks rob chicken and turkey nests and frequently kill turkeys and chickens.

PIKE COUNTY.

C. P. MOTT, Milford:

Skunks are not very numerous in our county, and the mice, etc., destroyed by them more than compensates for the very small damage that they do to poultry.

POTTER COUNTY.

O. J. JACKSON, Borle:

The Skunk does some damage to poultry.

SNYDER COUNTY.

F. J. WAGGENSELLER, M. D., Selinsgrove:

Skunks are injurious; have known them to kill chickens, destroy birds and small game.

SOMERSET COUNTY.

E. B. HOSTETTER, Kingswood:

The Skunk is a very injurious animal, will kill all the feathered fowls, such as chickens, turkeys, pheasants, quail, etc.

JEREMIAH PHILLIPS, Garrett:

Skunks suck eggs and sometimes catch chickens and ducks, but not often.

DR. H. D. MOORE, New Lexington:

Skunks. Both beneficial and injurious, but I believe the injury outweighs the benefit. If there were not any ground-nesting birds or fowls, I have no doubt he would make a good living on grubs, bugs, etc. I have a very poor opinion of the Skunk. He is entirely too familiar; when he goes on a visit he is liable to stay a whole week, and if you disturb him the whole neighborhood finds it out and everybody is down on him and every effort is made to destroy him, bounty or no bounty. Allow me to digress a little from your question and say that I haven't the least idea in the world what the Skunk was created for. He doesn't seem to have any sense at all. I never knew one to turn short around and start for home; if he didn't find a barn, or log, or the fence around a ten acre field to turn him he would go on and on forever. I have met him at all hours of the night, on the road, on the walks all around my house, office and stable, and he always has the right of way. Coming home late at night I have found him in possession of the premises. By maneuvering around and calling to my wife to hand the shot gun out of the back window, I have been able to convince him that he had been jumping my claim.

JOSIAH PILE, New Lexington:

Skunks are injurious, they will come to the farmers' barn at night and if there are any young chickens about the barn that are not shut up he is sure to get them; it matters not how many young chickens are there he generally takes them all; it is no mystery when the farmer gets to his barn in the morning and finds them all gone what has taken them—the smell tells the story. I cannot see in what way they are a benefit.

SULLIVAN COUNTY.

OTTO BEHR, Lopez:

Think Polecats are beneficial to the farmer; the damage they do in occasionally eating the eggs out of a nest out doors, or catching a setting hen is more than balanced by the insects they feed on.

J. K. BIRD, Millview:

The Skunk is one of the worst pests the farmer has, often coming to our doors and poultry houses and robbing eggs and young chickens from under the hen, and many times killing old fowls. I would recommend a bounty of one dollar on Skunks.

C. F. HUNSINGER, Colley:

I consider the Skunk more of a benefit than an injury, for the reason that I know of many parties who trap them, making good wages selling their hides and a good fair income by frying out the oil from the carcass, which is useful and valuable.

SUSQUEHANNA COUNTY.

JASPER T. JENNINGS, New Milford:

The Skunk does little or no damage to crops of any kind. Their principal depredations are among the chickens and young poultry. I have often known a whole brood of young chickens to be destroyed by them in a single night. They often burrow under some rock or go into a Woodchuck hole near the farmer's dwelling and prowl forth at night in search of prey; they are great destroyers of meadow mice, and they dig out hornets and bumble bees' nests for the larvae of the bees; they are rarely seen in the day time, but when so found will often follow a person to throw their almost unendurable odor upon him. Skunks bring forth several young at a time and increase very rapidly. They are taken quite extensively in the fall of the year when their fur is good, by means of a stone trap, set with a figure four, denominated a "dead fall." The bait is generally composed of a chicken's head or entrails; the boys, as well as some men, derive no little pleasure, as well as some profit, in running a line of traps.

S. S. THOMAS, Lynn:

Skunks very common; think fully 3,500 are killed in this county

annually. Woodchucks, about one to the square acre. Rabbits, quite common, diminishing before ferrets. Wildcats, quite rare; in fact, almost unknown in this part of the county. Meadow mice, exceedingly thick some years, in others rare. Minks and Weasels quite common. Foxes, quite common, but diminishing. Squirrels: Pine, common; Gray, plenty when they migrate this way; Black, nearly or quite extinct. Raccoon occasionally seen; less plentiful than formerly. Opossum very rare. Black Bear unknown in this part of the county; one killed near here some twenty-five years ago.

Am inclined to believe that the Skunk by his ceaseless war on other vermin compensates for the damage he does to the poultry. I have twice caught him at the bee hives scratching the outside of the hive to bring out the inmates and devouring them as fast as they appeared. This was just at daylight in the morning.

M. B. LYMAN, Lynn:

Skunks. Beneficial in killing mice, grasshoppers, insects and other noxious insects, evidenced by upturned stones and shallow punctures in meadows where they are often seen.

TIOGA COUNTY.

P. W. REXFORD, Mansfield:

I think Skunks are injurious for they rob all birds' nests that are on the ground, and they are bad on poultry.

UNION COUNTY.

GEO. W. CHAMBERS, Mifflinburg:

Skunks are certainly of no benefit to farmers or anybody else. I know that I have a good deal of trouble with them and I would be willing to help pay fifty cents for every scalp. I have had to fight them for years. If they get under a floor in a barn or house they destroy all the eggs and chickens in a short time. The act paying fifty cents a scalp should never have been repealed; if it had not there would not now be a Skunk in this county and that would have been a benefit to the whole country.

DR. THOS. C. THORNTON, Lewisburg:

Poultry raisers in this section suffer considerable loss yearly from the depredations of hawks included in the genus *Accipi-*

ter. The Great Horned Owl and sometimes the Barred Owl also destroy domesticated fowls. The Duck Hawk, and its smaller relative the Pigeon Hawk, and the Bald Eagle will kill domesticated fowls. Among mammals, the common Weasel, Mink, Wildcat, and both kinds of Foxes also destroy a large amount of poultry every year; and these four-footed depredators in common with the raptorial birds above cited do a great deal of mischief by destroying game—birds and mammals—as well as many kinds of small beneficial song birds. The Mink, which lives in the vicinity of water courses, in addition to doing many other bad deeds, destroys fish; large-sized trout seem to be most agreeable to the taste. While hawks and owls, like some of their mammalian cotemporaries, do not, so far as I can learn, disturb the eggs of poultry or wild birds, we have the pestiferous Skunk which is a most adroit nest robber. This animal, like many other evil doers, goes about in the dark to kill poultry or eat their eggs, and when these cannot be readily obtained he attacks the eggs and broods of all ground-nesting birds he can find. Skunks do much damage to poultry, and the havoc they make among game birds, especially Turkeys, Quail, Pheasants and Woodcock, should prompt every lover of the dog and gun to extirpate these sneaking and sly pilferers. They of course prey to some extent on different forms of insect-life, but, possibly, it may be they consume almost as many beneficial species as they do of noxious kinds. Some observers believe this to be the case, and if they are correct, then there can be no room for doubt that the whole Skunk race should be exterminated as their ravages in poultry yards, to game, and to insect-devouring birds is well established.

C. K. SOBER, Lewisburg:

The Skunk, or Polecat, as this nocturnal quadruped is called by many, is, according to my observation, a most despicable animal. While it is probably true that he destroys some destructive larvae and beetles which subsist on the farmer's crops, the damage he and his numerous family occasion by frequent visits to the hen coops is considerable. I think the loss to the farmer and fruit-grower, through the destruction of the eggs and young of insectivorous birds by Skunks, is much greater than the good these animals do by devouring crop-destroying insect pests. Sportsmen who desire to see the game birds increase, very generally favor the extermination of Skunks because they devour the eggs and young of Pheasants, Turkeys, Quail and Woodcock; and they sometimes eat young Hares.

They also catch, it is said, destructive mice in meadows where they hunt for food; but in such places, I have little doubt, they do much injury to small song and insectivorous birds, as they will not hesitate to rob all the nests which they can reach as they slowly and methodically hunt over the ground in the twilight, moonlight and dark.

VENANGO COUNTY.

L. T. WILT, Franklin:

Skunks are no doubt beneficial as well as injurious. If left alone they will injure no one, except in case of extreme hunger or on being molested. Why not rate him among the higher order of mammals, on account of nature endowing him with the faculty as chemist of preserving so fine a weapon of defence and in so fine a chemical state of subdivision and in so small a laboratory and capable, with a very slight effort on his part, to open his laboratory and in an instant perfume so great an amount of atmosphere.

H. C. DORWORTH, Oil City:

I consider Skunks injurious for the reason that they will kill poultry and eat eggs. I have been told that the stench from these animals is readily taken up by milk; I know that local dairymen are bothered by these animals.

Many instances of Weasels and Polecats killing poultry in this county have occurred. I know of a case where a farmer hearing a commotion in his chicken coop went to investigate; he got there in time to see a Weasel killing the eighteenth chicken. James Black, of Black Siding, this county, not long ago lost twenty fine White Brahmas. The Weasel had come up through a crack in the floor, killed the whole flock and dragged every chicken to the crack. The owner found his twenty chickens in a row along this crack with their heads drawn down through it. The Polecat does not kill as many chickens at one time as a Weasel; one or two usually satisfies his hunger.

WASHINGTON COUNTY.

GEORGE MONTGOMERY, Washington:

The Skunk has been very destructive at times to our poultry, a few years ago one was quartered under the coal house, not more than twenty feet from the kitchen door, and took two dozen full grown hens before we discovered his where-

abouts. I had no dog at the time and that was perhaps the reason he took quarters so near the house. There was another one a few years after, which was under a pig pen in the orchard that gave me considerable trouble, and destroyed many eggs and chickens, before I succeeded in killing him. There is one at the present time staying under our barn, which we have not succeeded in capturing; he has killed many chickens for us the past summer and eaten a great many eggs. There have been six Skunks killed on this farm this year. I have been advised to let the one remain at the barn so long as he does not kill the chickens, and have a dead sheep or something of the kind for him to nibble at, but my sentiments don't tend that way.

JAS. S. NEASE, Washington:

During the year 1870 Skunks were very abundant in Washington county. I saw one in the town of West Alexander in the chicken coop eating a young chicken; I think it had killed two or three and destroyed some eggs under a hen. This was early in the evening, about eight o'clock. Father shot it while it was eating the chicken. During that winter Skunks would come into the yards in town and on soft nights, scratch on the bee hives and when the bees came out would eat them; this weakened the hive. When the ground was muddy (the kind of weather Skunks prefer to travel) they would leave the hives muddy where they scratched it at the hole left for bees to enter. At this time the Skunk was hunted but very little for its fur, but in a few years thereafter the fur brought a good price and they have become very much scarcer. The incentive in obtaining its pelt has so reduced it in numbers that it now ought to be protected for the good of the farmers. They now stay far from dwellings and those which remain are needed to kill mice, yellow jackets, hornets and bumble bees. The Skunk when not exceedingly numerous is very useful. The price of its fur makes it much sought after and keeps its numbers greatly reduced. It should be protected for a year or two.

WAYNE COUNTY.

G. C. BELL, Maplewood:

Injurious by eating up our small birds' eggs.

G. W. WOOD, Equinunk:

Skunks are odious and odororous; destructive to poultry; worse, even than Foxes.

PAUL SWINGLE, S. Canaan:

Skunks are very injurious by destroying poultry.

JOHN KELLOW, Carley Brook:

Skunks like good fat poultry, but I do not think they are very destructive; they also catch mice; while we do not know how many mice they catch, they might balance accounts.

E. B. GAGER, Dyberry:

Skunks kill our chickens and eat our eggs.

GEO. FRANC, Ariel:

Skunks, quite common. Destructive to poultry.

GEO. M. DAY, Dyberry:

Skunks are beneficial. They destroy many bugs, beetles, squash bugs, bumble bees, nests, etc. Where do they collect and bottle up their ammunition for defence if not in our fields and pastures? Step on a lot of the large bugs found on the squash and pumpkin vines, then interview a Polecat, at a safe distance, and see if the perfume is not the same. Now if they are willing to pick up a living in that way, and grow fat on it, why not let them?

C. W. PENNELL, Hemlock Hollow:

The Skunk is very destructive to poultry of all kinds and is quite plentiful here. I have known the Skunk to destroy nests of eggs and whole broods of young chickens in a single night. I am sure it was a Skunk, as I put a steel trap in a nest with a few eggs and caught him the next morning. Think the State should pay a bounty on the Skunk.

N. F. UNDERWOOD, Lake Como:

Skunks are plenty here; do not do much damage; they will occasionally kill chickens.

PETER COVEY, Newfoundland:

Skunks are common; from personal knowledge know they are injurious to poultry.

WESTMORELAND COUNTY.

JOHN NICHOLAS, Bradenville:

The Polecat is an animal most unpleasant in many respects, but must, like all other animals, have been created for some

purpose. It is only within one year that I have discovered their use to man. Most all animals prey upon one another, the Skunk upon field mice and what is called the "hop grub;" he should be protected as beneficial to man.

W. C. SLOAN, Sloan:

Skunks carry off young chickens.

YORK COUNTY.

DR. WM. B. BIGLER, East Prospect:

Skunks are injurious. I know they will destroy eggs and sometimes chickens.

Mr. I. D. HOWELL, York:

Skunks or Polecats are plentiful, and in my opinion, based on experience and observation of over fifty years, they are the most destructive vermin in the whole catalogue as regards wild game and all forest birds that hatch or build their nests on the ground: Wild Turkey, Pheasant, Partridge or Quail, Woodcock or Snipe, Lark, Whip-poor-will, or Night Hawk, Sparrows, and all of the bird kind which nest on the ground. They are great workers, constantly rooting over the surface of the ground, turning up the leaves and decayed matter, hunting bugs, "clocks," ants, worms, insects of all kinds. These habits bring them in direct contact with the hatching fowl; the mother bird usually escapes but the eggs or young birds are easy prey for the Skunk. I have known them to take the eggs from under a tame turkey and not disturb the old bird. They are a great damage to all kinds of poultry, they sometimes go in families, as many as eight together.

OTHER STATES.

DAKOTA.

I. H. TROCH, Watertown:

Skunks, Foxes, Muskrats, Minks, Rabbits and Mice are common and injurious.

WISCONSIN.

ALBERT BOEHN, LaCrosse:

Skunks are destructive to poultry and their eggs.

RED SQUIRREL.

Sciurus hudsonicus.

DESCRIPTION.

Body longer than the tail; body averages $6\frac{1}{4}$ to $7\frac{1}{2}$ inches long. Weight, about half a pound. (Fox Squirrel, old adults, sometimes weigh fully two pounds). Its rather broad ears, in winter, are coated with long hairs, and those on back of ears form a short tuft. The tail is flat and narrow. In summer, soles of feet are naked, but furred in winter, except tubercles at base of toes. Upper parts grayish rusty; a bright, reddish-brown, broad band extends from the top of head down middle of the back, and on upper surface of the tail. Lower parts, except the tail, are white or whitish; under surface of tail, rusty, blackish and gray. Eyes, brown; teeth (incisors) yellow.

Habitat.—This species, "including its varieties, is found over most of North America, extending north to the limit of forest vegetation, and south over the northern two-thirds of the United States."

The Red Squirrel or Chickaree is common throughout this State. Many persons, particularly those residing in the mountainous districts, call this animal the Pine Squirrel, or "Piney." It is spoken of sometimes by sportsmen and hunters who are not familiar with the Fox Squirrel, as "Fox Squirrel." Of course such an appellation is erroneous and misleading. The Chickaree is not over one-third the size of an old Fox Squirrel, from which it can easily be distinguished by its white under parts, brighter-colored dorsal markings, as well as its greatly inferior size.

ALBINISM.

Partial or complete albinism is common among birds. We often see white or whitish colored Blackbirds, Crows, Sparrows, Hawks, Owls, etc. This freak of nature—a result of the absence of coloring matter—may be observed in many mammals; Squirrels, espec-



RED SQUIRREL.

2/5



ALBINO RED SQUIRREL.



HOW TO FOOL A FOX.

ially, are often captured which are wholly or partially white. During the past five years the writer has secured seven specimens of albino Red Squirrels. One of these was taken back of a farmer's poultry house where for several days he had been seen at different times. When the owner of the premises first observed the Squirrel he thought "it was a 'white' Weasel which was after mice and rats," but as the brood of young chickens decreased daily it was determined to watch for the depredator.

HIS LAST CHICKEN.

A boy took a good position near the old hen and her brood. Presently a white animal was seen to come from a near-by woods, and running along the fence rails make a straight course to the hen coop, where he seized a young chicken and started off. The boy shot the thief, I bought it, and reader, you can see its stuffed skin reproduced on the accompanying plate. No more chickens were stolen until a pair of bold hungry Cooper's Hawks came that way and killed eleven, in three days, when the boy succeeded in shooting them, and finding their nest with five young, nearly ready to fly. This was when bounties were paid and the successful boy got \$3.50 for the seven hawks from a neighboring justice of the peace, who on a former occasion paid fifty cents each for the heads of several Night-hawks, two Shrikes, which were called "bird-hawks;" and, it is said, he also paid for and burned the heads of turkeys and domesticated fowls, believing them to be the remains of poultry and game destroying hawks or owls.

DESTROYS MANY BIRDS.

Although the Red Squirrel will eat mast, cereals,

berries, fruits, roots, seeds, buds, certain kinds of tender fungi, as well as other plants, and sometimes, it is said, even catch insects, he is decidedly carnivorous in his tastes.

Trappers despise him because he steals meat with which they bait their traps; and he does much mischief by destroying birds which nest in forest and shade trees where he loves to live, propagate and depredate. He is often seen in the apple or pear orchards destroying fruit or robbing nests. I have several times seen this noisy and agile marauder devouring birds of different species. Robins, Flickers, Vireos, Wilson's Thrush, Wood Thrush, Cat bird and several kinds of Sparrows, as well as other species of song birds are victims of this Squirrel's attacks. The able and venerable Mr. John Burroughs gives the sprightly and wicked Mr. *Sciurus* a "knock-out" blow in the following language:

"Nearly all the birds look upon it as their enemy and attack and annoy it when it appears near their breeding haunts. Thus, I have seen the Pewee, the Cuckoo, the Robin and the Wood Thrush pursuing it with angry voice and gestures. If you wish the birds to breed and thrive in your orchards and groves, kill every Red Squirrel that infests the place."

ADDITIONAL EVIDENCE AGAINST HIM.

Many testimonials of the Red Squirrel devouring native birds, and destroying—"cutting off"—growing fruit, particularly pears and apples, have come to this office. The impudent and frolicsome Red Squirrel also sucks the eggs of birds of many species; among game birds the Ruffed Grouse suffers often from his visits, for he spends much time on the ground.

Mr. James Carnes, Clearfield, Pa., writes:

"The Pine Squirrel, which is so common in our woods, is one of the worst pests, as he destroys so many pheasants' eggs."

Mr. B. F. Shaffer, Nittany, Centre Co., Pa., says:

"Saw a Red Squirrel eating the brains of a young Robin. These squirrels are a great nuisance where plentiful. They kill different kinds of wild birds and suck their eggs, and they also sometimes catch young poultry."

Mr. H. M. F. Worden, of Harrisburg, and a gentleman who has been one of the most earnest advocates in the Commonwealth for better laws to protect game, fish and insectivorous birds, says:

"For some time I doubted the statement that the Red Squirrel would catch and kill young birds, but recently I know that a pair of these squirrels killed and devoured a nest of young robins. I have also learned, on making inquiry among some of my friends who are well acquainted with Chickarees in their native haunts, that these mammals often destroy young birds, and, in the course of a year, do a good bit of damage."

SOME OF HIS PURSURERS.

The Red Squirrel has his own troubles and must not only keep his eyes open for men and boys with guns, or traps set for his destruction, but he has to be on the alert for Hawks and Owls which often catch him in an unguarded moment. Red Squirrels, in common with other species of the Squirrel family, are often destroyed by the forest fires which almost every year, in this State, consume thousands of dollars worth of property, besides destroying a great amount of animal life.

ADDITIONAL FACTS OF HIS LIFE HISTORY.

Dr. C. Hart Merriam makes the following remarks, which portray in a most pleasing and entertaining manner, much that is of interest:

"The Chickaree combines qualities so wholly at variance, so unique, so incomprehensible, and so characteristic withal, that

one scarcely knows in what light to regard him. His inquisitiveness, audacity, inordinate assurance, and exasperating insolence, together with his insatiable love of mischief and shameless disregard of all the ordinary customs and civilities of life, would lead one to suppose that he was little entitled to respect; and yet his intelligence, his untiring perseverance, and genuine industry, the cunning cleverness displayed in many of his actions, and the irresistible humor with which he does everything, command for him a certain degree of admiration. He is arrogant, impetuous and conceited to an extreme degree, his confidence in his own superior capabilities not infrequently costing him his life. In fact, these contradictions in character and idiosyncrasies in disposition render him a psychological problem of no easy solution.

"From earliest dawn till the setting sun has disappeared behind the distant hill, the Red Squirrel enlivens the silent solitude of the forest with his merry ways and saucy chatterings; and he may sometimes be discovered in the darkest hours of the night stealing softly over the ground—bent, doubtless, on some errand of dubious propriety.

SOMETIMES ACTIVE AT NIGHT.

"Moonlight evenings he is often as active, though not so noisy, as during the day, and in early autumn he vies with the Flying Squirrel in nocturnal nut-husking exploits.

"Though an expert climber, delighting in long leaps from bough to bough, which he executes with grace and precision, he spends far more time on the ground than other arboreal Squirrels, sometimes even making his home in holes in the earth.

HE SEEKS THE FENCE RAILS.

"Old logs, stumps, wood-piles and brush-heaps are favorite places of resort, and by excavating burrows beneath, he converts them into the securest of retreats. Our fences serve as highways upon which he travels from wood to wood, and the zig-zig rail fence in particular is one of the boons of his existence. It is his most frequented path, his playground, his race-course, and when pursued, his readiest means of escape. It is the step-ladder from which he leaps into the branches of neighboring trees, and the place where he meets his friends at all hours of the day. He frequently follows it to the farm-house and takes up his abode in the woodshed or other outbuilding, placing his nest between the ceiling and roof, or in some other

equally out-of-the-way spot, whence he is with great difficulty dislodged.

KEEPS JUST OUT OF REACH.

"He is the least wary of the Squirrels, rarely taking trouble to hide himself at the approach of man. In fact, on such occasions he usually assumes an aggressive attitude, chippers, shakes his tail in an impudent and wholly uncalled for manner, but takes care to keep just out of reach. This daring fearlessness is clearly the result of the fact that he is not worth the powder necessary for his destruction, and he is therefore tolerated, though an acknowledged nuisance. But there are times when his conduct becomes so scandalous that the shot gun is brought out for his suppression. He is soon deeply impressed with the range and effect of this weapon, and though many of his brothers may have perished before the warning was heeded, he now becomes, in this particular locality, the most circum-spect of brutes. He scorns the thought of running away, but grows so vigilant, sly, and crafty that the farmer is put to his wits end to devise means for his riddance."

THE GRAY SQUIRREL'S FOE.

The indefatigable, nut-hunting, bird-destroying Red Squirrel is a relentless foe of Gray Squirrels, which have good reason to fear his vicious onslaughts. In conclusion I regret that it has been necessary to write and quote as has been done, but to be accurate such a course had to be followed. We can say, as has been said "kill all the pesky Red Squirrels," but to those who are familiar with the woods and its tenants, I am sure if the merry and shrill note, chir-r-r-r, of the Chickaree was forever hushed in death, we would miss him greatly and be glad to welcome him—cruel, wicked and bad as he is—back to the scenes of childhood days.

OPOSSUM.

Didelphis marsupialis virginiana.

DESCRIPTION.

Variable in size; weight from six to ten pounds; measures from twenty to thirty-two from end of pointed snout to tip of the tail; the tail, about as long as the head and body, is very flexible and, except at the base which is hairy, is covered with scales, which enable the 'possum to cling with absolute security to the limbs, amongst which he climbs with great dexterity. The eyes are brown. Fur of body is quite soft, and woolly, thickly sprinkled with long white and blackish hair that gives the animal a shaggy dress. Sides of head, face, throat and chin, whitish, with a more or less brownish area about the eyes; legs and feet blackish brown; the ears, conspicuous, rounded and lengthened, are dark-colored and naked; belly whitish. The long white and blackish hairs of the body give the animal a frosted, dusky appearance. In antediluvian times when father Noah "lived and built himself a bark," 'tis said, the 'possum had long and numerous hairs covering his long and tapering tail; such a condition does not now exist, and this nakedness has been facetiously accounted for in the following stanzas, taken from Mr. A. M. Brayton's report:*

WHY DE HA'R IS MISSIN'.

Go 'way fiddle—folks is tired a-hearin' you a-squawkin'.
Keep silence for your betters—don't you hear de bango talkin',
About de 'possum's tail she's gwine to lecter—ladies, listen!—
About de ha'r what isn't dar, an' why de ha'r is missin'.

De ark she keeps a sailin', an' a sailin', an' a sailin';
De lion got his dander up, an' like to bruk de palin'—
De sarpints hissed—de painter yelled—tell, what wi'd all de
fussin'.
You c'u'dn't hardly heah de mate a-bossin' roun' an' cussin'.

Now Ham, de only nigger what was runnin' on de packet,
Got lonesome in de barber shop, an c'u'dn't stan' de racket;
An' so for to amuse he-self, he steamed some wood an' bent it,
An' soon he had a bango made—de fust dat was invented.

He wet de ledder, stretched it on, made bridge, an' screws, an'
apron;
An' fitted in a proper neck—'twas very long an' tap'rin'.
He tuk some tin, an' twisted him a thimble for to ring it;
An' de mighty question riz, how was he gwine to string it?

*Report of Geolog. Sur. of Ohio, Vol. IV. Zoology, page 170, as a quotation from Scribner's Monthly, January, 1878.



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OPOSSUM.

De 'possum had as fine a tail as dis dat I am singin';
 De ha'rs as long an' thick an' strong—des fit for banjo-stringin';
 Dat nigger shaved 'em off as short as wash day dinner graces,
 An' sorted ob'em by de size, from little e's to basses.

He strung her, tuned her, struck a jig—'twas "Nebber min' de wedder";

She soun' like forty-'leven bands, a playin' all togedder;
 Some went to pattin', some to dancin'; Noah called de figgers,
 An' Ham he sot and knocked de tune, de happiest ob niggers!

Now, sence dat time—it's mighty strange—dere's not de slightest showin'

Ob any ha'r at all upon de 'possum's tail a-growin'.

An' curi's, too—dot nigger's ways; his people nebber los' 'em—
 For where you finds de nigger, dar's de bango an' de 'possum!

Habitat.—Common and abundant in the South; generally rare or of irregular occurrence north of latitude of Central Pennsylvania. In some of the northern parts of this State the Opossum is almost unknown.

This animal, which is so abundant in the southern states where it is highly prized for food, is quite numerous in the southern parts of Pennsylvania. In the the counties of Delaware, Chester, York, Lancaster, Cumberland, Dauphin and several others Opossums are plentiful.

3,500 A YEAR IN CHESTER COUNTY.

The Messrs. Weil, extensive fur buyers, of West Chester, Pa., say they have, for the last six years, annually purchased about 2,000 'possum skins in Chester and neighboring counties, and that fully two-thirds of this number were obtained in Chester county. According to the estimates of several fur-dealers in Chester county it is believed that there are annually sold to the "trade" about 3,500 Opossum skins taken in Chester county.

MAY EVENTUALLY GET TO KLONDIKE.

On many of the higher mountainous districts of northern and central Pennsylvania these animals are

rarely seen; but they have been captured, according to reports received at this office, in probably every county of the State. As the forests are removed, the Opossum, hunters say, is discovered in localities northwardly, where, in former years it was rarely, if ever seen.

A NIGHT PROWLER.

The Opossum hunts in the night and on bright starlight or moonlight nights, in warm weather, can often be seen moving about in a rather slow and awkward pace. Unlike the Wildcat, Red Fox, and some other preying animals it does not go far from its home; and sometimes, but not often, according to my experience, is it found traveling by daylight, yet frequently it goes out in quest of food by twilight.

ITS NEST.

The Opossum's home is situated in various places, such as hollow logs, old stumps which are hollowed and protected above, or in cavities which the animal makes under roots of trees or stumps; and they have been known to take up their quarters, like Skunks, Minks and Weasels often do, under the farmer's buildings. Their nests are lined with miscellaneous materials, such as leaves, grasses, lichens, etc.

HUNTS A TREE WHEN PURSUED.

The mischievous small boy when discovered in wrongdoing will, usually, if his capture is attempted, start off for home as fast as his legs can carry him. The Opossum does not do this. He climbs up the nearest tree, when dogs or Foxes attempt to catch him, and makes himself comfortable. He will sit there

until his pursurers leave. When dogs are with hunters and the latter come to the tree which the Opossum occupies, a shot-gun ends the hunt. Sometimes the Opossum is shaken from his refuge and the dogs speedily kill him. However, it is much easier to talk about shaking 'possums and 'coons from trees, than it is to do it.

A VERITABLE CURIOSITY.

"We can imagine to ourselves the surprise with which the Opossum was regarded by Europeans when they first saw it. Scarcely anything was known of marsupial animals, as New Holland had not as yet opened its unrivaled stores of curiosities to astonish the world. Here was a strange animal, with the head and ears of a pig, sometimes hanging on the limb of a tree, and occasionally swinging like the monkey by the tail. Around that prehensile appendage, a dozen sharp-nosed sleek-headed young had entwined their tails and were sitting on their mother's back.

"The astonished traveler approaches this extraordinary compound of an animal, and touches it cautiously with a stick. Instantly it seems to be struck with some mortal disease; its eyes close, it falls to the ground, ceases to move, and appears to be dead! He turns it on its back, and perceives on its stomach a strange and apparently artificial opening. He puts his finger into the extraordinary pocket, and lo! another brood of a dozen or more young, scarcely larger than a pea, are hanging in clusters on the teats. In pulling the creature about in great amazement, he suddenly receives a grip on the hand—a twinkling of the half-closed eye and the breathing of the creature evince that it is not dead, and he adds a new term to the vocabulary of his language, that of 'playing 'possum'."

WISE PROVISIONS OF NATURE.

"The whole structure of the Opossum is admirably adapted to the wants of a sluggish animal. It possesses strong powers of smell which aid it in the search for food; its mouth is capacious, and its jaws, possessing a greater number and variety of teeth than any other of our mammals, indicate its omnivorous habits; its fore paws, though not armed with retractile claws, aid in seizing its prey, and conveying it to the mouth

The construction of the hind foot, with the soft yielding tubercles on the palms, and its long nailless opposing thumb, enable it to use these feet as hands, and the prehensile tail aids it in holding on to the branches of trees, whilst its body is swinging in the air; in this manner we have observed it gathering persimmons with its mouth and fore paws, and devouring them while its head was downward, and its body suspended in the air, holding on sometimes with its hind feet and tail, but often by the tail alone,"—Audubon and Bachman.

A PROLIFIC AND RAPID BREEDER.

Many curious and mistaken ideas are entertained about the breeding of this marsupial. I secured an Opossum in Chester county, Pa., early in the month of March with a foetus in utero. Observations which have been made show that the young remain in the uterus from fifteen to seventeen days—they have no placenta or after birth—and when born they are assisted by the mother into her pouch where at once they attach themselves to the teats from which they receive nourishment and grow rapidly. The Opossum is exceedingly prolific, producing two or three litters annually. The female when one year old, it is stated, begins to raise a family.

AN OMNIVOROUS ANIMAL.

The Opossum is a voracious feeder and where abundant often causes the farmer and poultry raiser much annoyance. Like the Raccoon, he loves green corn. He is fond of chestnuts, and other kinds of mast are consumed by him. He sometimes kills and eats rats, likewise mice, and insects, and he feeds quite extensively, hunters and trappers say, on birds and their eggs; he will eat young Rabbits and he feasts on different fruits and berries. Ground-nesting birds such as the Quail, Pheasant and other

species which build their nests low down in trees or bushes are frequently destroyed by this robber. Different roots, as well as other portions of plants, furnish him sustenance. This animal often visits the hen-roost and destroys the farmer's fowls. Unfortunately a large amount of data which was collected from farmers, poultry raisers and sportsmen concerning the damage which Opossums do to poultry, corn and wild birds, was destroyed by fire in February last, consequently I am unable to give in this paper their valuable and interesting reports.

SOME OF ITS ENEMIES.

Several of the larger species of Hawks, likewise the Cooper's and the Sharp-shinned Hawks, as well as the Great Horned, the Barred and the Snowy Owls, also the Eagles, will attack Opossums. Foxes often surprise and devour them, and Weasels have been known to kill these marsupials; and on one occasion one of my acquaintances shot a Red Squirrel eating a young Opossum which it was supposed he had caught and killed. Few animals are more easily trapped than is the Opossum. The steel trap, dead fall or snare may all be used with success to aid in his destruction, and either vegetable or animal bait can be used.

RED FOX.

Vulpes pennsylvanicus.

DESCRIPTION.

About as large as a medium-sized dog; weight about fifteen pounds; height about fourteen inches; measures about forty-four inches in length, including the bushy long-haired tail which measures about seventeen inches, to the tip which is generally white. The ears, behind, outside of legs, the snout, and the tips of many caudal hairs, are black. The general color is "a bright, clear, yellowish rufous, darker on the shoulders and flanks." The belly quite white along its middle, darkens laterally; the chin, throat and breast are white or whitish. The Black or Silver Fox, sometimes, though rarely, taken here, and the Cross Fox, which is much oftener captured in Pennsylvania are called by naturalists melanotic forms or varieties of the Common Red Fox.

I know of three Black or Silver Foxes in Pennsylvania, and when last heard from they were all alive, elusive and hearty. One is in Clinton county, another roves near Lake Ganoga, a delightful and romantic place on the Lehigh Valley Railroad in Sullivan county, and the third one lives largely like a good many other poachers, on Ruffed Grouse up in Pike county.

We find, not infrequently, animals with very defective coats, which fur dealers and trappers call "Sampson Foxes," they have little commercial value. Mr. A. M. Brayton* says: "Regarding this peculiar condition of pelage, Mr. Allen is of the opinion that it is the result of a disease which produces a crisp, woolly condition of the fur much as though it had been singed; hence the common name of 'Sampson' or 'Samson' Foxes." Mr. Brayton referring to the Cross Fox, and the Black or Silver Gray Fox, says: "Dr. Coues regards the Cross Fox as a 'special state of semi-melanism' (melanism is the result of an excess of dark coloring matter) of the Common Fox. This variety, common in northern New York, and sometimes as far southward as Pennsylvania and Ohio, receives its name from the presence of a black cross formed by a black band along the back crossed by another on the shoulder. It shades by varying and almost insensible degrees into the Black or Silver Gray Fox.

"Complete, or nearly complete, melanism distinguishes the Black or Silver Gray Fox. * * * The color is a uniform, lustrous black, with conspicuously white-tipped tail; more or less of the long hairs of the back and flanks, top and sides of head greyish, silvery at the end, giving a silvered appearance to the pelage. The perfectly black pelts are found, chiefly, in high latitudes."

Such pelts are very valuable.

*Mammals of Ohio, p. 17, in Geolog. Survey of Ohio. 1882.

RED FOX.



The prices of furs are always changing but those quoted in a recent list of a New York fur exporter are:

Red Fox (Northern Pa.), \$1.50 to \$1.60.

Red Fox (Western Pa.), \$1.40 to \$1.50.

Grey Fox, (Penna.) .60c to .70c.

Silver Fox (Eastern, Ca., and N. W.), \$20 to \$110.00.

Cross Fox (Eastern, Ca. and N. W.), \$5.00 to \$10.00.

"While the Cross and Black or Silver Foxes are usually considered different 'varieties,' they are not such, in the classificatory sense of that term, any more than are the red, black, or white Wolves, the black Marmots, Squirrels, etc. The proof of this is in the fact that one or both of the 'varieties' occur in the same litter of whelps from normally colored parents. They have no special geographical distribution, although, on the whole, both kinds are rather northerly than otherwise, the Silver Foxes especially so. It does not appear to be ascertained exactly how far the styles of pelage tend to perpetuate themselves; that is to say, in what proportion of cases a cross will produce a cross litter, or a black, a black litter; but the inter-breeding of the several varieties, and their purely accidental origin, from parents of the normal coloration, are incontestable."—(Coues and Yarrow, Zool., Epl., W. 100 Merid. V. 18, 75, 53).

Habitat.—This species, including its varieties, is common in the Arctic regions and the northerly portions of the United States. Found generally throughout Pennsylvania, and in sections of the State this predatory animal is very plentiful.

The Red Fox surpasses all other of our mammals in cunning; he is also exceedingly wary and often when plentiful in a section, he frequently, by watchful and cautious ways, escapes observation.

PLENTIFUL IN MANY FARMING DISTRICTS.

This species is much more plentiful in many highly cultivated farming districts than is usually supposed. This was noted in Chester county, Pa., in 1886*, when, under the scalp act of 1885, in about four months, upward of a hundred Red Foxes (they were the genuine article, as no dog or other heads would "go" in Chester for Foxes) were presented for bounty and paid for by the commissioners.

*See in Chapter IX numerous records of Foxes in different counties of Pennsylvania.

SOME FOX HUNTERS WORRIED.

The publication of these bounty payments, together with the killing, for premiums, of some thirty Red Foxes in one week, in the West Chester Daily Local News—a newspaper which goes to nearly every home in the County of Chester, with its population of 100,000 people—created quite a furore among Fox hunters who loved to pursue, but not destroy sly Reynard. The objectionable scalp act was freely discussed, and by some roundly “cussed.” The fox hunters, with, possibly, a few exceptions, who condemned the bounty of a dollar a head on Foxes, made little complaint about the killing of Hawks, Owls and other birds which had been captured and paid for, at seventy-cents each (twenty cents to justice of the peace) to the number of about 800. The claim was made

“that it was a waste of public funds: the Fox was a badly abused animal and he furnished lots of sport: Hawks and Owls were of little or no account, and when they were killed off, the large bounty payments would cease and the money spent for them would, in future years be found, so far as poultry and game interests were concerned, to be a wise outlay.”

SOME THINGS THEY DID.

The members of the West Chester Microscopical Society, a body of well-informed scientific men, did not concur in the expressions quoted above, as can be seen by turning to succeeding pages. These birds, which devoured legions of destructive grasshoppers, and beetles or thinned out the Meadow Mice, were not, it is true, hunted by men in bright red coats, buttoned high in front, nor were they followed by pedigreed packs of baying hounds (that so often frightened the sheep, and sometimes stampeded the cows) and swift, high-priced, well-kept steeds, that tore the sod, or



BLACK OR SILVER GRAY FOX.

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occasionally smashed fence posts and rails, where beneficial birds of prey so often waited and watched, in daylight and dark, for insidious foes which consumed the land owner's crops.

Finally several of the Fox hunters—those who pursued Foxes for pleasure alone—who knew much of the damage done to poultry by Foxes with young, made up a purse, and agreed to pay farmers who were digging out old Foxes and their whelps, for all the domesticated fowls that were killed. It was further stipulated that Mr. and Mrs. Reynard's heirs should not be slain for bounty, but when caught should be kept alive, until a certain size, when they were to be liberated. This arrangement saved the lives of many Foxes.

A DIVERSION ENJOYED BY MANY.

Fox hunting for pleasure—a most exhilarating and, to many, enjoyable diversion—is engaged in by some of the foremost citizens of Chester, Delaware, Montgomery, Lancaster, Washington and perhaps a few other counties. In these localities there is more or less sentiment expressed in favor of Foxes.

THEY SAY HE DOES MUCH GOOD.

Some gentlemen, and I believe they are sincere in what they say, claim that:

"Foxes subsist chiefly on mice, rats, or other rodents; and also consume great quantities of grasshoppers and 'bugs': and that the consumption of these pests is of far more value, pecuniarily considered, than is the occasional turkey, chicken, duck or goose, which are rarely stolen, unless other food supplies run short."

These persons seldom, if ever, refer to the Fox's keen sense of smell, and acute hearing, which, with his

bright, sharp eyes, enable him, with wily strategy and soft, cautious tread, to destroy nearly all kinds of terrestrial birds, ranging in size from the old Wild Turkey which weighs twenty-five pounds, to an Oven-bird that weighs about a couple of ounces. Of course such a lack of knowledge is pardonable, for it is a known fact that few people who hunt in bright red clothes, find time to look on the trail of death which almost daily marks the Red Fox's path. They know him simply as a crafty and pretty creature, which by marvelous tricks is so often enabled to baffle the hounds, as he speeds through the valleys, across broad fields, over hill-tops, crossing streams, running on logs, or along fence-tops, and when tired defiantly shakes his much-prized "brush" and tossing his head, hides in the rocks.

SHEEP-KILLING DOGS AND FOXES.

Some sheep-killing dogs, it is asserted, will not commit their costly and vexatious depredations near home, and many claim that the Red Fox which has his wife and little ones near a farmer's hen coop will rarely visit it with evil intent, unless reduced to extremity by hunger's pangs. This, perhaps, is in some instances true, but if Mr. Fleetfoot Fox does not steal poultry, or young lambs near his burrow, so often usurped, he certainly does plenty of this kind of work away from his home. He is built for speed, and often travels over a large space of country on foraging excursions. When he leaves his vigilant wife and playful children and lies away on these food-hunting expeditions it is not uncommon for some neighboring relative who also left his family in a snug den—about which boxes, feathers, hair, and other animal remains

are scattered—to come and steal the poultry and lambs or young pigs of the farmer, which the other crafty Fox allowed to live unmolested. Naturally the result of this is that Foxes are, very generally, despised by farmers and poultry raisers, and they, not unwisely, destroy these “pesky brutes.”

SOME OF HIS NUMEROUS VICTIMS.

Sportsmen who have taken the pains to investigate the habits of Foxes, particularly the Red Fox, abhor them and urge their extermination, because it has been ascertained that where these marauders are abundant game of all kinds decreases with astonishing rapidity. The fact is well established that Foxes destroy, with indiscriminate greed, almost all species of desirable game—birds and mammals—which they can master. The fact that they will kill young fawns is beyond dispute and shows that the doe has in the artful Fox, as well as the sneaking Wildcat, foes which need constant watching. If it was customary for crafty and sagacious Foxes to hunt in packs, like Wolves do, there unquestionably would be a much greater paucity of Virginia Deer than at present exists in Pennsylvania. I have in my museum a Black Bear, about as big as a large house cat, which was obtained from a woodsman who said he found it at a Red Fox's den.

SOME ANIMALS FOXES KILL.

Among the numerous kinds of wild birds and mammals which Foxes destroy, remains of the following have been found in their stomachs or at their dens:

MAMMALS.

Fawn,
 Varying Hare,
 Gray Rabbit (Cottontail),
 Gray Squirrel,
 Black Squirrel,
 Red Squirrel,
 Chipmunk,
 Woodchuck,
 Opossum,
 Skunk,
 Muskrat,
 Weasel,
 Mice,
 Rats.

BIRDS.

Wild Turkey,
 Ruffed Grouse,
 Mongolian Pheasant,
 Quail,
 Woodcock,
 Field Plover,
 Sora,
 Wood Duck,
 Mallard,
 Dove,
 Meadowlark.
 Nighthawk,
 Screech Owl,
 Song Sparrow.

This list, so far as the feathered animals are concerned, could be materially increased as there is probably hardly a species of the bird family which nests on the ground that has not suffered from the raids of Foxes, which devour with alacrity any of them—old or young—and if these cannot be caught they eat the eggs. The Fox hunts in daytime as well as at night. He will eat carrion if nothing better can be found, and fish, it is said, are also sometimes agreeable to his palate. Some writers say he will eat ripe grapes and many other kinds of fruit, which is no doubt true, but I have never known either the Red or Gray Fox to feed on a vegetable diet.

FOXES LOVE LAMB CHOPS AND PORK.

As several gentlemen have sent communications to this office defending Foxes and also asserted that these animals seldom, if ever, disturbed lambs, and that it

was absurd to say that they would go near a vicious old sow when she had a litter of young, I wrote to Dr. L. W. Schnatterly, a well informed naturalist, of Freeport, Armstrong county, Pa. I knew he resided in a section of the Commonwealth where Foxes were said to be very numerous, and much addicted to stealing lambs, poultry and young pigs. The doctor kindly took the trouble to interview on this subject a number of his farmer friends and other reliable gentlemen. The facts thus obtained are told by Dr. Schnatterly in the following words:

Mr. John Ehrenfelt, a farmer and stock dealer of Armstrong county, tells me that every spring the Foxes stole many of his lambs, and the only way he could prevent it was to take a dead one, fill it with arsenic or strychnine and leave it where they would get it. He says he has cleaned the Foxes out many times that way.

Mr. Geo. Ralston, farmer, Armstrong county, has lost many lambs by Foxes but could never catch the cunning fellows at their work, but has found many lambs' pelts and skeletons at their dens. Along the Allegheny river hill which adjoins my farm there is a den of them now and they are around my barnyard weekly.

Mr. Geo. Sterick, formerly a farmer but now one of our townsmen, who used to be a great hunter says that all along the river and Buffalo Creek hills, you can see bones of lambs, pigs, turkeys, chickens and other game that would make a cart load at the many different Fox dens in the rocks.

Mr. Thos. Hill, farmer, Armstrong county, occasionally loses a few lambs and he supposes they have been taken by Foxes, but as he lives several miles back from the North hill they don't molest him very much.

Mr. Homer Iseman, formerly a farmer but now an oil and gas driller, relates what he witnessed only one year ago. He and Abe Thompson were drilling a well in Westmoreland county. Near where they were at work was a large flock of sheep and lambs. The latter were out playing one morning and a large Red Fox came down to the lambs. The Fox crouched down as a cat does and lay there motionless. The lambs played closer and closer until they came within a few

feet of the animal. The Fox made a leap and caught a lamb and started off with it for its den on the Creek hill; the men began to yell and they frightened the Fox so it dropped the lamb but it was crushed so it died.

Mr. J. E. Hodel, of Allegheny county, says that he and Jas. Henderson blamed a Fox for stealing their poultry; they sought for her den and dug her out. It was an old she Fox and they found several bushels of bones of lambs, pigs, ducks, geese, turkeys in an ante-chamber or dining room, by side of den.

Mr. Geo. Murphy, farmer, Armstrong county, tells me that several years ago a drover with sheep and lambs was passing his place and the lambs gave out and were left there a day; during that time a large Fox paid them a visit, caught and killed one, and then perched itself on the fence to bask in the sunshine. He went to get a gun to kill it but when he came back it had taken its prey and left. Not long after a sow had a litter of pigs in the woods; he heard them making a noise one day and went to see what was the matter. A big fight was on between the old sow and the Fox; the Fox would run at the sow like a dog, and then the sow would run at the Fox to drive it away from the pigs that were huddled in the nest; this was repeated several times until the Fox got the sow real mad and she made at the Fox and run it several yards from the pigs. The Fox then, quick as speed would let it, bounded round past the sow into the nest, grabbed a pig in its mouth and was gone before the sow could get back to the nest. He had to take the sow and pigs home to keep the rest from being stolen.

Mr. Thos. Stroup, farmer, Armstrong county, had four lambs taken in one week by Foxes. The lambs were one week old.

Mr. Samuel Reddick, farmer, Armstrong county, had a sow with a litter of pigs in the woods near house in a rail pen. A Fox or Foxes, made nightly visits to the pen and took seven pigs and the sow became so frantic and enraged that she tore the rail pen down to get at the intruder. The pigs were a week old.

Mr. Thos. Jack, farmer, says there is nearly a cart load of bones of all kinds of small animals at some Fox dens along the river hill near Logansport. None of the above gentlemen ever heard of Foxes attacking calves or killing them.

These remarks refer to both the Red and Gray Foxes but by far the greater amount of damage

was done by Red Foxes, as they are much more common. Dr. Schnatterly writes that farmers generally tell him they lose many lambs every spring by Foxes that come about chiefly at night. The indignant farmers and stock raisers know that Foxes commit these depredations as they find the remains of lambs at the Foxes' dens among the rocks.

WHERE PHEASANTS THRIVED.

I call to mind a locality in Centre county, where all the natural conditions are most favorable for Ruffed Grouse to live and multiply. Second growth white pine and hemlock thickets, and extensive patches of large rhododendrons (buck laurel) abound; wild fruits and berries, chestnuts, acorns, arbutus, ferns, together with other kinds of plant-food they live on, are plentiful in and around the old slashings and abandoned log and tram roads. But the noble Ruffed Grouse has for the past three years been very scarce there. Four years ago this splendid game bird abounded in this locality where I have often known a good marksman to shoot in a day's tramp, of eight or ten miles, from six to a dozen of them.

FOXES DID IT.

Some may say hunters killed all the birds; this, however, is not the case, but it is very clearly shown that Foxes are largely responsible for the Pheasants' diminution. When these birds abounded in this particular locality, preying birds and mammals, other than Red and Gray Foxes, hunters and trappers found to be fully as plentiful as they now are when the Pheasants are so scarce. The farmers who live in the valleys

that separate the mountains of this romantic region say Foxes have increased rapidly and their destruction of domesticated fowls, young lambs, and occasionally young pigs, causes individual losses, estimated to be from five (\$5) to twenty-five (\$25) per farm. These depredators are so cunning and sly that even the most experienced trapper rarely is able to catch one in any of the devices no matter how artfully placed.

TALKED ABOUT FOXES AND GOT SOME VOTES.

Recently I met a man, who formerly lived in the locality previously referred to, and as we traveled through the tangled underbrush, over old fields, and across disused log roads, and saw on the snow numerous "signs" of Foxes, we met three farmers who had just shot a Gray Fox which they were skinning. My companion knew the men, with whom politics and Foxes were discussed for a few minutes, then we separated. As the dinner gongs were sounding in the valley below, we sat down to lunch at a spring where a bright-eyed Weasel, in dark coat, peeped at us for an instant, through the matted roots of an upturned tree.

THE WEASELS.

My companion said:

"If you had been ready with the auxiliary barrel you could have had that animal. It is one of the smaller of the two species of Weasels that we have in these parts. This inquisitive and active little fellow kills rabbits and birds, but he catches great numbers of mice, and eats insects, and probably, in the course of his life, does more good than harm. The other species—the Common Weasel—so abundant in many localities and found, no doubt, all over the State, I think is a nuisance as he not only kills game but, oftentimes, cleans out all the chickens in your coops."

GOOD FOXES ARE DEAD FOXES.

Seeing that I was interested in his observations, my companion continued and spoke about as follows:

"During the last forty years a large portion of my time has been spent in lumber camps and places like you see about us. I have always taken a deep interest in wild animals, and am quite familiar with their haunts and curious ways. Some of them are, through a lack of proper knowledge, often most wrongfully condemned, but Foxes should not be included in this abused group. Careful observation leads me to say, good Foxes are dead Foxes, but their skins, if the animals are destroyed by poison, will not bring the highest market price; and expert fur-dealers readily recognize the ones which have been killed with poison.

"I am told that down in the vicinity of Philadelphia people—but surely they are not farmers—love and protect the Foxes, and say they are good things to have around farms to destroy vermin. I, of course, don't know anything about the habits of Foxes which live down there, but I doubt if they are a whit better than the ones you an hour ago heard those men talking about in such harsh terms.

THEY COULDN'T UNDERSTAND.

"You remember, I smiled and winked at you, but said nothing, when 'Andy' talked about dead Foxes as he pulled the Pheasant's breast meat out of the Fox's stomach you asked him to cut open; and, no doubt, you call to mind that all the men said they couldn't understand why it was that four or five years ago a man with a pair of good dogs might hunt all day and never start a Fox, but now, if all the 'run-ways' were covered by good marksmen, a party would get three or four in a day. When I first came here, about fourteen years ago, Foxes were very numerous, and when I found they killed so many Pheasants, Wild Turkeys and Rabbits, as well as all kinds of poultry, and sometimes young lambs, I tried to trap them but had poor success; they were too smart.

VALUABLE INFORMATION.

"One day as good luck would have it, I hired a man who had spent much of his time, in early life, with trappers in the far west. He suggested, that if I wanted to kill Foxes, it

could easily be done by shooting some sparrows, charging them with strychnine, and placing them where Foxes rambled. Before beginning this (to me) new mode of warfare against the cunning Foxes which had so often defeated me in former years, I spent about a week shooting sparrows, and I took some chickens' heads, and nearly twenty tame pigeons which I shot, and scattered these about places where Foxes loved to rove. These birds and heads were not poisoned; they were only put out to let the sly robbers learn how easily they could get a good meal by coming to my premises.

ANDY, IT WAS STRYCHNINE,' NOT DISEASE.

"The second week I followed the man's advice and soon dead Foxes were found scattered around over the mountains, in fields; generally, however, they were found near water. The farmers and woodsmen were astonished and always believed some fatal disease had attacked these animals. I followed this plan, every season, with the result that Foxes, after the first two years, were hardly ever seen.

BIRDS INCREASED.

"The Pheasants increased rapidly, and many of these little ground birds which you know by different names, were much more plentiful then than they are now. Four years ago I left this place; no more Sparrows were put out for wandering Foxes, and, you see, as they increase Pheasants decrease, and the Wild Turkey is rarely, if ever, seen in places where five years ago it was of common occurrence.

HOW TO FIX THEM.

"If you ever want to destroy Foxes get a lot of Sparrows—English Sparrows are worthless—and open the belly, pull out the insides, then put in the cavity as much strychnine as you can hold on the point of the small blade of an ordinary pocket knife, then push the entrails back; take about three poisoned birds and put them in a place together; hang them on a low bush or twig, lay them on a stump, or anywhere in the Foxes' feeding grounds, away from human habitation.

WHAT A CHESTER COUNTY FARMER BELIEVES.

"Sometime ago you sent me a circular asking about birds and animals. I will send you some memoranda which can, if

they are worth the space, be used in your books, but I do not care to have my name go with them, as I make no pretensions to be either a naturalist or a writer.

HAWKS AND OWLS.

"There are several kinds of Hawks and Owls about our farm and most of them do little harm because they live chiefly on Mice. Of course, every now and then a pair of big Hoot Owls (Great Horned), which nest in February in the woods, come around and steal some chickens, but they, too, eat Mice, Rats, and Rabbits, all of which, when numerous, are a nuisance. Then there are two varieties of slimly-built Hawks, with long tails, that every spring are very troublesome when the hens hatch out their broods. These Hawks will sometimes dash by you and carry off a young chicken under your very eyes. My son, last year, shot two, and the taxidermist who stuffed these birds called them the Cooper's Hawk, and the Sharp-shinned Hawk. These names may be right but we call them Chicken Hawks. When they can not get chickens they kill birds such as the Robin, the Lark, the Dove, and lots more of smaller kinds that I call field and ground chippies; and these Hawks always kill Partridges when any are about, but won't catch grasshoppers and Mice as the little Sparrow Hawk does. They do much mischief and I believe should be killed.

WEASELS, SKUNK AND MINK.

"When the Skunk gets in the habit of visiting the hen roost or stealing eggs he had better be dead so far as the farmer and poultry raiser are concerned; but Skunks generally, I believe, would rather eat grub-worms, June-bugs, grasshoppers, crickets, other kinds of insects and Mice. When these can be found they don't often come about to rob our hens. I like the Weasel because he kills so many Mice and Rabbits, but then he, too, frequently comes to rob us of poultry, and his visits mean the death of many fowls. The Mink is a very bad neighbor. A family of Minks did much damage to our fish in the pond last year, and killed a lot of ducks, and several chickens; then the boys, luckily one day, found the Minks in their nest under an old building near the dam, and they killed them all. There are not very many Minks about these parts, at least, I have not seen or heard of any for nearly twelve months past. I never knew the Red Squirrel to disturb chickens but he kills a good many Robins and some other small birds. Rats are great poultry thieves; and once I saw a Mouse eating a chicken,

two or three days old, which I believe it caught. 'Coons and 'Possums both catch chickens, but neither is half as bad in this respect as the Red Fox.

THE FOX A TERROR.

"This wily and sagacious animal is not only fond of chickens but he will catch ducks, turkeys and geese whenever a chance is offered. He menaces the lives and happiness of all birds which brood on the ground; he is a terror and most adroit in this line of contemptible plunder. The great scarcity of Part-ridges (Quail) in this and neighboring counties, where some years ago they were quite abundant, I think is mainly due to the Fox devouring the eggs and young, and the old birds too, if he can catch them. However it may be, as some say, that mowing machines have been, in part, the cause of the pleasing call 'Bob-White' becoming so scarce; but as already stated I blame the sharp-nosed Fox for the scarcity of the plump, white-throated whistler.

EVERYBODY KILLED FOXES THEN.

"Sixty years ago, when I was a boy, everybody killed all the Foxes they could; they were usually shot, as they were very hard to catch in traps. About ten years ago one of our boys bought a new shot gun, and early one bright spring morning when the birds were singing their sweet, joyous songs of praise to the Giver of all that is good, I took it and slowly made my way through the dewy grass, behind a hedge row, to some rocks where I knew a family of Foxes lived. Reaching the place I saw an old Fox and five young ones, about half grown, devouring one of my neighbor's ducks. I shot both barrels and killed two of the young, and the rest scampered into the den in the rocks. I felt well satisfied with my success and took the animals down to the house.

HE PLEAD AND ALMOST CRIED FOR FOXES.

"You can imagine my surprise when my nephew, a young man of about twenty, nearly cried when he saw the dead Foxes, which he said he had paid our hired man to watch so no harm might come to them. He told me how they destroyed mice, caught all kinds of harmful bugs, hunted grasshoppers, and killed Rabbits which consumed the cabbage and barked young fruit trees when deep snows covered the ground. Finally I promised not to shoot any more Foxes, and the agreement has

not been broken. I was at a loss to understand how he had become so impressed with the good deeds which he attributed to Foxes, yet seemed to know nothing of their evil ways.

HOUNDS AND A BOB-TAILED HORSE.

"Later on I found he had an interest in a pack of dogs, which in winter season he followed with fancy dress, colored like the British wore at the Battle of Brandywine where some of his ancestors died; and he had a bob-tailed saddle horse, that could run and jump the fences. When I was young we didn't have such things, but times, and the ways of people, have changed most remarkably. I sometimes think as I learn of baneful results of many of these changes that it is well that my eyes have grown dim, that my hands have lost their cunning, my steps become tottery, and that soon I shall depart this life and rest in peace, love and contentment with my God above. Foxes now live unmolested on the farm and although they often take chickens or ducks I never complain, as the money value is small, probably not over five or ten dollars a year from all Foxes, and the other kinds of poultry-catching pests. When my good wife, who sleeps in the church yard over the hills, and I began life ten dollars was considered a good deal, but now it don't seem to be valued by young people, particularly if some one else earns it, and gives it to them to spend. A boy or girl rarely appreciates the true value of dollars, unless they earn them by honest work.

"I hope you will deal fully with the birds and animals, and write books without a lot of big Latin names, so that our school children can read them and know more about the true relations that these creatures have in the broad field of nature. The lack of proper information about insects, birds, animals and plants is a source of much loss to those who engage in agriculture.

HOW HE BEHAVES ACROSS THE OCEAN.

In the Old World Foxes appear to be just as bad as they are on this side of the Atlantic. The European Red Fox, eminent writers say, has no specific identity from our Red Fox. To show how the Fox acts in other lands the following extracts are transcribed from Dr. Brehm's Life of Animals:

"The Fox preys on all animals from a young roe to a beetle, but principally Mice. * * * He spares neither old or young, and zealously pursues Hares and Rabbits, and even attacks young roes or Deer. He not only plunders the nests of all birds brooding on the ground, devouring both eggs and young, but also tries to overcome the old birds, and not infrequently succeeds in doing so. He swims and wades through swamps and marshes, in order to reach the birds which brood on the water, and there are cases on record where he has killed brooding Swans. He also attacks tame poultry and effects an entrance into isolated farm-yards at night; and if he is afforded a good cover, he pursues the poultry even in broad daylight. In large orchards and vineyards he is a more frequent visitor than one imagines. There he catches grasshoppers, May-bugs and their grubs, Rain-worms, etc., or gathers sweet pears, grapes or berries. At the river bank he tries to surprise a fine Trout or a stupid Crab; at the sea-shore he empties the nets of the fishers; in the forest he robs the nooses spread by the hunter. In this way his larder is always well stocked and he becomes straitened in circumstances only when the snow is very deep and impairs his opportunities. Then he is satisfied with anything edible, not only with carcasses, which he will feed upon at any season and seems to like, as all Canidae (dog family) do, but even with an old, dried-out bone or a piece of half-rotten leather. Quite frequently, also, he visits the encampments of wood-choppers to pick up the remains of their repast. When his hunger is half satisfied, he plays long and cruelly with his prey before dispatching it. * * * Only the pangs of hunger can goad him into reckless actions; but when he has been long deprived of food he becomes downright impudent. In broad daylight the hungry Fox will put in an appearance in a yard, seize upon a Chicken or Goose before people's very eyes, and hasten away with his prey. He is much averse to parting with the booty so arduously procured, and if he is compelled to relinquish it, he repeatedly returns to see whether he still cannot make away with it. The same boldness is occasionally displayed by him under circumstances calling for immediate flight. Once a Fox, which was being hunted by hounds, and had twice heard the shot buzzing by, seized a sick Hare in his flight and carried it with him for a considerable distance. Another was surrounded in a field; he came out, attacked a wounded Hare, killed it before the eyes of the huntsmen, rapidly buried it in the snow, and then fled directly through the line formed by the sportsmen."

THEY DO FAR MORE HARM THAN GOOD.

Field observation and post mortem examinations show that Foxes unquestionably do far more harm than good. The great destruction of wild birds is, I believe, of more loss to agricultural interests than the benefit such interests receive from Foxes catching destructive mammals, grasshoppers and other forms of insect life. Foxes not only destroy all kinds of song and insect-eating birds and eggs they can get, but they consume game of all kinds—and many of the game birds, at certain seasons of the year eat harmful insects. Advices from different parts of our State, especially in some of western counties, show that Foxes kill a great many young lambs, and sometimes destroy whole litters of pigs; this means a loss of money which, in the aggregate, is considerable every year. The destruction of all kinds of domesticated fowls by Foxes is shown on succeeding pages to be a serious hindrance to poultry raisers. There is little doubt that Foxes—both species—destroy annually many thousands of dollars worth of poultry in Pennsylvania. Gray Foxes do less injury to poultry interests because there are less of them in our State, and, as a rule, they seem to prefer to stay in woods and thickets away from the habitations of man. The Gray Fox seems to want to keep away from man's improved possessions, and while he often steals the poultry of farmers about the outskirts of the dark thickets and tangled underbrush he lives in, his evil work consists mainly in destroying beneficial birds and game. The Gray Fox is a good traveler, but he does not, when searching for food, it appears, wander over so much territory as his red-coated relative. In the southern states where Gray Foxes are much more numerous than they are with

us, they catch large numbers of Quails; and in this State Quail, Wild Turkey and Ruffed Grouse or Pheasants, and their nests, are destroyed by the sneaking gray-coated depredators whenever they can surprise the birds or find their carefully-concealed homes.

WHAT FARMERS, POULTRY RAISERS AND SPORTSMEN SAY ABOUT RED AND GRAY FOXES.

HON. N. B. CRITCHFIELD, Jenners Cross Roads, Somerset County:

A neighbor had a flock of eighteen turkeys, consisting of mother hen and seventeen half-grown ones, destroyed by a Fox in one night during last summer. It was believed to be a Red Fox because a track was outlined by feathers dropped on the way for a distance of over a mile into a piece of woodland where it could be plainly seen that the turkeys were dragged into a hole under a ledge of rocks, and around the hole were feathers and bones of other fowls that had been taken. The mother Fox may have had help from the paternal occupant of the den, but of that we cannot be certain. On the second morning after this wholesale destruction my attention was attracted by the vigorous barking of a Fox at a spot near where the turkeys were when they were taken and when I gave his foxship chase he went directly to the den of which I have spoken. We have both Red and Gray Foxes; they are detrimental; the Red is much more common and destructive than the Gray.

A. W. COLEGROVE, Colegrove, McKean County:

Both Red and Gray are found here. Red is very plentiful. They are very destructive to game; they, with the Wildcats, will exterminate it in a short time if something is not done to exterminate them. A large portion of this county is old slashings and bark peelings which makes an ideal haunt for them.

E. O. AUSTIN, Austin, Potter County:

Both Red and Gray Foxes are plenty. The Red predominating and most destructive to poultry. The Gray and Red Samson Foxes are very shy of clearings and all prefer small wild game, and all are persistent mousers; either kind, as well as the Wildcat, will kill and eat the Porcupine, skinning him with

almost a single snap and jerk. They occasionally take poultry or a young lamb, but I consider them far more beneficial than detrimental to the farmer. I have had young lambs carried off by Foxes, but have never had or heard of calves being injured by Cats or Foxes. About ten years ago an old she Fox was so persistent after a weak lamb near my house that she would not be frightened away and I was compelled to shoot her.

The Mink, Fox and Wildcat will attack and kill turkeys, ducks, geese and chickens. The Weasel also is at times very destructive to poultry, yet people often take great trouble to get a Weasel to put in their barns on purpose to drive away the rats and mice. The Great Horned Owl is also very destructive to poultry, especially to young turkeys and chickens. The Owl, too, is probably the worst of any creature on the Pheasant or Ruffed Grouse. It matters little how many start in to winter, the Owls, with the help of the Fox, will diminish their numbers greatly by spring.

A. JUDSON SMITH, New Millport, Clearfield County:

Both species are found here, but the Red is more plentiful than the Gray, and the Red more sly and destructive than the Gray. They are not numerous enough to do much damage to poultry, although I lost a setting turkey hen and her eggs last season, and I hear of some others; but some parties here claim they are beneficial in destroying meadow mice. They destroy Rabbits and while we do not grieve over that, we would prefer they leave the Pheasants alone, which they do not seem disposed to do.

B. ALEXANDER, Conemaugh, Cambria County:

We have both species and both deemed equally destructive to poultry and game and small birds. Our Grouse, Rabbits and Quail are almost exterminated by the depredations of these animals. Many complaints from farmers about destruction of fowls and young lambs. These animals are very numerous since the removal and refusal of our commissioners to pay the bounty.

E. P. CAMPBELL, West Pittston, Luzerne County:

Both kinds are here: Red most common. Killed three young and two old Foxes; the male was red and full grown, the female gray; these were the dam and sire of three pups; they are

as strongly marked a cross gray and red as I ever saw; I examined the stomach of one of the two-thirds grown pups and it contained Field Mice and remains of Pheasants.

GEO. W. HILL, Media, Delaware County:

I have lived on or been interested in some farm in Delaware county for sixty-five years and have noticed particularly the habits of Red Foxes and believe them to be beneficial to the farmer. Many of our best farmers are of our opinion, and will not suffer them destroyed or disturbed. It is true where they have pups they will occasionally take chickens, but never until the stock of Groundhogs, Muskrats and Mice are exhausted. I have known them to carry Groundhogs and Muskrats one-half mile to their young and have watched them catch Mice and pile them up eight or ten in a heap after they had eaten all they wanted, and verily believe by destroying these animals they more than pay for all the poultry they eat. We have no Gray Foxes.

DR. J. E. CLEVELAND, Canton, Bradford County:

We have the Red, Gray and Cross Fox. The first quite common and all equally destructive in proportion to their numbers. Foxes destroy a great many Field Mice and not a few Woodchucks; but, on the whole, I believe them detrimental to the farmer.

When a boy on my father's farm I went to a back pasture to drive home the sheep; as I got in sight of the flock they were huddled together and looking towards the woods; I soon discovered the cause of their fright. A Fox was making towards the woods as fast as his burden would let him. The farm dog gave chase and the Fox dropped his prey and scampered off. I found a lamb still bleeding that the Fox was carrying off. The sheep had dropped the lamb that day but it was large and had apparently been on its feet and nursed. Several lambs had disappeared mysteriously. Several days after while hunting for drummers (no game laws then), I found a hollow log with feathers of Geese and Turkeys, skulls of Woodchucks and bits of lamb skin with the wool on scattered around. I stopped up the end of the log with stones, secured help and an axe and took out of the log the mother Fox and five whelps. I hear complaints every year from the farmers among whom I practice of their losing poultry. Grown and half grown fowls are usually taken in the day time and by Foxes. If a large number of fowls are

taken from a neighborhood a search generally reveals a den of young Foxes with abundant evidence of where the lost poultry has gone. Chicks that are destroyed at night are generally at roost near the farm buildings where a Fox dare not come. A steel trap usually proves the marauder to be a Skunk. Last summer one of my patrons complained of losing hens eggs and blamed the domestic cat. I took an egg and with the sharp point of a knife made a small hole in one end of it and worked in a grain or so of strychnine and requested it to be put in the nest after the hens had gone to roost, and to be looked after early in the morning. The egg disappeared and a full grown Skunk was found dead a few rods from the hen house. Rats destroy the eggs of poultry.

RANDALL BISBING, Minsi, Monroe County:

We have both Red and Gray Foxes. They occasionally take a chicken or turkey for a change, but they fairly earn them by catching large quantities of bugs and beetles and grasshoppers. Yet I believe if the bounty was taken off their heads they would become so plentiful that they would be a great detriment to poultry raisers. I have caught Foxes, Minks, Skunks, Opossum, Wildcats and Weasels in the act of killing poultry. Cannot remember the number killed. Foxes as a rule kill but one bird at a time and carry it away if they have young to feed. They will come for chickens every day or every other day. A friend had ten young turkeys taken by Foxes this last summer; he found the family house and dug out two young ones, Red and one Cross Bar, and this confirms a theory of mine that the Cross Bar Fox is only a freak of nature. The Mink and Weasel will kill from one to a dozen fowls at a time, and I think the Weasel is the most destructive to poultry and Rabbits, yet they prefer Rats to Chickens, and won't kill the latter as long as Rats are plenty.

P. FRANK RANGLER, Lewisburg, Union County:

I consider the Fox the worst enemy to our game birds. Near the close of the last season I was hunting Pheasants along the "White Deer Creek" well up in the mountains, when just at evening I shot a fine bird that fell on the opposite side of the creek, and as I could not cross the creek without walking at least a mile or get wet, I concluded to let the bird go until morning, when I would hunt that side of the creek. The next morning I started with the assurance of having at least one dead bird to begin with, but what was my disappointment

when coming to where I had marked the bird—only to find a lot of feathers—a Fox having claimed the other share during the night. There being several inches of snow I saw that this fellow had left his trail at least thirty yards—went straight to the dead bird and after devouring it returned by the same track to the old road and went up on the mountain. Now then, if a Fox can scent a dead bird that distance how many Pheasants do you suppose one Fox will kill in a year? and how about the young birds that cannot fly or protect themselves at all? Foxes destroy a great many Turkeys, Chickens and Ducks for our farmers. Both species of Foxes are found in this and neighboring counties, but the Red Fox is the most numerous. The Gray Fox don't often come about farm buildings, but he catches all the poultry he can which wanders near his favorite haunts in the woods and slashings, he devours large numbers of ground-nesting birds and is probably as bad as the Red Fox in destroying Pheasants. I certainly favor a bounty for the heads of these cunning rascals.

J. H. DAVIS, Water Street, Huntingdon County:

We have both Red and Gray Foxes; the former is the most common. The Fox and Polecat have often taken whole broods of chickens from us; the Polecats come within three rods of the house and interview the occupants of the coop.

HON. CHAS. LUHR, St. Mary's, Elk County:

We have both Red and Gray Foxes, and the Red predominate. They will visit very often the hen roosts and are very bad about destroying game, especially Pheasants and Rabbits. Both detrimental.

J. R. LEHMAN, Warrior's Mark, Huntingdon County:

We have both Gray and Red Foxes. The Red is the most common and destructive to chickens and turkeys. Consider both kinds detrimental to the farmer.

HON. P. M. LYTLE, Huntingdon County:

Both Red and Gray occur here. Red species is the most common and most destructive to game and poultry. Both kinds are detrimental to the farmer.

L. WELLS, Wyalusing, Bradford County:

Both kinds found here. Red is most destructive to poultry, because it is more numerous than the Gray. Both kinds de-

your a great deal of game and catch some Mice. Consider them detrimental.

FRED. L. KRAEMER, Williamsport, Lycoming County:

We have both the Red and Gray Foxes in our county. The Red is the most common and destructive in our neighborhood.

P. S. STOVER, Lavonia, Centre County:

We can hardly raise turkeys at my place because of the Foxes; we have to watch them nearly all day in summer.

DR. A. D. JOHNSTON, Allegheny:

We still have the Red Fox, thanks to his superior cunning. They are not very abundant. They do help themselves to the farmer's chickens occasionally. No bounty should be paid for them. The sportsman will take care of them that they do not become too abundant.

W. C. BABCOCK, Blossburg, Tioga County:

Red Foxes are plenty, the Gray scarce; very destructive to game. Are detrimental to farmers because they destroy so much poultry. They catch a good many Mice and some insects also.

ABNER FAGUE, Picture Rocks, Lycoming County:

I have known Wildcats to kill young Deer and Foxes to kill young lambs. The Red Fox is most common and destructive to poultry of all kinds. Both Red and Gray Foxes are great destroyers of game, and they also consume large numbers of small song birds. They are very bad tenants on the farm. The Mice and other enemies we have which Foxes catch do not compensate farmers and poultry raisers for fowls they lose by the Foxes' cunning raids.

W. H. HERBERTSON, Brownsville, Fayette County:

I often see where Foxes have got in their work on both domestic fowls and game birds. Foxes and Hawks are our worst enemies in this section and we kill all that we can, and the Gun Club has been paying fifty cents per head on all killed within six miles of our town.

A. P. YOUNG, Millville, Columbla County:

Have had Turkeys and Chickens on different occasions taken by Foxes; Skunks will rob nests. There should be a bounty on Foxes.

DAVID COPE, Leonard, Chester County:

Red Fox rather common and I consider this animal detrimental to the farmer.

F. H. FASSETT, Meshoppen, Wyoming County:

Red Fox common, Gray Fox rather scarce. Both are detrimental; they destroy poultry, game and song birds which brood on the ground.

CAPT. JOHN M. BUCKALEW, Fishing Creek, Columbia County:

Foxes, Minks and Weasels all destroy poultry. Have many times found feathers and bones of domestic fowls at dens of Foxes; also have seen both Foxes and Minks carrying off poultry.

Red Foxes and occasionally Gray are found here. Red common and quite destructive to game and song birds and their nests. Gray believed to be quite as much so, as he is inclined to climb.

H. K. MENSCH, Muncy Station, Lycoming County:

Foxes have destroyed many Turkeys and Chickens for me and my neighbors.

W. F. WAGNER, Coalport, Clearfield County:

Both kinds are here, the Red Fox most common. Both species are detrimental to the farmer. They destroy a large amount of poultry and are persistent hunters of game. Pheasants and all birds which build on the ground are destroyed by Foxes.

A. W. WRIGHT, Colfax, Huntingdon County:

Have known Foxes on different occasions to kill lambs, and know of numerous instances where he caught Chickens and Turkeys. Weasels often destroy poultry—Turkeys as well as Chickens. Foxes, both Gray and Red, are certainly very detrimental to farmers. They destroy many broods of the Wild Turkey, and Pheasants are one of their main articles of diet.

PROF. H. T. FERNALD, State College, Centre County:

Both species are found about here, but the Red Fox is much more plentiful than the Gray. They do much damage to poultry and game.

TOWNSEND PRICE, Canadensis, Monroe County:

Foxes and Minks catch a good many Chickens and Ducks. Skunks and Foxes destroy eggs. Foxes do a great deal of damage to game interests by devouring so many Pheasants and Rabbits.

J. E. HALLOBAUGH, Patterson, Pa.:

We have both the Red and Gray Fox; consider them detrimental to farmers.

SAMUEL M. DOWNS, Mauch Chunk, Carbon County:

Have both Red and Gray Foxes. Gray is the most common and destructive to game and poultry. I consider both kinds detrimental to the farmer.

I. D. HOWELL.

Foxes, Red and Gray, are quite plentiful and increasing; since the premium for killing is stopped there is no inducement to hunters to capture them. The Fox is ever prowling round improving every chance, and is very bold and daring. Several of my neighbors last year lost their hatching Turkeys and the whole brood by a Fox; a few days ago a neighboring farmer had one killed in sight of his house by a Fox. The Fox occasionally carries off a Lamb; would steal all of them but for the old dam that is usually on guard. Last spring a year ago, there were some fifty Foxes caught in this section by three hunters. The Red Fox is the worst.

M. C. OSBORN, Henderson, Mercer County:

We have some Red Foxes, but they are no good to the farmer; I think they hunt Mice and young Rabbits, but the farmer can get along without them.

THOS. B. DARLINGTON, West Chester, Chester County:

Foxes are more plenty than welcome and farmers who are not hunters would be glad if there was not a Fox in the county;

they take a great deal of poultry and birds as anyone may see by going to a den when they have a litter of young to feed; it has been my opinion for a long time that they destroy a lot of Partridges while roosting on the ground at night; they also catch the Redwing Blackbird and other species which nest on or near the ground.

DR. A. B. MacCREA, Berwick, Columbia County:

Both kinds here; Red common; they are destructive to poultry in the back districts. They are very detrimental to game.

ALFRED SHARPLESS, West Chester, Chester County:

Foxes are rather plenty and no doubt carry away many Chickens, Ducks and Geese that cannot be accounted for from the farmer's flocks. His presence here is a nuisance because of his bringing out sportsmen and dogs who daily traverse the country throwing down and destroying fences in their reckless pursuit of him. A bounty should be placed on his scalp.

JAS. S. NEASE, Washington, Washington County:

The Red Fox only is found here. Destroys some Rabbits and occasionally Ruffed Grouse and Quail. Foxes destroy humble bees, yellow jackets and Mice. I consider them to be beneficial to the farmer.

GEO. MONTGOMERY, Washington, Washington County:

A farmer who lives in the western extremity of this county told me he had nineteen Turkeys killed by Foxes last fall. Do not know of any Gray Foxes in this county. The Red Fox is very destructive to game and poultry, and has been known to steal a whole litter of young Pigs. They kill a great many Field Mice, but I think they might be classed as detrimental to the farmer.

JOSIAH PILE, New Lexington, Somerset County:

We have both Red and Gray Foxes; the Red is the most common and destructive. I consider both species detrimental to the farmer.

E. B. HOSTETLER, Kingswood, Somerset County:

We have Foxes, both Red and Gray. They will kill Lambs, Chickens, Turkeys, Pheasants, Rabbits, etc.

W. J. STULL, Coalport, Clearfield County:

We have both Red and Gray Foxes; the Gray are very rare, the Red more common and destructive to poultry and game. I consider Foxes detrimental to the farmer.

JOHN KELLOW, Carley Brook, Wayne County:

The times are so numerous where I have personally suffered from the depredations of the Red Fox that I cannot detail them. Every year we lose from five to twenty Turkeys by them. Three years ago I lost eleven out of a flock of twenty Turkeys, and in the daytime while the workmen in a neighboring hay field were looking on. The Turkeys were catching grasshoppers in a pasture lot adjoining the hayfield, but at some distance from the men; there was a woods close to the pasture, and when the Foxes attacked them they flew in every direction. It was near evening. As soon as the workmen told us we went for them and recovered four or five before dark; the next morning we found four or five in the trees; in all we got nine out of twenty. Sometimes the Foxes will find a hen Turkey sitting on a nest of eggs, when they take both Turkey and eggs. I could tell of scores of their depredations. It would take a ream of paper to detail all of the mischief of the red devils.

JEREMIAH PHILLIPS, Garrett, Somerset County:

Three years ago, right in our neighborhood, there were about 100 young Foxes caught for premiums, and if they had made their escape the farmers could not have raised any Lambs or poultry. One spring there was a den of a Fox close by my father's, and he caught about sixty Turkeys and probably twice as many Chickens in the neighborhood. One Sunday we heard a racket among our hens. My father walked out to see what was wrong, and there was a Fox going for them. He went back to the house, got his rifle and shot him; he had killed eight chickens. I could name several cases like this. I have on several occasions found dens which were well filled with the remains of poultry, Pheasants, small song birds and Lambs.

SAMUEL BOTHELL, Shelocta, Indiana County:

Both species occur here; about eight Red to one Gray. They both are very detrimental; they thin out Rabbits as nothing but a very hard winter will do.

Have personal knowledge of Foxes carrying off young Lambs, A few years ago I lost eight; they take them any age under

three weeks. Crows will kill very young Lambs by picking their eyes out.

I have personal knowledge of most all domesticated fowls being killed, carried off and injured by Foxes, Minks and Hawks. Last summer a Fox reared its young within half a mile of our poultry yard, and they carried off for us from twelve to thirty full grown Chickens during the daytime. We saw them several times. A few years ago we lost seventeen half-grown Chickens in one night, presumably by a Mink—anyway by a blood sucking animal. I have often noticed Crows destroying young birds, their eggs and the eggs of fowls.

A. C. SISSON, La Plume, Lackawanna County:

Foxes, both Red and Gray are found here; Red the most common and destructive to poultry and game; they are no benefit to the farmer, but detrimental. Foxes occasionally take young Lambs.

JAMES THOMAS, Curwensville, Clearfield County:

Foxes, both Red and Gray are very destructive and very plentiful, destroying poultry and game; also carry away young Lambs, and are highly detrimental to the farmer.

HARRY WILSON, Gum Tree, Chester County:

I have never seen any but the Red Fox in Chester county. I have seen this Fox catch grown hens in daytime. I once saw a Fox catch a hen which owing to her weight he was unable to carry; the Fox after dragging it a short distance took the hen by the head, threw it across his body over the shoulders and ran with its head to one side. It is generally believed that Foxes live in holes, but I have more than once come upon them in daytime sleeping curled up dog fashion in fence corners; so I believe except as a refuge, and during breeding season, and while the litter is yet young, Foxes do not live in holes. I do not believe that Foxes are more detrimental to farmers than beneficial. They destroy a vast amount of Field Mice. I have never had a Fox visit my hen roost or poultry yard except when they had a litter. I have on two occasions seen a Fox chase sheep, but in both cases as the sheep ran to buildings, the Fox gave up the chase. I once dug out a litter of young Foxes for the Fox bounty; there were five in the hole. I found along the passage way leading to main burrow two pockets or recesses, in the side of the hole; both, like the nest, were lined with dried

grass, and contained Chicken feathers, bird feathers, Rabbit fur, bones and a much decomposed Weasel.

DR. L. W. SCHNATTERLY, Freeport, Armstrong County:

Both species occur here; the Red most common and destructive to poultry. They destroy a great many broods of young Quail and Pheasants. Both kinds destroy young Lambs.

GEORGE W. CHAMBERS, Mifflinburg, Union County:

We have the Red and Gray Foxes; the Red the most common; the Gray stay more on the mountains, but the Red ones come into the valleys and live among the rocks, where they are safe. They do considerable damage, and are the most destructive to poultry and game on account of their roving disposition. A few years ago an old Fox made her home in a piece of timber not far from my home. Turkeys that were hatching out in the field were killed. We tried to find her but could not until a little snow fell, when one evening we found a hollow tree in which we supposed she had some young hid; being late, we concluded we would wait until morning, and that night the snow melted. In the morning we cut down the tree, but she had taken them away in the night. The tree was filled up with Turkey and Chicken bones. They destroy many Quail and Pheasants. I do not think that the Fox scalp act should be repealed, for they would become so plentiful as to become a great nuisance to farmers.

F. J. WAGENSELLER, M. D., Selinsgrove, Snyder County:

We have both the Red and Gray Fox; the Red is the most common and the most destructive to game and poultry. I consider them detrimental to the farmer, and one of the chief causes of the decrease of game.

W. R. PARK, Athens, Bradford County:

Both Red and Gray Foxes are present, but Red most plentiful and destructive to game. Would consider them detrimental to farmers in many ways.

F. M. McKEEHAN, Ferguson, Perry County:

Foxes are common, but few Gray ones; ordinarily Foxes do not do much harm to poultry, but destroy much wild game. When they have their den of young the old she one becomes

very bold. A gentleman told me last spring a Fox made a raid on his poultry nearly every morning. He was on the lookout for it; when he saw it coming he ran for his rifle, when the lady of the house cried out "the Fox!" The Fox then turned and ran for an old hen, never stopping; but as he grabbed the hen, he shot; the Fox ran on, the hen rose and flew to barn dropping dead; the Fox had bitten her in the head.

Mr. Isaac Orwan, who has given considerable thought and attention to our mammals, says, when in Northumberland county, he found a den of Foxes around which were pelts and bones of Lambs. A Mr. Park residing near there had lost about fifteen Lambs. Another time he found a den where a Weasel had just been caught and brought in. He has frequently found dens where there were plenty of poultry feathers.

JASPER T. JENNINGS, New Milford, Susquehanna County:

The Fox often destroys Partridges and other kinds of game, and is probably more of an enemy to the hunter and sportsman than he is to the farmer.

AARON WEIDNER, Arendtsville, Adams County:

We have both Red and Gray Foxes; the Gray are the most common and destructive to game and poultry. I consider both detrimental to the farmer.

C. P. MOTT, Milford, Pike County:

Foxes are quite numerous, but their natural food of Squirrels, Rabbits, Birds, Mice, Moles, etc., so nearly furnish their wants that their slaughter of poultry near clearings and habitations are infrequent. They, like the Weasel, Mink, Wildcat and Groundhog, appear to have no usefulness to compensate for their depredations and should go.

JOHN F. THOMAS, Carrolltown, Cambria County:

Foxes are known to be destructive to all smaller game, particularly Rabbits and Ruffed Grouse (when hatching) as well as to the Quail. We have in this county both Red and Gray Foxes, but the Red predominates and is the most destructive. I think the Fox (either kind) highly detrimental as regards the preservation of our game.

H. C. KNOUSE, Swales, Juniata County:

Gray Foxes are rare; Red Fox is a great enemy of both poultry and game; they depredate in day time and make bold to

come close to the house; but the greatest damage they do is among Turkeys, since Turkeys take a wide range and are therefore more exposed.

C. W. DICKINSON, Norwich, McKean County:

Have both Red and Gray Foxes in this county, but the Red is the most common. They do but little damage to poultry; they catch a good many Rabbits and Partridges and many kinds of small birds. I think the Fox does as much good as he does damage, for I know he catches a good many Squirrels, Woodchucks and Field Mice. The Fox is a great hunter. I have seen an old she Fox with five Mice in her mouth at one time that she was carrying to her young. I have seen a Fox with four Chipmunks (Ground Squirrels) in her mouth at once, therefore I certainly think the Fox does more good than damage to the farmer.

I have known of Foxes killing Turkeys, Geese and Chickens; a Fox killed five setting Turkeys for me in a single season and devoured all the eggs. The Turkeys were sitting on 101 eggs in the five nests. I saw the Fox tracks in the soft ground around four of the nests and found where the Fox had carried some of the Turkeys to its den for its young.

GEO. M. DAY, Dyberry, Wayne County:

Mr. H. W. Adams, two years ago lost nearly 100 chickens, mostly by Foxes. Red Fox is most common here. I have paid bounty on seventy-two Foxes this fall and winter; sixty-nine Red and three Gray Foxes, so give the Red Fox credit for most good or evil as the case may be. If the farmer has too many Chickens scattered around his fields, Mr. Fox is ready and anxious to help him care for them, or if grasshoppers and Mice abound he is ever ready to reduce the crop. I watched a pair of young Foxes one frosty October morning playing, hop, skip, etc., but a nearer view showed they were busy catching grasshoppers, and they kept it up an hour or more; at other times they are very busy looking for Mice, and do more good that way than we usually give them credit for. An old time way to get them is to go out early in the morning (say in November) and call them up by imitating the squeak of a Mouse.

H. T. FRANKENFIELD, Frutchays, Monroe County:

Red and Gray Foxes we have here and plenty of them. I consider them detrimental to the farmer and sportsman. I have

found whole coveys of Quail destroyed in a single night; they eat what they can and bury the rest, the same as a Dog does. I found not long ago where a tree had blown down; the tree lay high on the stump, the top on the ground; snow falling on the trunk formed a hole or cavity under the tree; the Quail went under for shelter or roost; the Fox sprang in the hole, and I think destroyed them all. By going to their dens where they have their young you can find feathers of poultry and game.

SAMUEL D. IRWIN, Tionesta, Forest County:

Reynard is well represented in the western part of Forest county, on the hills and among the rocks in the neighborhood of farms; both Red and Gray, the Red being the most plentiful, constituting, I should judge, seventy-five per cent. I do not consider the Fox beneficial to the farmer, especially if he wishes to engage in poultry raising. Mr. Hinton, of Tionesta township, in one week lost forty chickens out of two hundred, through the agency of Foxes. They got so bold that they carried off Chickens in daylight. They are extensively trapped and hunted for their pelts and scalps, on which there is a bounty in this section.

WM. D. ROMBACH, Saltsburg, Pa.:

Both Red and Gray Foxes; think Red are most numerous, and they are the most destructive. Both detrimental.

E. GARD EDWARDS, Ramey, Clearfield County:

Foxes are common and they are more destructive to game than poultry.

D. KISTLER, Kistler, Perry County:

The Fox destroys Wild Turkeys, Grouse and any other bird he can get. Foxes carry off Lambs, and all of them ought to die. Foxes are plentiful in this locality, and they destroy a great deal of poultry.

J. K. BIRD, Millview, Sullivan County:

We have the Red Fox. They destroy poultry of all kinds; also Pheasants and young Lambs.

M. B. TRECOTT, Harveysville, Luzerne County:

I have seen Foxes catch Turkeys by daylight out in the open fields, and Chickens the same way, and carry them to their

burrows. I have followed and caught the whole nest of Foxes, both old and young. Several years ago my father found something had killed our Chickens, twenty-two in number; were all gone but one. He followed the trail and found the whole twenty-one dragged off to hiding places. The last one, still warm, was dragged into a hollow black ash. We pulled the chicken out and found a Mink (a very large one) had gone in first and was still trying to drag the "old rooster" in after him, but the hole was too small. I came home one night and found an Owl of very large size had lit down in the back yard and was feeding on a Goose. I had a whole flock of Pigeons destroyed in one night by Owls. Their roost and boxes were in a long shed; we found one Owl glutted so he could not fly; the others had flown to a piece of woods about twenty rods off, and after a little search we found three of the Owls there unable to fly. I had a brood of half-grown Guineas destroyed the same way. I have seen Crows dart down into a chicken yard, pick up a young Chicken and fly off, and have seen Hawks do the same, and sometimes take a full grown hen. I might write much more in the same line of my own experience with Minks, Foxes, Weasels, Crows, Hawks and Owls.

JOHN E. STOCKER, Ashley, Luzerne county:

We have both Red and Gray Foxes; the Red is the most common on our mountains; they are of no value to farmers, as they destroy poultry if not secured in sheds; they are very destructive to Pheasants and Rabbits—to the young Pheasants especially; oftentimes along the rocks one will find their dropping composed mostly of Rabbit hair and toenails. English Sparrows were fastened to bushes with their entrails taken out and stuffed with poison; some Foxes were taken in that manner, also some Dogs. Oftentimes some railroaders coming down the mountains would see Foxes feeding on some recently killed Cow, or be running along the track in quest of Woodchucks or the Cottontail, feeding on corn or grain dropped from grain cars.

GEO. FRANC, Ariel, Wayne County:

Foxes are quite abundant and very destructive to domestic fowls and small wild birds.

PETER COVEY, Newfoundland, Pa.:

Foxes are numerous; we have both Red and Gray, and they are about equal in their destructiveness to game and poultry;

they are quite troublesome to farmers here. I have personal knowledge of the loss of thirty-two half-grown Turkeys in one night. Am confident that Foxes did it by the feathers scattered in all directions. Have frequently seen Foxes carry off poultry.

ENOS BLOOM, New Millport, Clearfield County:

Have both Red and Gray Foxes; the Red is the most plentiful and is detrimental to the farmers; they kill and destroy poultry and kill young Lambs, and are also very destructive to wild birds, such as Pheasants and various other species which the State should protect; particularly is this true of the young Pheasants. It is the habit of the young Pheasant on being first alarmed to poke its head under a leaf or grass, leaving the body exposed, and the Fox scents them and makes many feasts on them.

N. F. UNDERWOOD, Lake Como, Wayne County:

Concerning the breeding habits of Red Foxes would say that John F. Jaycox, a hunter and trapper of this place, killed a female Fox here only a day or two ago, which contained six young ones; the usual litter is, I think, three or four. Red Foxes very common; have paid bounty on thirty or forty this winter. Gray Fox rare. Foxes destroy considerable poultry as well as much game, Pheasants, Rabbits and small birds.

GEO. W. WOOD, Equinunk, Wayne County:

Foxes are numerous, and very destructive to poultry. Wayne county paid in 1893 over \$700 as bounty on Foxes, Wildcats, etc.

EMIL ULRICH, Stroudsburg, Monroe County:

Gray Foxes are most common and they steal many Chickens. Consider them detrimental to a farmer, and favor bounty on them.

DR. H. D. MOORE, New Lexington, Somerset County:

We have both Red and Gray Foxes. The Red Fox is most destructive to poultry; he seems to be more cunning and bold than the Gray Fox. Both are equally destructive to game. Beneficial to farmers by destroying Field Mice.

DR. C. E. GOLDSBOROUGH, Hunterstown, Adams County:

We have Red Foxes common in our lowlands, and Red and Gray Foxes equally common on the mountains. Red Foxes

are more destructive because larger, swifter and bolder. Both kinds are detrimental to the farmer.

Foxes, I am satisfied, do much mischief to turkeys while hatching, and with their young; am led to this belief from having suffered on one occasion until I killed three Foxes, when the trouble ceased. Weasels come next in destroying Chickens.

L. T. WILT, Franklin, Venango County:

Both Red and Gray; the Red more abundant, hence more destructive to poultry and game. They prey on the Ruffed Grouse during the whole year; they are experts in taking a Ruffed Grouse in winter when they have plunged under the snow. The Fox jumps zigzag past the hole in the snow, and as the bird raises takes him on the wing. The writer never saw a case where it would score a miss. Detrimental to the farmer, and likewise to the game interests.

GEO. K. BOAK, Pine Glen, Centre County:

We introduced Wild Turkeys in our game preserves and the Wildcats and Foxes destroyed them, both old and young, regardless of efforts made to exterminate them by poison and traps. We have both Red and Gray Foxes; they are very destructive to game and poultry in this region.

OTTO BEHR, Lopez, Sullivan County:

Have only seen Red Foxes in this county. Think they are beneficial to the farmer. They catch multitudes of grasshoppers, beetles and insects of all kinds, and lots of Wood and Meadow Mice. My brother found a nest of young Foxes not more than a week old, that had forty-two Mice and Squirrels in it, mostly all Mice. There is occasionally a Gray Fox shot here, but not often.

B. F. HERRINGTON, Waynesburg, Greene County:

No Gray Foxes; the Red Fox is quite numerous and is detrimental to some extent from the fact that he preys on the poultry, and has been known to carry off young pigs and lambs.

J. L. BRAUNER, Exchange, Montour County:

Red and Gray Foxes are found in our county, and both are destructive to the farmer's poultry and game.

M. E. KEMERER, Weissport, Carbon County:

Foxes kill great numbers of our Chickens, Turkeys and Ducks, and they also destroy considerable game of different kinds.

HON. A. L. MARTIN, Enon Valley, Lawrence County:

We have both Red and Gray Foxes. They are detrimental. They annually destroy a large amount of poultry.

J. S. GAY, Terrytown, Bradford County:

Both Red and Gray Foxes are found with us, but the Red ones are more common; both species are destructive to the farmer as they catch poultry.

A. P. BREWER, Norwich, McKean County:

Foxes I consider a great benefit to farmers, as they catch a great many Mice.

GEO. S. APPLEBY, Decorum, Huntingdon County:

We have plenty of both, and they do much damage to poultry raisers. They also devour a great deal of game of various varieties.

PAUL SWINGLE, S. Canaan, Wayne County:

Foxes, both Red and Gray, do a large amount of damage to farmers in this region by destroying poultry.

MR. PIERSON, Dysart, Cambria County:

Have Red and Gray Foxes in quantities about equal. The Foxes of Cambria county destroy more game than all the hunters. Have trailed a Fox and have known him to kill and eat four Pheasants in one night, and kill one Rabbit and eat the head of it. Like the Wildcat, Foxes are hard on young Pheasants, Rabbits and Turkeys.

B. F. BENNET, Pike County:

Have both Red and Gray Foxes; both detrimental to farmers. They destroy a good deal of game, particularly Grouse.

THOS. SEABORNE, Newlin, Pa.:

Foxes are perhaps the worst animals we have, destroying Chickens, Turkeys, Ducks and Geese.

C. R. NOYES, Westport, Perry County:

Foxes are destructive to poultry and game.

ARTHUR MARTIN, Sandy Lake, Mercer County:

We have some Foxes, mostly Red; they destroy poultry and wild game to a considerable extent.

CHAS. HICKOX, Oliverburg, Pa.:

We have both Red and Gray Foxes; the Red most plentiful and very detrimental to the farmer.

T. B. HOOVER, Wellsville, Pa.:

We have Red Foxes. They are considered detrimental to the poultry interests.

FRED SAXE, Taxidermist and Naturalist, West Pittston, Pa.:

We have both the Red and Gray Foxes in our county. The Red is most common, and is the most destructive to poultry and game. I consider that both kinds are detrimental to the farmer. There was a man in town that owned a Fox a couple of years ago, and it got loose one night and killed four Chickens in a neighbor's hen roost. Foxes will also eat eggs of chickens.

A. D. McCracken, New Lebanon, Mercer County:

We have both the Red and Gray Foxes; the Red most numerous and destructive to game and poultry. I consider them a detriment to the farmer.

JAS. LINDSAY, Utica, Pa.:

We have both Red and Gray Foxes here and they do considerable damage to poultry. They also destroy many kinds of small wild birds.

T. H. HARTER, Bellefonte, Centre County:

Foxes are very destructive to Pheasants.

A. W. RHOADS, Wilkes-Barre, Pa.:

Red Foxes are common and numerous; Gray Foxes rare. The Red Fox is a great destroyer of game birds and poultry. They are highly detrimental to the farmer.

HON. G. C. BROWN, Yorkana, York County:

Have known Foxes to kill and eat Lambs of forty to fifty pounds weight. I have poisoned six with one Lamb carcass, and all were lying dead at one time along with a Hawk and three Crows.

NOAH H. PARKER, McKean County:

Foxes are the most destructive of any animal we have here. They prey upon domestic fowls and birds of any kind whenever an opportunity presents itself.

R. W. WEHRLE, Blairsville, Indiana County:

Farmers in this section have told me that Foxes have killed large numbers of Lambs.

J. H. VAN ETTEN, Milford, Pike County:

Little difference as to species. Both kinds destructive to game and poultry. One hundred and eighty of both kinds killed in year 1893 in Pike county.

JACOB B. MEIXEL, Boiling Springs, Cumberland County:

We have both kinds of Foxes in our county. The Red Fox does the most damage to game. I consider Foxes enemies to farmers.

W. G. SARGEANT, Meadville, Crawford County:

Red Foxes are not very abundant and occasionally a Gray one is seen. I consider that they should be exterminated because they destroy our game birds, especially young Grouse.

GEO. R. BROWNELL, A. P. POPE and W. R. PAGE, Smethport, Pa.:

Farmers lose many Lambs by Foxes each spring.

L. C. OBERLIN, Smicksburg, Indiana County:

Foxes are common and destructive to poultry and game. The Red are the worst. I never knew a Gray to kill poultry, but still they may be detrimental.

JOS. W. KYLE, Milroy, Mifflin County:

Foxes are quite common and the Red Fox is the most numerous. They are very destructive to poultry and game. I regard them to be detrimental to the farmer.



GRAY FOX

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GRAY FOX.

Urocyon cinereoargenteus.

DESCRIPTION.

Nearly as large as the Red Fox, but perhaps a little more chunky and has shorter legs. It is not subject to the marked variations of pelage already described in the Red Fox. The prevailing color is a frosted grayish-black; each of the long hairs projecting above the thick coat of yellowish and grayish fur, and so conspicuous on upper parts generally are starting at the roots, whitish, then dusky, then white, about $\frac{1}{4}$ of an inch) and black (about $\frac{1}{2}$ an inch) to ends. Cheeks and throat are whitish. The ears behind and about base, side of neck, streak across the chest, edges of abdomen, and more or less of legs, reddish or cinnamon brown. Lower parts are whitish and pale yellowish brown or reddish. Tail is blackish above, has dark tip, and is rusty below. More or less blackish about muzzle. A whitish patch on each side of nose.

Habitat.—A southern species. "Occurs in Oregon, Texas and California, and with the Red extends from the Atlantic to the Pacific. It is not common in New England and only accidental in Maine and Canada. It is more southern than the Red Fox, being the prevailing species from Virginia southward."—Brayton, Mammals of Ohio.

The Gray Fox, when pursued by dogs does not, like the Red, lead the barking hounds long distances, but will play hide and seek with them, oftentimes in a very small area of territory.

HE CIRCLED, AND TURNED IN AND OUT.

Some years ago I was hunting Pheasants in an old bark peeling along the Susquehanna river, above Lock Haven, and flushed eight or ten birds which scattered and hid along the mountain side, and in a deep ravine. On one side of this ravine there was a dense patch of laurel, with lots of decaying logs, fallen tree-tops, and lichen-covered boulders. This place was nearly half a mile long and about half as wide. Two hounds were in there making lively music, and their exertions

caused me to lose several good shots as they flushed and drove away several Pheasants and a Wild Turkey. The noisy dogs kept running to and fro in this thick covert for at least two hours and I thought they were after Rabbits, but finally a Gray Fox came out into a path and a man shot it. When the Fox was killed the hounds left and we were not bothered any more. My companion said it was a very common habit of this species, when pursued by dogs in thick underbrush, to act as this one did.

RARE, IF FOUND AT ALL, IN SOME COUNTIES.

Gray Foxes are frequently met with in different, in fact almost all, sections of the State, but there are probably fifteen times as many, if not more, of the Red Foxes in Pennsylvania. I have never seen a Gray Fox in Chester county where I have spent several years in field work, and the Messrs. Weil, who make a special business of purchasing raw furs in Chester, Lancaster, Montgomery and Delaware counties, say they never have had but one Gray Fox, and that was killed in Maryland. Fox hunters in Chester, Delaware and Montgomery counties report that they never find any Gray Foxes.

THEY TAKE TO TREES.

The Gray Fox to escape its enemies will sometimes ascend the inclined trunk or large pendent and low limbs of trees. Up in the wilds of Clinton county, where this species is of frequent occurrence and a menace to the existence of its ground-dwelling feathered neighbors, it seems some of them possess monkey-like ability as tree climbers; at least, such inference can be drawn from the following paragraph published

by Mr. S. N. Rhoads* in his list of Mammals of Central Pennsylvania:

"Regarding the dexterity of this species climbing trees the junior Nelson (Seth I.) told me he had seen one ascend after a Squirrel to the height of sixty feet on an erect dead pine stripped of its bark. It did this voluntarily, literally 'shinning' twenty-five feet up the branchless trunk and backing down again as a boy would do it. He has known his dog to run them up an erect tree eighteen inches in diameter, the first limb of which was twenty feet from the ground."

I have often heard of the climbing powers of the Gray Fox but never knew they possessed such remarkable dexterity as that which is reported to have been seen by young Mr. Nelson. However, Clinton county has plenty of good water, an invigorating climate, numerous Pheasants, plenty of other wild birds, lots of Cottontails, a good many Varying Hares, an abundance of small rodents, and a share of domesticated fowls about the places where Gray Foxes sneak, murder and hide, and it may be such advantages all tend to give certain of these animals powers, inclinations and elevations which Gray Foxes do not commonly assume.

HE LOVES THE WOOD AND UNDERBRUSH.

Messrs. Coues and Yarrow, in alluding to this species, say:

"It is not a burrowing animal, at least to any great extent; and when it digs, the burrow is simple with a single entrance. It lies concealed in rank herbage, beneath or inside fallen logs, under partially excavated stumps and similar retreats. This habit is in evident correlation with its woodland range, for having no such protection as the Red Fox, which takes to the earth any where it is forced to abide where there are the nat-

*A contribution to the Mammalogy of Central Pa. Proc., Acad. Nat., Sci., Phila., April, 1897.

ural means of concealment just mentioned. This same habit, moreover, causes a certain modification of the animal's range with the settling of a country; in clearing off forests the Gray Fox is forced to seek elsewhere, although in effect the circumstances that cause removal of one species are precisely those that invite the other, the Red Fox being able to exist in settled regions where the other could find no suitable resorts. It is this that makes the Red a greater nuisance to the farmer; it sticks close to the farm yard, being forced, in a measure, to thus supply itself, owing simply to its being in more cultivated districts. The Gray Fox subsists more extensively upon the wild game of his habitat. Another distinctive feature is the climbing powers of the Gray Fox, much greater than would be expected from an animal with non-retractile claws, and no great 'hugging' powers. When hard pressed the Gray Fox is treed as regularly as the Red is earthed. The climbing seems to be simply an agile leaping along on inclined trunk, or from bough to bough, through it has been noted that the animal can climb a small trunk by clasping or even with its claws like a cat or Raccoon' (Brayton's Mams. of Ohio).

WHAT GRAY FOXES LIVE UPON.

Gray Foxes feed upon all kinds of wild birds they can catch; the Cottontails and Varying Hare, numerous Mice, other small mammals, some insects, occasionally frogs and sometimes, it is said, non-poisonous snakes, are all eaten by them. They destroy poultry, and, as can be seen on previous pages, they devour Lambs. Farmers and sportsmen, very generally, speak of Gray Foxes as being little, if any, better in habits, than the red-coated robbers. Woodsmen who have learned much of their sneaking ways say they should all be killed. Some good observer, Audubon I think it was, said the Red Fox is a sly, bold robber, but the Gray Fox is a cowardly, skulking sneak-thief.



$\frac{3}{8}$

ERMINE OR LARGE WEASEL

COMMON WEASEL.

Putorius noveboracensis

DESCRIPTION.

This species varies greatly in size as well as in coloration. Length of head and body nine to ten inches, tail four to six inches, body long and slim. In summer pelage this species is brown (usually rather dull) above, tail same color, except about 1-3 or $\frac{1}{4}$ at the end which is always black. Lower parts whitish and pale sulphury-yellow. In winter the pelage is white, more or less tinged, particularly toward posterior parts with pale sulphury-yellow; end of bushy tail is black. The many conditions of dress between the two extremes above noted, give rise to different common names applied to this animal, and which have reference to its coat. White specimens I have much oftener found in the mountainous and northern sections of the State than elsewhere, and as Mr. Malloy says on a succeeding page, Weasels in winter are much more apt to be brown of some shade than white. The male weighs, it is said from five to eight ounces, and the female about four ounces.

Habitat.—"Europe, Asia and America, extending north to the limit of existence of terrestrial mammals. In America south to very nearly the southern border of the United States, but no specimens seen from the Gulf States, New Mexico, Arizona or Southern California."—Coues.

ITS MANY NAMES.

The reasons whereby this little animal gets its name are worthy of note and so this paper is begun with an explanation of them.

The technical name *Putorius* is taken from "putor" a "bad smell." It is an appropriate title for both sexes have the powers of emitting a "peculiar fluid" which is most offensive and only a little less pungent and piercing than that of the Skunk. Skinner tells us that "Stoat" comes from the Belgic "stout" (bold), and in England he is called Stout to the present time. Certainly he deserves this name, for game larger than himself deters him not; long runs through bush and briar—he seldom takes to the open—carry no fear to

his little heart, as he bounds along in great leaps or runs with remarkable celerity in search of prey. Not to the land alone does he confine himself in this search, however, but in underground passages made by the Rabbit or Mouse and also in the water, his long slender body aiding his advance. The unwary bird who has paused on some low bush to carol forth his song or wet his parched throat in the running brook or rest quietly on the bough in the hush of the night, have frequently met their death by the teeth of this little creature. Mr. Wm. Macgillivray says of him "in proportion to his size he is at least as courageous as a lion." So much for the cognomen Stout and now let us turn our attention to that of "Ermine." Dr. Elliott Coues in his admirably written work on "Fur Bearing Animals" says of this one: "Gwillim," in his "Display of Heraldrie," gives the following etymology of Ermine:

"This is a little beast lesse than a Squirrel, that hath his being in the woods of the land of Armenia whereof he taketh his name."

The latter word is sometimes written in English "ermin" or "ermelin," and the same term occurs in several other languages.

THE IMAGE OF A SERPENT.

The same writer (Coues) also says:

"A glance at the physiognomy of the Weasels would suffice to betray their character; the teeth are almost of the highest known raptorial character; the jaws are yoroked by enormous masses of muscles covering all the sides of the skull; the forehead is low and the nose is sharp; the eyes are small, penetrating, cunning and glitter with an angry green light. There is something peculiar, moreover, in the way that this fierce face surmounts a body extraordinary, wiry, lithe and muscular. It ends a remarkably long and slender neck in such a way that it may be held at right angle with the axis of the latter. When

the animal is glancing around with the neck stretched up and the flat triangular head bent forward and swaying from one side to the other we catch the likeness in a moment—it is the image of a serpent.”

So we have this sanguinary animal compared by two eminent authorities in this line, as like a lion for courage and a serpent in manner and appearance.

TWO SPECIES.

While every farmer's boy or other person who is at all acquainted with the common furred and feathered denizens of the woods and fields will speak of different kinds of Weasels, it does not appear to be generally known, except, of course, to naturalists or others who have taken the trouble to investigate the matter, that there are, it is believed, only two distinct species of Weasels in Pennsylvania. Many farmers and numerous sportsmen are heard to speak of “white,” “brown,” “black” and “yellow” Weasels, and consider them to be different species. The terms big and little are often applied to these animals, but those employing them commonly consider the Weasels designated by the particular adjective used as belonging to the same species, but of different age and size. The Least Weasel is in some instances undoubtedly mistaken for the young of the Ermine whether in winter or summer attire.

THE LEAST WEASEL.*

The Least Weasel, according to the best information obtained from local naturalists throughout the State,

*The Least Weasel (*Putorius cicognani*) is “very small, length of head and body six or eight inches, of tail-vertebrae two inches or less, tail-vertebrae about one-fourth or less of the head and body, tail slender, cylindrical, pointed at tip, which is concolor or not obviously black; under parts white, rarely, if ever, tinged with sulphury; coloration otherwise as in common Weasel.”—Coues.

does not appear to be of very frequent occurrence. In fact, quite a number of zoological students who are believed to be entirely competent to distinguish both species report the Least Weasel to be rare or unknown in their localities.

Mr. George P. Friant, taxidermist, of Scranton, Penna., during the past ten years has had over one hundred Weasels taken within a radius of twenty-five miles of his home, and of these not more than three or four were the smaller species. The experience of Mr. Chas. H. Eldon, taxidermist, of Williamsport, Penna., is very similar to that of Mr. Friant. During the past eight years the writer has collected zoological specimens in almost every county in the State, and in a collection of seventy odd specimens at least six were of the small kind.

In 1885 and 1886 thirty-seven Weasels, on which bounty had been paid in Chester county, were examined and all were found to be the Ermine or Common Weasel. From evidence at hand it seems that the Least Weasel is to be found in the northern and mountainous regions of Pennsylvania, and I am inclined to think it is more plentiful than some observers and writers believe. Unfortunately a series of about seventy-five skins of Pennsylvania Weasels which I had were destroyed a couple of months ago when the contents of my office was burned with the State Capitol. This loss and the destruction of my note books make it impossible for me to specify the localities from which the Least Weasels I had came.

THEY CHANGE THEIR COATS.

In one way at least these sprightly animals are not unlike some modern day politicians who have made



ERMINE OR LARGE WEASEL.

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very hurried and wondrous changes in their political coats but with some of whom such change was only on the surface, as their hearts were always loyal to old, true and tried friends from whom they separated from necessity, to join the "bread and butter brigade." Some Weasels change their coats, and, in winter, when snow covers the ground, they are white, but in summer brown. Probably such changes also enable these animals to obtain more easily the necessary livelihood. However, in any dress, Weasels always carry death and destruction to animal life about them. Their homes are frequently to be found in a decayed log, tree stump, under rocks, about old buildings, etc.

HUNTS HIS PREY BY SCENT.

Concerning his power of hunting his prey by scent, eminent authorities are positive that he does track quarry in this manner.

Mr. Hogg, in *London Magazine*, describes how, in December, 1831, he observed a Stout hunting in this style.

"I was an eye witness to the fact of a Stout being able to pursue its prey on scent."

Coues writes of it as follows:

"Swift and sure footed he makes open chase and runs down his prey; keen of scent he tracks them."

DESTROYS POULTRY.

The poultry yard is frequently visited and his apparently insatiable desire for rapine is most clearly shown while on these visits. One chicken will satisfy his appetite, but after that is gratified he does not leave; he kills and slays without mercy all the remainder of the poor frightened chickens, until there are none left, and not until then does he leave the scene of carnage.

He sucks the eggs also, leaving, in some instances, the unlucky farmer, who has unwillingly and unwittingly been his

host, completely routed as regards his efforts in the poultry line.

The Ermine is common and present in all sections of the Commonwealth.

HIS FOOD.

From the testimony of various writers and other well-informed and competent observers, it would appear as if the Weasels, although undoubtedly great destroyers of Mice and also of Rats, are extremely detrimental to poultry, especially Chickens, as well as game, particularly Ruffed Grouse and Rabbits, together with many kinds of small wild birds.

Robert Kennicott, in his report of the quadrupeds of Illinois, as quoted by Dr. C. Hart Merriam in the Mammals of the Adirondack region of Northeastern New York, says, in writing of the Common Weasel:

"A more fierce and cruel mammal does not exist in America than this Weasel. The courage and sanguinary disposition of the panther are insignificant in comparison, having regard to the strength of the two. Without hesitation, the Weasel attacks animals five or ten times its own size, and, not content with killing enough for food, wantonly destroys whatever life it can. When a Weasel has gained access to a poultry yard it will frequently kill every fowl within its reach in a single night. Fortunately, however, this animal, even when abundant, does not enter the farm yard so frequently as might be expected, appearing to prefer a free life in the woods to easy but more dangerous feasts on domestic fowls. Meadow Mice are certainly the greatest pests among mammals in Northern Illinois, and of these the Weasel destroys great numbers.

FEEDS ON RATS AND MICE.

"Stacks and barnfuls of grain are often overrun with Rats and Mice; but let a Weasel take up his residence there and soon the pests will disappear. A Weasel will, occasionally, remain for some time in a barn feeding on these vermin without disturbing the fowls. But it is never safe to trust one near the

poultry yard, for when once an attack is made, there is no limit to the destruction. When the animal has entered stacks or barns, it has a curious habit of collecting in a particular place the bodies of the Rats and Mice it has slain; thus, sometimes, a pile of a hundred or more of their victims may be seen which have been killed in the course of two or three nights."

The activity and strength of the Weasel are such that he is able to climb trees with great ease, either to escape enemies or to search for food.

This ability as a tree climber enables him to destroy both the eggs and young of different species of birds which erect their homes in the forest, shade and fruit trees.

The nests of Ruffed Grouse, Wild Turkeys and Bobwhite or Quail, besides those of other species of the feathered kinds which nest on or near the ground, are often, it is asserted, pillaged by the inquisitive and bright-eyed Weasels.

Although Weasels hunt both by day and night, the popular idea seems to be that they are more nocturnal than diurnal. While it is doubtless true that they subsist, to some extent, on various kinds of insects, particularly beetles and occasionally grasshoppers, the amount of insect life which they consume is not, so far as the observations of the writer have gone, very considerable.

A RABBIT HUNTER.

Weasels, like the fox hound or trained and well-bred pointer or setter, follow the tracks of their prey by the scent. In this way large animals such as Gray Rabbits and even the Varying Hare are pursued and overpowered in their securest retreats.

In regard to its power of hunting by scent, Thomas Bell, says:

"In pursuing a Rat or Mouse, it not only follows it as long as it remains in sight but continues the chase after it has disappeared, with its head raised a little above the ground, following the exact tract recently taken by its destined prey. Should it lose the scent, it returns to the point where it was lost, and quarters the ground with great diligence until it has recovered it; and thus, by dint of perservance, will ultimately hunt down a swifter and even stronger animal than itself. But this is not all. In the pertinacity of its pursuit, it will readily take the water and swim with great ease after its prey."

I have heard hunters and woodsmen say that "white" Weasels can easily detect the Ruffed Grouse, which frequently in winter has the habit of plunging into the loose snow, and that they destroy many of these birds in such hiding places.

Audubon, the famous naturalist, records an instance that came under his personal observation, of where an Ermine captured a Rabbit and after beheading it, the fierce little depredator dragged the body some twenty yards over the fresh fallen snow, beneath which it was concealed and the snow slightly pressed down over it.

HE IS WELL ACQUAINTED WITH WEASELS.

I am indebted to Mr. Hugh Malloy, of Freeland, Luzerne county, Pa., for the following very interesting and instructive account of his observations of the Weasel. I know of no person who has devoted as much attention to these agile creatures as he has. Mr. Malloy informs me he has captured during the past twenty years about fifteen hundred Weasels. What he says about them in the following paragraphs shows

very conclusively that he is thoroughly acquainted with their haunts and sanguinary ways:

The Weasel is the only animal to my knowledge that never rests; it is always on the move and the more game he kills the more he wants to kill. I have followed the track of this animal every winter, for twenty years, and I was never able to run one down by following the track. He never walks; his jumps are from eighteen to twenty-two inches, and any person following his tracks on the snow, when there has been a light snow squall at intervals of two or three hours, during forty-eight hours as I have done, to learn if he had any home, will find that he rests only while killing his victim. The snow is never too deep or the weather too cold for him. I have followed his track when it was seven degrees below zero, and snow eight inches deep.

HE KILLS BUT DON'T DISFIGURE.

I have followed the back track to see where he came from and found eleven dead Rabbits killed by him, and all of them hidden either in the hole that he started them from or pulled under the snow; sometimes twenty feet to some brush pile. The Weasel, to my mind, has a great instinct. If you follow the track on very deep snow, you will find frequently a small hole in the snow where he went down and came up, perhaps fifty feet away; you will discover also, every time, a Rabbit hole at the very spot that he went into the snow, and if a Rabbit is in the hole, it will have gone only about twenty yards, when you find the snow tramped for about six feet square and you may see a little fur; then look sharp and you will discover where the Rabbit was pulled back into the same hole, and by putting a briar or rod into the hole you can twist it fast to a dead Rabbit, with a small hole between the ear and eye. After it has killed four or five in a few hours, you will not find any mark on them, as it sucks the blood without making any visible marks until you pull the skin off the head and neck.

While the Weasel will stand any cold, when at liberty, if you confine it in a box or cage, it will be dead in a few hours, by having to remain still, even when it is not zero weather.

The Weasel has great digestive powers. I find, when it is getting all the blood it wants, that in about every twenty yards, in the snow, you will find its excreta about three-fourths of an inch long, thick as a common slate pencil and like frozen blood.

A VERY RESTLESS ANIMAL.

The Weasel is a restless animal. If you happen to come up to it in rocks where there is no snow you will have to stand only a few seconds, and you will imagine that you have found a whole family of them, as his head will be sticking out of several holes almost at the same time; but if the snow is on the ground to the depth of three inches, you will only see him once, but if you make a large circle around the place where you saw him last you will find a small hole in the snow and a Weasel track going away from it, that will lead you more than twenty miles in every direction, and still you will not see him. In the fall of 1894 I was in a barber shop in Freeland, and about half shaved when several boys came running to the door, telling me that a whole family of Weasels were under the plank side-walk. Of course I pushed the barber away and jumped out of the chair. There was a very large crowd surrounding the walk, all having clubs and shovels, and a Weasel head was peeping out of every hole at almost the same time, and a knot-hole in the sidewalk showed a head about every thirty seconds and that one was supposed to be the leader. I joined the crowd of watchers and sent my boy for my flobert rifle. I shot the first Weasel that showed its head, and told the boys that I would give them a dollar for every other Weasel that they would see. I did not have to pay a dollar.

WHERE HE PREFERS TO LIVE.

The Weasel frequents the wildest portions of our mountains and seldom ventures into any open ground, except when it has all the game killed in the thickets. It will climb a tree after a bird's nest or when chased, but it cannot run down a tree head foremost like a Squirrel. It will jump from branch to branch until it gets to the lower branches and then comes down backwards or jumps. I never saw the Weasel on a very large tree or up very high on a tree.

WILL SUCK ITS OWN BLOOD.

A Weasel will suck its own blood. In the summer of 1895 I caught a very fierce looking, coarse haired, dark brown Weasel in one of my wire traps, and I stabbed him through the wires with the long blade of my knife in the shoulder; as soon as he saw the blood he turned his neck, took hold of the wounded part and sucked all the blood until he swayed back and forth and fell dead.

WILL HELP EACH OTHER OUT OF TRAPS.

One Weasel will let its mate out of a trap. I had a wire trap set for a Weasel and every time I went to see it the live bait was eaten and fresh droppings of the Weasel were in the trap, but no Weasel. I took another trap and set the two close together and the next time I came I had a very dark brown Weasel in each trap. One Weasel would go in first and kill the bait, the other would go half way, put his fore-foot on the drop, open and put his head out in the hole and come out.

ATTACKED THIS BUNNY IN THE REAR.

I was after a Weasel once when the snow was on the ground to find where he had killed some game, so that I could set my trap for him, I found he crossed the track of a Rabbit that had just come out of a stone wall, and went right back again. I was surprised to see the track of the Weasel going away without killing the Rabbit. I pulled away some stones and found the Rabbit squeezed tight in a very small opening, between two stones, and only his hind legs sticking out; but he was dead, and the blood had been sucked by the Weasel from his hind legs and had made only a very small opening in the leg.

THE YOUNG.

Weasels have their young between the 15th of April and 15th of June. I have never found their nest while the young were in, but I have caught them during that time, with young in them, and also after having their young, with milk in their teats. The highest number I found in any one of them was six, one only had three. The young will follow the old one until September, when they seem to scatter and go on their own hook. It is very easy to catch them after they scatter, and these are the ones that generally get after the chickens before they learn how to catch game.

A Weasel will always come back to the place where he hid the game to feed off it when he cannot find any game to kill. I put a trap by a hidden Rabbit once and I did not catch the Weasel for six weeks, but in most cases you will be able to catch them the second or third night.

THEY HAVE MANY CHANGES OF DRESS.

I do not believe there are any White Weasels in summer, but I do know that they are dark brown, light brown, dark red and light red in winter and that I have caught them every week from December 1 until April 1. I caught a dark brown, a dark red and a pure white all in one night, but at different places. I never caught a "maltee" Weasel in winter, but have caught many of them in summer.

The "Maltee" Weasel is very fine furred, no long, coarse hair, and have a blue shade in the fur. Now this Weasel changes its coat in November.

I burned two hundred Weasel skins last winter as the moths had gotten in them. I could have sent them to you had I thought you cared for them. I had a card on each one saying when and where I caught it.

DESTROYS GREAT NUMBERS OF YOUNG GROUSE.

The Weasel is very hard on Grouse until the birds are six weeks old and able to fly. He will follow them and sometimes kill the whole brood. I found thirteen out of fourteen killed by a Weasel the very day they came out of the shell and the fourteenth would have been killed, but I heard the old Pheasant making a great noise and I killed the Weasel. The birds were too young to hide under the leaves, the fourteenth bird was sitting beside the nest. I never saw where the Weasel killed any old Pheasants, but saw where a Pheasant carried a Weasel away out of a hole in the snow where the Pheasant was sitting, when the Weasel came in and attacked it.

KILL ALL THE QUAIL.

The Weasel will kill all the Quail in February and March if the snow is deep. The birds will go under windfalls and brush heaps covered with snow. The Weasel will track and go in after them at night, killing every one; then the farmers will find them in the spring and think they were frozen. I found west of White Haven one day (I was after a Catamount), where a Weasel had killed over one hundred birds. I pulled out with a stick fourteen of the dead birds; no marks on them, but track of teeth on neck near the head.

A Weasel will follow a Rabbit on bare ground the same as a well-trained dog. I put one off the trail several times in

ERMINE OR LARGE WEASEL.

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one morning when I was going fishing, and every time he would find it again, and I soon heard the Rabbit squeal where the Weasel was killing it.

THE WEASEL PULLED AND I PULLED.

I was going fishing one morning about four years ago, when I saw something going slowly across the road about one hundred yards ahead of me. I ran to where I saw it and there a Weasel was pulling a very large Rabbit through under an old log; I caught the hind legs of the Rabbit and the Weasel pulled at the other end. I got a club and tried to kill the Weasel, but I could not hit him. Every time I would let the dead Rabbit go, the Weasel would take hold of it and begin to pull it under the log; I laid the Rabbit close to the log and held my foot on side of log; when the Weasel put his head out and was pulling the Rabbit again I put my foot down on top of him and killed him. The Rabbit was yet warm. I opened it and found nine young Rabbits almost large enough to make their appearance in the world, but they were all dead.

WHAT FARMERS AND POULTRY RAISERS SAY.

The following extracts concerning the habits of Weasels are taken from letters received by the writer from farmers, poultry raisers, sportsmen and naturalists.

JOHN F. THOMAS, Carrolltown, Cambria County:

I have known the Weasel to kill six full grown hens in one night on my father's farm. It is supposed that it kills its victims for their blood only, and all the fowls killed by it, that I have seen, substantiate this, since, in every case, the blood vessels of the neck were severed close to the head and there was apparently no flesh missing. I recollect an experience, when a boy, that proves them to be remarkably bold at times. I was pursuing one that had in its mouth a Mouse; in an attempt to strike it with a stone, I struck the Mouse with such force as to throw it a distance of eight or nine feet from the fence, when to my surprise, he immediately left the fence and regained the Mouse and disappeared along the fence. They seem to have a greater appetite for Mice and Rats than poultry, as I have known them to be in my father's barn for several weeks and

yet we never missed any poultry, but there was a noticable decrease of Rats.

A. W. RHOADS, Wilkes-Barre, Pa.:

The Weasel, I am sure after years of personal experience and observation and careful study, is the worst enemy the Pheasant and Quail have. I have repeatedly tracked a Weasel that had followed the track of a Quail and Pheasant in the snow, and at last came upon the dead birds. I, on one occasion, saw a nest of thirteen Pheasant eggs, about to be hatched, and in returning in an hour found that eleven of them had been destroyed by a Weasel which I saw and killed.

C. P. MOTT, Milford, Pa.:

Weasels are the greatest destroyers of game and poultry, and they deserve total extinction. I know of no redeeming feature or any possible usefulness alive in their wild state. They are scarce when small game is, and numerous when such game is easy prey. They seem to be travelers and to such parts as are prolific of game. There is no escape for the Rabbit when once they get its track, and a nest of Grouse eggs furnishes him a meal, if the hen bird escapes his quick, stealthy approach. I consider that the Weasel has no equal as an enemy of game.

ARTHUR MARTIN, Sandy Lake, Pa.:

We have the Weasel; they destroy poultry to a great extent, sometimes will or have for us, killed whole broods, but at the same time are great hunters for Mice, Rabbits and small game.

HON. N. F. UNDERWOOD, Lake Como, Wayne County:

Some Weasels; don't do much damage; they will occasionally destroy chickens.

D. KISTLER, Kistler, Pa.:

The Weasel abounds and will kill grown chickens.

ENOS BLOOM, New Millport, Clearfield County:

The Weasels are plentiful and also destructive to poultry.

JOHN F. WEAKLY, Slippery Rock, Pa.:

Weasels will kill a whole flock of Turkeys or Chickens at a time; have known them to kill as high as twenty at a time.

C. R. NOYES, Westport, Pa.:

Weasels kill Chickens, but I think not when they can get Rats or Mice.

The following table contains the condensed reports of one hundred observers residing in Pennsylvania, and of these gentlemen, probably not less than eighty-five are practical farmers and poultry raisers.

The X indicates the animals specified in the column-heading under which it occurs which the Weasels have been observed to usually prey upon by the gentlemen opposite to whose names said mark (X) is placed.

Hisling, Randall, Monroe co.,	X				X	Yet they prefer rats to chickens and won't kill the latter as long as rats are plentiful. Occasionally do considerable damage. They are fond of poultry and game.
Cope, David, Chester co.,	X				X	
Criste, Hon. P. J., Northumberland co.	X				X	
Cannon, John, Luzerne co., ..	X			X		They killed all my ducks and chickens. Destroy some poultry and game.
Critchfield, Hon. N. B., Somerset co.	X			X		
Dickinson, C. W., McKean co.,	X			X		
Davis, E. M., Clearfield co., ..	X			X		
Drasher, Wesley, Luzerne co.,	X			X		
Dobert, Peter, Luzerne co., ...	X			X		
Darlington, Thos. E., Chester co.	X			X		
Fernald, Prof. H. T., Centre co.	X			X		
Friant, George P., Lackawanna co.	X			X	X	Depredations to poultry do not often occur. Have known a Weasel to kill 80 chickens in one night. Killed 14 chickens in one night. Killed 44 chickens in two nights.
Frankenfield, H. T., Monroe co.,	X			X		
Filbert, Benjamin A., Schuylkill co.,	X			X		
Goldsborough, Dr. E. C., Adams co.	X			X		
Gay, J. S., Bradford co.,	X			X		
Gager, E. B., Wayne co.,	X			X		
Hilliard, Jacob, Armstrong co.,	X			X		
Herbison, James, Armstrong co.	X			X		
Hazzard, Dr. T. L., Allegheny co.	X			X		
Herbertson, W. H., Fayette co.	X			X		
Hosetley, Ed. B., Somerset co.	X			X		
Homert, F. L., Mercer co.,	X			X		

Eighteen chickens were found on one occasion with blood sucked out; attributed to Weasels.
Farmers and sportsmen make many complaints about damage done by large Weasels.
Will destroy a whole brood in one night.
We have frequently lost chickens.
They are almost as bad as Foxes.
They are common and destructive.
One killed 9 full-grown chickens in one night.
Tolerably common.
Occasionally take fowls, mostly young ones.
Common and very destructive.
Common and very destructive.
Have caught them in the act of killing chickens.

FOOD OF WEASELS.—Continued.

Observers.	Poultry.	Chickens.	Turkeys.	Ducks.	Geese.	Small wild birds.	Game.	Pheasants.	Rabbits.	Squirrels.	Rats.	Mice.	Remarks.
Haslet, S. H., Forest co.,		X							X	X	X	X	They are quite plentiful.
Jones, Amon, Wayne co.,		X									X	X	They are very destructive.
Jennings, Jasper T., Susquehanna co.,		X									X	X	Occasionally destroy chickens, but do much good by destroying Rats and Mice.
Karsstetter, C. M., Clinton co.,	X												Common and very destructive.
Kyle, J. W., Mifflin co.,	X						X						Weasels are rather rare in this region.
King, Harrison, Somerset co.,		X	X				X	X	X	X			Weasels killed 30 chickens in one night.
Kline, John L., Snyder co.,		X					X						Gray Squirrels.
Kemerer, M. E., Carbon co.,		X					X						They also kill other kinds of poultry and much game.
Luhr, Hon. Charles, Elk co.,	X						X						But damage done is not serious.
Linn, Hugh, Allegheny co.,	X						X						Tolerably common.
Lyman, M. B., Susquehanna co.,	X						X				X		Occasionally kill poultry.
Mench, Melanathon, Union co.,	X												They are good ratters.
Mersch, N. K., Union co.,	X												Abundant; do considerable damage to poultry and game.
McSparran, Jas. G., Lancaster co.,	X												Tolerably common.
McKeehan, F. M., Perry co.,		X											Common and very destructive to young chicks.

FOOD OF WEASELS.—Continued.

Observers.	Poultry.	Chickens.	Turkeys.	Ducks.	Geese.	Small wild birds.	Game.	Pheasants.	Rabbits.	Squirrels.	Rats.	Mice.	Remarks.
Sober, C. K., Union co.,	X	X					X	X	X		X	X	Common and destructive. Quite numerous and bloodthirsty. I once had a flock of about 200 young chickens, and in one morning a Weasel killed about 12 or 15, and he would have killed all I believe, but I killed the Weasel. They annually destroy many chickens for us. They are numerous in mountainous districts. Not sufficiently numerous here to do serious damage.
Sober, M. L., Northumberland co.	X						X	X	X		X	X	
Smith, A., Judson, Clearfield co.										X			
Stunkard, J., Jefferson co., ...	X	X											They are exceedingly destructive. Weasels are particularly destructive to poultry. Common and quite destructive. They are plentiful: killed 21 chickens in one night.
Stocker, John E., Luzerne co., ..	X								X				
Sargeant, W. G., Crawford co., ..	X												
Schnatterly, Dr. L. W., Armstrong co.	X						X						
Tucker, L. A., Crawford co., ..	X												
Trescott, M. B., Luzerne co., ..	X						X						
Thomas, James, Clearfield co., ..	X	X											
Taggart, Hon. A. L., Montgomery co.	X						X						Common and very troublesome. Weasels killed 12 chickens at one time
Van Etten, J. H., Pike co.,	X	X	X	X	X							X	

WILD CAT.

Lynx rufus.

DESCRIPTION.

Fur moderately full and soft. Head moderate size and rounded; body rather slender; legs long and quite stout; soles of feet naked. Ears large, erect and nearly triangular in shape, and tipped (in winter specimens) with coarse black hairs fully half an inch long; inner surface of the ears furnished with a loose coat of long, pale, yellowish-white hairs, and the outer surface is covered with short fur, which is black, except a conspicuous patch of dull white in the centre.

Forehead grayish-brown, irregularly streaked with dark brown; whitish streaks above and below the eyes; whiskers for the most part are white; chin and upper part of throat white, lower part of throat and neck very similar to sides, but paler. The upper parts and sides of the body and legs (outer portions of the latter) are pale rufous or brownish-red overlaid with grayish, which latter color is produced by the whitish ends of the hairs; the rufous coloration is most noticeable on sides of the body, sides of the head below and back of the ears, and about the occipital (base of head) region. The sides are indistinctly spotted with dark brown, and down the middle of the back a more or less distinct line of blackish-brown extends from near the shoulders to the base of the tail. Under surface of body and legs white and pale-yellowish spotted with black; inside of front and hind legs banded and spotted with black. The irides (eyes) of the adults are greenish-yellow in color, but in the young they are brown. Individuals of this species vary greatly in coloration. In fact it is an exceedingly difficult matter to find two specimens exactly alike. Ten specimens, now before me, captured in Pennsylvania during the winter season, show a marked diversity in color, as well as in size; and two or three individuals, taken in the late spring or early autumn, which I have examined, are decidedly more brownish-red in color, particularly on the sides, than those killed in the winter. The male is considerably larger than the female. In the month of January, 1890, I secured five females in Cameron and Potter counties, Pennsylvania, which weighed respectively ten and one-half, twelve, twelve and three-fourths, nine and one-fourth, and thirteen pounds, or an average of about eleven and one-half pounds each. Three adult males which I captured in Pennsylvania during the months of January, February and April, weighed respectively fifteen and one-fourth, seventeen, and eighteen and three-fourths pounds, or an average of seventeen pounds each. In the winter of 1892 Senator Harry A. Hall, of St. Mary's presented me with a very fine male which had been killed near his home in Elk county. This animal, which is the largest I ever saw weighed, tipped the scales at

WILD CAT

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twenty-six and one-half pounds. Hunters and woodsmen whom I believe to be reliable, have assured me that Wildcats are sometimes taken which weigh thirty-five, forty and fifty pounds each.

Habitat.—This species or its varieties occur generally throughout the United States from the Atlantic to the Pacific. Tolerably common in the mountains and sparsely settled districts of Pennsylvania.

A VARIETY OF COMMON NAMES.

The majority of hunters and woodsmen who reside in sections of Pennsylvania where the Wildcat or Bay Lynx occurs, have various local names for this wary and prowling animal. The appellations Bob-cat, Catamount, Mountain cat and Tiger cat are perhaps the ones which are most frequently employed. These names, or any others which may be heard, it is safe to say, have reference to *Lynx rufus*, which is doubtless the only species of its genus found in the State.

During the past five years I have made very careful inquiries in all sections of the Commonwealth where the Canada Lynx was reported to occasionally be present, and I have also examined a number of specimens of what were called by the owners "*Lynx canadensis*," but, as yet, I have not been able to discover a true example of the Canada Lynx, which may be distinguished from its congener, the common Wildcat, by its larger size, longer hair, fuller fur, grayish, hoary color, thick, heavy and clumsy legs and the large-sized feet, which are so densely furred (in winter) as to cover the soles or pads. The ears are also very conspicuously tufted with long black hairs.

There are, however, it is said, two or three well-authenticated instances where specimens of the Canada Lynx have been taken in Pennsylvania within the last twenty-five years. Possibly future investigations will

enable us to record this decidedly northern animal as a rare inhabitant of our forested areas.

From repeated interviews with hunters and woodsmen it is learned that the Catamount is very generally believed to be a wholly different species from the Wildcat. However, on questioning these persons closely, I find that size is about the only distinctive point they can call to mind to support their claim, and all large-sized cats are denominated "Catamounts," and, on the other hand, the smaller ones are termed wild or "bob" cats.

ACQUIRE MORE KNOWLEDGE.

The indiscriminate employment of local names to distinguish many of our birds and mammals, oftentimes leads to much confusion; but, until the great mass of our citizens become better acquainted with the furred and feathered inhabitants, such errors are bound to occur. In this connection it may be stated that, through the wise efforts of our progressive and intelligent State Superintendent of Public Instruction, Dr. N. C. Schaeffer, and his able assistants, much good work has been done to create a popular interest in zoological study throughout the common schools of the State. If Dr. Schaeffer's ideas are carried out, as they should and doubtless will be, the time will soon come when our school children will be readily able to recognize and speak intelligently of at least the common birds and mammals which they see about the parks and gardens, and in the fields and forests.

THE WILDCAT'S FAVORITE HAUNTS.

The Wildcat inhabits forests, rocky ledges and briary thickets, but its favorite place is in old slashings

and bark peelings, where, in the impenetrable and tangled recesses, it is comparatively safe from pursuit: and it is also able to prey upon many varieties of animals which have a permanent or temporary residence in such unfrequented wilds.

There are large tracts of land in the mountainous districts of Pennsylvania from which the marketable forest trees have long since been cut. These places, called slashings and bark peelings, in many instances are thickly strewn with decaying logs, fallen trees that were cut down for the bark, brush piles, tree tops. Such situations so overgrown with bushes, young trees, briars, and frequently large patches of buck laurel (rhododendron) as to be almost impassable unless one selects the old log roadways which traverse extensive areas. In these places Rabbits and other quadrupeds, Pheasants and many different kinds of small birds find an excellent cover.

WILD CATS INCREASING IN SOME PLACES.

Through my own personal observations in the field and also from the statements of thoroughly trustworthy hunters, trappers and lumbermen I am of the opinion that this species has been increasing during the last four or five years in several of our counties, namely, Elk, Clearfield, Forest, Cameron, Centre and McKean, where large districts have been denuded of their forest trees.

At the last session (1897) of the Legislature when the bounty bill was under discussion both in committee and before the House of Representatives, it was clearly shown that Wildcats were not only a cause of considerable loss annually to poultry raisers, but that they also killed many deer (both adults and fawns), great

numbers of Ruffed Grouse, Rabbits, besides a large number of the smaller species of insectivorous and song birds. It was also clearly demonstrated to the lawmakers that Wildcats were increasing quite rapidly in the several counties previously particularized by name.

The Wildcat subsists entirely on a flesh diet, and the damage this species does in destroying poultry, lambs and young pigs of farmers who reside in the sparsely-settled mountainous regions is not in any degree compensated by the destruction of other small wild animals which molest the farmer's crops or his poultry.

THEY PURSUE AND KILL DEER.

Wildcats, as will be seen by consulting the testimony of numerous contributors on the latter pages of this article, are very detrimental to game. They unquestionably kill many young Deer and they also not infrequently, it is said, attack and kill the adult Deer. United States District Attorney Hon. H. A. Hall, of Pittsburgh, informs me that at St. Mary's, Elk county, where Messrs. Andrew Kaul and J. K. P. Hall own a game preserve of probably 650 acres, in which are confined a large number of deer, there is much trouble experienced from the Wildcats disturbing the Deer. Mr. Hall further states that small bands (probably families) of these carnivorous animals, in the winter when snow is on the ground, sometimes pursue, like dogs, full grown Deer, which they run down and kill.

MANY KINDS OF BIRDS SLAIN.

One of the few, in fact, about the only species of game bird that is at all numerous, which the sportsman can go in quest of in this Commonwealth without almost continually coming in contact with trespass notices

warning him to "keep off the grass" is the Ruffed Grouse or Pheasant, and, unfortunately, the favorite haunts of this noble game bird are in localities where the Wildcat loves to sneak, hide and depredate. The cautious and ravenous "cat" is passionately fond of Grouse. He destroys them, both old and young, and also their eggs whenever an opportunity presents itself. He kills Wild Turkeys and sucks their eggs, it is affirmed, whenever a nest can be found. The number of small insectivorous and wild song birds, that nest on the ground or in low bushes, which he destroys during the summer season, about the slashings and abandoned lumber camps, is considerable.

MAMMALS, EGGS, ETC., ARE DEVoured.

Rabbits, Squirrels, Mice and Skunks are also eaten by Wildcats, and in the southern States Audubon says they visit sometimes

"The dry beds of streams or brooks to pick up the catfish, etc., or crayfish and frogs that remain in the deep holes of the creeks during the drought of summer." The same authority states that "the wildcat is a great destroyer of eggs, and never finds a nest of Grouse or Partridge, Wild Turkey or other bird without sucking every egg in it."

HUNTS THE QUILLFUL PORCUPINE.

About ten years ago I spent ten days or two weeks in the winter in company with two hunters and trappers in Cameron and Elk counties. We secured nine Wildcats; two with guns, the remainder with steel traps, and on examining these animals I found that three of them were well filled with quills of the Porcupine. This led me to infer that the Wildcat does not hesitate to attack an animal capable of making a pretty vigorous defense.

METHODS OF CATCHING GAME.

Wildcats hunt both by day and night; but, like the great majority of thieves and murderers, they appear to select the darkness as the most auspicious time to commit their deeds of violence. When a Wildcat discovers a flock of Wild Turkeys, Pheasants or a Rabbit running on the ground, he will follow them for some distance, and when he ascertains the direction in which they are going, will make a quick detour and, concealing himself behind a log, in the brush, or on a low branch of a tree, will hide, and, like an assassin, wait patiently until his prey comes within reach. I once, when hunting "white rabbits" in Cameron county, saw a Wildcat run into a clump of laurel and lie in ambush until a Rabbit, which he had been chasing, approached within springing distance. The Rabbit ran up a narrow roadway and when within a few feet of the laurel bed suddenly stopped. Instantly the cat sprang upon it and seizing it in his mouth ran directly up the mountain side, where my companions shot him.

COWARDLY ANIMALS.

Romancing newspaper correspondents and hunters with fertile imaginations have been instrumental in creating an impression, which seems to be generally accepted by the common mass of people who are not acquainted with the true nature of Wildcats, that these animals are daring, ferocious and always on the outlook to spill human gore, and that they will not hesitate an instant to attack human beings, no matter how big or ugly the latter may be. This, however, is not the case. Wildcats are cowardly and will flee from their pursuers, but if wounded and unable to escape, or if surprised in a place where they cannot get away and

forced to give battle, they will fight viciously and do great execution with their strong retractile claws and sharp teeth.

TREED HER LOVER.

One of our correspondents in southwestern Pennsylvania writing on this topic says: "The Catamount is a destructive and ferocious animal, for one attacked me one night when I was going home from courting a girl and treed me on a fence and I had to stay there till daylight." This surely is a unique case, and it possibly may be that Wildcats are inclined to attack young men who are in love.

WHERE THE YOUNG ARE FOUND.

The Wildcat usually makes its domicile or nest in a hollow tree or log. The nest is well lined with leaves, moss and lichens (*Usnea barbata* and its varieties), called commonly "hair moss." The nest is also sometimes found in rocky ledges and caves. From two to four constitute a litter. It is stated that the young are brought forth about the middle of May. Wildcats may be caught in traps baited with Rabbits, chickens, Grouse or fresh meat. Their fur has very little commercial value.

WHAT FARMERS AND HUNTERS TELL OF THEM.

The agitation of game laws and bounty or scalp acts at the session of our Legislature, 1893, was largely instrumental in arousing a widespread interest in these subjects on the part of farmers, fruit growers, sportsmen and naturalists in almost every county of the State. Since the Legislature (1893), adjourned there have been received at our office about five hundred com-

munications bearing on the economic relations of different wild animals, chief among which, so far as mammals are concerned, may be mentioned Foxes, Minks, Weasels, Wildcats, Rabbits, Skunks, Woodchucks, Muskrats and Raccoons.

In view of the unusual interest manifested by our citizens on the bounty question and also of the habits in general of our common mammals, the writer prepared a circular soliciting information concerning the life histories of mammals attributed to the State. This circular, early in January, 1894, was distributed to farmers, fruit growers, naturalists, sportsmen, hunters and trappers in nearly every county of the Commonwealth.

The following questions in regard to the Wildcat appear in said circular:

1. Please state whether the Wildcat is found in your county, and whether it is rare, common or only tolerably common.
2. If Wildcats occur in your neighborhood or county, state whether or not their depredations to game, poultry and small wild birds are of a serious character? Have you ever known Wildcats to attack persons? If so, give full particulars.
3. Have you personal knowledge of one or more cases in which cattle, sheep or pigs have been killed or injured by Wildcats? If so, give full particulars.
4. Have you personal knowledge of one or more cases in which Wildcats have killed or injured deer, old or young, Wildcats? If so, give full particulars.
5. Have you personal knowledge of the loss of turkeys, geese, ducks, chickens or pigeons from the attacks of predatory mammals? If so, how many, and what kinds were killed on each occasion? In each case mention the animal by which you suppose the mischief was done, and your reasons for this belief. Also mention the kinds of mammals which destroy the eggs of poultry, and give full particulars of cases which have come under your personal observation.
6. Do you favor the paying of bounties? If so, on what animals, in your opinion, should bounties be paid? Are you in favor of the bounty being paid by the counties in which the

animals are slain, or that said bounties should be paid by the State?

In response to these interrogatories a considerable amount of instructive and interesting information is given on the succeeding pages from letters of the gentlemen who are credited with their observations:

GEO. M. DAY, Wayne County:

Wildcats are not plenty this winter ('94). Eight have been killed that I have heard of. They are very destructive to rabbits, squirrels, ruffed grouse and other small game easily caught by them in winter. A large one was tracked by a hunter some years ago, and found to have eaten three rabbits and a ruffed grouse, all fresh, caught on same day. The skins of the rabbits were turned flesh side out on the snow, and the cat seemed to have room for more, as it was still hunting when the hunter gave up the chase. I have caught several of them in steel traps and saved one alive. With the help of two young men we drove it out of the woods, using a pitch-fork behind and a fish-pole attached to a trap chain ahead, as gentle persuaders to keep the peace, etc. It would hang back behind every bush at first, then a poke with the fork would send it full spring, at my face the length of the chain. When out of the woods it sulked and lay on the snow, and was dragged to a small crate, lifted in, and a board placed on the box, completing the capture. I have never known one to attack any one, but their sharp claws and muscular forearms make them look like dangerous customers. The usual weight of Wildcats is twelve to twenty-five pounds. One killed by S. Maloney near Beech Pond, in 1892, weighed forty-two pounds. I caught one the same season which weighed about twenty-five pounds.

MESSRS. HERMAN and OTTO BEHR, Lopez, Sullivan county:

Wildcats are common in this county. Think that they do quite an amount of damage to game, as they live entirely on flesh. Have seen where they caught black squirrels, white rabbits, porcupines and one deer. The deer mentioned was an old doe caught in the summer time; when found it was partly eaten and covered with leaves. It was captured by the Wildcat leaping on its back and biting it on the top of neck. A friend set a trap and caught the cat, which proved to be a large male.

Have seen where one chased a fawn a distance of about one hundred rods, but gave up the pursuit when the deer ran up a steep hill. They occasionally enter a chicken coop and do some damage. Such visits, however, are rather rare. Do not think that they would attack a person unless cornered. We caught an old male Wildcat in a bear pen in spring of 1889, which, during the six months that we kept it, became rather tame and listened to its name, "Jim." He would eat out of one's hand, if you trusted yourself, and would purr like a spinning wheel when we came around its cage.

We sent him to the "Zoo" in Philadelphia, and on calling there a year later we found him asleep in a cage with another smaller Wildcat. On calling him by his name he got up and purred, apparently recognizing us after an absence of one year.

There is very general opinion among hunters and other people that there are two different kinds of Wildcats, a small and a large variety. We looked this up carefully and found only one kind, and came to the conclusion that whenever a half-grown lynx was caught it was called a Wildcat, while a very large specimen was called a Catamount.

Their fur is subject to change in color during the year. In Summer it assumes a reddish tinge, while in the fall it becomes gray. We think one of the causes that Wildcats are not more abundant is their habit of catching Porcupines. Nearly all the Wildcats we caught had quills in their bodies. One old male cat in particular was covered with sores caused by quills, and he had some all through his body, which would doubtless have been the cause of his death if left to himself. We do not favor the paying of bounties.

DR. J. E. CLEVELAND, Bradford County:

Wildcats occasionally get into barn-yards and hen-roosts and destroy poultry in winters of deep snow, but they prey mostly on young Grouse, Quail, Rabbits and small birds. A Mr. Krise, while returning from Blossburg to his home in Liberty township, sometime last November (1893), had to pass over Briar Hill, where there was a dense thicket of briars and brush on both sides of the highway, about dusk. A large catamount sprang upon the back of one of his horses and fastened its teeth into the horse's flesh. The man having no weapons with him, jumped from the wagon, seized the cat by its neck, tore it from the horse and by sheer strength choked it to death. The man's clothes were torn to shreds and his body and limbs were frightfully torn and lacerated.

Sometime in the sixties I was called to see a patient who lived on the head waters of the Tioga river in Ward township, Tioga county, Penna. When I arrived at the house, some of the boys of the family had just returned from the woods with a load of fire wood and reported that a "Painter" had killed a large deer in their sugar camp. As there was a fresh snow on the ground I investigated and found the tracks of the marauder along the body of a hemlock tree, which had been turned up by the roots. It had perched itself on the roots, and had remained there until the warmth of its body had melted away the snow. The deer, a two-year-old doe, had been feeding and had not suspected danger until too late to escape. The struggle was long and severe as shown by the upturned leaves and trodden down snow. The victor had partaken of a hearty meal from the neck and fore shoulder of the deer. I procured a steel fox trap and set it by the dead deer. On visiting the carcass the next day I found trap and drag gone. I followed the trail a few rods and found a large catamount with the trap to his hind leg. I could cite another instance where a Wildcat had killed a yearling deer. Am in favor of a bounty. Let each county pay its own bounty, but only to its own citizens.

JAMES THOMAS, Clearfield County:

Wildcats are very destructive to game, poultry and small wild birds. I know of two cases where they have been very bold. A man of my acquaintance was carrying a quarter of beef through a small strip of woods and a Wildcat attacked him, tore his clothes and scratched him badly. Another man once got a ham, weighing about twenty pounds, and put it in a cave some twenty feet from the house and the next morning it was gone. I found it in a field, and seeing the tracks of a Wildcat leading to and from the ham, I set a trap and caught the animal on the following night. It was about four feet seven and one-half inches long and weighed twenty-eight and one-half pounds. Am favorable to a bounty paid by the State.

A. W. COLEGROVE, McKean County:

Wildcats are common in this county, and are very detrimental to game. Rabbits and pheasants are their principal subsistence. They will track a Rabbit like a hound and have as good a nose for birds as a pointer. They usually kill more than the sportsmen or pot hunter. They will not attack a person unless cornered. I have killed many and but in one

instance have I ever seen one show fight. I once had one cornered in the rocks, and after vainly trying to escape he turned upon me, when a shot between the eyes settled the battle. Wildcats will attack deer; I have killed deer that showed evidences of a fight with them. Red Foxes are very numerous here and exceedingly destructive to game. They, with the Wildcats, will exterminate game in a short time unless something is done to eradicate them. A large portion of this county consists of old slashings and bark peelings which make an ideal home for the cats and foxes. Since the county commissioners have refused to pay bounty on these predatory animals they have increased to a frightful extent. Their pelts alone are not a sufficient incentive for hunters to trap them. I am in favor of a bounty on Foxes, Wildcats, and also on certain kinds of hawks and owls; to be paid either by county or State. When the bounty law was in force, game, such as Rabbits and Pheasants, increased in proportion to the depletion of their four-footed and feathered enemies. Since then it has changed and unless there is an incentive for trappers the sportsmen must soon hang up his gun and use his pointer for sausage.

A. KOCH, Williamsport, Lycoming County:

Wildcats have been too rare in our neighborhood for more than forty years to hear of any depredations. Know of an instance where a boy, in winter, killed a large Wildcat with a stone. Favor a bounty and think it should be paid by the county.

ZIBA SCOTT, Lackawanna County:

The Wildcat is one of the most destructive animals we have, both to the farmers and to game. Wildcats as a general thing do not trouble the farmer much in the winter time, when they retire to the forests and subsist principally on rabbits and Pheasants. At this season of the year, when snow is deep, the pheasants live mainly on buds of the trees. When the pheasant has gotten its crop full of buds it often dives under the snow leaving a hole where it goes in. Here is where the Wildcat gets in his deadly work on the unsuspecting Grouse. He sneaks along until he gets within a bound of the place where the bird rests and with one leap he lands right over the hole where the bird sits, and nine times out of ten he gets the Pheasant. I have seen hundreds of places in my time where pheasants have been caught in the manner just described. In the summer time when the leaves are out the Wildcat is the

source of much loss to the farmer. He then lurks about the grass and grainfields waiting for chickens, turkeys or other kinds of poultry, and sometimes he gets in amongst the sheep. About two years ago one of my neighbors, Mr. Joshua Doran, of Covington township, had three half-grown lambs killed by a cat.

TOWNSEND PRICE, Monroe County:

Wildcats are quite numerous here, and their depredations to game and lambs certainly are of a serious character. Never knew them to attack persons and do not think they would unless they could not get away. I have personal knowledge of black bears killing cattle, sheep and pigs. Last year (1893) I had the misfortune to have between thirty and forty sheep killed by bears. In the northern part of Monroe county, near the line of Pike county, there is a great deal of land which is useless except for grazing, as the timber has been cut for the bark and it burns over nearly every year. This is the place where the bears and Wildcats have been doing their destructive work for the past few years. If there is not sufficient bounty placed on these animals to decrease them this pasture ground will have to be abandoned. I have known Wildcats to bite lambs in the neck and then leave them lay Favor bounty being paid by State.

J. C. HEYLER, Nauvoo, Tioga County:

The greatest enemies the sportsman has to deal with are Wildcats. They certainly destroy more Ruffed Grouse than anything in the woods. I have known them to scent Grouse as much as eighty yards and catch them without any difficulty; and I have seen them capture Grouse on nests. They catch and devour numerous other kinds of birds, and also kill small deer. I lose on an average from three to seven lambs in a season by them. A Wildcat sometime ago visited the home of one of my neighbors and in one night killed twenty-six chickens.

C. K. SOBER, Lewisburg, Union County:

Wildcats destroy game and poultry. At Glen Union a family of these animals inhabited, until recently, a cavern in the mountains. In this place I found the bones and remains of fawns, poultry and other kinds of animals, which they had carried there to feed upon. I regard Wildcats as the greatest enemies we have to game, such as Pheasants, Fawns and Rab-

bits. Am in favor of a liberal bounty being placed on their worthless heads.

JOHN E. STOCKER, Luzerne County:

We have Wildcats and Catamounts and they are very detrimental to game. They occur most plentifully on the Wilkes-Barre mountains in the neighborhood of Triangle and Crystal lakes, and also on the North mountains; the latter are better suited for them, as there more game, large and small, abounds. Favor bounty being paid by the county.

GEORGE R. BOAK, Pine Green, Centre County:

Wildcats are plentiful and very destructive to our game; are particularly bad about killing pheasants and they also destroy young deer in our game preserve. We introduced Wild Turkeys into our preserve and the Wildcats and Foxes destroyed both old and young notwithstanding the fact that we tried faithfully to exterminate them through the aid of traps, poison and guns. Favor a bounty being paid by the county.

WM. B. BIGLER, M. D. York County:

They are so rare in this county that little is known of their depredations. One killed a few years ago, near Brogueville, was said to have killed and eaten a number of chickens.

DR. A. B. MacCREA, Berwick, Columbia County:

Wildcats are comparatively common in some parts of the county, and no doubt destroy game to a considerable extent, but they do not, it seems, disturb poultry very often.

W. B. K. JOHNSON, Allentown, Lehigh County:

No Wildcats in this county so far as I know. Possibly some may be present in the extreme northern part of Lehigh. I have travelled where the lynx was numerous; never knew of grown persons being attacked, but have been told chickens were. They live on game, birds, small lambs and young pigs. I have helped to hunt them in Florida when lambs and pigs were thus killed.

N. W. MILLER, Fayette County:

I think it would be right to put a bounty of, say, two dollars, on the Wildcat, as this animal is very destructive to game. One Wildcat will kill more game than six hunters in a sea-

son, as animals of this species hunt both night and day. I have seen large Wild Turkeys killed by them and have taken their track from the dead turkey, following it and killed them. Have never known a Wildcat to attack anyone; I have climbed trees and shaken them off to the dogs at different times.

H. T. FRANKENFIELD, Monroe County:

Catamounts are quite numerous. They kill Grouse, Rabbits, and the young Deer; I have known Deer to be killed and partly eaten by Wildcats and then covered with leaves. They rank with Foxes in destroying poultry and game. I have never known them to attack persons unless wounded.

L. M. KARSTETTER, Clinton County:

Wildcats are very destructive to game such as Fawns, Turkeys, Grouse and, in fact, birds of all kinds, and when pressed by hunger they visit the barnyard for any kind of prey they can capture. I have known Wildcats on several occasions to catch and kill full grown Deer. A bounty of not less than five dollars should be allowed.

R. S. STOVER, Centre County:

Wildcats are the worst animals we have in this locality. A few years ago they killed two deer within a half-mile of my place; they destroy a great many young deer. I favor a bounty of at least four or five dollars and think it should be paid by the State.

H. K. MENSCH, Lycoming County:

Wildcats are few in this locality but they should not be allowed to exist as they possess no good traits and are capable of doing much mischief. A liberal bounty should be paid for their scalps.

CAPT. JOHN M. BUCKALEW, Columbia County:

When woods approach near a farm house Wildcats or Catamounts sometimes catch our chickens. They destroy the Pheasant, Quail, and almost anything that comes within reach, as Rabbits, Skunks, etc. Not dangerous to man but will fight when wounded or cornered. They are becoming rather rare here. Yes, am in favor of a bounty.

J. WARREN JACOBS, Wayensburg, Green County:

Wildcats are very rare; two have been recorded here during the past ten years.

JACOB B. MEIXEL, Cumberland County:

Wildcats do serious damage to Pheasants, and I have known them to kill fox hounds in a chase. I favor a bounty to be paid by the county.

N. H. PARKER, McKean County:

The Wildcat is too wild and wary to visit residences much, but occasionally takes a goose, chicken, or a turkey. Subsists mainly on game in the woods; Rabbits and occasionally a young Deer.

A. P. BREWER, McKean County:

Wildcats are quite plentiful in some localities. They do a great deal of damage to Pheasants and sometimes to chickens and turkeys. I never knew them to kill lambs.

MERION E. KEMERER, Carbon County:

Wildcats are numerous in some parts of our county, especially in the Pine Swamp. They destroy all kinds of poultry and much game. I favor a liberal bounty for their destruction.

C. W. DICKINSON, McKean County:

Wildcats are common here. They live chiefly on small game such as birds, Partridges (Grouse), Rabbits and sometimes they attack larger game. I never knew one to attack a person and I have killed lots of them. I have seen where Wildcats have killed a full grown deer. Three times in my life I have known of Wildcats killing Deer. I have known Wildcats to kill sheep and poultry. I am in favor of placing a bounty of three dollars on the Wildcat or Catamount.

TUNIS SMITH, Wayne County:

Wildcats are plentiful. They destroy poultry but are most destructive to game and small wild birds. From personal observation have never known them to kill Deer, but have no doubt that they do destroy many, for while hunting Deer I have seen where they have followed them for miles. Have never known them to kill sheep or lambs, but I do know of

one instance where they took young pigs. I think a high bounty should be paid for their destruction because they are so detrimental to game that if something is not done to exterminate them they will destroy nearly all the game in the woods, such as Pheasants and Rabbits.

J. B. OVIATT, McKean County.

Wildcats are tolerably common and very destructive to game. There can be no doubt but that they kill a good many Deer, especially when the snow is deep and crusty. Have known them to kill lambs, fowls, etc. They would not attack a person unless in a place where they could not easily escape. I favor a bounty of not less than three or more than five dollars.

DR. C. E. GOLDSBOROUGH, Adams County:

Wildcats are tolerably common in the mountains of this county. They kill all kinds of feathered game and Rabbits, and are believed to destroy young Deer. Am not in favor of a bounty being paid for any animal.

JASPER T. JENNINGS, Susquehanna County:

Wildcats are very rare; however, one is now and then met with in the northern part of the county. Years ago when the species was numerous in this vicinity poultry and lambs were often destroyed. I once cut down a large birch stub that was hollow at the top, where it had been broken off some forty feet from the ground, and within the hollow I found nearly half a bushel of bones and the skulls of Rabbits, Chipmunks, Squirrels, etc., intermingled with a mass of sticks and rotten wood where a Wildcat had lately had its den or nest.

LINCOLN WELLS, Bradford County:

Wildcats are present in some portions of our county. They do considerable damage to game of different kinds, especially Grouse, and small wild birds. Favor a bounty to be paid by State.

ABRAHAM NEVELING, Coalport, Clearfield County:

The depredations of Wildcats are of serious character. They destroy Turkeys and Geese, as well as game. I have known a pair of Wildcats to kill a fawn. Am in favor of a bounty being paid by the State.

J. P. SCHALL, Northampton County:

The Wildcat is not numerous but occasionally one is shot; one of my neighbors killed one a few years ago that weighed forty-two pounds. They generally live on game and will also carry off poultry.

J. ALBAUGH, Forest County:

Wildcats are present in this county and they are very destructive to poultry, lambs and young pigs.

SETH NELSON, Jr., Clinton County:

Wildcats are great destroyers of poultry and game. I have seen one of them kill a deer. Am in favor of a bounty of five dollars.

S. H. HASLET, Forest County:

Wildcats kill Pheasants, Rabbits, Geese, Chickens, Lambs, Fawns, etc.

THEODORE DAY, Wayne County:

Wildcats are destructive to poultry of largest size, small game and small lambs. The bounty of two dollars each should remain. A few years ago three (different ones) were seen in one day near the town of Dyberry.

DR. E. F. BONHAM, Luzerne County:

Wildcats are very destructive to game. There should be a bounty of two dollars for each one killed.

JOHN R. LEHMAN, Huntingdon County:

Wildcats destroy game and small birds; am in favor of a bounty being paid by the State.

W. C. BABCOCK, Tioga County:

Wildcats destroy large quantities of game such as Grouse and Rabbits. They rarely venture in farming localities. Favor bounty being paid by the State.

A. P. YOUNG, Columbia County:

Wildcats are seldom seen or heard of in our agricultural districts.

JOSEPH P. McKELVEY, Huntingdon County:

Wildcats are rather rare and they seldom are seen in the farming districts.

ROBT. H. COLEMAN, Lebanon County:

Wildcats are about exterminated in our hills.

DANIEL H. PERSHING, Westmoreland County:

Wildcats are too scarce in this locality to do much injury.

HON. CHAS. LUHR, Elk County:

Wildcats are present in considerable numbers in our woods; they destroy more fawns and young deer up to one year than any other wild animal. Favor bounty being paid by the State.

P. FRANK RANGLER, Union County:

Wildcats destroy game. I have killed several in this county but they are rather rare.

HON. N. B. CRITCHFIELD, Somerset County:

Wildcats are found in the mountainous regions of our county, but their haunts are as far from human habitations as they can get.

ABNER FAGUE, Lycoming County:

Wildcats are found only in the mountains, where, in some sections, they are rather plentiful. Have known them to kill young deer.

A. W. WRIGHT, Huntingdon County:

Wildcats destroy poultry, game and small wild birds. Favor a bounty to be paid by the State.

G. C. BELL, Wayne County :

Wildcats kill poultry, game and small birds of different kinds.

B. ALEXANDER, Cambria County:

Wildcats cannot be said to be numerous in our county; know of one to have killed a deer. Am in favor of a bounty.

RANDALL BISBING, Monroe County:

Wildcats are rather plentiful in some parts of our county.

and some years they do much damage to poultry. Know of one instance where Wildcats killed a lamb. Am in favor of a bounty.

CHAS. LOTT, Warren County:

Wildcats are not sufficiently numerous in my locality to do much damage to either poultry or game.

M. B. TRECOTT, Luzerne County:

Wildcats are of frequent occurrence in some sections of our county.

GEORGE MILLER, York County:

I do not think there are any Wildcats in our county except perhaps in the South mountain.

E. E. BRILHART, Indiana County:

Wildcats are rather numerous in some parts of the county.

JEREMIAH PHILLIPPI, Somerset County:

Wildcats or catamounts are frequently met with in some sections of our county. They destroy a great many Wild Turkeys and Pheasants when hatching, and during hard winters they kill a good many Deer. I think the State should pay a premium of five dollars on every Wildcat.

J. H. VAN ETTEEN, Pike County:

In 1893 nineteen Wildcats were killed in this county. Wildcats kill game and small wild birds; never heard of them killing poultry. I have, however, heard from a reliable source that Wildcats kill fawns, but I never heard of them killing lambs or calves.

BENJ. A. FILBERT, Schuylkill County:

The Wildcat is a rather rare inhabitant of our mountainous districts.

C. W. PENNELL, Wayne County:

Wildcats are quite numerous and they destroy much poultry and game,

JOHN PERRY, McKean County:

Wildcats are quite plentiful here. They live mostly on Rabbits and Partridges (Ruffed Grouse). I often hear of them catching lambs in the spring.

DR. F. J. WAGGENSELLER, Snyder County:

Wildcats are found to some extent, and where they are will do very serious damage to poultry, game, and small wild birds. Favor of bounty to be paid by the State.

P. D. REXFORD, Tioga County:

Wildcats are tolerably common in some parts of our county. They are very destructive to poultry and small wild birds. Am not in favor of paying bounties on any animals.

W. G. SARGENT, Crawford County:

Wildcats are very scarce in our county, hence do little damage.

W. K. PARK, Bradford County:

Wildcats are rather scarce in the section of the county where I reside; have only known two to have been killed in the last three or four years. Am in favor of bounty being given by the State.

M. B. LYMAN, Susquehanna County:

Wildcats are very rare in this county:

W. F. WAGNER, Clearfield County:

Wildcats are tolerably common. They destroy game and birds. I favor a bounty to be paid by the State.

FRED. L. KRAEMER, Lycoming County:

Wildcats are rare in many sections of this county. They destroy poultry and game.

A. K. PIERCE, Clinton County:

Wildcats only on rare occasions attack and kill the young of Deer. I do not favor a bounty on any animal.

JAMES BEIHL, Union County:

Wildcats kill game and poultry. Am in favor of a bounty and think it should be paid by the State.

J. B. OVIATT, Norwich, McKean County:

The Wildcat is the worst animal of the whole lot. I have had several full-grown sheep killed during the last two seasons by the Wildcat, and they are destroying lots of game, such as Pheasants, Rabbits, etc. Have seen where Rabbits and Pheasants were killed this winter by Hawks, Owls and Foxes.



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MINK.

Putorius vison.

DESCRIPTION.

Larger and stouter than the Ermine or Common Weasel; the coat is shaggy and tail bushy; ears short; the tail, about half as long as the body, is blackish; feet semi-palmate (half webbed). General color, dark brownish chestnut. Sometimes rather small-sized individuals of this genus are taken which are of a very dark-brownish black color, and such are known to hunters and farmers as "black minks." The back is usually marked with a blackish area, running lengthwise of the body. The end of the chin is white, and the edges of the upper lip, sometimes, though rarely, are also white, and the throat, breast and belly are frequently marked with irregular patches of white. Average weight about two pounds; average height about five inches; length fifteen to twenty inches.

Habitat.—North America. Rather common, in suitable localities, throughout Pennsylvania.

The Mink is found generally throughout the State and is fairly plentiful. It is expert at swimming and diving, and able to remain long under water, where it pursues and catches fish, which it frequently destroys in large numbers. Dr. C. Hart Merriam says: "Often-times its destructiveness in this respect renders it a serious obstacle to the industry of fish culture."

FOND OF BROOK TROUT.

Along some of our mountain streams, where Minks are plentiful, hunters and woodsmen claim that many Brook Trout, generally the large-sized ones, are killed by these amphibious depredators.

CHICKENS AND DUCKS ARE FAVORITE FOOD.

The Mink does much damage to poultry, especially chickens and ducks. Various kinds of wild birds, particularly ground-nesting species, cray-fish, frogs and

reptiles are included in the dietary of the Mink; and it is also learned from the testimony of different writers and observers that the eggs of domestic fowls are often taken by these nocturnal plunderers.

KILL PHEASANTS, QUAIL AND RABBITS.

Sportsmen despise and condemn Minks because of the taste these brown-coated marauders have acquired for Pheasants, Quail, Rabbits and Squirrels. Rails and other marsh-inhabiting birds frequenting a locality where Minks resort, are often preyed upon by these blood-thirsty and keen-scented quadrupeds.

Injurious rodents, such as Mice, Rats and Muskrats, so troublesome on the farm, which Minks eat, do not, we are assured by eminent naturalists who have given much attention to the economic status of Minks, compensate the loss occasioned by their attack on barn-yard fowls, fish and game.

The aquatic nature of the Mink is such that it is usually found inhabiting the borders of streams, mill ponds or dams. When Minks take up a residence in or near the farmer's poultry house, as is frequently the case, they have been known to destroy every fowl in the place in a short time.

It is claimed by some that the Mink feeds upon insects; this may be true, but as I have only examined the stomach contents of four of these animals captured at a period of the year when insect life was abundant, and neither of them showed, on dissection, any evidence of such food, I am not, of course, prepared to confirm or deny the statement.

A MUSCULAR ANIMAL.

The average weight of an adult Mink is about two pounds, and for an animal so small it is astonishing to

observe the great strength it possesses. Dr. Merriam cites an instance where a Mink "was known to drag a mallard duck more than a mile, to get it to its hole, where it was joined by its mate."

The Mink can be easily taken in steel traps or dead-falls; it is remarkably tenacious of life and will live for many hours struggling under the pressure of a pole or log which squeezes its body almost flat. Audubon and Bachman relate a case where they found a live Mink under a dead-fall with a pole across its body, held down by a weight of one hundred and fifty pounds, beneath which it had struggled for nearly a whole day. The steel trap which is commonly employed for catching Minks should be concealed with ordinary care, and baited with fish, a small bird or the head of either a Pheasant, duck or chicken.

FISH OIL ALLURES THE MINK.

"Professional trappers," Dr. C. Hart Merriam writes, "find the Mink attracted by the smell of an oil made from fish that have been allowed to decay, in a loosely corked bottle placed in the sun.

"The odor from this oil is said to be effective at a considerable distance, and a few drops of it will often entice a Mink into the trap when no bait is visible."

The following extracts, taken from letters on file in our office, and which have been kindly sent us by farmers, naturalists and sportsmen, show very clearly the character of depredations done by this animal.

THE MINK AS A DESTROYER OF POULTRY AND GAME.

MR. PIERSON, Dysart, Pa.:

Have known of hundreds of geese, ducks and turkeys and also chickens to be killed by Weasels, Minks, Skunks and Foxes. A Weasel killed thirty-four chickens in one night; a Mink, three ducks in one night; a Fox, two geese in one night;

a Skunk, two chickens in one night; a Mink, two chickens in one night, at different times at my place. Could cite a hundred similar cases. This county loses over \$6,000 a year from Foxes, Minks and Weasels.

C. P. MOTT, Milford, Pa.:

Minks too few to cut any great figure, but more than needed. They love the farmer's poultry and are loath to be satisfied with less than the whole coop.

F. H. FASSETT, Meshoppen, Pa.:

About one year ago one of my neighbors lost three or four grown chickens by a Mink; was finally caught.

THOS. SEABORNE, Newlin, Pa.:

Minks are very destructive to poultry. When they attack poultry, they kill the whole flock before they stop; only eating, perhaps, part of one or two at most.

GEO. PERMAR, New Castle, Pa.:

Minks are very plentiful in some localities, and they are especially destructive to our hen roosts.

C. K. SOBER, Lewisburg, Union County:

Minks are great destroyers of poultry. Some years ago on the farm a family of Minks took up their abode under a pig pen, and before we were aware of their presence they had killed not less than one-hundred and fifty chickens, large and small. Finally, when the marauders were located, we were obliged to tear down the pen and killed two old and five young ones, the latter about one-third grown.

JOHN L. KLINE, Liverpool, Perry County:

Minks are very destructive to game and poultry. I have known the Mink to kill as high as thirty to forty ducks in one night. I have known them to enter a chicken coop and kill as high as twenty chickens.

J. M. DUMM, Mackeyville, Clinton County:

Two years ago my next neighbor had fifty young chickens killed in one night; I went to his home with my dog, but we could not catch the supposed Mink. The following morning my other

neighbor across the way had about sixty young chickens destroyed. The dog barked at a stone pile in the yard, and, with some help, we killed six three-fourths grown Minks, the old one escaping.

H. K. MENSCH, Muncy Station, Lycoming County:

Minks are plentiful and do much damage to poultry.

R. S. STOVER, Livonia, Centre County:

Minks are bad on chickens in summer.

HON. A. L. MARTIN, Enon Valley, Lawrence County:

A Mink broke in my chicken house and one night cut the throats of thirty-seven chickens eight weeks old; different nights did other injuries until captured.

HON. N. F. UNDERWOOD, Lake Como, Wayne County:

Minks still common here; sometimes destructive to poultry; will kill more than they can eat or carry away. Know of one case as follows: A brother-in-law of mine found that something was killing off his chickens; after losing a number he took those that were left alive and put them on the barn floor, turning a large dry goods box over them; the next morning he found them all killed and a Mink in the box. The Mink had squeezed himself through a small aperture between one edge of the box and the floor, and gorged himself on chicken until he was too large to squeeze out. Fishermen here say that Minks are very destructive to the trout in our streams.

JOHN F. THOMAS, Carrolltown, Cambria County:

The Mink does much damage in poultry yards, particularly those situated near creeks or near the head of a minor tributary. In this locality they are often taken with the common steel trap when on their predatory expeditions. The Mink travels generally in the night, but they have been caught in daylight.

A. W. RHOADS, Wilkes-Barre, Luzerne County:

I had a large flock of ducks which were destroyed by a Mink and Weasel which I saw along the brook frequented by the ducks.

The Weasel, Mink and Red Fox destroy fowls.

It has been, for years, a custom among a few enthusiastic

sportsmen, like myself, to poison with strychnine Skunks, Foxes and Wildcats, by the use of fresh meat or sparrows impaled on a stick and placed on old roads and paths in the snow. The Weasel and Mink are trapped with the ordinary spring trap.

C. W. PENNELL, Hemlock Hollow, Wayne County:

A Mink visited my mother's hen roost and killed nine grown chickens the first night, and the second night finished the flock; the third night they caught him in a steel trap. Think the State should pay a bounty on Minks.

W. B. K. JOHNSON, Allentown, Lehigh County:

I saw a Mink take a chicken in broad daylight.

J. B. OVIATT, Norwich, McKean County:

Minks are very destructive to birds, fowls and game, such as Partridges, Rabbits, etc.

N. G. BUNNELL, Vosburg, Wyoming County:

Minks are scarce, but sometimes a few follow streams from the river, and are bad on poultry.

GEORGE M. DAY, Dyberry, Wayne County:

We lost sixty out of eighty-five chickens the past summer by Minks.

J. S. GAY, Terrytown, Bradford County:

I have know'n a Mink to catch twenty-seven hens in two nights.

W. M. BENNINGER, Walnutport, Northampton County:

Minks and Weasels have done great damage to our poultry; they have killed hundreds of young chickens for me and my neighbors, and we find them very difficult to eradicate.

EMIL ULRICH, Stroudsburg, Monroe County:

My wife shot a mink when he was in the act of carrying away a young brahma chicken almost as big as himself, and I have missed many eggs taken by Minks; they do not destroy or suck the eggs in the nest, but take them away; but when it came to the nest egg made of porcelain, they found out the

mistake and shortly dropped it. Young ducks were always lost when big enough to go to water; one after another would disappear, and I lay this to the Mink.

L. M. CASTETTER, Green Burr, Clinton County:

People living at a distance from streams do not know what a pest Minks are, but those who live close to the streams know all about them, for they have to shut their poultry houses very close; if they neglect it once, they can be sure they will lose the whole stock, as the Mink will not stop at one or half a dozen, but as long as they can find a living chicken they will kill. Not over a week ago a farmer lost forty-eight chickens in one night. They really destroy more poultry on an average than the Fox. There should be a good bounty on them, not less than \$1.00 for each Mink.

GEORGE G. HUTCHINSON, Warriors' Mark, Huntingdon County:

Minks are numerous along the streams in this region. Have known one Mink to kill thirty chickens in a night.

JOHN KELLOW, Carley Brook, Wayne County:

Minks are partial to poultry, and act similarly to the Weasel; that is, bite them in the neck and suck the blood and leave the carcass; have known fifteen hens in one coop killed in one night by Mink.

F. M. McKEEHAN, Ferguson, Perry County:

Tolerably common along our streams. Are destructive to poultry and fish, especially if they breed near your residence. I live on the Little Buffalo creek, and have lost many dollars worth of poultry since here (1876.)

TOWNSEND PRICE, Canadensis, Monroe County:

Minks are destructive to poultry, game and fish, and they catch a great many chickens and ducks.

ENOS BLOOM, New Millport, Clearfield County:

I think the Mink to be the most destructive to poultry of any and all enemies. I could, if required, enumerate by the hundreds chickens that were killed by the Minks in our valley.

C. R. NOYES, Westport, Pa.:

The Minks destroy poultry, both chickens and turkeys, but they also destroy rats and mice in large quantities; on the whole, perhaps, one will balance the other.

J. K. BIRD, Millville, Sullivan County:

The Mink is scarce; he destroys poultry and is very destructive.

D. KISTLER, Kistler, Pa.:

The Minks are plenty and destroy a great deal of poultry.

T. H. HARTER, Bellefonte, Centre County:

The Mink is very destructive to Pheasant or common Grouse.

ZIBA SCOTT, Spring Brook, Lackawanna County:

The Mink is a very mischievous little scamp; he is full of tricks; he likes to kill chickens for their blood; if he gets in a chicken coop he seldom leaves one alive. One got in my mother's coop one night, killing thirty-five chickens, but we put a dog on his trail in the morning, run him into a hole and killed him. He also catches Rabbits and Pheasants.

JOHN NELSON, Talley Cavey, Allegheny County:

The Mink is notorious: he killed many of our ducks and chickens; if he can get in the coop at night he leaves none to tell the tale; will carry off chickens nearly half grown. Minks are very fond of eggs.

JOSIAH PILE, New Lexington, Somerset County:

Sometime ago there were eighteen full grown chickens killed in my chicken house in one night, all bit about the head and neck; I found the place where the thief entered, set a trap and caught a Mink. Another time there were ten killed, and still another time twelve killed, all in the same way. Caught a Mink every time.

ADDITIONAL NOTES ON FOOD OF MINKS.

Name and Address of Observer.	Poultry.	Remarks.
L. C. Oberlin, Schmicksburg, Pa.	Destroy chickens and turkeys.	Have known a mink to kill 30 or 40 in one night.
J. L. Brannen, Exchange, Pa.	Destroy chickens	
Noah H. Parker, Gardeau, Pa.	Destroy chickens.	They also destroy fish and mice.
W. J. Stull, Coalport, Pa.,...	Destroy chickens.	20 were killed in one night by a mink.
J. W. Van Kirk, Milton, Pa.,	Destroy ducks, ..	On one occasion I lost eight ducks; each was bitten in the neck.
Jasper T Jennings, New Milford, Pa.	Destroy poultry, .	They usually disturb poultry in the neighborhood of streams they frequent.
S. S. Thomas, Lynn, Pa.,....	Destroy chickens.	A mink will frequently kill all the chickens in a roost.
G. C. Bell, Maplewood, Pa.,...	Destroy chickens.	They also destroy many fish.
Melanthan Mench, Millinburg, Pa.	Destroy chickens and ducks.	A mink destroyed three old ducks and 16 marketable chickens.
C. W. Dickinson, Norwich, Pa.	Destroy chickens and ducks.	
Thos. B. Darlington, West Chester, Pa.	Destroy poultry, .	Minks and weasels are both poultry loving pests.

THE MINK AS A FISHERMAN.

MR. PIERSON, Dysart, Pa.:

Minks destroy an immense amount of trout here. They catch them after they run them under stones or logs when they have them cornered. I, on one occasion, trailed a Mink that caught from fifteen to twenty trout in one night and eat part of each.

A. W. RHOADS, Wilkes-Barre, Pa.:

I have personal knowledge of the catching of fish by Minks and Raccoons; they dive for them in shallow waters.

MR. ARTHUR MARTIN, Sandy Lake, Pa.:

Minks have killed many fish in our ponds.

HON. GERARD C. BROWN, Yorkana, Pa.:

Minks are still around brooks and are good fishers. A Mink won't take long to clean out a small trout pond

JOHN M. BUCKALEW, Fishing Creek, Columbia County, Pa.:

Minks destroy fish; sink down in the water to catch and come to the surface to consume. Minks are numerous and a damage to the communities where found.

SAMUEL M. DOWNS, Mauch Chunk, Pa.:

I have no personal knowledge, but reports of Mink depredations to fish are common; having a semi-palmated foot and being expert swimmers and divers they experience little difficulty in capturing such prey.

FRED. W. WELD, Sugar Grove, Warren County, Pa.:

I have occasionally seen dead fish along Stillwater creek killed and partially eaten by Minks, but have never observed their method of capture.

E. W. CAMPBELL, West Pittston, Luzerne County, Pa.:

Trout have been killed by Minks, as they have been caught at it.

H. C. KIRKPATRICK, Meadville, Crawford County, Pa.:

I have only seen the Mink fishing. Once when duck shooting in Conneaut Marsh I noticed a great commotion in the water just beneath an oak tree which overhung the water; thinking it might be a Wood Duck I made a large circle and came out under the tree; crawling up to where I could look over the bank I saw a large Mink about ten feet from me; it seemed to be hunting in the weeds for something; in a moment it disappeared under the water, in about fifteen or twenty seconds it reappeared with something in its mouth and swimming to shore jumped out on the bank where it shook it as a dog shakes a rat; after it was apparently dead the Mink dropped it and sniffed around it a few times and disappeared in the underbrush. Then I went to where the object was lying and found it to be a large species of Salamander about one foot long. Although they are not a fish, it illustrates, to a certain extent, the Mink's manner of fishing for that kind of game.

OTTO BEHR, Lopez, Sullivan County, Pa.:

Minks are very good fishers. Saw one come out of the open riffle in winter with a large trout in its mouth, which it had caught across its back; on another occasion I caught one dragging a good-sized eel along in the snow. They sometimes

get into chicken coops and kill a dozen or more fowls in a single night.

W. J. STULL, Coalport, Clearfield County, Pa.:

Mr. Thomas Millen informs me that a Mink has taken quite a number of fish from his fish pond by diving or plunging after them.

PAUL SWINGLE, South Canaan, Wayne County, Pa.:

Minks are very destructive to fish; they swim through the water and catch them.

S. S. THOMAS, Lynn, Susquehanna County, Pa.:

A few years ago I had a large number of cat-fish and one eel in a box in my spring drain. Their continued disappearance (the eel among the rest) surprised me, but I one day discovered as many as twenty of the bull-heads (cat-fish) piled up under a log near by. A steel trap stopped the theft and added half a dollar to the youngsters' pocket money in the way of Mink bounty.

ZIBA SCOTT, Spring Brook, Lackawanna County, Pa.:

The Mink likes fish; brook trout suits him best if he can get them. He is an expert swimmer; goes under the water and catches them easily. I have shot two within the past year with trout in their mouths. The last one had a trout eight inches long.

C. P. MOTT, Milford, Pike County, Pa.:

Minks undoubtedly kill many fish.

GEARY C. BELL, Maplewood, Wayne County, Pa.:

A Mink got into a carp pond last winter and destroyed a great many carp, some of which were nearly two feet long.

J. B. OVIATT, Norwich, McKean County, Pa.:

Have often seen where Minks have caught fish in winter time and have brought them on shore and eat or hid them. Minks have no trouble in catching fish when the water is low.

J. C. HEYLER, Nauvoo, Tioga County, Pa.:

Minks destroy poultry and birds, but the greatest damage done by them is to brook trout, which is their principal living; they also catch other fish, but trout is their favorite fish diet.

H. C. DORWORTH, Oil City, Venango County, Pa.:

Have seen a Mink catch a trout in one of our neighboring streams, in the winter, by diving under the overhanging banks (where the trout usually stay in winter) and catch the trout as they attempted to swim past him. Minks, two years ago, killed all the carp, forty in number, in a pond on Sage run. As these fish work down in the mud in winter, the Minks had no difficulty in catching them.

GEORGE FRANCE, Ariel, Wayne County, Pa.:

The Mink destroys fish, particularly brook trout, and he is also very destructive to domestic fowls, especially chickens.

EMIL ULRICH, Stroudsburg, Monroe County, Pa.:

Minks destroy fish, particularly brook trout, and they usually catch the largest ones they find in the deep holes.

JOHN KELLOW, Carley Brook, Wayne County, Pa.:

Minks are at home under the water, where they readily capture fish. They annually destroy great numbers of trout.

W. R. PARK, Athens, Bradford County, Pa.:

Minks are expert fishermen. They kill large numbers of trout. I once shot a Mink with a large trout in its mouth.

SILAS FRAMTON, Coalport, Clearfield County:

During the trout season of 1896, Mr. H. A. Wagner, of this place, and myself, were fishing on Bell Run—a tributary of the Juniata—when I saw a Mink dart into the water and come up with a good-sized trout; we watched him make four trips and each time he came up with a trout. I shot at it then with an ordinary revolver, but, owing to the distance, missed it. On another trip in 1896 I saw an ordinary Garter Snake come up out of the water with a trout in its mouth. I tried to kill it but it got under some drift and I could not catch it.

J. F. REYNOLDS, Carbondale, Lackawanna County:

Have seen positive evidence of the fact that Brook Trout have been destroyed by Minks.

E. J. STURDEVANT, Forksville, Sullivan County:

Minks kill many trout. They also destroy poultry and game.

A. W. COLEGROVE, Smethport, McKean County:

Otter and Mink destroy fish.

J. S. TILLOSTON, Tilloston, Crawford County:

I know of an instance where a Mink in one evening killed from ten to fifteen carp.

H. H. RANATT, Pipersville, Bucks County:

Have seen Mink fishing.

B. F. FRITZ, Divide, Columbia County:

Fish in Little Fishing Creek suffer from Foxes, Minks and Hawks.

G. S. TURNER, West Hickory, Forest County:

I have seen Minks catching fish in small streams; have seen Cranes, Great Blue, Night and Green Herons catching fish. It is common report that one Crane on a trout stream will catch almost all the trout in it in one season.

PAUL A. OLIVER, Oliver's Mills, Luzerne County:

Have seen Mink catching Brook Trout.

F. C. FIELD, Balsam, Tioga County:

Have seen fish destroyed by Minks; they also destroy much poultry.

D. F. LEWIS, Gillett, Bradford County:

I have caught the Mink catching large fish.

GEORGE C. CONNELL, Columbia X Roads, Bradford County:

Have seen fish destroyed by Minks and Muskrats.

From these quotations it will be seen that Minks unquestionably are great destroyers of fish, while it is well known that they will catch and feed upon almost any species of the finny tribe which they can secure. These amphibious animals have, there is little doubt, a preference for the toothsome and beautiful brook trout. The number of trout which Minks annually kill about our mountain streams is no doubt considerable.

RACCOON.

Procyon lotor.

DESCRIPTION.

An animal of an inquisitive turn of mind, as its long nose and moveable naked snout would indicate. Its nails are not covered by hair and they are also long, sharp and hooked, like claws, and "are used in an almost human manner." Its head is round rather than long, with low erect ears, that are covered with hair on both sides and rounded above; its tail is about one-third its length and is very bushy, has some four or five rings of black alternating with rusty white interspaces, all being of equal width. Its feet on the soles are naked, otherwise it is clothed with two kinds of hair, the inner one like wool, soft and finer than the outer, which is long and coarse. Length thirty to thirty-six inches.

Habitat.—Generally distributed in United States east of the Rocky Mountains.

A POULTRY THIEF.

He is a thief and annoyance to poulterer and farmer; he will feast to satiety on a nest of eggs; nor are his depredations in the poultry yard confined to eggs alone, for letters are constantly received at this Department from various counties, telling of losses among the chickens themselves. The most serious one comes to us from Mr. A. Judson Smith, New Millport, Clearfield county, who says that in one month he lost between twelve and fifteen dollars worth of hens from the visits of a Raccoon. W. G. Bunnell, Vosburg, Wyoming county, writes that a Raccoon, which he was so fortunate as to catch in a trap, killed some twenty-five chickens in two nights. Mr. M. E. Kemerer, Weissport, Carbon county, says: "Raccoons kill chickens or any kind of poultry;" and Noah H. Parker, of McKean county, asserts that this animal "will kill fowls whenever he gets a good chance, and do considerable damage."

RACCOON.



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FEASTS ON CORN.

Audubon says:

"No negro on a plantation knows with more accuracy when the corn (maize) is juicy and ready for the connoisseur in roasting ears; and he does not need the aid of a fire to improve, but attacks it more voraciously than the Squirrel or Blackbird and is the last to quit the cornfield."

Further on this same writer says:

"When the Indian corn is ripening the Raccoon invades the fields to feast on the rich milky grain, as we have just stated, and as the stalks are too weak to bear the weight of these marauders they generally break them down with the fore-paws, tear off the husks from the ears, and then munch them at their leisure."

On this line advices reach us from numerous correspondents throughout the State, showing the love these animals have acquired for green corn, and the damage done.

AS A FISHERMAN.

Its long hooked claws serve it in fishing, and frogs, shell fish and soft-shelled turtle eggs are dainty bits for him. A number of complaints have reached this office from fishermen in different sections of our mountainous regions, where Brook Trout and Raccoons both are plentiful, that these latter animals destroy many of the speckled beauties. Our informants claim that the greatest amount of damage is done to Brook Trout when the waters of the streams are low. The Raccoon also destroys other species of fish which he is able to catch in streams and along the margins of ponds and pools.

FEEDS ON BIRDS' EGGS.

According to different writers and observers the Rac-

coon frequently feeds on the eggs of different species of birds. He is an expert climber and by reason of this fact, it is asserted, he frequently despoils the homes of the feathered tribes which are built in trees.

Audubon says:

"The Raccoon ascends trees with facility and frequently invades the nest of the Woodpecker, although it may be secure against ordinary thieves, by means of fore-feet, getting hold of the eggs or young birds."

Ground-nesting species, such as Ruffed Grouse and the Wild Turkey, hunters claim, are occasionally destroyed by the inquisitive Raccoon.

AN ENJOYABLE RECREATION.

A 'coon hunt means both pleasure and profit for its participants. The excitement attendant on the chase itself—the cool night air—the excited yelping of the dogs—the false starts and then the true find; the lanterns throwing their brightest light at the base of the trees around which the dogs are wildly leaping, casting deep shadows up and beyond; but they are neither too deep nor too black to prevent our discovering, high up and on the extremity of a limb, that for which we left the warm house and cozy fireside. Now the excitement is at its height; the dogs are bounding madly against the tree trunk, their duty fulfilled in having successfully piloted us thus far, and urging us to our part of the program with sharp, shrill bark. If the tree is a slight one a few shakes will bring our quarry heavily to the ground, but if it is one of the "Monarchs" then the steady stroke of the axe is heard; and we watch with breathless anxiety as the tree with its animal food begins to bend slowly earthward, then more rapidly, until it comes crashing down and the dogs end—as they had begun—the doings of that 'coon hunt.

HUNTED FOR BOTH FLESH AND FUR.

His pelt means money to the successful 'coon hunter, for his fur is used in the manufacture of robes, coats, capes, etc. In the line of this animal being a good article for food, C. L. Herrick, in Bulletin No. 7, the Mammals of Minn., says:

"The omnivorous and especially the insectivorous habits of this animal render it especially subject to internal parasites, in spite of the most remarkable precautions, which either experience or natural taste has developed in its eating habits. An instance was seen where the body of a Raccoon which had been exposed in the market with other meats, was literally filled with worms of the genus *Filaria*, several inches long, and these filled with living embryos in all stages of development."

Audubon says relating to this:

"In the dreary months of winter should you be encamped in any of the great western forests, obliged by the pitiless storm to remain for some days, as we have been, you will not be unthankful if you have a fat Raccoon suspended on a tree above your camp, for when kept a while the flesh of this species is both tender and well flavored."

 WHAT FARMERS AND SPORTSMEN SAY ABOUT RACCOONS.

J. B. OVIATT, Norwich, McKean County:

Raccoons catch fish in the open spring runs in the winter time; Brook Trout are frequently numerous in warm spring brooks during the winter time. They do but little damage to farmers.

JEREMIAH PHILIPS, Garrett, Somerset County:

The way Raccoon, Mink and Otter catch fish is in small streams and ponds when the water gets low, and the fish have no chance to hide from them.

W. C. BABCOCK, Blossburg, Tioga County:

Raccoons will visit corn fields when they are located near the woods. The sport they furnish the farmer and neighbors make up for the small loss in corn.

JAS. S. NEASE, Washington, Washington County:

Raccoons. I have not seen any damage done by them. They are said to eat corn sometimes, when growing along the woods. They are not destructive.

F. M. McKEEHAN, Ferguson, Perry County:

Raccoons, tolerably rare; do not do much damage; sometimes destroy a little corn when near timber land.

E. D. DAVIS and JOHN M. BUCKALEW, Fishing Creek, Columbia County:

Raccoon, not plentiful. They destroy corn in the field in the fall.

JOHN PERRY, Kasson, McKean County:

Raccoons are very common here; they destroy oats and corn and are very fond of chickens if they can get them.

C. W. DICKINSON, Norwich, McKean County:

The Raccoon will eat sweet apples, cherries and corn, but the damage by the Raccoon is not heavy. I have known of 'coon killing chickens two different times in my life, one at each time.

H. C. DORWORTH, Oil City, Venango County:

Raccoons have destroyed considerable corn for the farmers in this vicinity. In the northwestern part of this county the Cottontails have not only destroyed whole gardens but have attacked the growing grain. Young orchards (especially apples) are frequently seriously injured by these animals. Squirrels show a great fondness for corn, carrying away as much as possible at a time and repeating this operation with surprising frequency.

J. C. HEYLER, Nauvoo, Tioga County:

Raccoons are of no good; as we all know they are good fishers and very seldom fish for any other kind of fish than trout. They also destroy crops such as corn and buckwheat. They are common; no bounty should be paid on them.

A. P. BREWER, Norwich, McKean County:

Raccoons are plenty, but do no particular harm; they pay for catching.

N. G. BUNNELL, Vosburg, Wyoming County:

A few years ago had some chickens killed and supposed it was a Skunk; set trap by coop; next morning trap was gone; began looking for it and soon saw the dog was interested in it; we followed some twenty rods and found Mr. Coon had caught the trap in the fence. Think he must have killed twenty-five chickens in two nights. Think them worse than Foxes.

ABRAHAM NEVELING, Coalport, Clearfield County:

Have knowledge of their destroying fish, but cannot give their methods of capturing, with the exception of the Raccoon which captures the fish with its paws, same as a person would use his hands.

W. B. K. JOHNSON, Allentown, Lehigh County:

Squirrels and Raccoons did so much damage to my father's corn that we had to watch the Squirrels by day and the Raccoons by night.

GEO. FRANC, Ariel, Wayne County:

'Coons are plenty and destructive to corn and fowls.

DR. L. W. SCHNATTERLY, Freeport, Armstrong County:

I have witnessed both Raccoon and Muskrats catching fish, but they can only do so in very shallow water where the fish are penned up. The Raccoon catches them in his claws while the Muskrat dives and catches them in his teeth.

F. WAGGENSELLER, M. D., Selinsgrove, Snyder County:

The only mammals that destroy corn to any extent are Muskrats, Raccoons, Rabbits and Squirrels. Squirrels destroy eggs and young birds.

S. S. THOMAS, Lynn, Susquehanna County:

Raccoons in former years have done as much damage in corn fields as pigs would.

THOMAS B. DARLINGTON, West Chester, Chester County:

The Raccoon is not very plentiful in this section of the county; he likes chickens and sometimes makes a raid, but it

is not very common. All the damage they do to corn amounts to but little.

EMIL ULRICH, Stroudsburg, Monroe County:

Raccoons will go for the corn ears occasionally, but the damage is trifling.

GEO. S. APPLEBY, Decorum, Huntingdon County:

Raccoons devour corn and they are sometimes very destructive to it.

J. S. GAY, Terrytown, Bradford County:

I have known 'coons to wallow the corn down equal to turning the hogs in. Muskrats I have known to destroy corn to a certain extent.

HON. G. C. BROWN, Yorkana, York County:

Raccoons are very fond of fresh water clams, which they dig out of the sand or gravel on the banks of streams with great dexterity.

L. T. WILT, Franklin, Venango County:

Submitted to Al. Simons (a colored gentleman sportsman). He says: "Raccoons are great water waders, fishing with their paws under small stones, and when bitten in the claw by a crab or crawler, the Raccoon raises his paw to his mouth and removes the object that had taken hold. The Raccoon, when working on corn, scratches the husk with his paw on account of the husk getting between his teeth, then cuts the grain clean to the cob."

JAMES THOMAS, Curwensville, Clearfield County:

Raccoons fish from early in the spring until late in the fall; they will follow a fish, wallowing like a hog, and chase them under a stone, then catch them.

W. C. SLOAN, Sloan, Westmoreland County:

Raccoons destroy corn in the roasting season; Squirrels, wheat in head; Muskrats and Groundhogs (Woodchucks) cut and destroy corn, oats, wheat and grass when in the green stage. Done yearly on my farm.

OTTO BEHR, Lopez, Sullivan County:

Raccoons fish by feeling with their paws under the stones and in this manner catch a good many crawfish, but the amount of fish they catch in this manner would be very small, as they only fish in shallow water.

GEO. R. BOAK, Pine Glen, Centre County:

I have seen fields of corn one-third destroyed by Squirrels and Raccoons.

W. A. ALBA, Bradford County, Pa.:

Raccoons destroy some corn in the fall when fit to roast.

PAUL SWINGLE, South Canaan, Wayne County:

Raccoons are quite destructive to corn while it is in the milk by pulling down the ear and eating the same and carrying it away.

R. W. WEHRLE, Blairsville, Indiana County:

Raccoon very destructive to crops.

CHARLES RUSSELL, Russell Hill, Wyoming County:

'Coons and Mink destroy many trout in our small streams when they are low in summer.

GEO. S. PURDY, Honesdale, Wayne County:

Have seen Raccoons fishing in shallow pools on trout streams.

E. O. AUSTIN, Austin, Potter County:

Raccoons catch trout; have seen them.

G. C. MARSHALL, Uniontown, Fayette County:

The Water Snakes and 'Coons, during low water, are the greatest enemies of trout.

FRANK G. KEATLEY, Clarion, Clarion County:

Have seen Minks and Raccoons catch trout.

A. S. HECK, Coudersport, Potter County:

Have often seen places in trout streams where Raccoons have caught trout.

JAMES VANDERGRIFT, Stony Fork, Tioga County:

Raccoons kill fish.

A. B. DOAN, Little Marsh, Tioga County:

'Coons destroy fish.

JOHN B. TRUMAN, Wellsboro', Tioga County:

When the streams are low the Minks and 'coons kill a great many fish.

I. D. REITTER, Karthaus, Clearfield County:

Raccoons are the most destructive to trout though they are getting very scarce.

CHESTER M. LINGLE, Phillipsburg, Centre County:

'Coons in this section catch trout.

CHAPTER VI.

LOCALITIES WHERE POULTRY-DESTROYING
ANIMALS ARE FOUND.

MISCELLANEOUS INTRODUCTORY NOTES.

By DR. B. H. WARREN, *State Zoologist.*

This great commercial highway of the nation, with branches penetrating almost every county in Pennsylvania, New Jersey, Delaware and Maryland—the Pennsylvania Railroad—reaches every section of this territory where the best of the present gunning and fishing may be found, from the bays and harbors of the matchless Jersey coast with their famous fishing grounds, and the islands and inlets of the Chesapeake Bay with their acres of wild ducks, to the mountain wildernesses of Clinton, Clearfield, Elk and Cameron counties with their ideal trout streams, their deer ranges, and their shaggy-coated Bears and predatory Wild Cats. Covering such a vast and diversified territory, and affording conveniences and comforts of travel unsurpassed by any other railroad in the world, it holds out peculiar inducements to the gunner, the angler, and to the naturalist in search of knowledge, specimens or sport, and recreation.

A CONVENIENT CLASSIFICATION.

For the convenience of sportsmen or zoological students who would hunt the poultry and game-devouring animals, the data in the following pages has been classified under the different kinds of game and fish; and, still further, it has been divided into three sections in respect to territory; the first section covering the territory east of the Susquehanna and its tributaries, New Jersey, and the entire Delaware and Virginia Peninsula; the second section covering the territory drained by the Susquehanna, and that lying immediately north and south which is reached by the lines of the railroad; the third section covering all the territory in the State of Pennsylvania west of the summit of the Alleghenies which is reached by the Pennsylvania Railroad.

The wide scope of territory traversed by the Pennsylvania Railroad system, hereinafter referred to, extends from the broad Atlantic southward to the fine ducking grounds of the renowned Chesapeake with its several large tributaries, which at certain seasons teem with Rail (Sora) and Reed birds, besides numerous other varieties of aquatic birds so eagerly sought for by sportsmen and epicures; and westward to the picturesque Allegheny Valley.

A GRAND FIELD FOR SCIENTIFIC RESEARCH.

This expansive and diversified area is, it seems almost needless to remark, a grand field for the student of natural history; forsooth, it matters not what special branch of the systematic natural sciences he pursues. Entomologists claim that probably fully 25,000 kinds of insects find suitable dwelling places here; numerous species of fishes—many of which furnish fine sport to

ALONG THE SUSQUEHANNA.



anglers—valuable for table use, inhabit the salt and fresh waters, and in some parts the rich and varied deposits are especially alluring to the mineralogist. Fertile soil or other hosts give sustenance to thousands of species of plants (flowering and non-flowering) hence the botanist assures us this is “a field of milk and honey” as regards the securing of rare specimens for the herbarium.

Individuals who desire to study the life histories and economic status of poultry-destroying birds, mammals, or fish, can, by consulting succeeding pages of this chapter, surely find these creatures—made by Divine hand with some good object in view—which at times are so aggravating to farmers, poulterers and sportsmen.

THE MECCA OF NATURALISTS.

Pennsylvania, by reason of its peculiar geographical position, its mountain ranges, large area of wild lands, its numerous water courses, and many romantic lakes, is a natural game preserve, and the home of many species of the feathered tribes, which, although unknown to the sportsman who goes in quest of furred and feathered game, are eagerly sought after by the natural history student. The advantages which the Keystone State possesses for zoological investigations are manifold. Many dainty species of nimble Warblers, the sweet-voiced Thrushes, certain fierce or, on the other hand, well-disposed members of the raptorial feathered races, as well as several members of the Sparrow family, together with other representatives of avian-life, all of which are attributed to the Canadian fauna, make their summer homes in sequestered mountain fastnesses of this Commonwealth. A num-

ber of birds included in the Carolinian fauna find congenial homes within the borders of this favored land of Penn.

OVER 300 KINDS OF BIRDS.

Ornithological research has shown that there are accredited to Pennsylvania, not less than 325 species and subspecies of birds, which occur here as residents, migrants, summer sojourners, stragglers or extralimitants. Of this large number, the majority are of great service to mankind because of their insect-eating proclivities; nearly one-half of this number occur as breeders with us.

A PARADISE FOR OOLOGISTS.

The presence of so many species in this State during the season of reproduction places Pennsylvania high in the list of localities to be visited by students especially interested in oological science.

SPECIES NEW TO SCIENCE.

In this connection it is worthy of remark that the note books and field observations of thoroughly trustworthy naturalists show, peradventure, that certain species of birds, whose nests and eggs have never yet been defiled by human hands, are to be found regularly during the summer or breeding season, in the virgin forests—so rapidly disappearing before the woodsman's axe or ruinous forest fires—about the picturesque and higher mountain peaks, with their stately forest monarchs, their beautiful and ever green rhododendrons, and other sweet-scented wild flowers, which in the balmy June days are shown in all their charms. This is the time the oological student should take his vacation to search for desired treasures, and

his heart may be made to bound with indescribable joy by finding the neatly constructed nests and eggs of species which the eyes of man—so far as written records are concerned—have never beheld.

FINE TERRITORY IN WINTER.

The student of natural history, if his wants are in the line of feathered specimens for the cabinet, can travel the rich agricultural or wild unimproved tracts of Pennsylvania, and secure much material. Different species of birds retire in the summer season to the boreal wilds, where they rear their young and are comparatively free from man's despoiling hand. As winter approaches these birds migrate southward from the land of the Eskimo and savage Polar Bear to glean a livelihood which, so far as many of them are concerned, is a great boon to mankind.

WINTER BIRDS.

Besides these natives of the Arctic solitudes, numerous other species, some residents of Pennsylvania, and others which, for the most part, breed north or south of our boundaries, are present with us in goodly numbers, as is evidenced by the fact that the winter birds in Pennsylvania number approximately about one-third of the bird fauna.

SOME ANIMALS WHICH HAVE BEEN EXTERMINATED.

Many years ago Pennsylvania contained the massive, shaggy-coated Buffalo, the bulky and big-antlered Elk, and the fleet footed and clean limbed Virginia Deer, which, with other kinds of furred, feathered and finny game, then so abundant, furnished bounteous repasts

to our sturdy pioneer ancestors who blazed through unbroken forests the trails to the land of the setting sun.

WHEN THE FLINT-LOCK WAS EMPLOYED.

Indeed, one does not have to look back to the early history of this State; in Revolutionary days, or later, when savage aborigines and wild beasts of the pathless forests were constantly on the watch to waylay the settler or destroy his possessions,

By referring to the annual report of the Department of Agriculture, (Pa.) for 1896, we find (pages 323-326 and 330-334) some most interesting records concerning game in Pennsylvania. In this publication, an account, entitled "How Our Forefathers Hunted Big Game," is given of some famous hunts which took place in Bradford county, of this State, about 70 years ago.

KILLED FORTY DEER IN ONE DAY.

On one occasion, where the prosperous town of Waverly now stands, there were killed in a single day's hunt, forty Deer, eight Black Bears, thirteen Wolves, a large number of Foxes and a few Panthers. In the fall of 1818, a big hunt, in which the pioneer farmers for miles about took part, was had in Bradford county.

A MENANCE TO LIFE AND PROPERTY.

"In those days wild animals were so numerous in the valley and on the surrounding hills as to be a serious drawback to the pioneer farmers in the growing of their crops and the keeping of their live stock, to say nothing of the constant fear in which they stood for the safety of themselves and families."

HUNTED WITH FLAILS AND PITCHFORKS.

This hunt was engaged in by many men who collected from far and near on a given day. The majority were armed with flint-lock guns, but many in the ranks were armed with no such weapons, and they carried axes, pitchforks, clubs, and even flails. These rude weapons were made good use of on the march and in the round up one man, Sylvant Decker, covered himself with honor by despatching two Bears with his flail, but only after a hard battle with each animal. A flail in the hands of Jacobus VanSickle, was used to crush the head of an immense buck as it attempted to rush by; gaunt, snapping Wolves, and game-devouring Foxes were killed in numbers with clubs and pitchforks.

COL. STEVENS' FAMOUS HUNT.

In 1818 Colonel Adin Stevens conceived the idea of a big hunt. He collected together early in the morning of December 4th, about 1,000 settlers, who formed in line and marching from all directions, covering a large circle of territory, they proceeded, making all the noise possible by blowing horns, etc., to a high knoll of about three acres, which was reached late in the afternoon.

"As the hunters drew in around this knoll they killed one hundred and fifty deer, fifteen bears, fifty wolves, and no end of foxes. Thirty deer escaped through one gap in the ranks. Among Colonel Stevens' hunters was Major Theron Darling, a veteran of the Revolution. He was a man over six feet tall. In the chase of one of the deer on the knoll, a big doe, Major Darling stood still, waiting for the deer to be driven his way. He stood with his long legs wide apart. Suddenly the doe started toward him, ducked her head and rushed between the Major's legs, that being the most available opening she saw for escape. The contact threw the Major forward on the

doe's back. He mechanically clasped his arms about her body. Away the perplexed deer flew through the forest, bearing Major Darling, feet first, along with her. He held on, and after the deer had run with him half a mile or more, he managed to catch her by one hind leg and trip her up. She fell heavily to the ground, and before she could regain her feet the Major cut her throat."

"THINGS ARE DIFFERENT NOW."

As civilization advances and improved firearms become every year cheaper and more numerous, the wild birds and four footed (undomesticated) animals will decrease. This is not alone true of Pennsylvania, for we see in other regions, where proper laws are not enacted and enforced for the protection of game (birds, mammals and fish), these creatures, interesting and often valuable from commercial and other economic standpoints, are frequently exterminated.

MANY YET REMAIN.

Ingenuity has enabled man to make the most deadly and rapid-firing arms, which, in the hands of professional meat or skin hunters, have, within the last fifteen years, caused much depletion of the large four-footed game, and also feathered kinds, as well as the brightly-dressed song and insect-eating birds, which, fashion has decreed that frail, fastidious woman—lovely though she is, and, without her, terrestrial existence would not be worth a farthing—shall decorate her pretty head.

FIFTY SPECIES OF MAMMALS.

Notwithstanding the slaughter in the last quarter of a century of wild animals, dressed either in warm coats of fur or attractive feather garbs, one may yet, with proper instructions and investigations, find many

species of mammals (undomesticated) in Pennsylvania, where we have at the present time probably fifty well-defined species.

Birds, also, even in the face of most heartless crusades made against them by market hunters, (after the game birds and other kinds slaughtered by the tens of thousands for the millinery trade), are still to be found, as stated elsewhere in this article, at certain seasons and in particular localities, quite plentifully.

SOME THAT HAVE GONE.

The last Bison or Buffalo, according to Mr. S. N. Rhoads,* "killed in Central Pennsylvania was shot about the year 1800, by Col. John Kelley, in Kelley township, Union county, five miles from Lewisburg."

THE LAST ELK.

About 35 years ago a large Elk was taken, my friend and colleague, the Commissioner of Forestry, Dr. Joseph T. Rothrock, tells me, when he was with a corps of civil engineers, surveying a line for the Philadelphia and Erie Railroad, in the county of Elk.

Mr. S. N. Rhoads says in referring to this species: "The latter-named regions (Potter, Tioga and Lycoming counties), formed the hunting grounds of my veteran friend, Seth I. Nelson, whose diary, between 1831 and 1837, shows that he killed 28 Elk during the period."

Mr. Rhoads, quoting Seth I. Nelson, says:

"A bull Elk was killed in Elk county in 1867 by a veteran Indian hunter of the Cattaraugus Reservation, named Jim Jacobs,"

*A contribution to the Mammalogy of Central Pennsylvania, by Samuel N. Rhoads. Published in the Proceedings of the Academy of Natural Sciences of Philadelphia, April, 1897.

This is believed to have been the last Elk taken in Pennsylvania.

THE BEAVER.

The broad-tailed Beaver, a valuable fur-bearing animal, many years ago was abundant in different sections of this State. One may at the present time find remains of their ancient dwelling places about streams and dams. The former presence of these intelligent animals in numerous localities is further attested by such familiar and suggestive names as Beaver Dam, Beaver Creek, Beaver Meadows, etc. According to Mr. George K. Boak, Pine Glen, Pa., the Beaver was found in Centre county about 30 years ago, but like the Wolk, Elk and Panther, which also occurred there, all have been exterminated. Mr. Abraham Neveling, an aged and well-informed naturalist, of Coalport, Pa., says, "The last Beaver was trapped in Clearfield county in 1837." The latest record of the capture of this species in Pennsylvania, of which I can find any record of reliability, is that made by Mr. S. N. Rhoads, who quotes as follows, from Mr. Seth Nelson, Jr.:

"The last (Beaver taken in this State) was killed on Pine Creek, nine years ago (1884). A part of Pine Creek is in Clinton county, and part in Tioga county, but the Beaver was started in Potter county and followed down through Tioga county, and killed in Clinton county.'

BEAVERS IN "OLD VIRGINIA."

If the natural history student desires to study the Beaver on his native heath, he can at a very moderate money outlay and in a short time, find them at home in the swampy woods of Surrey county, Virginia, where last year the writer found freshly fallen trees cut

THE NARROWS, PENNSYLVANIA RAILROAD.



down by a small colony of these animals. To reach this place from Philadelphia one can procure at Broad Street Station, a ticket to Old Point Comfort by way of Cape Charles, then take a James river steamer to Claremont, where guides and hotel accommodations can be had. In the heavily-wooded swamps, about two and one-half miles south of Spring Grove post-office, which is some six miles by wagon road west of Claremont, you can, I am quite confident, find Beavers living in hollow logs, or in houses of their own make. Last year a hunter whom I met in this locality and who had eight pelts of these animals which he had recently slain and sold for \$40, said he discovered no "houses," but found the Beavers living in logs and trees which were hollow.

THE AMERICAN WOLF.

In view of the fact that for several years past the writer has made especial efforts to verify the statement that this animal is still to be found in Pennsylvania, and has failed, he is very much inclined to the opinion that none of the species, in a wild state, are present in this Commonwealth. It is true that bounty records in different counties of the State, as late perhaps as six months since, show that "wolf scalps" have been paid for. Such data, however, must not be taken as conclusive evidence of the presence of these animals, for the "heads and ears" of grizzly, long-haired cur dogs, etc., or the pelts of wolves brought to Pennsylvania from other states, have in past years proven of considerable value to scalp hunters, although expensive to the local taxpayers. A large Wolf was lately slain in Westmoreland county, but investigation disclosed the fact that it had been shipped alive from the far west

and liberated to be pursued by hounds, from which it escaped, to be subsequently taken as a genuine example of a Pennsylvania Wolf.

WOLVES IN TIOGA COUNTY.

Up in Tioga county, the section which for several years has so well and faithfully been represented in our State Legislature by Hon. W. T. Merrick, three Wolves were killed in the autumn of 1896.

In support of such an important record the following paragraph is clipped from the Athens (Pa.) News, January 29th, 1896:

"Last fall Charles Lee's circus and menagerie was sold out at Canton by the Sheriff, and among other animals three coyotes or prairie wolves were sold for fifty cents each to Charles Kerby. He kept them tied up in his dooryard for a couple of months and then took them over into Tioga county in a box, and a wolf 'hunt' was held. Kerby made affidavit to the killing of the wolves and collected the bounty of \$30 from the county commissioners, telling them a 'fairy tale,' about his exploits in the mountains of Union, where he alleged the dogs ran the wolves and he shot them."

SHOULD SUCH PRACTICES EXIST?

This kind of work is "legal," that is, if I am correctly informed about the bounty law, which allows a premium of ten dollars each, with additional fees to the local officials before whom the affidavit of killing is made. It was also considered to be in accordance with the letter of the law, when, under the provisions of the "Scalp Act of 1885," Hawks, which were caught alive in traps in neighboring states and brought over the line into Pennsylvania and killed, to pay for their "heads." The eggs of several kinds of birds of prey were, it is said, also collected in Ohio, and other adjoining states, carried into different counties of this

Commonwealth where, under domesticated fowls or in incubators they were hatched out, and the young ones were sold for the 50 cents bounty under the Act of 1885.

WOLVES WERE BAD NEIGHBORS.

Years ago, when our sturdy, brave-hearted, industrious and hard-working pioneer fathers had their flintlocks at all times by their sides, ever ready to battle with the treacherous and cunning Indians and other wild forest animals, the ravenous, howling, and fleet-footed Wolf held high carnival here, but now this predatory animal, like the Indian of Revolutionary days, has passed away.

Illustrative of the destructive nature of the prowling bands of Wolves which formerly infested our Commonwealth, the following extract is taken from the note-book of Mr. C. W. Dickinson, of Norwich, McKean county, Pa.

A TERROR TO SHEEP OWNERS.

"The Wolf was a terror to the sheep owners for, like the Indian, he wanted to kill as long as there was a sheep left. In 1869 Wolves killed twenty-eight sheep in the month of May for a neighbor of mine; they killed fourteen each night; they made but two raids on them, and there were only two Wolves each night. These two Wolves had a litter of whelps. I know this to be a fact, for I followed them to their lair and captured the old slut and five whelps. From the 18th day of May, 1869, to May 15th, 1872, I caught fifteen Wolves and crippled three more. I think I have seen where wolves have killed one hundred and fifty sheep, at least. I have seen where wolves have killed deer a good many times. The last Gray Wolf killed in this county was taken by a boy on the Kinzua creek, in 1886."

FOLLOWED HUMAN BEINGS.

Mr. Abraham Neveling, of Coalport, Pa., mentions that in 1836 he knew a band of Wolves to kill, in one

night, eighteen sheep; and to illustrate the bold and blood-thirsty nature of this dog-like animal, Mr. Neveling adds, "the last Wolf I have knowledge of was killed by myself in 1858, near Janesville, this county, (Clearfield). The circumstances were as follows:

"Mr. Joseph McCully and wife were on their way to the grist mill at Janesville; a colt was following the sled and the Wolf came in pursuit; it followed within a mile of the settlement. Mr. McCully aroused me in the early morning and related the facts in the case, and I took the track of the animal and in a few hours shot him."

A DOCTOR'S TERRIBLE EXPERIENCE.

About the year 1845 Wolves were abundant in Tomhickon Valley, between Catawissa and Hazleton, where, according to my friend, Dr. Thomas C. Thornton, they often attacked human beings, destroyed the settlers' cattle, sheep, pigs and poultry and devoured game. When the Catawissa railroad, a part of the Philadelphia and Reading system, was being built, Dr. Thomas A. H. Thornton, a practicing physician and the father of Dr. Thomas C. Thornton, now a prominent medical practitioner of Lewisburg, Pennsylvania, one cold Autumn night was called out of bed to visit a patient about twenty miles from his home. At that time there were no regular roads as we now have. In their place the traveler used narrow paths or trails, which, in many places, were illy defined, and an inexperienced person often lost his way when endeavoring to follow them. This was the misfortune of Dr. Thornton who, in his anxiety to reach the bedside of the sufferer, attempted to make a short cut. He lost his way and for one week wandered through the wilderness; and, having no gun, was obliged to subsist on

roots and herbs. The doctor was on horseback, and after wandering aimlessly about the pathless forests for four or five days, they got into a large swamp where the horse stepped into a quagmire, from which his owner was unable to extricate him and the noble animal had to be abandoned, imbedded as he was almost to his belly in the soft and boggy bed. The Doctor removed the saddle bags containing his supply of medicines, etc., threw them over his shoulders and started off. In those days it was customary to wear green baize leggings to protect one from the cold.

WOLVES ON HIS TRAIL.

Several hours after the Doctor got out of the swamp where he had abandoned his horse he was horrified to see that he was being followed by a band of five or six Wolves. At first they kept at a respectful distance when sticks were thrown at them, but finally as if they appreciated the helpless condition of their intended victim, and, as darkness came on, the hungry, blood-thirsty band became bolder and bolder; they circled around the terrified and jaded man, and closing in started to attack him on all sides. One more vicious and impulsive than the others made a spring at the Doctor's throat, but a well directed blow from a club temporarily disabled the animal and caused his ravenous companions, most fortunately, to discontinue at that time their premeditated and combined attack. The Doctor, by this thrilling episode, and the Wolves' frightened condition, succeeded in going perhaps a mile unmolested, when, to his great horror, he found the whole pack, led by the vicious brute he believed he had maimed with his club, were hot on his trail. The stunning blow administered to the leader of the

howling band seemed to have only intensified the brute's courage and thirst for blood. The man, weakened by long exposure and loss of food, realized that he would soon be torn to pieces if he did not adopt some new means of defense.

A DESPERATE BATTLE ON THE ROCKS.

Fortunately, as the animals began closing around him for another onslaught, he reached a high rock and mounted on its top, where a giant tree served to protect him from falling backward. He reached this eminence in time to drop his saddle bags and provide himself with some stones and two or three good clubs before his pursurers started to attack him. He stood, back to the tree, and as the animals, led by the leader, attempted to come up he drove them back with his primitive weapons. A large stone hurled with great force and accuracy broke the head of one of the assailants; this fortunate occurrence gave the Doctor a breathing spell.

AMMONIA SAVED HIM.

The man, however, realized that he must soon quit this refuge, and remembering that he had in his saddle bags a large bottle full of ammonia he determined to employ it as a final resort to save his life. He quickly removed one of his baize leggins, tied it securely to a stick, and after saturating the material with ammonia, he boldly started down from the rocky promontory toward the Wolves. The cunning animals apparently aware that he could more easily be overpowered on level ground, separated, slunk off, and permitted him to proceed several hundred yards before they renewed the pursuit. They did not, however, allow much time

to elapse before they took the trail of the man who had thus far so successfully baffled their powers. The Doctor stood still and waited until one of the brutes rushed within an arm's length when he struck him in the face with the cloth saturated with ammonia. This reception was a most novel and unique one for the Wolf who ran off howling with pain; two more of the band were slapped across the mouths with the saturated baize, and they left. After this experience the Wolves followed the Doctor till daylight the next morning when they gave up the chase which they had continued for forty-eight hours, and which unquestionably would have resulted in a most horrible death if it had not been for the contents of the ammonia bottle. Dr. Thornton succeeded in finding a shanty occupied by the men constructing the Catawissa railroad, where he was carefully cared for, and in the course of four or five days was taken to his home, where he was ill for fully a month.

THE PANTHER.

In former times the Panther was present in all parts of Pennsylvania, but now, if the animal is found here at all, and I very much doubt the species' presence in our State, it is certainly restricted to a very few of the most inaccessible mountain sections. The bounty records of Centre county for 1886 shows money was given for a "panther" killed there in that year. Mr. Rhoads quotes the following from Mr. Seth Nelson: "There may be one or two yet in Clearfield county; but the Askey boys and I killed two, two years ago (1891)." Mr. Rhoads, also on the authority of Mr. Seth Nelson, makes reference to a Panther taken in 1893 by the Long boys on "big run of Beech Creek."

ROMANCING SCRIBES.

The name of "Catamount" given by many woodsmen to large-sized examples of the Wildcat or Bay Lynx, has given newspaper correspondents in regions where these sneaking and detrimental animals are plentiful, an opportunity to send to the press some most readable and surprisingly sensational stories when a big "cat" is caught and killed, of the capture of a ferocious man-eating or live-stock devouring "panther." The writer has, during the past three or four years, taken especial pains to investigate these newspaper panther stories and, without exception, all have proven false or at least they were founded on erroneous identification. Some people, not versed in natural history matters, consider the names "Catamount," Panther and "Painter" to be synonymous. This misunderstanding is perhaps the cause of so many wrong statements which find their way into the columns of some of our most reputable papers, the managers of which, I am well aware, strive faithfully to guard against all such errors.

SPECIES WHICH ARE RARE.

The Fisher and Pine Marten or American Sable, tenants of the pine and hemlock forests, and both of considerable economic value for the warm and attractive articles of wearing apparel their loose blackish or brown coats make when passed through the skillful furrier's hands, are likewise about ready to be elided by the naturalist from the indigenous fauna of the Keystone State.

Dr. Isaiah F. Everhart, the distinguished traveler and naturalist, of Scranton, about ten years ago obtained two Fishers taken in that region by a hunter.

In 1874, Mr. M. S. Trescott, Harveyville, Luzerne county, says: "One was killed on the Loyalsock creek, in Sullivan county." From reports of New York City and Pennsylvania fur dealers and shippers, it is learned that probably not over half a dozen Fishers are now annually killed in this State. At the present time about the only counties where these animals are to be found are in Clearfield, Cameron, Elk and probably Clinton, Potter and Sullivan, and in all of these they are reported to be very rare.

THE PINE MARTEN.

The Pine Marten, an animal very mink-like in its general appearance, but which can be distinguished from the blood-thirsty and destructive Mink by its white and yellowish throat markings, seems to be present, but only in very small numbers, in a few sparsely-settled sections of Cameron, Potter, Clearfield, Clinton, Sullivan and Elk counties. Fur dealers claim from twenty-five to fifty are annually taken in this State.

THE WILD PIGEON.

Twenty years ago the Wild Pigeon occurred in great numbers in this Commonwealth. Nesting or roosting places, covering several miles each, of these game birds with which the older residents are so familiar, were regularly resorted to year after year by the pigeons.

The love of pecuniary gain stimulated market hunters to visit these places and with nets, axes, guns and other murderous devices, they soon drove the helpless pigeons from one locality to another and finally from the State.

A few of these birds are yet occasionally seen along

the lines of the Philadelphia and Erie Railroad, in Cameron, Elk and Warren counties, as well as in a few other sections of the Commonwealth.

THE SQUIRRELS.

The game laws of Pennsylvania protect two species of Squirrels which are designated by the common names of Fox, Gray and "Black." The Gray Squirrel and the Black Squirrel are very generally regarded by sportsmen as different species. Naturalists, however do not so consider them, but call the black individuals melanistic examples of the Northern Gray Squirrel, (*Sciurus carolinensis*; *leucotis*). The gray form and their black-coated relatives are some years very abundant in different sections in the hard wood districts along the Philadelphia and Erie Railroad from Williamsport to Warren. In the seasons of 1896 and 1897 individuals of this species, particularly those with gray coats, were very abundant at different points along the Northern Central Railroad from Williamsport to Elmira.

Besides the Squirrels named in the last above paragraph we have the Flying Squirrel, a species and subspecies of the Red Squirrel, and one species and a geographical race of the Chipmunk or Striped Ground Squirrel. These animals feed on nuts (mast), seeds, roots, buds, berries and fruits; they eat cereals, but, with the exception of the Gray Squirrel, which, in some sections and in certain years is quite plentiful, they do but little damage to the farmer in the way of destroying his crops. Squirrels, however, do not live exclusively on a vegetable diet; they catch insects and some of them often devour the eggs and young of birds.

and they have also been detected depredated in the poultry yard.

EAT EGGS, BIRDS, DUCKS AND CHICKENS.

Referring to the Red Squirrel's bill of fare Dr. C. Hart Merriam* says:

"The propensity to suck the eggs and destroy the young of our smaller birds is the worst trait of the Red Squirrel, and is in itself sufficient reason for his extermination, at least about the habitations of man. I have myself known him to rob the nests of the Red-eyed Vireo, Chipping Sparrow, Robin, Wilson's Thrush, and Ruffed Grouse, and doubt not that thousands of eggs are annually sacrificed, in the Adirondack region alone, to gratify this appetite. Therefore, when abundant, as he always is during the springs that follow good nut years, his influence in checking the increase of our insectivorous birds can hardly be overestimated. Dr. A. K. Fisher informs me that on three occasions he has known these Squirrels to destroy young Robins. * * * * I have long been aware that this animal was an occasional depredator of the poultry yard, and find, in a journal written twelve years ago, a note to the effect that a case had come to my knowledge where one was caught in the act of killing both chickens and ducks."

Numerous letters and answers to circulars received at this Department from farmers, sportsmen and poulterers testify to the destruction of different kinds of wild birds, especially Robins and Chirping Sparrows, by Red Squirrels; and at least a dozen persons have written about Squirrels destroying young chickens or the young of domestic pigeons.

THE FOX SQUIRREL.

This, the largest of all our Squirrels, is known by some as the "Cat Squirrel," a name which I have

*The Vertebrates of the Adirondack Region of northeastern New York, p. 117.

frequently heard applied to the mammal in Virginia, Maryland, Georgia and Florida. Mr. Bangs* in his review of the Squirrels, has named this animal, that in former years was quite plentiful, old hunters tell us, in different regions of Pennsylvania where stately oaks were numerous, (*Sciurus ludovicianus vicinus*), or Eastern Fox Squirrel.

WHERE FOUND IN PENNSYLVANIA.

The Fox Squirrel is rapidly becoming rare in this State. The species, however, may still be found in the following counties:

Adams,	Franklin,
Clinton,	Huntingdon,
Cumberland,	Juniata,
Dauphin,	Mifflin,
Fulton,	Perry,
	York.

THE CHICKAREE.

The common and well-known Red Squirrel or Chickaree, of which two forms are thought by Mr. Bangs to exist in Pennsylvania, is not, as many suppose, protected by the Harris Game bill, passed at the legislative session of 1897.

THE "RABBITS" OR HARES.

The "White Rabbit," called also the "Mountain Jack" and the "Snowshoe Rabbit" by hunters and woodsmen, is found in many retired swamps in the mountainous regions of Pennsylvania. Naturalists style this animal, which in the winter season is

* *Proc., Biol., Soc., Wash.* 1896.

dressed in a fluffy coat of white, but in the summer is attired in brown, the Alleghenian Varying Hare (*Lepus americanus virginianus*). It is a southern race, a smaller brother, so to speak as it were, of the Northern Varying Hare which abounds in the Fur countries. Through field observations during the last five or six years I know that it occurs in the following counties:

Bradford,	Luzerne,
Clinton,	Lycoming,
Clearfield,	Mifflin,
Cambria,	McKean,
Centre,	Pike,
Cameron,	Potter,
Elk,	Sullivan,
Erie,	Tioga,
Forest,	Union,
Huntingdon,	Wayne,
Juniata,	Warren,

Wyoming.

"COTTONTAILS."

The Rabbit, as this Hare is commonly called, occurs abundantly throughout Pennsylvania. The Rabbit or "Cottontail" which is taken in the higher forested mountains which are cleared and where the Varying Hare formerly had his home, is considered by Mr. Bangs to be entitled to rank as a subspecies which he calls the Alleghenian Wood Hare (*Lepus sylvaticus transitionalis*).

These Hares last named are so abundant in some sections of Pennsylvania—particularly is this said to be the case in Clearfield and Northumberland counties—as to be a serious nuisance to farmers. The "Cottontails" destroy, fruit growers and nurserymen

say, great numbers of small fruit trees about their premises. The common everyday Rabbit, with which every farmer's boy is well acquainted, is called the Carolinian Wood Hare (*Lepus sylvaticus*).

DON'T USE SNARES OR FERRETS.

However, notwithstanding the mischief they do, it is not legal to use snares, other similar devices, or Ferrets to capture these mammals which inhabit the woods and cultivated fields.

FOXES.

Both the Red Fox and the Gray Fox are found in Pennsylvania. They are destroyers of game birds and small mammals. The Red Fox is particularly fond of poultry; he also captures many mice and insects, and, sometimes, he kills lambs and pigs.

THE WILD CAT.

This animal, which is so extremely destructive of game, as well as of the farmers' poultry, that he chances to meet on his foraging expeditions, is found in a number of counties of Pennsylvania, and according to all accounts this species is increasing quite noticeably in several regions of the Commonwealth. The Wild Cat is quite common in Clearfield, Cameron, Clinton, Elk, Forest, McKean, and Potter counties.

Wild Cats appear to have multiplied in recent years so rapidly in several counties of Pennsylvania that at the last session of our Legislature ('97), by the earnest efforts of prominent residents of Cameron, Clearfield, Lycoming, Elk and a few other counties a bounty of two dollars per head was placed on these animals.



WHERE FOXES ROVE.

THE RACCOON.

The 'Coon' is common and well-known. It occurs generally throughout Pennsylvania, from which region large numbers of pelts of this corn-loving animal are annually shipped. Raccoons catch fish, and they feed upon mice, frogs, young birds, birds' eggs, cray-fish mollusks, turtles and their eggs. They capture large-sized insects; nuts, fruits and poultry are dainty morsels for these animals which are more destructive to corn than any other of the farmer's possessions.

THE OTTER.

This wary and valuable fur-bearing animal, so destructive to fish, is found about streams and lakes in nearly every section of the State, but it is nowhere abundant and may, not improperly, be classed among the species termed rare. Individuals of this species are, of course, much oftener found about streams and lakes or old splash dams in the mountains and sparsely-settled districts than elsewhere in Pennsylvania. Two or three years ago two were captured along the Brandywine Creek, near Chadd's Ford, Delaware county.

The Otter loves Brook Trout and he delights to make his home in localities where this toothsome food is plentiful and readily obtained without continued interference on the part of man, his most deadly foe.

THE VIRGINIA DEER.

The Virginia Deer is found in a wild state in many regions of Pennsylvania.

In the counties of Clearfield, Potter, Pike, Elk, Clinton, Fulton, Franklin, Adams, Tioga and Huntingdon, the species is said to be of frequent occurrence. In

1890, records show that 119 of these animals were killed in Pike county; about 1892 or '93 over sixty were captured in the Diamond Valley (Huntingdon county). Mr. Rhoads says, quoting Mr. Seth Nelson:

"In the period between 1861 and 1865 the deer became so numerous in that county (Clinton) that they generally damaged the crops, and snaring was employed to diminish their numbers. In contrast with this there were killed in 1895, in his vicinity, all told, only ten deer, and most of these out of season, by wild hounds or pot hunters. The chief agencies in the extermination of deer are forest fires and wandering dogs, both of which pursue their relentless course during the entire year, the latter being ten times as destructive as the Gray Wolf ever was."

WITH PROPER STATE AID DEER WILL INCREASE.

If the lawmakers of Pennsylvania will enact proper measures which will enable county officers under the direction of the State Forestry Commissioner to keep in check the disastrous forest fires, game of all kinds should increase rapidly, now that we have such a good law for the protection of birds and mammals.

If the Pennsylvania Board of Game Commissioners receives, as it should, from the Commonwealth, money to fairly compensate Game Wardens to enforce the new law of 1897, it will not be long before the Virginia Deer, and other kinds of game will be much more plentiful. The days of the professional market hunter were numbered in this State when the Harris Game bill became a law June 4th, 1897.

THE BLACK BEAR.

This animal is found in nearly every county where the Virginia Deer occurs with any degree of regularity. In some sections of Pennsylvania, particularly large areas of land from which the timber has been cut and

brush has grown up, there seems to be no doubt in the minds of experienced woodsmen that Bears have become much more numerous than they were fifteen or twenty years ago. Fur dealers claim that about 150 Bears' skins are annually shipped to the markets from Pennsylvania.

The Bear is omnivorous. Dr. Merriam referring to his food says:

"His larder consists not only of mice and other small mammals, turtles, frogs, and fish; but also, and largely, of ants and their eggs, bees and their honey, cherries, blackberries, raspberries, blueberries, and various other fruits, vegetables and roots. He sometimes makes devastating raids upon the barnyard, slaying and devouring sheep, calves, pigs and poultry. In confinement he shares with the inmates of the hog-pen whatever is left from his master's table."

In addition to the several species and subspecies (local or geographical races) of mammals referred to on preceding pages there are in Pennsylvania the following, of which but brief mention will be made:

Two species of Weasels, two kinds of Minks, eight or nine varieties of soft-furred Moles and Shrews, concerning the economic relations of which so many diverse opinions are entertained by farmers and sportsmen; and at least a half dozen species of insect-destroying Bats.

THE BAT'S WINTER HOME.

Bats, like some other of our mammals, spend the winter months in retirement. In Centre county there is a cave about fourteen hundred feet long, containing numerous large chambers and showy stalactites and stalagmites. This immense cavern, penetrating the whole length of a small mountain range, has the floor

covered with water several feet deep. To explore it one must go in a boat and take a guide, both of which are always obtainable. The boat's bow is furnished with a large light, otherwise it would be impossible to see anything in the Stygian darkness that invades every nook and corner of this weird opening that penetrates the bowels of mother earth. This place, called Penn's Cave, is the source of Penn's creek. The stream, with its several feeders, is noted for the abundance and excellence of speckled beauties (trout) they contain. Few sections of the State afford better Ruffed Grouse shooting than is to be found in the mountains around these cool, healthful and rapidly-flowing streams. Penn's Cave—a modest, old-fashioned summer resort—can be reached by a branch of the Northern Central Railroad, which extends from Mountandon to Bellefonte. In the winter season the cave is the harboring place of thousands of Bats which congregate in great masses on the limestone rocks where they escape the piercing winter's cold, and remain in quiet, harmony and contentment, unless their hiding place is invaded by human beings, when they crawl over one another or fly aimlessly about the boat and its occupants, uttering all the while, in their squeaking way, the most violent protests at being aroused from their winter's nap.

Bats are beneficial. They destroy great numbers of insects—particularly flying species. They do not disturb the young of birds nor do they destroy young chickens as some persons suppose they do.

THE OPOSSUM.

We have a single species of the Opossum—the only marsupial in the State—and of this animal's breeding



Penn's Creek.

ALONG PENN'S CREEK.

habits some highly erroneous ideas are prevalent. The Opossum is abundant in the South, where it is greatly esteemed for table use. The long shaggy coat of the Opossum is considerably used by furriers in the manufacture of different articles of wearing apparel. This animal subsists on both animal and vegetable food.

THE PORCUPINE.

The Porcupine whose head, back, and tail are abundantly furnished with hard spines, hidden in a thick coat of fur and straggly long hairs, is still to be frequently found in the hemlock forests of the mountainous regions. This animal, some believe, seems to have been made for one purpose and that is to add misery to the lives of hunters, who take dogs in hemlock districts where this dark-coated and yellow-toothed animal goes, so that he can visit, in the still night hours, lumber camps for salty food, or browse on the tender evergreen boughs. The Porcupine does not, when defending himself, discharge his spines or quills as some people say he does.

THE MUSKRAT.

The Muskrat is common and generally dispersed throughout the Commonwealth. Many thousands of these animals are every year killed along water courses, and mill ponds. Their fur, which is marketed at a low price—at least in a raw state—is made into different articles of wearing apparel and sold under various names. This amphibious rat eats the farmer's corn, if a field with this growing cereal is near the stream or pond which he and his relatives inhabit; he also feeds on mussels and fish. Several persons have

informed me he will catch ducklings of wild and domesticated kinds.

THE CHIPMUNK OR GROUND HACKEY.

The common every-day Chipmunk, which, in our happy boyhood days we chased along the fences and into his subterranean home under shelving rocks, moss-covered stumps, and stately forest trees, has been carefully studied by naturalists who have found another Chipmunk which is denominated *lysteri* to distinguish it from the typical *striatus* that occurs so plentifully in the southern half of Pennsylvania, while on the other hand the Canadian form (*lysteri*) is supposed to be present in our northern counties. Chipmunks feed largely on mast; they sometimes steal the farmer's corn, but to compensate such injury they prey on army worms and sometimes catch yellow butterflies.

RATS GALORE.

Rats, at least some kinds, are plentiful and most vexatious. They eat a great amount of young poultry and eggs; also devour grain and are a nuisance generally. Oftentimes when the hen coop is raided the Skunks, Raccoon, Opossum or little agile Weasel are made to pay the penalty with their lives for the loss sustained by the angry owner, who blames them for the thieving act of the cunning Norway Rat, which is alike abundant in coal and iron mines, about farm buildings and in the large cities. A black coated rat is of frequent occurrence in the neighborhood of Scranton: perhaps it is the Black Rat (*Mus rattus*), an introduced species.



ALONG THE JUNIATA.

THE CAVE RAT.

There resides in some of our mountainous sections a large hairy-tailed and long whiskered animal called the Allegheny Cave Rat (*Neotoma magister*). Of the habits of this mammal I know nothing from personal observation. I have, however, seen the species in Juniata, Huntingdon, Clinton and Centre counties. Woodsmen say this rat will catch young chickens and suck eggs; that it is fond of wild birds as well as their eggs, and like other rats will eat grains or other vegetable materials.

THE FLYING SQUIRREL.

This little animal is common and occurs generally throughout Pennsylvania. It usually lives in the woods, but sometimes will take up its abode in lofts of farm houses or hide under a roof, back of plaster, and from some convenient opening come out to steal chestnuts, shellbarks, hazle nuts, etc., which the school children have stored away to eat during the long, cold winter nights.

SKUNKS.

In the common nomenclature of naturalists there are two forms of Skunks in Pennsylvania. They are designated by the names Canadian Skunk and Carolinian Skunk. These animals prowl about in the night to do good, but sometimes they find hens' nests, and the riper the eggs are, the better, it is said, they are to the palate of the Skunk. In their nocturnal wanderings they frequently get into trouble in various ways, and often cause great inconvenience to persons who have business or love matters which com-

pel them to travel after daylight in vehicles along public highways.

THE MOST USEFUL MAMMALS.

Farmers and sportsmen, in fact people in general, speak ill of Skunks, and although they are probably the most useful of all our mammals in destroying noxious insects and troublesome mice, farmers and horticulturists will encourage their destruction.

Skunks are easily domesticated and become as gentle as kittens, and they can, a writer affirms, be handled with impunity if care is taken to use the tail as a handle.

Skunks are prolific animals, and they are abundant in this Commonwealth where many thousands are every year captured and their pelts shipped mostly to New York and Philadelphia markets.

THEY DO GOOD SERVICE.

Notwithstanding the untold services which these animals do in the farming districts, farmers as a rule allow hunters and trappers to employ all devices which their ingenuity can invent to slay these four-footed protectors of cultivated crops. Strange, is it not, how prejudice and ignorance, like love and confidence wrongfully placed, will often lead one to do that which sooner or later does him serious injury?

It would be a wise expenditure of public money if the State officials who have full power would direct subordinates who are entirely competent to do such work to prepare and have published for the widest possible circulation to school children and farmers, books and bulletins which would fully explain the

birds, mammals, insects, trees and plants and the value which most of them are to the human race.

Such publications, if properly illustrated, would be of far more service to the people at large throughout the Commonwealth than the cumbersome and tardy Legislative Record, and certain other documents which so often find their way to the junk shop.

LET THE MILLIONAIRE HELP THE POOR.

Generally, however, when efforts are made to provide for such really useful publications, which will be of great worth to the poorer classes, and which would be paid for largely by corporations and individual taxpayers of large holdings, some wise (?) fellow comes forward and cries "economy," "job," etc. I have known individuals to raise such protests, and having been in a position to know something of their official acts and broken political contracts, it occurred to me that their utterances, made most guardedly and by insinuation under, often, the mask of hypocritical friendship, were given birth to hide their own questionable methods, even if it did injury to others who endeavored to be honest and when placed in official places faithfully tried, to the best of their ability, to give to the public printed matter in an attractive and useful form.

THE WOODCHUCK.

This bothersome animal, which is known to many as the Ground Hog, is common and of wide distribution throughout the State.

WHAT A PRACTICAL FARMER WROTE.

My good old friend, the late A. C. Sisson, of La Plume, Pa., about two years ago, and but a few days

before his sudden death, which was lamented by all who were acquainted with this true christian and honest gentleman, wrote as follows:

"The Ground Hog, or Woodchuck, is fast becoming one of the farmer's and gardner's most destructive enemies. I would most earnestly recommend legislative aid in suppressing this intolerable nuisance. There should be a bounty of at least twenty-five cents upon every one killed. I have looked in vain for some one redeeming trait in this sneaking, groveling curse to the agriculture of our State. He is a gross feeder, devouring nearly as much clover as a full grown sheep; he eats to give him strength to dig holes, and then he digs holes to give him an appetite for more clover. He takes supreme delight in tearing the bark from young fruit trees, and will wipe out entirely a good sized bean patch in a day, and will make truck gardening impossible in many localities, and his subterraneous excavations make it dangerous to drive teams over our fields. It is said that he hibernates in the winter and ceases for a time to follow his damaging occupation, but it would seem that he simply retires when he can spend the long winter months in making diagrams for new and more extended operations for the coming season. Whether or not he could be domesticated and educated so as to be utilized in promoting sub-irrigation and laying drain tile, is an unexplored field for scientific investigation."

THEY ARE GOOD FOR FOOD.

The succulent vegetable diet of the burrowing Woodchuck makes his flesh, particularly when he is young, a most toothsome article of food for man, consequently this species is much sought after by many for the table. The thick and strong hide when properly cured is used, I am informed, in some sections to make shoes which are said to be particularly durable. Sulphur fumes, gun powder, or dynamite when ignited and placed in the Woodchuck's underground retreats, speedily destroy him; and a rifle in skillful hands will soon enable the farmer to rid himself of these annoying animals.

THE MICE.

Last, and among the least, so far as their physical development is concerned, we have the Mice, which in species, number nine, and this number will likely be augmented when more careful investigations are made. While these mammals, so far as size is concerned, are insignificant to look upon, they, or at least, certain species—notably those termed Meadow and Field Mice—are of great economic importance. In districts where these little rodents abound they do great damage and cause thousands and thousands of dollars loss annually in the agricultural communities. When the farmer is at rest in the night time these sprightly, sleek-coated little robbers become most active and prey upon the results of the husbandman's care and labor.

The common House Mouse, an exotic, is omnivorous; it has been known to kill cage birds and young chickens. The White-footed Mouse likes honey and he also, it is said, has been known to attack chickens but a few days old. Dr. C. Hart Merriam, writing of the White-foot Mouse, says:

"It is fond of flesh, and, like the Flying Squirrel, eagerly devours dead birds placed in its way. Indeed, this is done so naturally, that the suspicion arises as to whether it does not sometimes capture and prey upon the smaller birds on their roosts at night."

MICE, HAWKS AND OWLS.

The thoughtful person says: Why is it that these nimble four-footed pests which inhabit the meadow and grass fields have increased so rapidly within the last few years? The answer is: In the first place they are hardy and exceedingly prolific; then popular

prejudice and widespread ignorance throughout Pennsylvania, a few years ago, prompted the lawmakers to pass a measure which allowed bounties to be paid for all kinds of Hawks and Owls as well as some other animals. These birds, with few exceptions, and some of the mammals, also, which were included in the bounty law, lived almost wholly on Meadow Mice. These birds of prey and their co-partners, or the mice-destroying mammals, had voracious appetites, and being numerous in agricultural districts, they readily kept the Mice in check.

The stimulus which Scalp Acts gave hunters to slay, seemingly without any consideration, nearly all kinds of wild birds and mammals they found, resulted in the killing of many thousands of animals whose dietary consisted almost entirely of destructive Mice. Hawks and Owls, which are foremost among Nature's natural agencies to aid man in combating the voles or Meadow Mice, are not prolific like many others of the feathered kind.

The cruel warfare so relentlessly waged for many years, with Legislative aid, against these faithful guardians of the farmer's crops, is now being most dearly paid for by the loss annually of thousands of dollars through ravages of the rapidly increasing army of well fed, sleek Meadow or Field Mice.

FISHES.

One hundred and fifty kinds of fishes, it is said, are found in the waters (Lake Erie included) of Pennsylvania. Many of these are highly valuable for food.

The Susquehanna river at different points, fur-

nishes excellent sport to anglers who desire to catch bass, perch, salmon and other varieties of the finny inhabitants.

Brook Trout, which sometimes will eat Mice, are abundant in many of the cool mountain streams, and in the winter season, when the numerous lakes in north-eastern Pennsylvania are frozen over, fishing with the "tip-up" for pickerel, through holes made in the ice, is a favorite diversion with many persons. Certain species of fish catch ducks and sometimes other feathered animals, but the damage they do in this direction is not very great.

SECTION 1.

EASTERN PENNSYLVANIA, NEW JERSEY, AND
THE DELAWARE AND VIRGINIA
PENINSULA.

PRINCIPAL KINDS OF GAME.

MAMMALS :

Rabbits, Squirrels, Raccoons, Foxes, Deer.

BIRDS :

Quail, Ducks, Pheasants, Reed Birds, Snipe, Rail Birds, Woodcock, Geese, Doves, Plover, Marsh Hens.

PRINCIPAL KINDS OF FISH.

SALT WATER :

Sheepshead, Bass, Weakfish, Drum, Porgy, Blue Fish, Flounder, Black Fish.

FRESH WATER :

Bass, Perch, Pike, Trout, Carp, Catfish, Rock Fish, Sun Fish.

RABBITS.

Rabbits seem to be the most generally distributed mammalian game to be found in the territory reached by the Pennsylvania Railroad. They are most plentiful in the Eastern agricultural districts, in the lowlands and meadows along the Atlantic Coast, and in that long stretch of timber land commonly called "barrens," extending through New Jersey from the vicinity of Raritan Bay southward to near the mouth of the Maurice river. The best localities for hunting this kind of game are near Wood-

bine, Cape May county, New Jersey, on the Cape May Division of the West Jersey and Seashore Railroad, and in the forests near Atco and Winslow Junction, Camden county, New Jersey, on the Atlantic City Division. Good hunting is also reported in the neighborhood of Spotswood, Middlesex county, New Jersey, on the Amboy Division; also around Island Heights in Ocean county. All of these towns furnish good hotel accommodations, and with the exception of Atco and Island Heights no guides are needed; at the latter points guides are preferable and can be secured. Rabbits are also reported plentiful in the vicinity of Lewes and Rehoboth, Sussex county, Delaware, on the Delaware Division of the Philadelphia, Wilmington & Baltimore Railroad. Ample hotel accommodations are afforded, and no guides are needed.

SQUIRRELS.

Squirrels, like Rabbits, are found throughout the eastern section of Pennsylvania, New Jersey and Delaware. They are less plentiful, however, in this territory, owing to the absence of large forest trees. They are, perhaps, most numerous in the vicinity of Spotswood, Middlesex county, New Jersey, and along the Millstone river in Somerset county, New Jersey. The first point is reached via the Amboy Division, and the latter via the New York Division to East Millstone or Rocky Hill. The best Squirrel hunting, however, is probably found in the Allegheny Mountains.

RACCOONS.

Raccoons seem to have become quite scarce. A few may still be found along the Millstone river in Somerset county, New Jersey, reached via the New York

Division to East Millstone or Rocky Hill; also in the neighborhood of Winslow Junction, Camden county, New Jersey, on the Atlantic City Division of the West Jersey and Seashore. They are also reported in fair numbers in the vicinity of Milford, Kent county, Delaware, on the Delaware Division of the Philadelphia, Wilmington & Baltimore Railroad. Guides are unnecessary, and any of the towns named furnish good hotel accommodations.

FOXES.

Foxes are reported very scarce in the eastern district. A few are still found in the vicinity of Hammonton and Egg Harbor, Atlantic county, New Jersey, on the Atlantic City Division of the West Jersey and Seashore Railroad. Better fox hunting, however, is found among the Alleghenies.

DEER.

At two points only in the eastern section are deer reported. In the wooded districts lying between Egg Harbor, Atlantic county, and Vineland, Cumberland county, New Jersey, deer hunting is said to be still quite good. Vineland is reached via the Cape May Division of the West Jersey and Seashore, Egg Harbor via the Atlantic City Division. Guides are considered necessary and can be secured at either of the above-named points. These towns also afford good hotel accommodations.

BIRDS.

QUAIL.

Quail are reported most plentiful around Spotswood, Middlesex county; Port Norris, Cumberland county;

Island Heights, Ocean county, New Jersey; and Lewes and Rehoboth, Sussex county, Delaware. Good gunning is also found around Alloway, Quinton, Bridgeton, Cape May, Rio Grande, Ocean View, Woodbine, Belleplain, Manahawken, Atco, Hamonton and Wenoah, New Jersey; Milford, Seaford, Kirkwood, Clayton and Smyrna, Delaware; Centreville, Hopewell, Ridgley, Trappe, Marydel, Hursley and Berlin, Maryland; Pottstown, Spring City, Birdsboro and Auburn, Pennsylvania. Guides are not usually needed, but can be secured where necessary. Good hotel accommodations are afforded at all of the above points, except Rio Grande, New Jersey.

WILD DUCKS.

The Chesapeake Bay is the home of wild ducks, and the shores of the Peninsula are their feeding grounds. Along the bays and estuaries of the eastern shore especially they may be seen in almost any number during certain seasons of the year. Cape Charles and vicinity is probably one of the best places in the country for wild duck gunning. Excellent shooting may also be had in Hog Island Bay, Pocomoke and Tangier Sounds, on Cobb's Island, and in the vicinity of Keller and Exmore. They are also reported plentiful in Chineo Bay near Hursley; in the rivers near Easton, and on the Blackwater marshes, Hooper's Island, and Fat Bay near Cambridge, Maryland. In fact, good duck shooting may be found at almost any point on the Eastern shore of the Chesapeake and on the Atlantic side of the Peninsula; the further south probably the better. Guides are generally necessary, and they can be secured at almost any point on the Peninsula; previous notice may sometimes be necessary. Good

hotel accommodations are afforded at the larger towns.

PHEASANTS.

Pheasants are most plentiful in the Jersey "barrens" around Brown's Mills Junction, Woodbine, Rio Grande, Belleplain, and Hammonton; also around Quinton, Alloway, Bridgeton, Manahawken and Rocky Hill. Fair gunning is also reported on Welsh Mountains near Dowingtown. Guides are not necessary and good hotel accommodations are afforded with the exception of Rio Grande.

REED BIRDS.

Reed birds are very plentiful in their season along the Lower Delaware, the Delaware Bay, and the larger tributaries. They are reported most plentiful near Linwood, Pennsylvania, Swedesboro, Burlington, Quinton, Salem, Bridgeton, and Port Elizabeth, New Jersey. Guides are sometimes needed and can be secured. All of the above points afford good hotel accommodations.

SNIFE.

Snipe are found in greatest numbers in the marshes and on the river shores near the coast. They are reported particularly plentiful along the Rehoboth Bay, Rehoboth; along the Indian river and Beach near Frankford, and along the Delaware & Chesapeake canal near Delaware City, Delaware. Good shooting is also reported in the marshes near Quinton, Sea Isle City, and around Seaville, New Jersey. Guides are sometimes desirable and can be secured. Good hotel

accommodations are afforded at all of the above named towns.

RAIL BIRDS.

Rail birds are most plentiful in the marshes along the Delaware bay and river and their tributaries. They are reported most abundant near Linwood and Croydon, Pennsylvania; Wilmington, Delaware City, and Seaford, Delaware; Port Elizabeth, Bridgeton, Quinton, Salem, Wenoah and Delanco, New Jersey. Experienced pushers and good hotel accommodations can be had.

WOODCOCK.

Woodcock are reported most plentiful around Belleplain, Cape May, Alloway, Quinton and Ateo, New Jersey; and along the canal at Delaware City, Delaware.

GEESE.

Wild Geese are most plentiful in Rehoboth Bay, Indian River near Frankford, and Isle of Wight Bay near Selbysville, Delaware; in Chester River, Centreville, and near Hursley and Berlin, Maryland. Good hotel accommodations are afforded, but guides are hardly needed.

DOVES.

Turtle Doves are most plentiful in season in the vicinity of Cape May, Ateo, Wenonah and Martin's Creek, New Jersey; and Seaford and Selbyville, Delaware. No guides are needed; good hotel accommodations.

PLOVER.

Good Plover shooting is found in season near Mohrsville and Leesport, Berks county; Waverly, New Jersey, and Delaware City, Delaware.

MARSH HENS.

Marsh Hens or Mud Hens are reported most plentiful in the marshes near Anglesea, Wildwood, Sea Isle City, and Pleasantville, New Jersey. Guides are preferable; good hotel accommodations are afforded at all of these towns except Pleasantville.

FISH.

SALT WATER FISHING.

Excellent salt water fishing is found all along the Atlantic Coast from Cape Charles, at the mouth of the Chesapeake, north to Asbury Park and Long Branch. The best fishing, possibly, is found in the vicinity of Anglesea and Ocean City, Cape May county, Beach Haven and Barnegat, Ocean county, New Jersey; Rehoboth, Lewes, and Millsboro, Sussex county, Delaware; Ocean City, Worcester county, Maryland; Franklin City and Chincoteague. Accomac county, and Cape Charles, Northampton county, Virginia. Also on the eastern side of the Chesapeake at Chestertown, Oxford, Cambridge and Crisfield. At these points almost any kind of salt fish may be found in large numbers. Sea Bass are perhaps most plentiful in the vicinity of Anglesea; Sheepshead in Barnegat Bay, Great Egg Harbor Bay, and Corson's Inlet near Ocean City, New Jersey; Blue Fish in Barnegat Bay and Great Egg Harbor; Blackfish at Chestertown, Kent county, Maryland; Flounders in Barnegat Bay.

Almost any of the South Jersey seashore points may be reached from Philadelphia by morning trains in time to enjoy a good day's fishing and return again in the evening.

FRESH WATER FISHING.

BASS.

The best Black Bass fishing is reported along the Upper Delaware from Lambertville, New Jersey, northward to Hancock, New York. Excellent fishing is reported near Milford, Riegelsville, Carpenterville, Martin's Creek, Manunka Chunk, Delaware Water Gap, and further up at Port Jervis, Narrowsburg, and Cochecton. Good fishing is also found in the Brandywine near Wilmington, and in the Schuylkill and its larger tributaries.

PERCH.

Probably the best White Perch fishing in the United States is found near Betterton, Kent county, Maryland, on the eastern shore of the Chesapeake Bay. Good fishing is also found in the Delaware river as far north as Milford, New Jersey, and generally a considerable distance up all the tributaries of that stream. Among the streams on the Jersey side where perch abound in their season are the Rancocas, Cooper's, Timber, Woodbury, Salem, Cohansey, and Alloway Creeks, and Maurice river. The Neshaminy and Brandywine near their mouths also abound with them.

PIKE.

Pike fishing is reported good in the tributaries of the Delaware river, as well as the rivers and creeks

of the Delaware Peninsula. The Rancocas, Crosswick and Alloway creeks afford, perhaps, the best pike fishing.

TROUT.

The best Brook Trout fishing in the eastern district is undoubtedly found in Monroe and Pike counties. In the Big Bushkill, Saw, Broadhead's and Lackawaxen creeks trout are quite plentiful; also in the tributaries of the Upper Delaware. Henryville, Cresco, and Canadensis, Monroe county, furnish good headquarters for trout fishermen.

CARP.

Carp are becoming quite plentiful in the tributaries of the Delaware, and good fishing may be found in Mantua, Rancocas, Chester, Darby, and Brandywine creeks; also in the Schuylkill river near Spring City. Carp, like some other exotic animals which have been brought to this country, have become a great nuisance. Since Carp are so numerous in many of our streams and ponds it is found that they have, in some places, almost depopulated the waters of other kinds of very desirable fishes. Fortunately the laws of Pennsylvania, through the efforts of our efficient Board of Fish Commissioners, do not give protection to the Carp at any season of the year.

CAT FISH.

Cat Fish are quite plentiful in all of the streams in this part of the country, and may be found in any of the tributaries of the Delaware river. They are reported quite plentiful at Alloway, Bridgeton, Port

Elizabeth, Westville, Clayton, Burlington and Frenchtown, New Jersey, and in the Neshaminy creek near Croydon.

ROCK FISH.

Rock Fish are reported quite plentiful near Manahawken, Burlington and Delanco, New Jersey; Berlin and Centreville, Maryland; and Milford, Delaware City, and Clayton, Delaware. Good hotel accommodations can be had at any of these points.

SUN FISH.

Sun Fish are most plentiful, perhaps, near Fish House Station, New Jersey. They are also quite numerous at Rocky Hill, East Millstone, Alloway, Lumberton, Florence and Burlington, New Jersey; also in the Schuylkill river and Manatawney creek near Douglassville, Berks county.

SECTION 2.

CENTRAL PENNSYLVANIA WEST OF THE
SUSQUEHANNA RIVER AND ITS TRIBUTA-
RIES, AND EAST OF THE SUMMIT
OF THE ALLEGHENIES.

PRINCIPAL KINDS OF GAME.

MAMMALS:

Rabbits, Squirrels, Deer, Bears, Foxes, Raccoons, Wildcats.

BIRDS:

Pheasants, Quail, Wild Turkeys, Ducks, Woodcock, Geese, Snipe,
Reed and Rail Birds.

PRINCIPAL KINDS OF FISH.

FRESH WATER:

Brook Trout, Bass, Carp, Perch, Pike, Salmon, Rock Fish, Sun
Fish, Cat Fish.

RABBITS.

Generally speaking, rabbits are less plentiful in this section than in Eastern Pennsylvania and New Jersey. They are well distributed throughout the territory, however, and good hunting may be found in most of the river valleys. The best rabbit hunting is reported in the vicinity of Mt. Union and Huntingdon, Huntingdon county, and near Tipton, Blair county; also in the neighborhood of Cameron, Cameron county, Johnsonburg and Rathbun, Elk County, on the Philadelphia and Erie Railroad; Snow Shoe, Centre county; Gap and Peach Bottom, Lancaster county, and Cono-

wingo, Cecil county, Maryland. With the exception of Snow Shoe, Rathbun and Johnsonburg, no guides are needed; at these three points guides are considered necessary and can be secured. With the exception of Tipton, Rathbun and Gap, all the above-named points afford good hotel accommodations.

SQUIRRELS.

Squirrels are more numerous in this section, especially among the Allegheny mountains. They are reported most abundant at Jack's mountain north of Mt. Union, and in the vicinity of Huntingdon; also at Snow Shoe, Centre county, and at Johnsonburg, Elk county. Good shooting is also found in the neighborhood of Peach Bottom, Lancaster county. At Snow Shoe and Johnsonburg guides are considered necessary. Good hotel accommodations can be had at any of these points.

DEER.

Deer are reported most plentiful along the line of the Philadelphia and Erie Railroad west of Lock Haven, and while they are nowhere very numerous, good hunting may still be enjoyed in the vicinity of Snow Shoe, Lock Haven, and Sinnemahoning (Karthaus mountain); in the Diamond Valley near Huntingdon; on Tussey mountain near Spruce Creek, Huntingdon county, and also on the Seven mountains near Reedsville, Mifflin county, and on Buffalo mountain near Glen Iron, Union county. The best deer hunting, however, is evidently found in that wild, mountainous region stretching westward from Lock Haven through Clinton, Centre and Clearfield counties. It is reached via the Philadelphia and Erie Railroad to

Lock Haven, Karthaus or Driftwood, or via the Pennsylvania Railroad and Bald Eagle Valley Railroad to Snow Shoe. Guides are generally considered necessary for deer hunting, and may be secured at any of the above named stations. Good hotel accommodations can also be had.

BEARS.

Bears are found in various parts of the Alleghenies, along the line of the Philadelphia and Erie Railroad, and in the neighborhood of Altoona. They are reported most plentiful on Karthaus mountain in the vicinity of Sinnemahoning; on the mountains around Lock Haven, and in the vicinity of Snow Shoe. A few may also be found near Rathbun and Renovo, and also in the Allegheny mountains near Tipton and Altoona, Blair county, and on Jack's mountain near Glen Iron, Union county. As in the case of deer, the best hunting grounds are evidently in Clearfield, Centre and Clinton counties, especially in the neighborhood of Snow Shoe. Guides are necessary, and can be secured at any of the above mentioned points. Good hotel accommodations are also afforded, with the exception of Tipton and Rathbun.

FOXES.

Foxes are reported most plentiful on Jack's mountain north of Mt. Union; among the hills and mountains around Bellwood, Blair county, and in the vicinity of Johnsonburg, Elk county. They also are found in the vicinity of Milesburg, Centre county, and around Montour Falls, New York. Guides are considered necessary at Bellwood, and can be secured. Good



CLINTON COUNTY.

hotel accommodations can be had at any of the above-named places.

RACCOONS.

Raccoons are reported plentiful at Mt. Union, Huntingdon county, Johnsonburg, Elk county, and Renovo, Clinton county. Guides are considered necessary at Johnsonburg, and can be secured. Good hotel accommodations are afforded.

WILD CATS.

Wild Cats are reported quite plentiful around Johnsonburg and in the vicinity of St. Mary's and Rathbun, Elk county. Guides are needed, and can be secured. Good hotel accommodations can be had at Johnsonburg and St. Mary's.

BIRDS.

PHEASANTS.

Pheasants are quite plentiful throughout this section, especially in the valleys and on the hillsides at the foot of the Allegheny mountains. They are reported very plentiful in the neighborhood of Bodine, Lycoming county, on the Northern Central Railway; also on Jack's mountain north of Mt. Union, and in the neighborhood of Huntingdon; near Mifflinburg, Millmont, and Glen Iron, Union county; near Coburn, Spring Mills, and at Zerby, Centre county; around Wolfsburg, Bedford county; along the Susquehanna river at Farrensville, Clinton county; in the vicinity of Rathbun, Elk county, and around Smoke Run, Clearfield county. One of the best localities I have ever found in Pennsylvania for Pheasants is at Loganton,

Clinton county. To reach this place you drive about eighteen miles from Lock Haven. Guides are not usually needed, and, with the exception of Rathbun, good hotel accommodations are afforded.

QUAIL.

Quail are less plentiful than in the eastern district. The best shooting is evidently along the Lower Susquehanna, in Lancaster county, and in Cecil county, Maryland. They are reported in good numbers near Conewago, Pennsylvania, and Rising Sun and Conowingo, Maryland. Quail shooting is also good in the vicinity of Halifax, Dauphin county. There is good quail shooting in the agricultural districts of Snyder county about Selins Grove, likewise in Columbia county in the valley in the neighborhood of Catawissa, and also in different points in York county. Property owners, however, in many of these places, object seriously to gunners. The best gunning, however, is evidently in New Jersey.

WILD TURKEYS.

Wild Turkeys are most numerous in this district. The best hunting ground seems to be along Jack's mountain from Mt. Union and Mill Creek, Huntingdon county, northeast to the vicinity of Glen Iron, Union county. They are reported quite plentiful in the mountains around Wolfsburg, Bedford county, and along the Susquehanna in the vicinity of Lock Haven; also at Barree, Huntingdon county. They are quite plentiful in Juniata county. Guides are desirable to direct strangers to the best localities, and they can be secured at any of the above places. Ample hotel accommodations are afforded.

DUCKS.

Ducks of various kinds are, of course, most plentiful along the Lower Susquehanna and in the vicinity of Chesapeake Bay. They are reported most abundant at North East, Principio, Perryville, Port Deposit, and Conowingo, Cecil county, Maryland, and near Quantico and Woodbridge, Virginia, on the Washington Southern Railway. They are also quite plentiful during certain seasons of the year in Seneca Lake, Lake Keuka, and at Sodus Point, New York. Guides are desirable in the vicinity of the Chesapeake Bay, and they can be secured at any of the above points. Good hotel accommodations can also be secured, except at Principio and Perryville.

WOODCOCK.

Woodcock are apparently nowhere abundant; but the best shooting, possibly, is found in Maryland in the vicinity of Conowingo, Cecil county, and Chase and Stemmer's Run, Baltimore county, on the Maryland Division of the Philadelphia, Wilmington and Baltimore Railroad. This kind of game is also found in fair numbers around Canton, Bradford county, East Bloomsburg, Columbia county, and along the Juniata river near Altoona. Guides are needed at Altoona, but are not considered necessary at the other points. Good hotel accommodations are afforded, except at Stemmer's Run.

GEESE.

Geese may be found along the line of the Philadelphia, Wilmington & Baltimore Railroad in the neighborhood of Perryman, Hartford county, and Bengies,

Chase and Stemmer's Run, Baltimore county, Maryland, on the Western shore of the Chesapeake. Guides are hardly needed, but they can be secured if desired. Bengies and Stemmer's Run afford no hotel accommodations.

RAIL BIRDS.

The Carolina Rail, also named Sora, and often improperly called "Ortolan," is very abundant on the extensive marshes of the Patuxent in the month of September. The best places to shoot these birds, in season along this river, are at Bristol, and Nottingham, Maryland. These points are best reached by the Pope's Creek Branch of the Baltimore and Potomac Railroad. At both of these localities sportsmen and naturalists can find poultry-destroying Hawks and other animals; good hotel accommodations and first-class pushers (boatmen) at reasonable rates can be secured. In September, 1897, fully fifteen thousand Rails, besides large numbers of Reed Birds, and a goodly number of wild ducks and snipe were shot on the marshes around Bristol. As many as 150 Rails were credited to one boat in a day; but the average was about fifty of these toothsome birds to a tide. To reach Bristol from Philadelphia go to Marlboro by the cars and drive to the river; and to visit Nottingham procure a ticket for Croome and take horse and wagon to the desired point. Arrangements can be made in advance by mail for pushers, hotel accommodations and conveyance to and from the railroad stations. For such information address Wilson Owens, Leon (name of postoffice at Bristol), Md., or Capt. John MacCubbin, Nottingham, Md.

SNIPE.

A few Snipe may be found along the lake shores near Watkins, New York; also along the Conewago creek near Conewago, Lancaster county; on the Patuxent river near Croome, Prince George county, Maryland, and along Ramney creek near Perryman, Harford county, Maryland. In March and April, or during the vernal migrations there is usually very good Snipe shooting along the Patuxent river, especially in the marshes in the neighborhood of Bristol, Md. It is nothing unusual for a skillful marksman to make a bag of twenty-five or thirty English or Wilson's Snipe in a day at this place. You can reach Bristol by river steamer from Baltimore, but the quickest way to get there from Philadelphia is via the Pennsylvania railroad to Marlboro, and then drive about five miles. No guides are necessary and good hotel accommodations can be had.

REED BIRDS.

Reed Birds are found in good numbers along the Patuxent river near Marlboro, Croome, and Glendale, Prince George county, Maryland, and in the marshes near Bennings, D. C. Good boatmen can be secured at very reasonable rates, and the hotel accommodations are good. During the first two weeks in September Reed Birds are usually very abundant on the Patuxent river marshes in the neighborhood of Marlboro, Bristol and Croome. These places can be reached in a few hours ride from Philadelphia.

FISH.

BROOK TROUT.

The best Trout fishing is evidently in Centre county, and in the vicinity of Emporium, Cameron county. In Centre county the best fishing is found in Buffalo Run and Spring Creek near Bellefonte; Fishing Creek, Sinking Creek and Penn's Creek near Centre Hall; and the Bald Eagle Creek, Moshannon Creek, Marsh Creek and Beech Creek in the western part of the county. All of these points are reached via the Bald Eagle Valley and Lewisburg and Tyrone Railroads. Bellefonte, Tyrone, and Snow Shoe afford ample hotel accommodations. In Cameron county the best fishing is found in the headwaters of Elk creek and Clear Creek, and in the numerous runs around Driftwood and Emporium. Good fishing is also reported in the neighborhood of Westport and Renovo, Clinton county; Rathbun, Elk county; Adamsburg and Beavertown, Snyder county, and Glen Iron, Cherry Run, Union county; also in Belle Run near Frugality, Cambria county, and in Spruce creek near Pennsylvania Furnace. All of these points except Pennsylvania Furnace and Rathburn, furnish good hotel accommodations. Guides are usually desirable to locate the streams and best fishing grounds.

BASS.

Bass fishing is reported good all along the Susquehanna, the Juniata and their principal tributaries. The best fishing, however, is found in the Lower Susquehanna from Columbia south to the Chesapeake. In fact, no better bass fishing can be found in the country than at Port Deposit, Octoraro, Rowlands-

ville, and Conowingo, in Cecil county, Maryland; and at Peach Bottom, Fite's Eddy, McCall's Ferry, Safe Harbor, and Washington Borough, Lancaster county. Excellent bass fishing is also reported at Sinnemahoning, Cameron county, Glen Union, Clinton county and at Huntingdon, and in the Sodus Bay, Sodus Point, New York. Any of these places other than Glen Union, furnish good hotel accommodations and guides if desired.

CARP.

Carp are reported most plentiful in the Susquehanna and Juniata rivers. Good carp fishing can be had at Altoona, Blair county; Barree, Huntingdon county; Mill Creek and Mt. Union, Huntingdon county; and Duncannon, Perry county; at Rockville, Dauphin county, and Bainbridge, Lancaster county. All of these towns furnish good hotel accommodations and guides if desired. Guides are not generally considered necessary, however, for this kind of fishing.

PERCH.

The best perch fishing is found along the Lower Susquehanna and in the inlets and bays along the western shore of the Chesapeake. Good perch fishing is reported at Conowingo and Perryville, Cecil county, Maryland; at Perryman, Harford county, and at Bengies, Stemmer's Run and Chase, Baltimore county, Maryland, on the Philadelphia, Wilmington & Baltimore Railroad. Good fishing is also reported in the Patuxent river near Croome, Prince George county, Maryland; in the Potomac at Bennings, D. C.; in Seneca Lake at Watkins, New York, and in Sodus Bay, Lake Ontario. With the exception of Perryville.

Bengies and Stemmer's Run, good hotel accommodations are afforded at all of the above points. Guides are needed for fishing along the Chesapeake, and can be secured at such points.

PIKE.

Good pike fishing is reported at Cherrytree, Cambria county; in the mountain streams around Altoona; in Seneca Lake at Watkins, New York; in the Susquehanna river at Williamsport and East Bloomsburg, and at Bainbridge, Lancaster county; also in the streams around Bengies, Chase and Stemmer's Run, Maryland, on the Philadelphia, Wilmington & Baltimore Railroad. Good hotel accommodations can be had at all of the above points except Bengies and Stemmer's Run. Guides are considered necessary for pike fishing and can be secured.

SALMON.

Salmon are found almost exclusively in the Susquehanna and Juniata rivers. They are reported most plentiful in the vicinity of Middletown, Dauphin county, although good fishing is also found at Conowingo, Maryland; McCall's Ferry, Safe Harbor, Wrightsville and Steelton; and as far north as Glen Union, Clinton county, and Wapwallopen, Luzerne county. Along the Juniata good salmon fishing is found at Newport, Perry county. Guides are considered necessary for salmon fishing, and can be secured at most any of the above-named places. Good hotel accommodations are also afforded.

ROCK FISH.

The best rock fishing is found along the Lower Susquehanna, and in the vicinity of Chesapeake Bay; at

Rowlandsville, Octoraro, Conowingo, Perryman, Bengies, Stemmer's Run, and Chase, Md., and at Port Tobacco and Croome on the Pope's Creek Branch of the Baltimore and Potomac Railroad. Guides can be secured at any of these points, as well as hotel accommodations, with the exception of Bengies and Stemmer's Run.

SUN FISH.

Sun Fish are reported most plentiful at Nottingham, Chester county; Conewago, Lancaster county; at Perryman, Harford county, and Hollins, Baltimore county, Maryland, on the Northern Central Railway, and at Sodus Point, New York. Good hotel accommodations can be had at any of these points, except Nottingham. Guides are not necessary.

CAT FISH.

Good cat fishing is reported at Rising Sun, Cecil county, and Bengies, Baltimore county, Maryland; at McCall's Ferry, Lancaster county; Rockville, Dauphin county, and at Cherrytree, Cambria county. No guides are necessary, and good hotel accommodations can be had at all these points except Bengies.

SECTION 3.

 WESTERN PENNSYLVANIA WEST OF THE
 SUMMIT OF THE ALLEGHENY
 MOUNTAINS.

PRINCIPAL KINDS OF GAME.

MAMMALS:

Rabbits, Foxes, Squirrels, Deer, Bears.

BIRDS:

Pheasants, Quail, Wild Turkeys, Ducks.

PRINCIPAL KINDS OF FISH.

FRESH WATER:

Trout, Bass, Salmon, Carp, Perch, Pike, Rock Fish, Cat Fish.

RABBITS.

West of the Alleghenies Rabbits are most plentiful in the mountains in the neighborhood of Lilly and in the "Big Woods" near Summerhill, Cambria county, and around Nineveh and Penn Station, Westmoreland county. Guides are not necessary, but if desired they can be secured. Good hotel accommodations are afforded.

FOXES.

Foxes are reported quite plentiful along the Chestnut Ridge Hillsides, Westmoreland county; also around Saxenburg, Butler county, ten miles west of Ebensburg, and in the mountains around Lilly, Cambria county. Guides are usually considered necessary.

and can be secured. Ample hotel accommodations are afforded at all the above stations except Hillside.

SQUIRRELS.

Squirrels are most plentiful in the neighborhood of Penn station, Westmoreland county; they are also said to be quite numerous in the vicinity of Allegheny Valley Junction, and around Ninevah Station. No guides are needed, and good hotel accommodations can be secured.

DEER.

Deer are quite plentiful along the chestnut ridge and Laurel Hill near Ninevah Station, Westmoreland county, and they may be found in the vicinity of Kane, in McKean county. Guides are necessary and can be secured. Good hotel accommodations can also be had.

BEARS.

Bears may be found in the vicinity of Croyland, Elk county, also in the mountains at Farrandsville above Lock Haven, and at Loganton, which latter place is also in Clinton county, and can be reached by wagon from either Lock Haven or Coburn; and about five miles northwest of Kane, McKean county. Guides are needed and can be secured, as well as ample hotel accommodations. Bear shooting, like hunting Wild Turkeys, is generally followed with very unsatisfactory results. I would not recommend any one to go after Bears unless he is able to do a lot of hard tramping over rocky, brush-covered mountain land. You should also have good dogs which are experienced in pursuing Bears. Woodsmen and trappers in Pennsylvania

who hunt Bears for their flesh and pelts secure these animals chiefly by trapping, and few of them appear to make any effort to educate dogs to follow and harass these hardy brutes as was done by hunters and trappers in former years.

BIRDS.

PHEASANTS.

West of the summit of the Alleghenies Pheasants are reported most plentiful in the mountains around Lilly, Wilmore, and Ebensburg, Cambria county. Good gunning is also found near Export and Donohoe, Westmoreland county; Saxonburg, Butler county, and Spring Creek and Youngsville, Warren county. Private accommodations can be secured at Export; no hotel accommodations are afforded at Donohoe; good accommodations can be had at all the other points named. Guides are not generally needed, although in Cambria and Warren counties they are desirable and can be secured.

QUAIL.

Quail seem to be quite scarce west of the Alleghenies, but good shooting is reported to be around Crab Tree and Penn. Westmoreland county, and in the vicinity of Dunbar, Fayette county. Good hotel accommodations can be secured at these points; no guides are needed.

WILD TURKEYS.

Wild Turkeys are reported plentiful around Wilmore; along Black Lick Valley, ten miles west of Ebensburg, and around Conemaugh, Cambria county;

also along Chestnut Ridge and Laurel Hill, Westmoreland county. With the exception of Lockport good hotel accommodations are afforded at all of these points. Guides are sometimes desirable and can be secured where necessary.

DUCKS.

Ducks are said to be plentiful along the Conemaugh, at Nineveh Station, at certain seasons of the year. The town affords good hotel accommodations, and no guides are needed.

FISH.

Brook trout are reported plentiful in Forest and Jefferson counties, and in the western part of McKean county; likewise in Potter county. Good fishing is found along the tributaries of Tionesta creek in Forest county; along the branches of the north fork in Jefferson county, and along the Kinzua creek in McKean county. Pretty good trout fishing can be found along the Philadelphia & Erie Railroad from Johnsonburg to Corry. Guides are generally required.

BASS.

Bass are reported most plentiful in Beaver run, five miles west of Export, and in the Conemaugh near Ninevah, Westmoreland county; in the Allegheny river near Springdale, Allegheny county, and at Allegheny Valley Junction, Westmoreland county; also in the creeks around Garland, Warren county. Good hotel accommodations can be secured at any of these points; guides are not needed.

SALMON.

A few salmon may be found in the Allegheny river near Allegheny Valley Junction, Westmoreland county; in the Monongahela river near Webster, Washington county and in the Conemaugh at Summerhill, Cambria county. Guides are not needed and hotel accommodations can be secured.

CARP.

Good carp fishing is found in the Monongahela river at Webster, Washington county, and in the Allegheny river at Allegheny Valley Junction, Westmoreland county.

PERCH.

Good perch fishing can be had at Webster on the Monongahela river, thirty-five miles south of Pittsburgh.

PIKE.

Pike are reported quite plentiful in the Conemaugh river near Ninevah, Westmoreland county. No guides are needed and good hotel accommodations are afforded.

ROCK FISH.

Rock fishing is reported best in the creeks near Garland, Warren county. Good hotel accommodations are afforded and no guides are needed.

CAT FISH.

Cat Fish are reported quite plentiful in the Monongahela river near Webster, Washington county.

CHAPTER VII.

TAPEWORMS OF POULTRY.

This chapter deals quite fully with a subject of great importance, both from a practical and scientific standpoint. As Dr. D. E. Salmon, Chief of Bureau of Animal Industry, U. S. Department of Agriculture, Washington, D. C., says, in referring to this matter:

"Our knowledge of the parasites of poultry is in a very unsatisfactory condition, and the contributions to it are so scattered through the literature of the world that they are not available to the greater part of those engaged in the investigation of this and allied subjects."

The serious outbreaks of epizootics which have occurred chiefly in Europe, among domesticated fowls, and which have been traced to tapeworms which infest poultry, has led scientific men abroad to investigate, with great care, these internal forms of parasitic life. As a result almost all the literature on the subject appears in

"Latin, German, French, Danish, Italian, etc, while in the English language we have only a few short notices concerning these worms."—Stiles.

Within the past two or three years several specimens of tapeworms and other entozoa have been sent to the Pennsylvania Department of Agriculture with statements that the fowls from which the specimens were taken were dying from some unknown disease; and that, although the fowls at times showed in-

creased desire for food, they grew thin, dull and listless, and leaving, with ruffled feathers and drooping wings, the rest of the flock, soon died.

In order that an interest involving annually in Pennsylvania about \$22,000,000 shall be fully dealt with in a publication which the Legislature has directed should be prepared to meet the great demand which comes especially from farmers for such a document, it has been deemed advisable to reproduce in this chapter the carefully prepared paper of Dr. C. W. Stiles, entitled

"A REPORT UPON THE PRESENT KNOWLEDGE OF THE
TAPEWORMS OF POULTRY,"

which was recently published as part of Bulletin No. 12 (Bureau of Animal Industry) of the United States Department of Agriculture, Washington, D. C. The handsome illustrations in this chapter, so true to nature, have been prepared from drawings made with especial care, from specimens in the National Government Museum, by Mr. Wm. S. D. Haines, an artist of rare ability.

This chapter, made up as it is of the most exhaustive report which to date has ever been printed in the English language on the Tapeworms, will no doubt, notwithstanding its technical character, be of great service to poultry raisers of Pennsylvania, as, by its teaching, they can learn that which will enable them to recognize and guard against outbreaks of disease from parasitic enemies, which have only lately been investigated by specialists in this country.

Tapeworms, as well as numerous other internal parasites, infest wild birds. The abdominal-thoracic cavity of the common Meadowlark is frequently the

refuge of masses or balls of parasites (filaria?); under the bony covering of the skull of the Anhinga or Snake bird a species of parasite is usually to be found. These parasites are often seen in birds of prey which subsist on an animal diet. Tapeworms are very common in the intestines of Crow Blackbirds, which are omnivorous. When in Florida, in 1885, the writer found the intestines of several Quail fairly gorged with whitish, pinkish or yellowish colored tapeworms. It was noticed that the Quail had been feeding to a considerable extent on a small species of batrachian, called by the natives "rain or sand frogs." In a period of about three months, in 1895, the writer obtained fully one hundred and twenty-five specimens of internal parasites from land and water birds and domesticated fowls in Florida. These specimens, prepared in alcohol, with full data, were presented to the late Joseph Leidy, M. D. Many of these specimens, some of which were new to science, were fully described by Prof. Leidy, in Medical Journals, etc.

Unfortunately, the fire of 1897, which destroyed the office, library, note books, etc., of the writer, consumed a large amount of data concerning tapeworms and other parasites of wild birds, mammals and domestic fowls, which had been collected by me in the field or presented by my esteemed friend and instructor, Prof. Joseph Leidy, who had, a short time prior to his death, accumulated a considerable amount of data concerning tapeworms of domesticated fowls and wild animals.

B. H. WARREN.

REPORT UPON THE PRESENT KNOWLEDGE OF THE TAPEWORMS OF POULTRY.

BY CH. WARDELL STILES.

PART I.

GENERAL DISCUSSION.

It has been known for years that tapeworms infest domesticated poultry, and in some cases they cause serious epizootics among fowls. The outbreaks thus far recorded have occurred chiefly in Europe, and as a natural outcome almost the entire work which has been published on these parasites is the result of European investigations. The literature upon the subject is accordingly in Latin, German, French, Danish, Italian, etc., while in the English language we have only a few short notices concerning these worms. Generic and specific diagnoses of the parasites of this group are almost unknown articles in the English language, while as yet we have absolutely no reliable data as to how many species of tapeworms are found in American poultry.

Several outbreaks of tapeworm disease have been noticed in fowls in different parts of the country, and upon various occasions specimens have been sent to this Bureau for identification. As Dr. Moore (1895)*

*A Nodular Taeniasis in Fowls, by Dr. V. A. Moore.

has recently called attention to this disease, and as we shall probably hear of its existence in various parts of the country, it may be well to state at this time what is known regarding the tapeworms of domesticated fowls and, in response to several requests from experiment stations, to give the generic and specific diagnoses as they at present stand.

The following table shows 33 species which have been recorded for poultry, but several of these are doubtful and probably several forms appear in the list more than once, under different names. Besides the forms given, one or two other forms have been recorded, but can be ignored for the present. A square □ signifies that the parasite is recorded only from poultry; a cross † that it occurs in wild birds, but probably not in poultry; the circle ○ signifies that the parasite is recorded both in poultry and in wild birds.

gracilis .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Small fresh-water mussel crabs (Candona rostrata, Cyprina ophthalmica) and copepods (Cyclops viridis). House fly (Musca domestica).
infundibuliformis .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Small fresh-water copepods (Cyclops brevicaudatus).
lanceolata .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Flea crabs (Gammarus pulex) and copepods (Cyclops viridis, C. agilis, C. luctuosus).
setigera .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Flea crabs (Gammarus pulex) and copepods (Cyclops agilis, C. pulchellus).
sinuosa .....	.....	.....	.....	.....	.....	.....	.....	.....	.....
tenuirostris .....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Davainea—										
cesticillus .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Slugs (Limax agrestis, L. variegatus, L. clivereus).
crassula .....	.....	.....	.....	.....	.....	.....	.....	.....	.....
echinobothrida .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Probably snails (Helix carthusianella? or H. maculosa?).
proglottina .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Small fresh-water mussel crabs (Cyprina chinerea).
struthionis .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	See p. 595.
tetragona .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	See p. 607.
Echinocotyle—										
Rosseri .....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Taenia S. l.—										
cantamiana .....	.....	.....	.....	.....	.....	.....	.....	.....	.....
conica .....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Delafondi .....	.....	.....	.....	.....	.....	.....	.....	.....	.....
exilis .....	.....	.....	.....	.....	.....	.....	.....	.....	.....
imbutiformis .....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Krabbei .....	.....	.....	.....	.....	.....	.....	.....	.....	.....
maileus .....	.....	.....	.....	.....	.....	.....	.....	.....	.....
megalops .....	.....	.....	.....	.....	.....	.....	.....	.....	.....
sp. (Conard, MS.) .....	.....	.....	.....	.....	.....	.....	.....	.....	.....
sp. ....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	3(6)	2	.....	11	(2)	7	9(16)	1		

From this table it will be noticed that 6 different tapeworms have been recorded from pigeons, 2 from turkeys, 11 from chickens, 2 from Swans, 7 from geese, 16 from ducks, and 1 from ostriches; 1 form has been recorded as common to pigeons, chickens, and ducks; 5 forms as common to ducks and geese; 1 form as common to geese and swans; 1 as common to pigeons and ducks, and 1 as common to pigeons and chickens. These statistics are based upon the suppositions that all the parasites mentioned are good species, and that the specific determinations of the parasites were correct. A comparison of the original types would, however, undoubtedly show that both of these suppositions are incorrect, for many of the species are very poorly described, and have been established upon very limited material.

Many of the specific diagnoses existing to-day are almost worthless; some of the species rest upon very weak characters and must undoubtedly fall, while the synonymy and proper names of the group need thorough revision. It would be hazardous to make any radical changes in the system at present; in fact, I do not believe this should be done unless the worker has a large series of specimens, with types, if possible, before him.

LIFE HISTORY AND SOURCE OF INFECTION.

Fortunately the life history of a number of forms is known. So far as yet worked out, the larval stage is in every case a cysticeroid and lives in some invertebrate (snail, insect, crustacean, or worm). A glance at the above table and the remarks under each specific diagnosis will show the source of infection (intermediate hosts) so far as known or supposed. There are no grounds for believing that poultry can become infected with tapeworms directly from the eggs contained in the droppings.

The life history of these worms agrees with the life history of other tapeworms; the ova of the parasites are voided with the excrement and are swallowed by insect) and develops into a larval form known in this an oncosphere) contained within the eggshell then bores its way from the intestine into the body cavity of the intermediate host (a worm, snail, crustacean, or insect) and develops into a larval form, known in this case as a cysticercoid. This larva develops into an adult worm when swallowed by a chicken, duck, goose, etc.

The known or supposed life history has been based upon four different methods of work, i. e.—

1. Experimental infection of the fowls by feeding to them known larval stages found in invertebrates, and thus raising the adult stage.

2. Experimental infection of invertebrates by feeding to them the eggs of tapeworms found in birds, and thus raising the larval stage.

3. Comparison of the hooks upon the heads of adult tapeworms of birds with the hooks of larvae found in invertebrates and thus associating the young and the old stages.

4. Wild speculation as to the intermediate hosts, based upon negative results and totally devoid of any scientific foundation.

Of these four methods of work the first two give positive proof of the life history when the experiments are successful; the third gives a probability to the statements, but not a proof; the less said about the fourth method the better.

The following are the data we have at present regarding the life history:

1. Experimental infection of fowls with larvae in invertebrates.

Davainea prolottinal of chickens.—Gassi & Rovelli (1887, 1889A, 1892) fed the eggs (Pl. XV, fig. 198) of this tapeworm (Pl.

¹There are as yet but few popular names for the various poultry tapeworms. Several new popular names are introduced in the second part of this paper, but for the sake of exactness and brevity it is necessary to introduce the scientific names in all cases.

XV, fig. 194) to slugs (*Limax*), and raised the larval stage (Pl. XVI, figs. 199-202) in twenty days. Slugs containing these larvae were then fed to chickens, and within eight days the four segments were formed. There can, therefore, be no question that chickens become infected with this tapeworm by eating slugs.

Echinocotyle Rosseteri of ducks.—Small fresh-water crustaceans (*Cypris cinerea*)¹ containing a very characteristic larval tapeworm (Pl. XIX, fig. 251) were fed to a domesticated duck by Rosseter (1891A-B, 1892). The duck was afterwards killed and found to be infested with tapeworms possessing the same characteristic head (Pl. XIX, figs. 247-248). The life history of this form must therefore be looked upon as experimentally demonstrated.

2. Experimental infection of invertebrates by feeding the eggs of avian tapeworms:

Davainea proglottina of chickens.—This case has been discussed above.

Drepanidotaenia anatina of ducks.—Schmidt (1894) has recently demonstrated the life history of this worm in a manner which places the source of infection beyond question. He fed large quantities of tapeworm eggs to fresh-water crustaceans (*Cypris ovata*) and thus raised the larval form (Pl. IX, fig. 110). In summer these larvae developed in two weeks, but in winter they required over five weeks for their development, the difference in time being attributed to the difference in the temperature. The same larval form is described by Mrazek (1891) also from two other mussel crabs, i. e., *Cypris incongruens*¹ and *Cypris compressa*¹ (= *Cypris ophthalmica* according to Moniez).

3. Comparison of the hooks upon the heads of the adult tapeworms in birds with the hooks of larvae found in invertebrates, and thus associating the young and old stages.

This method of explaining the life history does not

¹There are no popular names for the numerous different species of small fresh-water crustaceans. The popular name mussel crabs is used for the Ostracoda (*Cypris*, *Candona*, etc.); water fleas for *Daphnia*; copepods for the Copepoda (*Cyclops*, Pl. VI, fig. 67; Pl. XI, fig. 130); flea crabs for *Gammarus*.

furnish the data which are demanded in science of to-day, although it shows what the probable life history is.

Davainea tetragona of chickens.—Piana (1881, 1882) found two larvae (Pl. XVIII, figs. 228-229) in snails of the genus *Helix*, which he associated with this chicken tapeworm (Pl. XVII, figs. 219-227, Pl. XVIII, figs. 231-235).

Dicranotaenia coronula of ducks.—Mrazek (1890) found larvae (Pl. III, fig. 25) in fresh-water mussel crabs (*Cypris ovum* and *Cypris ophthalmica* (*Cypris compressa*); Rosseter (1890) found a cysticeroid in *Cypris cinerea*, and Moniez (1891) in *Cypris ophthalmica* and *Candona candida*, which the three respective authors have associated with *D. coronula* of ducks.

Dicranotaenia spenoides of chickens—Grassi & Rovelli (1889A, 1892) claim to have found cysticeroids (Pl. IV, fig. 40.) in earth-worms (*Aillobophara Foetida*) which they associate with this species of tapeworm (Pl. IV, Figs. 37-38).

Drepanidotaenia fasciata of geese.—Mrazek (1890, 1891) classified a cysticeroid (Pl. VI, figs. 67-70) found in fresh-water crustaceans (Pl. VI, fig. 67) (*Cyclops agilis*) as the larva of this cestode (Pl. V, figs. 56-66).

Drepanidotaenia gracialis of ducks and geese.—Cysticeroids (Pl. VIII, Figs. 94-99) found in fresh-water mussel crabs (*Candona rostrata* by Scott, 1891, p. 314; *Cypris cobpressa* by Mrazek, 1891; *Cyclops viridis* by Mrazek, 1891, and *Cypris ophthalmica* by Moniez, 1891, p. 26) and in copepods (*Cyclops* sp. ?) by Schmidt, 1894, are looked upon as the larval stage of this parasite (Pl. VII, 80-85).

Drepanidotaenia infundibuliformis of chickens and ducks.—Grassi & Rovelli (1889A, p. 104; 1892) state that the larva (Pl. XV, fig. 191) of this parasite (Pl. XIV, figs. 173, 178) is found in the house fly.

Drepanidotaenia setigera (Pl. XIII, fig. 154) of geese.—Infection attributed by von Linstow (1892B, p. 503), to a cysticeroid found by Schmeil in copepods (*Cyclops brevicaudatus*).

Drepanidotaenia sinuosa (Pl. X, fig. 118) of ducks and geese.—Supposed to develop from cysticeroids (Pl. XI, figs. 130, 135) found in flea crabs (*Gammarus pulex*) by Hamann (1889, pp. 1-7; in copepods (*Cyclops viridis*, *C. agilis*, and *C. lucidulus*) by Mrazek.

Drepanidotaenia tenuirostris of geese.—Supposed larval stage (Pl. XIV, figs. 165, 168) was found in flea crabs (*Gammarus*

pulex) by Hamann (1889, pp. 7-9) and von Linstow (1892A, p. 338); and in copepods (*Cyclops agilis* and *C. pulchellus* by Mrazek 1891).

Thus, chickens are known to become infected with one tapeworm through eating slugs (*Limax*). They are supposed to become infected with a second through eating snails (*Helix*); by a third through eating flies, and by a fourth through eating earthworms.

Ducks are known to become infected with two worms through swallowing fresh-water crustaceans, and are supposed to become infected with three other tapeworms in the same way; another tapeworm is supposed to be transmitted to them through flies.

Geese are supposed to become infected with five species of tapeworms by swallowing small fresh-water crustaceans.

Nothing is known in regard to the source of infection of the tapeworms of pigeons and turkeys, but investigations in this field should be based upon the tapeworms of chickens.

THE RELATION OF THE TAPEWORMS OF WILD BIRDS TO THOSE OF THE DOMESTICATED FOWLS.

Only two of the chicken tapeworms (*D. infundibuliformis* and *T. malleus*) have as yet been recorded for wild birds, but the majority of the tapeworms found in the domesticated ducks and geese are also recorded from closely allied wild birds; besides these forms, however, many species have been described in wild birds which are not known to occur in the domesticated fowls. (See chart at end of text.) This renders the economic side of the question of avian cestodes extremely complicated and demands a thorough study of

the parasites of wild birds in connection with those of our domesticated fowls.

SYMPTOMS AND PATHOLOGY.

From a standpoint of symptomatology, practically nothing is known upon this subject. In general, however, it may be stated that aquatic birds are less affected by the presence of tapeworms than land birds; that young birds suffer more than old birds; and that, although a fowl may harbor a small number of tapeworms without showing any appreciable effects, a heavy infection injures the health and may result in death, as has been abundantly demonstrated by epidemics observed in different parts of the world. It has also been noticed that poultry are more severely infested in wet years than in dry years, and the general application may be made that poultry kept in damp places will be more heavily infested than fowls kept in dry places. All of these statements are general principles of parasitology.

Zürn (1882, p. 17) gives the symptoms as follows:

If numerous tapeworms are present in the intestine of young or old fowls a more or less extensive intestinal catarrh develops, corresponding to the greater or less number of parasites present.

The intestinal catarrh shows itself, especially in chickens and geese, as follows: The sick animals become emaciated, although the appetite is not especially disturbed. At times the appetite is even increased. The droppings are thin, contain considerable yellow slime, and are passed in small quantities but at short intervals. The poultry raiser must direct his attention to these thin, slimy, and often bloody droppings, for if any treatment against the tapeworms is to be undertaken, this must be done as early as possible. In observing the droppings it should be noticed whether tapeworm segments or eggs are present. The eggs can be seen, of course, only with the microscope.

After a time other symptoms develop. The sick animals become dull and listless, remain apart from the rest of the flock; the feathers are ruffled and the wings drop, the appetite is lost and the birds allow themselves to be easily caught. Although it was stated that in the beginning of the trouble the appetite is not disturbed, the sick animals develop an intense thirst for cold water. When it rains they run under the eaves in order to catch water, and in winter are eager for ice water.

At reading this some experienced poultry raisers will probably reply that many chickens which are not sick are fond of very cold water. The droppings are also thicker or thinner according to the food. Both of these facts are known to me (Zurn). At the same time I look with suspicion of tapeworms upon every chicken which shows an especial thirst for cold water; and as for the droppings, the fowls infected with tapeworms have droppings mixed with mucus and blood, and pass their excrements much oftener than other fowls do.

The intestinal catarrh often ends fatally.

Upon post-mortem the body is seen to be thin and anaemic. The intestine generally contains no food, the mucosa is soft and hyperaemic and covered with reddish yellow, more or less thick, purulent mucus. According to Hertwig epileptic attacks are frequently noticed in chickens affected with intestinal worms.

The diagnosis by symptoms seems to me very uncertain, and although the symptoms described by Zürn serve as an indication of the disease, they can not be taken as proof. The diagnosis by hunting in the droppings for segments of the parasite is less satisfactory than would be supposed, for it is not rare to find chickens badly infested with tapeworms when it has been impossible to discover segments in the manure. This method is rendered doubly uncertain because the color of the segments is about the same as the urine in the faeces. Microscopic examination of the faeces for eggs is quite a certain though not positive method for diagnosis of tapeworm disease of poultry, but it is thoroughly impracticable for the farmer to attempt it. The best method for the farmer to follow

is to kill one of the sick chickens, when he suspects tapeworms, and to cut out the intestine; he should then open the intestinal tract from the gizzard to the anus, in a bowl of warm water, and look for the parasites.

At least one species of tapeworm (*Davainea tetragona*) causes a serious nodular disease in the intestine of chickens which upon superficial examination may easily be mistaken for tuberculosis. This disease was probably first published by Rivolta & Del Prato (1880 or 1881?). It was afterwards described by Piana (1882) as occurring in chickens in Italy, and quite recently Moore (1895) has recorded it in this country. The following is extracted from Moore's article on the subject:

In the spring of 1894, a fowl (*Gallus domesticus*) died at the experiment station of this Bureau with a disease characterized by nodules or tubercle-like bodies in the intestinal wall. Upon closer inspection the lesions were found to be in the subserous and muscular coats, and not, to any appreciable extent at least, in the glands. In the intestinal contents there was a large number of small tapeworms, many of which were firmly attached to the mucosa. Later in the season about twenty fowls from the same flock were used for experimental purposes, and upon post-mortem examination were found to be more or less affected with this disease. In addition to these, one of four fowls which were examined from a flock of poultry on a farm adjoining the experiment station was found to be infested with tapeworms and the intestinal wall studded with nodules. A fowl received from Newbern, N. C., and one from Tacketts Mills, Va., were similarly affected.

Although but one fatal case came under my observation, the extent of the lesions in several of the fowls examined indicated that sooner or later many of them would undoubtedly have succumbed to this disease. The close resemblance of the nodules to tubercles renders necessary a somewhat detailed description of the lesions and of the means by which this disease can be readily differentiated from tuberculosis without the aid of laboratory facilities.

Description of the disease.--The fowl which died apparently from this disease was much emaciated, and the lesions were restricted to the intestinal wall. In the fowls used for other purposes, there were no observable symptoms by which the nodular affection could be detected prior to post-mortem examination. Diphtheria was the immediate cause of death of the fowls from North Carolina and Virginia. All of the fowls examined, affected with this disease, were from one to three years old.

The nodules were invariably more numerous in the lowest third of the small intestine. They occasionally appeared, however, in small numbers in both the duodenum and colon. The larger and to all appearances older nodules were found in the ileum near the caeca.

In the badly affected portion the nodules gave the appearance of closely set protuberances, varying in size from barely perceptible areas of elevation to bodies 4mm (1-6 inch) in diameter. In some instances they appeared to overlap one another. When separated by a band of normal tissue they were round or somewhat lenticular in form. In the latter case the long diameter was usually transverse to the long axis of the intestine. The larger nodules were of a pale or dark yellowish color while the smaller ones varied in shade from the more highly colored areas to the neutral gray of the normal serosa. To the touch they gave the sensation that would be expected if the subserous and muscular coats were closely studded with small, oval, solid bodies. The mucosa presented similar elevations. Attached to the mucosa over the nodules were a number of tapeworms. There were also in the more advanced cases a variable number of small (0.5 to 1mm) areas over the larger nodules in which the mucosa had sloughed, leaving small ulcerated depressions.

The larger nodules contained a greenish yellow, necrotic substance which appeared in the advanced stages as a sequestrum with a roughened surface. On section it has a glistening, homogenous appearance. Surrounding the necrotic substance was a thin layer of infiltrated tissue. The smaller nodules contained a more purulent-like substance and the smallest appeared to the naked eye as areas of infiltration. Sections of the affected intestine showed upon microscopic examination that the heads of the tapeworms had penetrated the mucous membrane and were situated in different layers of the intestinal wall. They were frequently observed between the villi. As would be expected the heads were not readily detected in the

necrotic masses contained in the larger nodules, but were almost invariably seen in the smaller ones. In a few sections the tapeworm could be traced through the mucosa to the nodule in the muscular tissue in which its head appeared. In the earlier stage of the nodular development there is a cell infiltration about the head of the worm. This process continues until the infiltrated tissue reaches a considerable size.

The worms attached to the mucosa were usually small. A larger form was commonly found in the intestinal contents. Although microscopically they appeared to be different, Dr. Stiles found that they were presumably of the same species.

It appears from the literature that this disease has not heretofore been demonstrated in America. In 1881, Piana described a disease of fowls in Italy, due to the presence of *Taenia bothrioplitis*. His article, however, deals more with the anatomy and classification of the infesting cestode than with the character of the lesions it produced. As he illustrates the nodules and heads of tapeworms in the intestinal wall there can be no doubt of the similarity of the lesions to those in the disease here described. Although fowls and birds are not infrequently infested with tapeworms, the lesions produced by these parasites are, with the exception indicated above, said to be more or less catarrhal in nature.

* * * * *

Economic importance.—The importance of this disease is much greater than it at first appears, as the close resemblance of the nodules to those of tuberculosis renders it of much significance from a different standpoint. As the intestines are stated to be frequently the seat of the specific lesions of tuberculosis in fowls, it is of the greatest importance that a thorough examination be made before a positive diagnosis is pronounced. There are already several statements concerning the presence of tuberculosis in fowls in which the data given are not sufficient to differentiate the disease from the one here described. A somewhat analogous disease of sheep¹ caused by a nematoid (*Oesophagostoma columbianum* Curtice) has led to the deliberate destruction of many animals, the owners believing that tuberculosis was being eliminated from their flocks. As the inquiry into the cause of poultry diseases becomes more general, it is probable that this affection will be occasionally encountered and unless its nature is recognized it may in some instances, like the sheep disease, lead to an unwarranted destruction of property.

¹Animal parasites of sheep, Bureau of Animal Industry, Department of Agriculture, 1890, p. 165.

In addition to its importance in differentiating tuberculosis it is in itself a malady worthy of careful attention. The fact that it has already appeared in two flocks in the District of Columbia and also in the State of North Carolina and Virginia, shows that the infesting cestode is quite widely distributed in this country. It is highly probable that the total loss it occasions both from deaths and from the shrinkage of poultry products, due to the chronic course of the disease it produces, is very large. * * *

Diagnosis.—Tuberculosis is, as before stated, the only known disease for which this affection is liable to be mistaken, and it is of much importance that the two diseases should not be confounded. The diagnosis has not, in my experience, been difficult, as in every case the attached tapeworms were readily detected upon a close examination of the intestinal contents, or of the mucous membrane of the infected portion of the intestine. However, the worms are quite small and could easily be overlooked in a hurried or cursory examination. In case of doubt, if the affected intestine is opened and the mucous surface washed carefully in a gentle stream of water, the small worms will be observed hanging to the mucous membrane. This discovery, in the absence of lesions in the liver or other organs, would warrant the diagnosis of the tapeworm disease. Although much is written concerning tuberculosis in fowls, especially in Europe, the investigations of poultry diseases by this Bureau have thus far shown that it is not common among fowls in this country.

TAPEWORM-INFECTED FOWLS AS FOOD.

None of the tapeworms of birds are transmissible to man in any stage of their development, and the presence of tapeworms in the intestine of fowls does not in itself warrant the condemnation of their bodies as an article of food.

PREVENTION.

From the nature of the intermediate hosts (fresh-water crustaceans) of the tapeworms of aquatic birds it is evident that nothing can be done to prevent the introduction of larval tapeworms into ducks and geese, if these animals are allowed to visit ponds.

Confining the animals to frequently flushed artificial tanks will, however, prevent tapeworm infection.

With chickens, the outlook is somewhat better. An extermination of slugs will insure immunity against *Davainea proglottina*, but no precise directions can be given to prevent chickens from becoming infested with other tapeworms until the life history of these parasites is better understood. It will be well, however, to keep chickens housed in the morning until the sun is well up and the ground is dry, for they will thus be less likely to meet with the supposable intermediate hosts of other worms.

Absolutely nothing can be done at present looking to a prevention of the transmission of tapeworms of wild birds to the domesticated fowls through known or unknown intermediate hosts, except to prevent the domesticated ducks, geese, etc., from visiting ponds.

There is, however, considerable outlook for improvement if different kinds of fowls are alternated in succeeding years upon the same ground or if the runs and yards of fowls are occasionally changed. From the table (pp. 554, 555), it will be seen that thus far none of the tapeworms of chickens are known to occur in turkeys. Whether this immunity of chickens to turkey worms and turkeys to chicken worms is real or apparent, however, is yet to be scientifically determined. Should it prove to be real, then an alteration of flocks of turkeys and chickens in different years will probably insure practical immunity of both birds from any serious outbreaks of tapeworm disease. If, however, turkeys or chickens, as the case may be, are raised upon the same grounds year after year, it is only natural that those grounds should become thoroughly infested with the larval stages of tapeworms and that fresh out-

breaks of tapeworm disease should appear from time to time.

Alternating flocks of geese and ducks promise similar but less satisfactory results.

The safest plan to prevent the spread of poultry worms would be to destroy the manure from infected fowls. If one is not willing to do this, however, because of its commercial value, he should at least take steps to prevent further infection from it. If the sick chickens are confined to a comparatively small space their droppings can easily be collected and placed in a strong barrel, to which the access of snails, slugs, worms, etc., should be guarded against. It is not known how long the eggs of poultry tapeworms will live, but it seems very doubtful to me whether they could live many months in such a barrel if placed in a dry spot. It seems almost certain that they could not live through the winter. The temperature required to kill the eggs has likewise not yet been determined, but probably 50° C. to 60° C. (112° F. to 140° F.) would suffice. Sulphuric acid (10 per cent) or quick lime is an excellent disinfectant for faeces containing eggs of parasites.

The proper care of the manure from infected fowls is unquestionably the most important preventive measure against tapeworm disease.

TREATMENT.

The treatment of tapeworm disease in the domesticated fowls must for the present be more or less experimental, as the records in this line are extremely limited.

The first rule to be carried out in all cases of diseased animals, whether chickens, turkeys, geese,

ducks, or others, is to isolate them from the rest of the flock and keep them confined until they have recovered. The second rule is to destroy the droppings of all animals known to be infected with parasites, or if the manure is needed as fertilizer, it should be treated in such a manner so as to kill the ova. These two rules can be easily carried out, and if a poultry raiser or a stock raiser is not willing to set aside a small yard for the isolation of the sick animals, where their droppings can be easily collected and taken care of every day, it is almost useless for him to administer anthelmintics to his fowls or other animals.

The chief drugs used against tapeworms are: Extract of male fern, turpentine, powdered kamala, areca nut, pomegranate root bark, pumpkin seeds, and sulphate of copper (bluestone).

Areca nut.—According to Zürn powdered areca nut is the best tapeworm remedy for fowls, but he calls attention to the fact that turkeys are unfavorably affected by this medicine.

Zürn advises the administration of powdered areca nut in dose of 2 to 3 grams (=30 to 45 grains), mixed with butter and made into pills.

Liquid extract of male fern is very effectual against tapeworms. Hutcheon advises a teaspoonful for young ostriches three to four months old, to a tablespoonful for a full-grown ostrich; it may be made into a pill with flour.

Turpentine may be given to ostriches in doses of a desertspoonful for chicks three to four months old, to two tablespoonsful for a full-grown bird; its action is much more effective when combined with a purgative, such as linseed or castor oil. (Hutcheon.)

The Bureau has recently made the following experiments upon chickens to determine in what doses turpentine may be administered to them without danger. As in the experiments with bluestone cited below, a small rubber tube was inserted through the mouth to the crop, and the medicine forced through the tube with a large bulb pipette. This insured the deposit of the entire dose into the crop, and proved to be a most excellent method of administering the liquid, since it caused no pain to the animal, a chicken's gullet being quite large and easily admitting a 3-16 inch (outside measurement) rubber tube.

No. 121. Full-grown chicken.

Jan. 13, dosed with 5^{cc} turpentine. Effects: Slight diarrhoea.

Jan. 16, dosed with 15^{cc} turpentine. Effects: Severe diarrhoea; animal sick and listless; complete recovery in three days.

No. 122. One-year-old chicken.

Jan. 13, dosed with 10^{cc} turpentine. Effects: Moderate diarrhoea.

Jan. 16, dosed with 25^{cc} turpentine. Effects: Very severe diarrhoea; animal quite sick and refused food; complete recovery in six days.

No. 123. Full-grown chicken.

Jan. 14, dosed with 15^{cc} turpentine. Effects: Moderate diarrhoea.

Jan. 16, dosed with 30^{cc} turpentine. Effects: Very severe diarrhoea; animal very sick and refused food; complete recovery in six days.

After performing these preliminary experiments in the laboratory I requested Dr. Schroeder to treat a larger number of fowls at the Experiment Station with doses of 15^{cc} turpentine, noting the age, sex, weight, etc., of the animals. Of these experiments he has handed me the following notes.

Each chicken in the following table received a dose of one-half ounce (14.785^{cc}) of spirits of turpentine injected through a rubber tube directly into the crop. The experiments took place from February 19 to February 25, 1896.

Number and sex.	Variety.	Weight.		Approximate age.		Remarks.
		Lbs.	Oz.	Years.	Months	
125.	♀	4	3	2-3	...	Two to three hours after the drug was given the chickens acted depressed and uneasy. Later they showed great drowsiness, were extremely thirsty, and passed large quantities of fluid, but very little solid feces. In a few cases the respiration was labored. All the animals, with the exception of No. 151, made a good recovery in from 48 to 60 hours.
126.	♀	3	10	3	...	
127.	♀	3	7	1	6	
128.	♀	2	7.5	1	6	
129.	♀	2	3.5	1	...	
130.	♂	4	5	1	...	
131.	♂	3	9.5	1	...	
132.	♂	2	10.5	1	...	
133.	♂	2	...	...	6-8
134.	♀	2	9.5	3	...	
135.	♂	6	7.5	3	...	
136.	♂	5	2	4	...	
137.	♂	5	...	1	6	
138.	♀	4	9.5	3	...	
139.	♀	4	9.5	3	...	
140.	♀	3	13.5	3	...	
141.	♂	2	10.5	...	9	
142.	♀	2	10.5	4	...	
143.	♂	4	6	2	...	
144.	♂	3	6.5	2-3	...	
145.	♀	2	12	3	...	
146.	♀	4	10	3	...	
147.	♀	2	3.5	3	...	
148.	♀	3	5	2	...	
149.	♀	2	10	1	...	
150.	♀	2	5	5	...	
151.	♀	2	1.5	1	6	
152.	♀	3	8	4	...	
153.	♀	2	6	3	...	
154.	♀	2	12	1	6	
155.	♀	1	10	...	6	

As far as it is possible to determine any difference in the action of turpentine on the different chickens from the small number included in the experiment, it seems as if the Black Spanish suffered more severely than the other varieties. No difference was noticed between the hens and roosters, but the younger and lighter-weight animals responded more than the older and heavier chickens.

Chicken No. 151 died about twenty-eight hours after being dosed. Post mortem: Intestine almost throughout its entire length congested in form of fine points; liver engorged with blood; heart, muscle pale, ventricles empty; kidneys apparently normal; one lung considerably congested possibly some turpentine entered the windpipe; no parasites in the intestine. Previous to death chicken showed considerable difficulty in breathing.

Thus, out of 32 chickens dosed with half an ounce (about 15^{cc}, about 1 tablespoonful, about 2 dessertspoonsful, about 4 teaspoonsful) of spirits of turpentine, one died. In another case dosed with 25^{cc}, in still another dosed with 30^{cc} (about 1 ounce, or 2 table-spoonsful) of turpentine the animals were very sick, but recovered.

It will be well, therefore, to make half an ounce (about 15^{cc}, or 1 tablespoonful) the maximum dose. As a safe rule, we can adopt 1 teaspoonful (about 4^{cc}, about one-eighth of an ounce) to 3 tea-spoonsful (about 12^{cc}, about three-eighths of an ounce) as the dose for chickens, the size of the dose being determined by the size of the chicken.

It will be noticed that the above experiments were made to determine how much turpentine could be safely given to chickens. As there was no outbreak of tapeworm disease among the fowls used in the experiment, no observations could be made on the effects of the medicine upon the tapeworms which occur in chickens. Turpentine is, however, one of the recognized remedies against tapeworms.

Powered kamala.—Mégnin states that very good results followed the use of this drug, mixed with the food, against tapeworms of pheasants. Hutcheon advises for ostrich chicks one month old 1 drachm, two months old 1½ drachms, three to four months old 2 drachms, eighteen months old 1 ounce, a full-grown ostrich 2 drachms more. It does not require to be mixed with a purgative. Powered kamala may be given mixed in a little flour and water.

Pumpkin seeds.—These, according to Zürn, are not well borne by turkeys and not always by chickens, but it would be well to experiment further with them.

Pomegranate root bark.—Very effective against tapeworms in ostriches, but must be given in large doses and followed by a purgative. (Hutcheon).

Sulphate of copper (bluestone).—This is an excellent taeniocide in calves and lambs but the doses for fowls have not been determined.

In some experiments which are now in progress I have given 60cc of a solution of 1 ounce sulphate of copper to 3 pints of water to a full-grown hen without noticing any ill effects from the dose. Thirtycc of the same mixture killed a half-grown rooster within twenty-four hours. Upon post-mortem it was found that the worms in the intestine were dead. Another half-grown chicken was dosed with 45cc of the same mixture and bore the dose very well.

I am not prepared to recommend bluestone for chickens at present, except in experiments, and would direct attention to the danger of allowing the solution to enter the windpipe, as a very small dose of this solution will kill a fowl if the medicine reaches the respiratory organs. As a safe method of experiment, I have inserted a thin rubber tube to the crop (a catheter would answer equally as well) and forced the medicine through this tube. This method obviates the danger mentioned and is borne very well by the chickens. I caution again, that a large series of experiments in this line is needed before bluestone can be recommended for general use in dosing fowls.

Perroncito advises the following treatment for tapeworms in chickens (dose for one chicken):

(1) Aloes (socotrine or carballine), 15 to 20 centigrams. The animal is fasted the same day.

(2) Pumpkin seeds, 40 to 50. Administered to each chicken on the second day. Or—

(3) Male fern, powdered, 100 grams. Mixed in bran.

All of the above medicines should be procured as fresh as possible. Many failures in treating for tapeworms are due to the fact that old drugs have been used which had lost their anthelmintic properties.

PART II.

CLASSIFICATION.

Part II contains the descriptions of the tapeworms found in poultry and a discussion of the different species, and it is placed for the most part in fine type because of its rather technical nature. There are, however, a number of points mentioned under the various species which are necessary to the poultry raiser who desires to obtain a thorough knowledge of this subject. I have endeavored to bring together in Part II the entire history of each species, in order to show the exact status of our present knowledge of the group.

The Bureau is gradually collecting the original types of many of these species, with a view to revising the entire group and placing it upon a more scientific basis. It is our desire also to obtain all the material possible from various parts of this country, and we invite poultry raisers, etc., to furnish bottles of alcohol or formalin, and mailing cases for such sendings. All correspondence should be directed to Dr. D. E. Salmon, Chief of the Bureau of Animal Industry, United States Department of Agriculture, Washington, D. C.

Worms sent to us for study or identification should first be washed in warm water and then placed in alcohol or in the preserving fluid furnished by the Bureau.

The following classification by genera is largely based upon the papers by Blanchard (1892B and 1893). In the specific diagnoses, the original descriptions and

figures have been consulted as far as possible and data derived from them have been combined with more recent diagnoses and descriptions.

It would be well if authors making and publishing specific determinations in this group would preserve their specimens in some way, so that they may be used by later writers on the subject, for in many of the species described below the determination can be looked upon only as approximate and provisional. The specific determination of these forms is of much greater importance from a practical standpoint than is generally assumed, for an exact knowledge of the species is necessary as a foundation for general preventive measures.

Nomenclature.—In several places where it is perfectly evident that the parasites are now sailing under wrong names, I have corrected the names according to the international rules. In the majority of cases, however, I postpone changes until I can complete a revision of the entire group based upon original material.

In the systematic arrangement given below keys are given not only to the species of adult tapeworms of domestic fowls, but also to some closely allied forms. The allied genera and sub-families are given in the keys in order to show the general relationships of the group.

The tapeworms of fowls belong to two families, the *Bothriocephalidae* and *Taeniidae*.

Regarding the generic position of the tapeworms of domesticated fowls it may be stated that up to within very recent years nearly all of the forms have been placed in the collective genus *Taenia*. To R. Blanchard and A. Railliet is due the chief credit of pointing out the absurdity of uniting these forms generically

with such forms as *Taenia solium* of man. True, other authors had recognized the great difference in some characters, but the group is such a difficult one to handle that helminthologists, either from lack of time, material, or courage, have carefully avoided any attempt at a natural classification.

Blanchard brought some order into the group in 1891 by proposing the new genera *Davainea* and *Echinocotyle* for certain forms, while Railliet followed up the work by proposing the genera *Drepanidotaenia* *Dicranotaenia*, and *Bothriotaenia* for certain other forms. These five new genera, together with *Mesocestoides*, *Ophryocotyle*, *Cotugnia*, and *Amabilia* enable us to make a provisional classification by genera. It should, however, be remembered that this classification is necessarily provisional in nature, as the internal anatomy of these worms is as yet very poorly understood, and a thorough study of that subject will probably result in great changes.

Regarding the species it may be again remarked that a considerable number of different forms have been described, but that a number of these species will unquestionably fall, while new species will have to be described for forms which are not yet recognizable as distinct.

ANALYTICAL KEY TO FAMILIES AND GENERA

- | | | | |
|----|---|---|---------------------------|
| 1. | { | Head with two elongated grooves or slit-like suckers; rostellum wanting; uterus with special pore; genital pores generally dorsal or ventral, | BOTHRIOCEPHALIDAE, p. 579 |
| | | Head with four cup-shaped suckers; rostellum present but not always evident; uterus without any special pore; genital pores generally marginal, | TAENIIDAE, p. 584 |
| | | Head is (always?) absent, | |

2. { Body without external segmentation; head without suckers, or two weak slit-like suckers develop (Ligulinae), LIGULA, p. 583
- { Body with external segmentation; head with two elongate slit or groove-like suckers, BOTHRIOCEPHALINAE, p. 580
3. { Genital organs single in each segment, p. 580
- { Genital organs double in each segment, p. 581
4. { Genital pores lateral (marginal) BOTHRIOTAENIA, p. 582
- { Genital pores ventral or dorsal, p. 582
5. { Penis, vulva, and uterus open ventro-medial, BOTHRIOCEPHALUS, p. 581
- { Penis and vulva ventro-medial; uterine pore dorsomedial, PTYCHOBOTHRUM
6. { Penis, vulva, and uterus open ventrally, KRABBEA
- { Penis and vulva ventral, uterus opens dorsally, ... DIPLOGONOPORUS
7. { Genital pores ventro-medial (gen. Mesocestoids),. MESOCESTOIDINAE, p. 581
- { Genital pores lateral (marginal), p. 584
8. { Head never provided with hooks; uterus transverse or reticulate; egg generally with pyriform body; larval stage not known; adults in herbivorous mammals, ANOPLOCEPHALINAE, p. 584
- { Head nearly always provided with hooks (T. saginata exception, see also Hymenolepis).
9. { Egg with thin outer shell and thick brown inner shell; uterus median and longitudinal with lateral branches; larval stage a Cysticercus, Caenurus or an Echinococcus generally in herbivora; adults in carnivorous mammals, ... TAENIINAE, p. 584

- | | | | |
|-----|---|--|--|
| 9. | { | Eggs with thin transparent shells; frequently in egg capsules, in some cases scattered through the segment; head nearly always armed with hooklets on rostellum; larval stage a cysticeroid; adults in birds and mammals, | DIPYLIDIINAE, p. 585 |
| 10. | { | Suckers unarmed.
Suckers armed with minute hooklets (with four exceptions known only in birds), | p. 586 |
| 11. | { | Genital pores double,
Genital pores single, irregularly alternate or unilateral, | p. 587
p. 585 |
| 12. | { | Two submedian ovaries in each segment,
One median ovary in each segment, | p. 586
AMABILIA, p. 588 |
| 13. | { | Several rows of hooks upon rostellum,
A single row of hooks upon rostellum, | DIPYLIDIUM, p. 586
COTUGNIA, p. 586 |
| 14. | { | Dorsal root of hook much longer than ventral root or prong; ventral root very short; hooks 8 to 12 rarely to 26) in number; known only in birds,
Dorsal root of hooks about the same length as ventral root and prong, ... | DREPANIDOTAENIA, p. 597
p. 591 |
| 15. | { | Dorsal root shorter than prong or ventral root; hooks generally less than 20 in number (range from 10 to 26); genital pores unilaterial or irregularly alternate; known only in birds, | DICRANOTAENIA, p. 591 |

As the terms anterior and posterior in referring to the roots of the hooks are reversed by some authors, I suggest the use of the words dorsal and ventral in their place. These words are not open to misinterpretation, the dorsal root being a continuation of the dorsum of the prong; the ventral root lies under the prong.

15. { Dorsal root longer than prong or ventral root; if rostellum is armed there are 24 to 30 hooks present; genital pores unilateral (on left of segments); 3 testicles normally present in each segment; retractile rostellum armed with minute hooklets or rudimentary and unarmed; eggs with 3 envelopes; parasitic in man, chiroptera, insectivora, rodents, and insectivorous birds; larval stage in insects or myriapoda, ... HYMENOLEPIS, p. 591
16. { Hooks on suckers arranged in circular rows on border; hooks on rostellum resemble a hammer in form and arranged in a double row; with four exceptions known only in birds, DAVAINEA, p. 613
 Hooks on suckers arranged in several transverse rows; hooks of infundibulum very small (4u) arranged in a single row; known only in birds, ... OPHRYOCOTYLE, p. 630
 Hooks on suckers arranged in one median set and two lateral sets; hooks on rostellum provided with long dorsal root and arranged in a single row; known only in birds, ... ECHINOCOTYLE, p. 628
17. { Anterior extremity of strobila expanded in form of a hammer, FIMBRIARIA, p. 636
 Anterior segments become caliciform and function as a pseudoscolex, INDIOGENES, p. 637

Family BOTHRIOCEPHALIDAE.

Diagnosis: Head provided with two groove or slit-like suckers; rostellum wanting; uterus with special pore; genital pores generally (possibly always) dorsal or ventral. Type genus: *Bothriocephalus* Rud., 1808.

The tapeworms of birds which belong to this family are classed in two (of the several) subfamilies. The forms recorded for the domesticated fowls are of little importance and the records of them are very incomplete. Three species have been reported from poultry. The first of these (*Ligula*) has been developed experimentally in ducks and pigeons; a second species (*Bothriotaenia longicollis*) has been recorded but once from chickens, and a third form (a "Bothriocephalide") is recorded once from a pigeon.

Subfamily BOTHRIOCEPHALINAE.

Diagnosis: Body with distinct external segmentation; head with two elongate slit or groove-like suckers. Type genus: *Bothriocephalus* Rud., 1808.

This subfamily contains among other forms the species mentioned above (*Bothriotaenia longicollis*) from chickens, the undetermined genus and species from the pigeon, and a number of species of the genus *Bothriocephalus* found in wild birds.

Although an unimportant subfamily, so far as the domesticated fowls are concerned, it is quite an important one in human and comparative medicine. Six of its species (*Bothriocephalus*, *B. cristatus*, *B. cordatus*, *B. liguloides*, *B. Mansoni* and *Krabbea grandis*) occur in man, while several forms are recorded from dogs.

Genus BOTHRIOCEPHALUS Rudolphi, 1808.

(1819, *Dibothrius* Rudolphi; 1850, *Dibothrium* Diesing.)

Diagnosis: Two suckers present; penis, vulva, and uterus open ventro-median.

Type species: *B. latus* (Linne 1758), Bremser, 1819.

¹If the rules of nomenclature were strictly adhered to there would be a general rearrangement of the species now included in *Bothriocephalus*. The species now known as *Ptychobothrium claviceps* (Goeze, 1782) was used by Rudolphi as the first species of *Bothriocephalus*, but within recent years *B. latus* of man has been tacitly understood by zoologists as representing the type species of the genus. This view, however, can not be

No species of this genus as at present revised (Blanchard, 1894, p. 699-702) is known to occur in domesticated fowls, although the pigeon "Bothriocephalide" may conveniently be placed here at present; several species (*B. dendriticus*, *B. ditremus*, *B. fissiceps*, *B. podicipedis*) are found in wild birds. For *Bothriocephalus longicollis* see *Bothriotænia longicollis*, p. 580.

1. BERTKAU'S PIGEON BOTHRIOCEPHALUS, gen. et sp., 'necert.

Cornelius (1875) mentions the occurrence of a tapeworm in a carrier pigeon at Eberfeld; hesitates that it was a true *Tænia*, but Bertkau, in a footnote to Cornelius's paper, remarks that it is a "Bothriocephalide," as it possessed two suckers.

The worm was yellowish white in color, 24^{mm} long; two suckers but no hooks on the head; neck short; anterior segments very short and straight, segments increasing in breadth to 6^{mm}, then decreasing again toward the posterior extremity; margin of strobila serrate.

The host had been listless and dull, but regained its natural condition after the expulsion of the worm.

Railliet (1893, p. 329), in referring to this form, mentions also a case recorded by Itzigsohn (Neudamm, Brandenburg). Dr. Itzigsohn was called to see a child which, he was assured, had vomited a worm, and, in fact, a *Bothriocephalus* was shown to him. An investigation, however, showed that the child had been playing with a pigeon, killed the evening before by the child's father; upon examining the bird a similar worm was found.

accepted, as Rudolphi did not mention this form among his species of this genus. Strictly speaking, the generic name *Ptychobothrium* should fall into synonymy under *Bothriocephalus* (type *B. claviceps*) and a new generic term should be given to the group of which *B. latus* is now taken as type. This would, however, be a radical step and could be taken consistently only in a revision. Another solution of the problem, which would have the advantage of creating less confusion, would be to accept another species as type of *Bothriocephalus*, which must obviously be one named by Rudolphi in 1808-1810, with penis, vulva and uterus opening ventrally.

From the date given it is utterly impossible to determine these worms, and it appears useless to attempt it.

Genus *BOTHRIOTAENIA* Railliet, 1892.

Diagnosis: Two suckers present; genital pores lateral (marginal). Type species *Bothriotaenia longicollis* (Molin, 1858) Railliet, 1892.

2. *BOTHRIOTAENIA LONGICOLLIS* (Molin, 1858) Railliet, 1892.

(1858, *Dibothrium longicolle* Molin; 1878, *Bothriocephalus longicollis* (Molin, 1858) von Linstow).

Diagnosis: 18mm to 27mm long by 4mm wide. Head small, claviform, thick, with 2 marginal oblong suckers, and a small central depression on the summit. Neck long and very thin. Body taenioid, flat, with 2 longitudinal grooves. Anterior segments very short; the following segments almost square, overlapping; posterior segments transverso-elliptic, thick with rounded borders. Gravid segments show a mosaic structure of dark, angular spots due to egg sacs. Genital pores unilateral, about in the middle of the margin.

Development: Unknown.

Host: Chickens (*Gallus domesticus*), by Molin.

Distribution: Pavia, Italy (by Molin and Polonio).

Molin seems to be the only author who has made any original observations on this worm, and these are not extended enough to give us any clear idea of the parasite in question. The egg sacs, unilateral pores, and the central depression on the summit of the head recall *Davainea* (vide p. 613), with the query whether Molin was really not in error in describing two suckers instead of four. Such an error would be an extremely easy one to fall into, as the suckers of avian cestodes are frequently indistinct or lost.

At all events, Molin's original specimens should be re-examined, as nearly forty years have now passed since the worm was first found; it has not been collected in recent years, although the chicken has frequently been examined for tapeworms.

Subfamily LIGULINAE.

Diagnosis: Body without distinct external segmentation; head without suckers, or two slit-like suckers may develop; genital pores ventral. Type genus *Ligula* Bloch, 1782.

Genus LIGULA Bloch, 1782.

Diagnosis: Body not segmented externally, but the genital organs are repeated and the three genital pores (Penis, vulva, and uterine pore) of each set open ventrally; head without distinct suckers, or 2 longitudinal slit-like suckers may develop.

Life history: The larval form lives in the abdominal cavity of fish (particularly Cyprinidae), the adult in the intestine of various piscivorous birds.

This genus does not normally occur in domesticated birds, but Duchamp (1876, quoted in Duchamp, 1877) infected ducks and pigeons (1877) with the larval form taken from the tench (*Tinea vulgaris*); he also (1878A) raised the adult in the peritoneal cavity of a dog. Donnadieu (1877) fed young ligules to ducks, and after twenty to thirty hours found adult ligules with eggs in these birds in some of his experiments, although in other infections of ducks his results were negative. Riehm (1882) also succeeded in infecting ducks with ligules.

From a piscicultural standpoint the immature stage of this parasite is of considerable importance, for it occasionally gives rise to serious epizootics among fish (for historical review, cf. Donnadieu, 1877).

A large number of species have been insufficiently described by various authors. Donnadieu unites them all with *Schistocephalus* under the name *Dibothrium ligula*; other authors, however, are inclined to recognize two species, i. e., *Ligula uniserialis* Rud., 1810 (Syn. 1839, *L. monogramma* Creplin), and *Ligula alternans* Rud., 1810 (Syn. 1839, *L. digramma* Creplin). The term *L. simplicissima* Rud., 1802, is generally applied to the sexual form in fish.

{ Genital organs simple, uniserial *L. uniserialis*.
 { Genital organs double and alternating *L. alternans*.

Family TAENIIDAE.

Diagnosis: Head with 4 cup-shaped suckers, rostellum present but not always evident; uterine pore wanting; genital pores generally marginal; body always segmented. Type genus: *Taenia* Linne, 1758.

This family is an extremely important one from an agricultural standpoint as all the tapeworms of domesticated animals (with the exception of a few belonging to the *Bothriocephalidae*) are classified here. Probably all of the tapeworms normally found in poultry belong to the subfamily *Dipylidiinae*.

The subfamily *Taeniinae*¹ (type genus: *Taenia* Linne, 1758) contains mostly large tapeworms, the adult stage of which lives in carnivorous animals (*T. saginata* of man, *T. marginata* of dogs, for instance) while the larval stage lives in herbivorous animals (*Cysticercus bovis* of cattle, *C. tenuicollis* of sheep, cattle, etc.).

The subfamily *Anoplocepholinae* (type genus: *Anoplocephala* E. Bl., 1848) contains most of the adult tapeworms of horses, cattle, sheep, rabbits, and allied animals.

Subfamily MESOCESTOIDINAE.

Diagnosis: Head with four suckers; segments distinct; genital pores in median ventral line. Type and only genus: *Mesocestoides* Vaillant, 1863.

Genus *MESOCESTOIDES* Vaillant, 1863.

(1885, *Ptychophysa* Hamann.)

Diagnosis: Char. of subfamily; a single egg sac present. Type species: *M. ambiguus* Vaillant, 1863.

Railliet (1893, p. 313) places Polonio's *Taenia imbutiformis* of wild geese in this genus as a species *inquirenda*, but I can not recognize Polonio's description and figure as supporting this view (vide p. 58). This genus would, therefore, according to my view, be without any representative among the parasites of do-

¹Syn. 1858, *Sclerolepidota* Weinland (hard-shell tapeworms); *Cysticae*; *Cystotaeniae*.

mesticated birds. The type species *M. ambiguus* is found in *Gennetta gennetta* (Linnè, 1758) [*Viverra genetta*], and one species, *M. lineatus* (Goeze, 1782) Railliet, 1893, is found in dogs and cats.

Subfamily DIPYLIDIINAE.

(1858. Malacolepidota Weinland—Soft-shell tapeworms; 1863. Cystoideae Leuckart; Cystoidei; Cystoidotaeniae; Taenia (Microtaenia).

Diagnosis: Head with 4 suckers; rostellum generally armed; genital pores lateral (marginal), single or double; egg with thin transparent shells, frequently arranged in egg sacs, in some cases scattered through the segments; larval stage a cysticer-cold; adults in birds and mammals. Type genus: *Dipylidium* R. Leuckart, 1863.

Probably all of the Taeniidae of birds belong to this subfamily, which is at present divided into nine genera. The tapeworms of domesticated fowls are confined to the five genera: *Cotugnia*, *Davainea*, *Dicranotaenia*, *Drepanidotaenia*, and *Echinocotyle*.

I. Genital pores double and opposite. Suckers unarmed.

Three different genera have been proposed in the subfamily Dipylidiinae for forms with double and opposite genital pores, but they have been very poorly defined from one another.

The genus *Dipylidium* contains species which infest mammals and with *D. caninum* as type species will unquestionably stand as a good genus. In birds several forms with double genital pores have also been described. *Taenia digonopora* Pasquale in chickens and *Taenia bifaria* Siebold in *Aythya nyroca* (*Nyroca leucophthalma*) have been placed by Diamare (1893A) in a new genus *Cotugnia*, which, however, he fails to define distinctly from *Dipylidium*, and which must unquestionably be suppressed unless better characters are brought to its support. Diamare (1893A) has also proposed the genus *Diamarella* for *Taenia lamelligera* in the flamingo (*Phoenicopterus antiquorum*).

Too little is known of the other forms described as possessing double genital pores to allow a determination of their generic affinities, and speculation in this direction would simply

complicate matters; the forms which must be taken into consideration are *Taenia polymorpha* Rudolphi, 1819, pars (as determined by Krabbe 1869, p. 301) from *Recurvirostra avocetta* and "*Taenia lavis* Bloch (Diesing)" (see Krabbe, 1869, p. 302), from *Aythya ferina* (*Fuligula ferina*).

In deference to my Italian colleague Diamare, I adopt his genera provisionally, postponing final opinion in regard to them until his more detailed publication appears.

a. Two submedian ovaries in each segment.

a'. Hooks on rostellum arranged in several rows.

Genus *DIPYLIDIUM* R. Leuckart, 1863.1

(1858, *Alyselminthus* Zeder, 1800, partim Weinland.)

Diagnosis: Rostellum retractile, armed with several transverse rows of alternating hooks; hooks with small roots, the base being discoidal; mature segments elongate with double sets of genital organs; pores double and opposite; testicles very numerous, scattered through the median field; ovary bilobed; vitellogene glands distal; uterus at first reticulate among the testicles, finally resolving itself into independent egg sacs containing one or several ova; ova with double transparent membranes. Type species: *D. caninum* (Linne, 1767).

No members of this genus have as yet been recorded from birds. The type species *D. caninum* inhabits the intestine of dogs, cats, and man; its larval stage lives in fleas (*Pulex serraticeps* *P. irritans*) and lice (*Trichodectes canis*).

a". Hooks on head arranged in a single row.

Genus *COTUGNIA* Diamare, 1893. (Gen. Inq.).

Diagnosis: Head large, with a rudimentary retractile rostellum armed with a large number of very minute hooklets arranged in a single row, prong thick and short, without dorsal root, with ventral root thin and elongate toward the point. Suckers large and unarmed. Mature segments broader than

For full bibliography consult D'amare's monograph (1893) *Il Genere Dipylidium* Lkt. < Atti. R. Accad. Scienze fisiche e matematiche, Vol. VI, ser. 2a, No. 7, 31 pages, 3 plates. Care should, however, be exercised in accepting the dates given by Diamare as many typographical errors have crept into the bibliography.

long. Genital organs double, opening separately each on its respective lateral margin. Uterus composed of egg sacs. Type species: *Cotugnia digonopora* (Pasquale, 1890) *Diamare*, 1893.

This genus was established by *Diamare* for a tapeworm which occurs in chickens. The diagnosis as at present given by *Diamare* fails, in my opinion, to separate the genus distinctly from *Dipylidium*. Two species have been described, but sufficiency of details in the specific diagnoses does not allow a satisfactory morphological distinction at present.

{ Found in chickens*C. digonopora*.
 } Found in ducks*C. bifaria*.

3. *COTUGNIA DIGONOPORA* (Pasquale, 1890) *Diamare*, 1893. The double-pored chicken tapeworm.

(1890, *Taenia digonopora* Pasquale.)

(Pl. I, figs. 1-11.)

Diagnosis: Strobila 40mm to 80mm broad and in contracted condition about 1mm thick; head 1.4mm by 1.12mm; rostellum with a crowded crown (in a single row) of very small hooks 8.35 μ long; base of rostellum 0.22mm by 0.15mm; suckers globular, prominent, 0.35mm in diameter. Neck short. Anterior segments broader than long, posterior segments longer than broad. Genital pores double in about the middle of the lateral margins; 2 ovaries in each segment; eggs evidently arranged in egg sacs.

Life history: Unknown.

Host: Chicken (*Gallus domesticus*) by Pasquale.

Geographical distribution: Abyssinia, by Pasquale.

Pasquale (1890) found this worm quite common in chickens in Massowah and thinks it probable that the poor condition of the fowls was due to its presence. It was frequently present in the caeca as well as in the small intestine.

4. COTUGNIA BIFARIA (von Siebold, 1848) Diamare, 1893. The double-pored duck taeworm.

(1848, *Taenia bifaria* von Siebold; 1871, *T. tuberculata* Krefft (nec Rudolphi, 1819).)

(Pl. II, figs. 12-17.)

Diagnosis: Strobila 39mm to 90mm long by (?) broad. Head triangular, with conical, pointed, (?) unarmed rostellum and 4 small unarmed circular suckers; neck short. Proximal segments small, narrow, gradually enlarged, and rectangular; distal segments the largest, subquadrate. Genital pores double, one each side in about the middle of the margin, prominent in sexually active segments. Male organs: Testicles few in number; each vas deferens inflated into a vesicula seminalis near the anterior margin of the segment, somewhat laterally of the median line; from here the seminal canal runs diagonally to the sirrus pouch, which is large; cirrus covered with minute spines. Female organs: Not well understood; evidently 2 ovaries present in the posterior portion of the segment, one each side of the median line.

Life history: Unknown.

Type specimen: Collection Siebold in British Museum.

Hosts: African Teal (*Aythya nyroca*), by von Siebold; White-eyed duck, *A. australis* (Gould), by Krefft.

Geographical distribution: ————— by von Siebold; Australia, by Krefft.

Von Siebold (1848, p. 147) mentions *Taenia bifaria* from the intestine of *Anas leucophthalmos* (= *Aythya nyroca*). The specimens possessed double genital pores similar to *D. caninum*. Monticelli (1889, p. 325) examined these specimens, preserved in the British Museum, and gave a short diagnosis. In another paper (1891, pp. 151-153) he gives a more extended description, together with figures. He did not observe hooks on the head but will not deny their presence. Monticelli states that Krefft's species "*T. tuberculata*" (= *T. tuberculata*), described from *Aythya australis* (Gould), is identical with *T. bifaria*. Diamare (1893, p. 12) places *T. bifaria* in the genus *Cotugnia*.

b. One median ovary in each segment.

Genus AMABILIA Diamare, 1893. (Gen. Inq.).

Diagnosis: Avian cestode with double lateral genital pores; double cirri; ovary single and medlum. Type species: *Amabilia lamelligera* (Owen, 1835) Diamare, 1893.

This genus was proposed recently in a preliminary communication by Diamare. A more complete knowledge of the worm is necessary before it will be possible to judge whether the genus is well founded or not. No member of the genus has yet been recorded in domesticated fowls, but the type and only species is found in the flamingo.

5. *AMABILIA LAMELLIGERA* (Owen, 1835) Diamare, 1893.

1835, *Taenia lamelligera* Owen.)

(Pl. II, figs. 18-20.)

Diagnosis: Strobila 120mm to 170mm long, 10.5mm broad, 2.1mm thick. Head almost globular; rostellum cylindrical, obtuse; armature? Neck absent; segments very short. Genital pores double; ovary single and median. Ova segregated near base of penis.

Hosts: Flamingo (*Phoenicopterus antiquorum*).

Geographical distribution: ? by Sykes; France by Gervais; ? Sardinia (? Cagliari) by Ficalbi.

II. Genital pores single. Suckers armed or unarmed.

A. Suckers unarmed: genera *Hymenolepis*, *Dicranotaenia*, and *Drepanidotaenia*.

Genus *HYMENOLEPIS* Weinland, 1858.

(1858, *Diplacanthus* Weinland (nec L. Agassiz).)

Diagnosis: Strobila small (filiform). Head small, provided with a retractile rostellum, well developed and armed with a single crown of 24-30 hooklets, or rudimentary and unarmed. (Neck long. Segments serrate, much broader than long, rarely less than 150 in number.) Genital pores marginal, sinistral, the female surface of the proglottid representing ventral. Testicles few, generally 3 in each segment, one left and two

Owen states that his specimens were collected by Lieutenant-Colonel Sykes "in a Flamingo, *Phoenicopterus ruber* Linn." Diamare states that his own specimens were collected by "Professor Ficalbi, della R. Università di Cagliari," from "*Phoenicopterus roseus*." According to Dr. T. S. Palmer, the Old World flamingoes are *P. antiquorum* Temm. (syn. *P. roseus* Pallas), *P. erythraeus*, and *P. minor*; the New World flamingoes are *P. ruber* Linn., and *P. ignipalliatu*s. In Owen's time, however, all flamingoes were included under the name *P. ruber* Linn. As it was not stated where Sykes collected his material it is impossible to determine the host species definitely, but upon Dr. Palmer's advice I take *P. antiquorum* as host.

right of the median line. Gravid segments transformed into a sac full of eggs; eggs surrounded by 3 shells separated one from another. Inner shell without pyriform body, but occasionally with a small knob at each pole. Larva is a Cryptocystis or Staphylocystis; intermediate host an insect or myriapode. Type species: *H. diminuta* (Rud., 1819).

(Revised generic characters from Blanchard, 1891C, pp. 49-50. I inclose in brackets several characters which I can hardly look upon as generic. For bibliography see R. Blanchard, 1891C.)

Weinland proposed this genus with *Taenia flavopunctata* as type, but as this form is identical with *taenia diminuta* the name *H. diminuta* is here inserted as type species. At the same time he proposed a genus *Diplacanthus* (nec L. Agassiz) with *Taenia nana* von Siebold as type species. The term *Diplacanthus* must drop, as it is preoccupied, and there seems to be no good grounds for separating *H. nana* generically from *H. diminuta*.

Weinland divided *Hymenolepis* into two subgenera: (1) *Lepidotrias* Weinland, 1858 (with 3 eggshells) with *H. murina* (Dujardin, 1845) Weinland, 1858, as type species, and including *Taenia scalaris*, *scutigera*, *tiara*, *pistillum*, *microstoma*, *nasuta*, *undulata*, *serpentulus*, *crateriformis*, *sinuosa* and *flavopunctata*; (2) *Dilepis* Weinland, 1858 (with 2 eggshells), with *T. angulata* Rud. as type species, and containing *T. purpurata*, *porosa* and *lanceolata*. Of these forms *T. sinuosa* (vide *Drepanidotaenia sinuosa* p. 604) and *T. lanceolata* (vide *Dr. lanceolata* p. 597) occur in domestic fowls.

Most of the species of this genus are parasitic in mammals, but Weinland included a number of avian tapeworms in *Hymenolepis*. Blanchard (1891 C, pp. 68-69), discusses the forms and concludes that only four avian species can be included here with any degree of probability. These species mentioned below do not occur in domesticated fowls.

Hymenolepis serpentulus (Schrank, 1798) Weinland, 1858. (Syn. 1798, *Taenia serpentulus* Schrank [nec Duj., 1845], found in *Oriolus gallula*, *Corvus cornix*, *C. corone*, *C. frugilegus*, *C. monedula*, *Nucifraga caryocatactes*, *Garrulus glandarius*, *Pica caudata*, *Picus aurulentus*.

Hymenolepis angulata (Rud., 1810) Weinland, 1858. (Syn. 1810,

Taenia angulata Rud.; 1845, *T. serpentulus* Duj. [nec Schrank, 1798]; found in *Nucifraga caryocatactes*, *Turdus atrigularis*, *T. iliacus*, *T. merula*, *T. musicus*, *T. pilaris*, *T. saxatilis*, *T. torquatus*, *T. viscivorus*, *Oriolus galbula*, *Pica caudata*.

Hymenolepis nasuta (Rud., 1802), Weinland, 1858. (Syn. 1802, *Taenia nasuta* Rudolphi); found in *Parus major*, *P. caudatus*, *P. Coeruleus*, *P. cristatus*, *P. palustris*.

Hymenolepis farciminalis (Batsch, 1786), R. Bl., 1891. (Syn. 1786, *Taenia farciminalis* Batsch; 1845, *T. undulata* Duj.); found in *Sturnus vulgaris*, *Garrulus glandarius*.

Genus DICRANOTAENIA Railliet, 1892.

Diagnosis: Rostellum provided with a single row of short, uniform hooks, generally few (10-26) in number, with the ventral root equal to or longer than the dorsal root, and forming with the prong a small pitchfork. Type species: *Dicranotaenia coronula* (Dujardin) Railliet.

Development: The larval cysticercoids develops in small crustaceans.

From the characters thus far given it is very difficult to distinguish this genus from *Hymenolepis*.

- | | | | | |
|---|---|---|-----------------------|---|
| 1 | { | Genital pores alternate; rostellum with 12 hooks 32 μ long; found in chickens | D. sphenoides, p. 595 | 2 |
| | { | Genital pores unilateral | | |
| 2 | { | Rostellum with 18 to 26 hooks 13 μ to 17 μ long; found in ducks, | D. coronula, p. 591 | 3 |
| | { | Rostellum with 10 hooks | | |
| 3 | { | Hooks 27 μ to 32 μ long; found in swans and big scaup duck | D. aequabilis, p. 593 | |
| | { | Hooks 47 μ to 66 μ long; found in wild ducks | D. furcigera, p. 594 | |

a. Genital pores unilateral.

6. DICRANOTAENIA CORONULA (Dujardin, 1845) Railliet 1892

(1845, *Taenia coronula* Duj.)

[Pl. III, figs. 21-28.]

Diagnosis: 120mm to 190mm long, 1.5mm to 3mm broad. Head almost rhomboidal, 0.20mm to 0.22mm; suckers prominent, angular, irregular, 0.066mm to 0.09mm in diameter; rostellum thick, 0.09mm by 0.06mm, surrounded by a simple crown of 18-26 hooks 9 μ to 14 μ (Dujardin), 14 μ to 15 μ (Krabbe), 13 μ to 17 μ (Railliet)

long. Anterior segments very short; following segments gradually increase in size. Genital pores unilateral. Penis 60 μ to 80 μ (Duj.) 110 μ (Krabbe) long by 30 μ to 53 μ broad, but able to swell to 80 μ covered with minute spines. Hooks of embryo 8 μ . Internal anatomy?

Development: Cysticeroid, probably in mussel crabs (*Cypris ovum* Jur., *Cypris cinerea*, *Cypria ophthalmica* Jur. and *Candona candida*).

Hosts: Tame ducks (*Anas boschas dom.*); Mallard duck (*A. boschas L.*); European Golden Eye (*Glaucionetta clangula*).

Geographical distribution: France (at Rennes, by Dujardin; at Alfort, by Railliet); Denmark (in Zealand by Krabbe); Germany (in Bavaria by von Siebold, after Krabbe; in Munich by von Willemoes-Suhm, after Krabbe, 1882). No epidemics reported.

Dujardin (1845, p. 574) described this species from parasites found in ducks at Rennes; Krabbe (1869, pp. 317-318) found the same species in domesticated ducks and adds a few observations, chiefly measurements; he cites it from Siebold's collection (from *Glaucionetta clangula*) and in 1882, p. 356, cites it from von Willemoes-Suhm (from *Anas boschas fera*). Railliet (1893, p. 303) has found young tapeworms in the domesticated duck at Alfort, which he determined as belonging to this species, although the dorsal root of the hooks were much more slender than those figured by Krabbe. These appear to be the only observations upon the adult worm, which as at present diagnosed, is based entirely upon external characters, and which, therefore, should be restudied anatomically.

Several authors have found larval cestodes in fresh-water mussel crabs which they look upon as the young stage of *Dier. coronula*.

Mrazek (1890) [in a publication which on account of the language I am unable to read, I quote from Moniez (1891, p. 26) and Railliet (1893)] has found a cysticeroid in *Cypris ovum* Jur. and in *Cypris ophthalmica* Jur. (*Cypris compressa* Baird) which measures 140 μ to 190 μ in diameter, and is provided with 22 to 31 hooks corresponding in form and dimensions to those figured by Krabbe, except that the dorsal root is somewhat more slender; the tail is 3 to 5 times as long as the body and bears the 6 hooks (8 μ long) of the oncosphere. Rosseter (1890) describes and figures the cysticeroid of *D. coronula* from *Cypris cinerea* in Kent. Moniez (1891, p. 26) states that this cysticeroid is rather common in France, where he has found it in *Cypria ophthalmica* and *Candona candida*; he also records it in *Cy. ophthalmica* from Durham and from China.

While it will be noticed that this cysticeroid is very similar to *Dicr. coronula* and that in all probability it represents its larval stage, it must not be forgotten that the experimental proof of the relationship of these organisms has not yet been forthcoming, and furthermore, that even the adult form is very superficially described.

7 DICRANOTAENIA AEQUABILIS (Rudolphi, 1810) Railliet, 1893

(1810. *Taenia aequabilis* Rudolphi.)

[Pl. III, figs. 29-30.]

Diagnosis: 160mm to 350mm long, 3.2mm to 4.6mm broad. Head subglobular; rostellum obovate, armed with a simple crown of 10 hooks 27μ to 32μ long; suckers rather large, orbicular, prominent. Neck very short. Anterior segments very short and thin; following segments trapezoidal, much broader than long. posterior angles acute, but becoming more rounded near the posterior end. Genital pores unilateral. Development unknown.

Hosts: European swan (*Olor cygnus*); ? domesticated swan (*O. cygnus* dom.); Widgeon (*Anas penelope*); European scaup duck (*Aythya marila*).

Geographical distribution: Pomerania (by Rudolphi and Creplin); Schleswig (by Friis). Epidemics: None reported.

Like the preceding species, this form has been seen but a few times and is established entirely upon external characters.

Rudolphi collected it originally and described it in 1810 (pp. 135-136) from wild swan. In 1819 (p. 155) he gives "*Anas olor*" as a host. According to Diesing (1850, p. 527) Bremser found it in *Olor cygnus*. Bellingham (1844, p. 320) quotes it for "*Cygnus ferus* and *Mareca penelope*." Krabbe (1869, pp. 316-317) examined the originals and figured the hooks; he cites in further from Creplin's collection, and mentions that Friis also found it. "Gervais and van Beneden, afterwards von Linstow, cite it, probably erroneously, from the domesticated swan" (Railliet). Von Linstow (1878, p. 158) records it for *Fuligula marila* (= *Aythya marila*), but does not give the collector.

8. DICRANOTAENIA FURCIGERA (Rudolphi, 1819) Stiles, 1896.

(1819, "T. trilineata Batsch" of Rudolphi; 1819, *T. furcigera* Rudolphi ex Nitzsch, MS.; 1845, *T. rhomboidea* Duj.; 1893, *Dicranotaenia rhomboidea* (Dujardin, 1845) Railliet.)
 (? 1779, *Taenia lineata* Bloch; ? 1786, *T. trilineata* Batsch; ? 1790, *T. Anatis* β *lineata* Gmelin; ? 1802, *T. longirostris* Frolich [nec Rud., 1819] ? 1803, *Halysis trilineata* (Batsch, 1786) Zeder; ? 1858, *T. conica* Molin.)

[Pl. III, figs. 31-34 (35-36).]

Diagnosis: 100mm to 35mm long by 0.5 to 1mm broad. Head 0.46mm to 0.52mm, rhomboidal, or prolonged anteriorly in a tube containing a thick ovoide, oblong, rostellum 0.22mm to 0.25mm long, armed with a single crown of hooks 65 μ to 66 μ (Dujardin). 18 μ to 58 μ (Krabbe) long. Suckers 0.18mm in diameter. Segments trapezoidal, 2 to 3 times longer than broad. Genital pores unilateral. Penis 9.7 μ broad, smooth. Embryo 36 μ ; hooks of embryo 14 μ (Krabbe), 16 μ to 17 μ (Dujardin). Development not known.

Hosts: Mallard ducks (*Anas boschas*) by Dujardin, Nitzsch, Krabbe, Friis; Pochard (*Aythya ferina*); is erroneously stated to have been found in domestic ducks, according to Railliet. See also hosts for *T. conica*, *T. lineata*, and *T. trilineata*, in chart at end of text, taken from von Linstow, 1878, and others.

Geographical distribution: France (by Dujardin), Italy (by de Ninni), Iceland (Krabbe), Schleswig (Friis). Epidemics, none recorded.

The early history of this worm is buried under indefinite and incomplete statements upon superficially studied material. We can, however, trace the species with certainty as far back as Rudolphi, 1819, p. 528. Nitzsch collected some worms from the Mallard in 1816, and sent them to Rudolphi, evidently under the MS. label *Taenia furcigera*. Rudolphi determined the worms as *T. trilineata* Batsch, 1786, which according to Krabbe (1869, p. 315), (Batsch's original not at my disposal), is a name Batsch introduced for Bloch's *T. lineata* of 1779. Krabbe afterward examined Nitzsch's specimens, and states (1869, p. 315) that they are identical with *T. rhomboidea* Dujardin, 1845. I adopt Nitzsch's name for the reasons given in the footnote.¹

¹A very delicate point of nomenclature is involved in this case, and one which has been entirely overlooked by helminthologists. In the first place, the name *trilineata* should be suppressed because (Krabbe, 1869, p. 315) it was originally intended for a species (i. e., *T. lineata* from *A. penelope*, *A. circa*, *Dafila acuta*) already named and figured. Accordingly, tri-

Dujardin (1845, pp. 574-575, *T. rhomboidea*) found a 30mm fragment and 6 young worms 10mm to 18mm long in a wild duck, in which "*Taenia megalops*" was also present. In Iceland Krabbe collected numerous young specimens of *T. rhomboidea* from wild ducks (*A. boschas fera*); they were 10mm long by 0.5mm broad; the rostellum was armed with 10 hooks, 47 μ to 58 μ long; genital apparatus not visible. Friis (Krabbe, 1869) collected the same species in Schleswig, and Krabbe thinks that the worm which Molin (1858, p. 139; 1861, p. 253, Taf. VII, figs. 1-2) found in wild ducks in Padua and described under the name *T. conica* is also identical with Dujardin's *T. rhomboidea*. Molin records his form from *Anas boschas*; von Linstow (1878) gives it for *A. boschas dom.*, but not for *A. boschas*. Railliet (1893, p. 303) places *T. rhomboidea* in the genus *Dicranotaenia*, and calls attention to the error in Diesing (1850 p. 543) of including *T. trilineata* as a parasite of the domestic duck—an error repeated by von Linstow. Railliet thinks that *T. Trilineata* Batsch, 1786, is identical with *T. rhomboidea*, although Dujardin (1845) thinks that *T. trilineata* is simply a variety of *T. sinuosa*.

There seems no way either to prove or disprove what species *T. trilineata* Batsch (= *T. lineata* Bloch) really represents, unless the types can be procured. In view of the poor descriptions I intend for the present to ignore these specific names entirely.

b. Genital pores alternate.

9. DICRANOTAENIA SPHENOIDES (Railliet, 1892) Railliet, 1896.

(1872, *Taenia cuneata* von Linstow [nec Batsch, 1786]; 1892, *T. sphenoides* Raill.; 1893, *Dicranotaenia cuneata* (von Linstow, 1872) Raill.)

[Pl. IV, figs. 37-42.]

Diagnosis: Body 2mm (von Linstow) to 4mm (Magalhaes) long.

lineata should never have been proposed, and hence can not be taken into consideration under any circumstances. Krabbe states that the description and figures of *T. lineata* are so imperfect that it is not possible to determine the species with certainty, although from Bloch's figures it is not probable that his worm is identical with *T. rhomboidea*. This statement relieves us from considering *T. lineata* further unless Bloch's specimens can be found. Authors have generally accepted Dujardin's specific name, but the publication of Nitzsch's name by Rudolphi establishes the date of *T. furcigera* as 1819, and associates the name with Rudolphi's description. Krabbe's establishment of the identity of *T. rhomboidea* with *T. furcigera* must naturally suppress Dujardin's name. Accordingly, Nitzsch's specimens are the oldest types as yet consulted, and nothing remains at present but to accept Rudolphi's publication of this name.

by 1mm broad, wedge-shaped; head 200μ long by 205μ broad, contracted posteriorly to form the neck; retractile rotellum cylindrical, 150μ long by 37.5μ broad, bearing 12 (von Linstow, Magalhaes, Piana) or 12-14 Grassi & Rovelli) hooks which measure 25μ (Magalhaes) or 32μ (other authors) long; dorsal root of hooks short and same length as ventral root. Suckers round to oval, 75μ in diameter, unarmed. Segments 12-13 in number, increasing gradually in size from the first to the last, so that the entire body is wedge-shaped. Genital pores irregularly alternate, situated at the anterior angle of the segments; male organs appear in first segments, testicles "numerous," vitellaria seen in ninth and following segments; mature eggs seen only in twelfth and thirteenth segments; they lie in 12-13 large vesicles which finally break, the eggs being scattered through the segments. Eggs spherical, 42μ in diameter, with 2 membranes; hooks of oncosphere, 6μ .

Development: Intermediate host is probably an earthworm (*Allobophora foetida* Eisen). The cysticeroid has no tail.

Host: Chickens (*Gallus domesticus*).

Geographical distribution: Germany (von Linstow); Italy (Grassi & Rovelli); South America—Brazil (Magalhaes).

Von Linstow (1872B, pp. 56-57) discovered this worm in chickens in Germany and described it as *Taenia cuneata*. Piana (1882, p. 393-394) evidently examined some of von Linstow's originals, but does not add much to the diagnosis. Grassi & Rovelli (1889A, p. 404; 1892, pp. 29-30, 88-90) found the same species in Italy; they found some cysticeroids in the earthworm (*Allobophora foetida*), which they believe represent the larval stage of *T. cuneata*. They evidently, however, did not make any experiments to determine this point, although they state that the hooks agree with the hooks of *T. cuneata*. This supposed intermediate host must therefore be subjected to experimentation before Grassi & Rovelli's statements are given full credence. Magalhaes (1892, pp. 145-146) records the same species from Brazil, adding several important points on the anatomy of the worm. Railliet (1892, p. 53) uses the term *Taenia sphenoides* for this worm, his ground evidently being that the term *T. cuneata* is already preoccupied. In 1893 (p. 304) he reverts to the specific name *cuneata*, placing the form in *Dicranotaenia*. By the international rules the term *cuneata* must fall, on which account I accept the next available name, *sphenoides*. (See addendum, p. 637.)

Genus DREPANIDOTAENIA Railliet, 1892.

Diagnosis: Head provided with a single row of uniform hooks, few (8-20) in number, with dorsal root much longer than ventral root, the latter always small; with prong directed posteriorly when the rostellum contracts. Type species *Dr. lanceolata* (Bloch, 1782) Railliet 1892.

Development: The larval stage (cysticeroid) of several species has been found in small crustaceans.

- | | | | |
|----|---|--|---------------------------------------|
| 1. | { | Genital pores alternate; rostellum | |
| | | with 16-20 hooks 20-27 μ long; | |
| | | Hab: chickens, ? pheasants, | |
| | | ? ducks, pigeons | <i>Dr. infundibuliformis</i> , p. 609 |
| | { | Genital pores unilateral | 2 |
| 2. | { | Rostellum with 10 hooks | 3 |
| | | Rostellum with 8 hooks | 4 |
| 3. | { | Hooks 20 μ to 23 μ long; found in | |
| | | ducks, domestic goose, and wild | |
| | | goosander | <i>Dr. tenuirostris</i> , p. 608 |
| | | Hooks 35 μ to 40 μ long; found in geese.. | <i>Dr. setigera</i> , p. 605 |
| | | Hooks 51 μ to 61 μ long; found in geese... | <i>Dr. sinuosa</i> , p. 604 |
| | | Hooks 65 μ to 72 μ long; found in ducks.. | <i>Dr. anatina</i> , p. 601 |
| 4. | { | Hooks 31 μ to 35 μ long; found in ducks | |
| | | and geese | <i>Dr. lanceolata</i> , p. 597 |
| | | Hooks 57 μ long; found in geese | <i>Dr. fasciata</i> , p. 598 |
| | | Hooks 77 μ to 80 μ long; found in ducks | |
| | | and geese | <i>Dr. gracilis</i> , p. 600 |

A. Genital pore unilateral.

a. Rostellum with 8 hooks.

10. DREPANIDOTAENIA LANCEOLATA (Bloch, 1782) Railliet, 1892. The lanceolate tapeworm.

(1727, *Taenia anserum* Frisch—vide Rud., 1810; 1781, *T. aetissima* Pallas, pars—vide Krabbe, 1869; 1779, *T. anservis* Bloch—vide Rud., 1810; 1782, *T. lanceolata* Bloch; 1786, *T. lanceola* Batsch—vide Rud., 1810; 1803, *Halysis lanceolata* (Bloch, 1782) Zeder—vide Rud., 1810; 1858, *Hymenolepis* (*Dilepis*) *lanceolata* (Bloch, 1782) Weinland.)

[Pl. IV, Figs. 43-53; Pl. V, Figs. 54-55.]

Diagnosis: 30mm to 130mm long by 5mm to 18mm broad. Head very small, globular; rostellum cylindrical, slightly swollen on the summit, armed with a single crown of 8 hooks 31 μ to 35 μ long; suckers rounded. Neck very short, can be retracted with the head into the anterior portion of the strobila. Anterior segments very short, the following segments increasing slightly

in length and becoming gradually broader to within a short distance of the posterior extremity when they become narrower, giving the body a lancet shape. Genital pores unilateral, near anterior corner of segment; penis armed with spines; cirrus-pouch small; testicles 3; female organs on opposite side of segment from genital pore (Feuereisen). Eggs with very thin external shell 50μ by 35μ ; hooks of oncosphere 8μ . Development: Unknown.

Hosts: Tame duck (*Anas boschas dom.*); black duck (*Anas obscura*); tame goose (*Anser anser dom.*); muscovy duck (*Cairina moschata*); white-headed duck (*Erismatura leucocephala*); pochard (*Aythya ferina*); African teal (*Aythya nyroca*); red-crested pochard (*Aythya rufina*); flamingo (*Phoenicopterus antiquorum*).

Geographical distribution: England, Denmark, France, Germany and Austria. Epidemic in 1710, reported by Frisch.

Bloch (1782, p. 7-9) found this worm more especially among lean geese; Goeze (1782, pp. 377-383) says that it is most common in lean geese which have been allowed to roam; Dujardin (1845, p. 562) mentions *T. lanceolata* as possessing 10 hooks and irregularly alternating genital pores, which makes it probable that he did not have this species before him. Krabbe (1869, pp. 295-296) found this form in 77 geese out of 400 examined, or about 20 per cent. The Vienna catalogue gives *T. lanceolata* and *T. sinuosa* together for 19 out of 139 tame geese. The epidemic of 1710 recorded by Frisch (1781, pp. 155-156) is attributed to this species. It has been found by various German authors. Megnin (1881A, pp. 29-32) has found it in ducks and geese in France, Railliet (1893, pp. 299-300) in Ardennes France, Lucet in Loiret, France. Railliet states that this is the most common form in geese. Hassall has one specimen from Liverpool, England.

Authors generally consider that there is little or no difficulty in recognizing this species; its anatomy, however, is very imperfectly understood.

11. DRPANIDOTAENIA FASCIATA (L? Rudolphi, 1810) Krabbe, 1869) Railliet, 1893.

(1868, "T. setigera Frolich," 1789 of Feuerisen [nec Frolich v. Siebold, 1848]; 1869, T. fasciata Krabbe.)

(? 1800, *Alyselminthus crenatus* (Goeze, 1782) Zeder pars—vide Rud., 1810; ? 1803, *Halysis crenata* (Goeze, 1782) Zeder pars—vide Rud., 1810; *Taenia fasciata* Rud.).

[Pl. V, figs. 56-66; Pl. VI, figs. 67-76; Pl. VII, figs. 77-79.]

Diagnosis: Body 60mm to 160mm long by 1mm to 2mm broad. Head hemispherical, compressed, 0.35mm broad by 0.25mm long;

suckers oval, 0.14mm long by 0.13mm (posterior) to 0.06mm (anterior) broad; rostellum long, thick, cylindrical 0.25mm by 0.05mm, armed on anterior end with simple crown of 8 hooks 57 μ to 60 μ long, roots of about equal length. Neck very long, much thinner than the head. Segments much broader than long; anterior segments 5 times as broad as long; posterior segments 3 times as broad as long, and somewhat funnel shaped; segments become 0.25mm thick; thickness especially in the median line, which is traversed by a dark longitudinal band; thinner and more transparent toward the border; straighter at the angles, the strobila having a crenate appearance. Genital pores unilateral in anterior half of margin. Calcareous bodies absent from the head, but present in the neck and increase distally. Male organs begin to develop in ca. one hundred and twentieth segment; 3 testicles present in distal portion of segment, one median, two lateral; vas deferens runs diagonally toward proximal aporose corner of segment, swelling into a vesicula seminalis; near lateral margin it turns, runs parallel to anterior margin and leads to cirrus pouch, which also runs parallel to anterior margin of segment; cirrus pouch lies on aporose side of median line and contains a second vesicula seminalis, which communicates with a very long cirrus; genital cloaca 0.2mm to 0.3mm long by 0.03mm to 0.09mm broad, the broader portion being next to genital pore; a row of spines at the point where the penis opens into the cloaca; penis covered with minute spines. Female organs not well understood; begin in ca. one hundred and forty-fifth segment; a median oval body and two lateral lobed bodies joined together; a median receptaculum seminis runs cephalad and diagonally, continues as vagina, which runs parallel to anterior margin nearly entire breadth of segments, and opens into cloaca near cirrus; a second larger lobed body = ? uterus.

Development: Cercocystis *Dr. fasciatae* in *Cyclops agilis*, recorded by Mrazek.

Hosts: White-fronted goose (*Anser albifrons*); graylag goose (*A. anser*); tame goose (*A. anser dom.*).

Geographical distribution: Denmark (by Krabbe); Germany (by Feuerisen); Bohemia (by Mrazek).

Zeder referred a tapeworm which he had found in a goose to *T. crenata* Goetze, which was reported from *Picus major* (see Krabbe, 1869, p. 300.) Rudolphi (1810, pp. 139-140) renamed the species *fasciata*, but does not appear to have examined it. Feuerisen (1868, pp. 162-190) then determined von Siebold's *T. fasciata* Rud. as *T. setigera* Frolich, 1789, and the year fol-

lowing Krabbe (1869, p. 300), stating that it was impossible to recognize definitely what goose tapeworm was included under the specific name *fasciata* by earlier authors, proposed to apply the name to a worm in geese provided with 8 hooks on the rostellum. Authors have since Krabbe's time adopted his form as *fasciata*. I retain this name provisionally, although it has no right to stand.

Mrazek (1890, 1891) records a cysticeroid from *Cypris agilis* which he identifies as the larval stage of *Taenia fasciata* Rudolphi. He evidently made no infections.

12. *DREPANIDUTAENIA GRACILIS* [(? Zeder, 1803) Krabbe, 1869] Railliet, 1892.

(1869, *Taenia gracilis* Krabbe.)

(? 1782, *Taenia collo longissimo* Bloch; ? 1803 *Halysis gracilis* Zeder; ? 1810, *T. gracilis* (Zeder) Rud.)

[Pl. VII, figs. 80-91; Pl. VIII, figs. 92-99.]

Diagnosis: About 270mm long by 1.5-2mm broad. Head subglobular; rostellum cylindrical, obtuse, armed with a simple crown of 8 hooks 77-80 μ long (95 μ and even 103 μ after Lonnerberg). Neck very short. Anterior portion of body very thin for a considerable length; anterior segments infundibuliform, the following segments gradually becoming quadrate, genital pores unilateral. Receptaculum seminis pyriform; penis unarmed; genital sinus provided with large spines.

Development: Cercocystis Dr. *gracilis* in *Candona rostrata* by Scott, in *Cypris compressa* Baird (*Cypris ophthalmica* Jurine) and *Cyclops viridis* Fischer by Mrazek, in *Cypris ophthalmica* by Moniez.

Hosts: Tame duck (*Anas boschas* dom.); mallard duck (*A. boschas*); widgeon (*Anas penelope*); tame goose (*Anser anser* dom.); goosander (*Merganser merganser*); red-breasted merganser (*Merganser serrator*); common sheldrake (*Tadorna tadorna*).

Geographical distribution: Denmark, Germany. No epidemics recorded.

It is impossible to tell what worm was referred to under the specific term *gracilis* before Krabbe's time; the earlier descriptions may therefore be ignored for the present, the names being accepted as unidentifiable synonyms; it is impossible to show that the earlier worms were not identical with Krabbe's form from

Anas boschas dom. The only positively known host for the adult up to Krabbe's time is, therefore, the tame duck.

Von Linstow (1872A, pp. 535-537) afterwards found a worm in the goosander (*Merganser merganser* [*Mergus merganser*]) which he identified with Krabbe's species. Lonnberg (1889, pp. 9-10, fig. 1) found a worm in *Tadorna vulpanser* which he described as a new variety: *T. gracilis* forma *Tadornae*. The hooks on this worm were much larger than those of the type specimen, a variation which Lonnberg explains as due to host influence. Lonnberg (1890, pp. 10, 30) also records this form for *Mergus serrator* (= *Merganser serrator*).

Von Linstow (1872A, pp. 535-537) found a cysticeroid measuring 0.14 by 0.09mm in intestine of a perch (*Perca fluviatilis*), which he looked upon as the young of *Taenia gracilis*. The larva has also been found in certain fresh-water crustaceans which probably represent the regular intermediate host. Thus Scott (1891, p. 314) noticed an object in a mounted slide of *Candonarostrata* Brady & Norman, from the Edinburg district; Blanchard (1891A, pp. 303-332) examined Scott's preparation from *Candona rostrata*, and after a careful comparison of the hooks of the cysticeroid concluded that this larva belonged in the life cycle of *Taenia gracilis*. He explains von Linstow's finding this same larva in a perch by the fact that the fish had eaten some ostracodes. He introduces the formula—the length= $a-c$, the base= $a-b$, in measuring the hooks, using it as follows: For *T. gracilis* ab: $ac=30-75$. Mrazek (1891, p. 128) cites the larva for *Cypris compressa* Baird and *Cyclops viridis* Fisch, while Moniez (1891, p. 26) mentions it from *Cypris ophthalmica* from China.

The larva referred to is in all probability the true larva of this species, but no infections have as yet been made.

b. Rostellum with 10 hooks.

13. *DREPANIDOTAENIA ANATINA* (Krabbe, 1869) Railliet, 1893.
(1869, *Taenia anatina* Krabbe.)

[Pl. IX, figs. 100-111; Pl. X, figs. 112-115.]

Diagnosis: Strobila attains 209mm to 300mm in length and 2mm to 3mm in breadth; worm of 70mm in length has about

650 segments; number of segments in longest worms probably reaches 2,000. Head with a simple crown of 10 hooks $65\ \mu$ - $72\ \mu$ long. Neck long. Fully matured segments half as thick as broad. Genital pores unilateral; copulation begins with about the five hundredth segment, uterus appears ca. 70 segments later. Male organs: Testicles 3 in number, one on pore side, two on aporose side of segment; cirrus pouch dorsal of vagina, elongate, extending to or slightly beyond the longitudinal canals, and possessing vesicula seminalis in its proximal portion; vas deferens swollen to an elongate vesicula seminalis near the pore-side testicle. Female organs: Vagina slightly longer than cirrus pouch, swelling into an enormous receptaculum seminis ventral of pore-side testicle; ovary large, about in median line; vitellogene gland distal of ovary; shell gland very small, dorso-proximal of vitellogene gland; uterus transverse, extending beyond longitudinal canals into the lateral field. Ova very characteristic; elongate $125\ \mu$ - $175\ \mu$ by $90\ \mu$ with 3 shells; external shell thin and transparent, inner shell slightly constricted at lateral borders of the oncosphere; oncosphere elongate, $50\ \mu$ - $60\ \mu$, hooks $10\ \mu$ - $11\ \mu$. Dorsal canal small, dorsal of ventral canal; genital canals pass dorsally of dorsal and ventral canals.

Larval stage: Cysticercoid develops in small mussel crabs (*Cypris incongruens* Ramd.; *Cypris ovata*; *Cypris compressa*), and consists of three portions: (1) Scolex with (a) armed rostellum and 2 rostellum sacs, (b) four suckers provided with very minute cuticular hooklets (Schmidt), and (c) long, narrow neck provided with 30-40 calcareous corpuscles; (2) a hollow cyst or sac, composed of three layers; (3) a long, thin tail, in which the 6 hooks of the oncosphere are visible. The excretory system can be traced from the suckers to the end of the tail, where it ends in a terminal vesicle. Extended, the entire body may measure ca. 2mm, the tail being $3\frac{1}{2}$ to 4 times as long as the cyst. The scolex is contracted into the cyst, which then measures 0.19mm to 0.20mm by 0.21mm to 0.23mm, tail 0.7mm to 0.8mm.

Host: Domesticated duck (*Anas boschas dom.*); mallard (*A. boschas*); pintail (*Dafila acuta*).

Geographical distribution: Pomerania, by Creplin; Zealand (Denmark), by Gad and Krabbe; Schleswig, by Friis; France, by Moniez; Germany, by Schmidt. No epidemics recorded.

Krabbe (1869, pp. 287-288) found some specimens in Creplin's collection under the label *Taenia larvis* Bloch, collected from tame ducks. These worms agreed with others of Creplin's collection labeled *sinuosa*, from the same host, and with a third lot of worms from Gurlt's collection labeled "*Taenia porposa*?"

Anas boschas fera," the latter being in a bottle with others which appeared to be *T. rhomboidea*. Friis found the same worm in wild ducks in Schleswig, and Gad and Krabbe found it in tame ducks in Zealand. The worm was found three times in 100 tame ducks. Krabbe (1882, p. 353 states that Professor Reinhart found this same species in 1874 in *Anas acuta* [— *Dafila acuta*] taken in Zealand.

Mrazek (1891, pp. 110-113) describes a cysticeroid which he found in Bohemia in *Cypris incongruens* and *Cypris compressa* Baird (according to Moniez, 1891, *Cypris ophthalmica*); the larva measured 0.40^{mm} to 0.43^{mm}, and bore 10 hooks 65 μ long; the tail was very long; embryonic hooks measured 10 μ . Moniez (1891, p. 26) states that he found the same larva in *Cypris incongruens* at Lille, France, and that the species *T. anatina* is the most common tapeworm of domesticated ducks of that country.

It is to J. E. Schmidt (1894) that we owe our chief knowledge of this worm and the experimental demonstration of its life history. Schmidt infected numerous small 2.25^{mm} to 2.75^{mm} fresh-water crustaceans (*Cypris ovata*) with the eggs of adult animals taken from ducks, and followed the development in all its stages. He found that the ova are eaten by *Cypris*; the embryo escapes from its shells and passes into the body cavity of the intermediate host; here it grows into a roundish hollow ball which gradually elongates and develops the various organs of the cysticeroid; when the organs are formed, the larva retracts its scolex into its cyst. In summer the entire development of the cysticeroid lasts but two weeks, while in winter it lasts over five weeks.

Ducks naturally become infected by swallowing the mussel crabs.

14 DREPANIDOTAENIA SINUOSA (Zeder, 1800) Railliet, 1893.

(1782, *Taenia collari nigro* Bloch—vide Rud., 1810; 1782, *T. infundibuliformis* (Anserum) Goeze—vide Dies., 1850; 1786, *T. collaris* Batsch—vide Rud., 1810; 1790, *T. torquata* Gmelin—vide Rud., 1810; 1800, *Alyselminthus sinuosus* Zeder; 1800, *Taenia breviararticulata* Goeze; 1803, *Halysis sinuosa* (Zeder, 1800) Zeder; 1803, *H. torquata* (Gmelin, 1790) Zeder—vide Rud., 1810; 1858, *Hymenolepis* (*Lepidotrias*) *sinuosa* (Zeder, 1800) Weinland).

[Pl. X, figs. 116-124; Pl. XI, figs. 125-139; Pl. XII, figs. 140-146; Pl. XIII, fig. 153.]

Diagnosis: 50mm to 160mm long by 1mm to 2mm broad. Head almost globular, rostellum armed with a simple row of 10 hooks 51μ to 61μ long. Neck very long. Anterior segments of variable breadth and length; the following segments trapezoidal; posterior segments rounded. Genital unilateral, situate toward the anterior third of the lateral margin; in each pore is found a globular sac, armed with spines, and appearing as a black point; this punctate line allows an immediate determination of the species. Eggs with 3 envelopes, the exterior 42μ to 44μ hooks of oncosphere 7μ to 8μ .

Development: Cercocystis *Dr. sinuosae* found in *Gammarus pulex* by Hamann and von Linstow; in *Cyclops viridis* Fisch, *C. agilis* Koch and *C. lucidulus* Koch, by Mrazek.

Host: Tame ducks (*Anas boschas* dom.); mallard duck (*A. boschas*); Brazilian teal (*A. braziliensis*); tame goose (*Anser anser* dom.); graylag goose (*A. anser*); pintail (*Dafila acuta*); tufted duck (*Aythya fuligula*).

Geographical distribution: France, Germany, Italy, Sweden and Bohemia.

The species *sinuosa* as at present adopted by authors stands on a most peculiar footing.

Gooze left a description and figures of this worm, with the MS. name *Taenia breviararticulata*, from *Anas fusca*, which were later published by Zeder (1800, pp. 295-298) under *Alyselminthus sinuosus*. According to Krabbe (1869, p. 298) Rudolphi determined as *sinuosa* forms which differ greatly from one another. Dujardin (1845) p. 573 then gave a more exact description of a form which he determined as *T. sinuosa* (Zeder) Rud., taken from *Anas acuta*, adopting Rudolphi's synonymy in all essentials. Krabbe (1869, pp. 298-299) adopted Dujardin's

determination of Zeder-Kuolphi's species, but ignored synonymy prior to Zeder. Thus we have no way of knowing whether the form now named *sinuosa* is identical with the original *sinuosa* or not, and Dujardin is the earliest author to whom we can trace the present *sinuosa* with any degree of certainty. Authors generally follow Krabbe in accepting Dujardin's determination of Zeder's *sinuosa* and it will be well at present to adopt this plan.

The views concerning the life history of this worm rest upon observations by Hamann, Mrazek, and von Linstow. Hamann (1889, pp. 1-7, Taf. 1) found some cysticercoids in *Gammarus pulex* which von Linstow determined as the young of *T. sinuosa*. They were oval to spherical; tail surrounds body as a yellowish border; 6 oncospheric hooks, 13 μ long, persistent, one pair at end, one in middle, and one at beginning of tail; tail 0.5mm, body with tail 1.3mm long; hooks of cysticercoid 50 μ long, 10 in number; calcareous bodies numerous, 6 μ in diameter, oval. Mrazek found a cysticercoid in Bohemia, 0.23mm long; tail moderately long, oncospheric hooks 11 μ ; 50 calcareous corpuscles present. He identified this organism with Hamann's larval form, and records it from *Cyclops viridis* Fisch, *C. agilis* Koch, and *C. lucidulus* Koch. So far as I can learn no infections were made with these parasites.

15. DREPANIDOTAENIA SETIGERA (Frolich, 1789) Railliet, 1893.

(1789, *Taenia setigera* Frolich; 1800, *Alyselminthus setigerus* (Frolich, 1789) Zeder; 1803, *Halysis setigera* (Frolich, 1789) Zeder; 1819, "*Taenia sinuosa* Rud.," 1810, of Rud., pars.—vide Krabbe, 1869; 1848, "*T. setigera* Frolich," 1789, of Siebold; 1858, *T. fasciata* Rud.," 1810, of Feuereisen; 1869, "*T. setigera* Frolich" of Krabbe.)

[Pl. XII, figs. 147-150; Pl. XIII, figs. 154-164.]

Diagnosis: Strobila 200mm long by 1mm to 3mm broad. Head subglobular, 0.24mm long by 0.28mm to 0.33mm broad; rostellum with simple crown of 10 hooks 35 μ to 43 μ (40 μ to 60 μ long, prong 20 μ long, roots 20 μ apart, after Feuereisen); ventral root short and plump, dorsal root longer. Suckers rather large, elliptical. Neck, 0.59mm long by 1.16mm broad. (Segments very short, 10 times as broad as long, Feuereisen.) Anterior segments very short, the following slightly longer, tunnel shaped, with very prominent posterior angles; chain traversed by a dark median band. Pores unilateral, small, situated toward anterior angle of the segment, frequently with extruding penis.

Genital organs begin with eight hundred and thirtieth segments; embryos begin with one thousand five hundredth segment. Calcareous bodies less numerous than in *Dr. fasciata*. Male organs: Male maturity is reached about the one thousand and thirtieth segment and is continued about 100 segments. Testicles three, 13 μ in diameter, posterior; an uncertain body (probably vesicula seminalis) lateral but near median line; vas deferens parallel and near anterior margin; cirrus pouch 0.35mm long, more than half as broad as the younger segments, parallel to and near anterior margin, 39 μ (median portion) 19 μ (lateral portion) broad; broadest part is 160 μ to 190 μ long and contains a vesicula seminalis 0.1mm to 0.15mm long by 30 μ broad; penis covered with minute spines. Female organs: Very imperfectly understood. A body appears on aporose side of median line, develops and divides into two pyriform bodies, which remain connected (— ovary?); from their point of juncture a canal runs toward the genital pore, and shows two swellings, a median (? receptaculum seminis) and a lateral (? receptaculum seminis); an oval body (— ? ovary) appears in the extreme aporose side of the segment, and from this extends another body (uterus) toward the median line, increasing in size as the (?) ovaries decrease. Oncospheres 19 μ , hooks 7.9 μ .

Development: Cercocystis *Dr. setigerae* in *Cyclops brevicaudatus* Claus, found by Schmeil.

Hosts: Tame goose (*Anser anser* dom.); white-fronted goose (*A. albifrons*); bean goose (*A. fabalis*); barnacle goose (*Branta leucopsis*); tame swan (*Olor cygnus* dom.) cited by von Linstow, but Railliet believes this erroneous; whooping swan (*Olor cygnus*).

Geographical distribution: Germany, France, Denmark, Sweden and Ireland. Lucet found it producing a serious epidemic among the young geese Loiret (Railliet, 1893, p. 301).

The name *Taenia setigera* was proposed by Frolieh (1789, pp. 106-111) for a worm 3 feet long and 3 lines broad, with unilateral genital pores, which he found in pastured geese. He states that the rostellum is unarmed; the form is, like many earlier species, not well described, and the figures are poor, so that it is not possible to tell with absolute certainty what species Frolieh examined. Bellingham (1844, p. 320) records it for Ireland. Von Siebold (1848, p. 131) states that in this species he found 10 hooks on the rostellum. There is no way of proving that Siebold's worm was Frolieh's *setigera*; at the same time, as there is no way of disproving it, we may as well accept

von Siebold's statement regarding the hooks; the species *setigera* accordingly would rest upon this character. Feuersen (1868, pp. 190-200) described the anatomy of a goose tapeworm, determined as *T. fasciata* Rud., which possessed 10 hooks and is probably identical with von Siebold's *T. setigera* Frolich. In 1865 and 1868 Krabbe (1869, pp. 289-290) examined 400 geese and found *T. lanceolata* present in 77 of them, and another tapeworm 9 times which possessed 40 hooks on the rostellum; this latter worm Krabbe determined as *T. setigera*. Krabbe also examined specimens from Rudolphi's collection (see Rud., 1819, p. 700) collected by Brosche in Dresden, and determined by Rudolphi as *T. sinuosa*; these worms were "undoubtedly identical with" *T. setigera*. Lonnberg (1889, p. 8) records this species for *Anser segetum* (new host) in Kristineberg; he also includes the white-fronted goose (*Anser albifrons*) among the hosts, but does not state his authority. Railliet (1893, p. 301) placed *T. setigera* in his genus *Drepanidotaenia*. Von Linstow (1892B, pp. 503-504) states that Dr. O. Schmeil found in *Cyclops breviceaudatus* a globular cysticercoid 0.133^{mm} in diameter, with a thin, long (2.14^{mm}) tail, 10 hooks 39 μ , on the rostellum, which von Linstow identifies as the young of *T. setigera*. No infections were made. The life history as given above is, therefore, theoretical though probable.

16. TAENIA KRABBEI Kowalewski, 1895 (nec Moniez, 1879). (Sp. dub.)
(1894, *Taenia Krabbei* Kowalewski [nomen nudum].)

[Pl. XII, figs. 151-152.]

Krabbe (1860, p. 290) states that he once found in the intestine of a domesticated goose a tapeworm head with 10 hooks similar in form to those of *Drepanidotaenia setigera* but much smaller, i. e., 24 μ long. He thought that perhaps it belonged to another form, but figured the hooks as "*T. setigera*?;" the hooks, as well as the head, bore a great resemblance to *Drepanidotaenia tenuirostris*. He also found a few heads with 10 similar hooks in the domesticated duck; the hooks were 28 μ long. Kowalewski (1894, p. 5), in a paper which I am unable to read because of the language, mentioned this worm as a new species under the name *Taenia Krabbei*. In a second paper (1895, p. 359, Taf. VIII, fig. 27), he gives a short discussion of the worm, and figures 2 hooks. In the German resume (1894, p. 279) of this paper he simply states: "A species from the goose which was already found by Krabbe, but not described,

is proposed as a new species (*Taenia Krabbei*) and its external characters are discussed."

The status of this species can not be judged at present, but the slight variation in the form of the hooks is not, in my opinion, sufficient to establish the form. As Kowalewski has unfortunately written in a language which is not understood by many authors, it is difficult to judge his work, and as it is now necessary for an investigating helminthologist to learn no less than ten languages in order to keep up with his branch, it is to be hoped that Kowalewski will in the future give full translations of his scientific articles in German, French, English, Italian, or some other language better known than his own.

Whatever may prove to be the status of this species, the name *T. Krabbei* can not be retained for it, as this name has always been used by Moniez for another form.

17. *DREPANIDOTAENIA TENUIROSTRIS* (Rudolphi, 1819) Railliet, 1893.
(1819, *Taenia tenuirostris* Rudolphi.)

[Pl. XIV, figs. 165-172.]

Diagnosis: 100mm to 125mm long, 1mm to 3mm broad. Head subglobular; rostellum delicate, subclaviform, armed with a single crown of 10 hooks $20\ \mu$ to $23\ \mu$ long; suckers round. Neck rather long. Anterior segments straight and short, the following longer, with sharp prominent posterior angles, like the teeth of a saw. Genital pores unilateral. Egg cylindrical, $85\ \mu$ long. Hooks of oncosphere $7\ \mu$.

Development: Cercocystis *Dr. tenuirostris* in *Gammarus pulex*, found by Hamann and von Linstow; in *Cyclops agllis* and *C. pulchellus* found by Mrazek.

Hosts: Tame goose (*Anser anser* dom.); European scaup duck (*Aythya marila*); tufted duck (*Aythya cristata*); goosander (*Merganser merganser*); red-breasted merganser (*M. serrator*); smew or nun (*Mergus albellus*); Greenland eider (*Somateria mollissima*); velvet scoter (*Oidemia fusca*); kittiwake (*Rissa tridactyla*).

Geographical distribution: Denmark, France, Germany, and Bohemia. No epidemics recorded.

Krabbe (1869, pp. 291-292) examined Rudolphi's types and found hooks upon the rostellum, although they had escaped Rudolphi's attention. The original specimens were collected by Bremser from *Merganser merganser*; von Siebold also found this species in the same host in Bavaria and Krabbe found the

same worm in *Aythya marila*. It is also reported from other wild birds. Bellingham (1844, p. 320) gives *Aythya cristata* as a host, but does not state his authority.

Hamann (1889, pp. 7-9, figs. a-c) found a cysticeroid in *Gammarus pulex* which he looks upon as the larval stage of this worm, and he assumes that as the domestic duck is the only bird (i. e., so far as Hamann knows) which visits the water in which this larval stage was found, this tapeworm is also found in domesticated ducks. An argument like this has value in science only in order to place us on our guard for the parasite, but it would be going altogether too far to accept this worm as a parasite of domesticated ducks until it is found in that host. Hamann made no infections with his larval form, and accordingly the demonstration that this cysticeroid represents the larval stage of *Dr. tenuirostris* is still lacking. Hamann describes the larva as lying in a cyst fastened to the intestine of the crustacean, and possessing a yellowish tail and grayish-white body; diameter 0.2mm, hooks 10 in number, 23 μ long; calcareous bodies oval 6 μ , oncospheric hooks 9 μ . Von Linstow (1892A, pp. 338-339) observed the same larva in the same host, and Mrazek (1891, pp. 101-103, 126-129) describes it from *Cyclops agilis* and *Cycl. pulchellus* in Bohemia. His specimens were very small 0.10mm to 0.11mm; 10 hooks 21 μ to 23 μ ; tail long; oncospheric hooks 8 μ .

B. Genital pores irregularly alternate.

18. *DREPANIDOTAENIA INFUNDIBULIFORMIS* (Goeze, 1782) Railliet, 1893.

(1772. *Globus stercoreus* Scopoli—vide Parona, 1894; 1779, *Taenia infundibulum* Bloch—vide Goeze, 1782; 1781, *T. avium* Pallas—vide Goeze, 1782; 1782, *T. articulis convideis* Bloch—vide Rud., 1810; 1782, *T. infundibuliformis* Goeze; 1786, *T. cuneata* Batsch [nec Linstow, 1872]—vide Rud., 1810; 1788, *T. conoidea* Schrank—vide Rud., 1810; 1794, *T. serrata* Rosa [nec Goeze, 1782]—vide Parona, 1894; 1800, *Alyselminthus infundibuliformis* (Goeze) Zeder; 1803, *Halysis infundibuliformis* (Goeze) Zeder.

[Pl. XIV, figs. 173-186; Pl. XV, figs. 187-193.]

Diagnosis: 20mm to 130mm, rarely 230mm long. Head globular, rather depressed; rostellum elongate, cylindrical, or hemispherical, swollen at summit, armed with a single row of 16-20 hooks 20 μ to 27 μ long, with long dorsal and short ventral root; suckers rather small. Neck very short. Anterior segments very short, the following funnel shaped, the anterior

border being much narrower than the posterior border; posterior segments almost as long as broad. Genital pores irregularly alternate. Penis thick, covered with few spines. Hooks of embryo 12 μ to 17 μ (See also diagnosis given below, p. 611.)

Development: According to Grassi & Rovelli the cysticeroid develops in the ordinary house fly.

Host: Chickens (*Gallus domesticus*); migratory quail (*Coturnix coturnix*); ? pheasants (*Phasianus colchicus*); mallard (*Anas boschas*); tame duck (*Anas boschas dom.*); ? crowned pigeon (*Goura sp.*); ? domesticated pigeon (*Columba livia dom.*); sparrow (*Fringilla domestica*).

Geographical distribution: France, Italy, Ireland, Zealand (Denmark) (Krabbe), Pomerania (Creplin), and Saxony (Kuchenmeister). No epidemics.

The earlier descriptions of *Dr. infundibuliformis* are exceedingly unsatisfactory, and in many cases it is impossible to recognize what species an author had before him when he determined it as *infundibuliformis*.

Krabbe (1869, pp. 339-341) examined Rudolphi's (1810) specimens and determined the forms from chickens as "undoubtedly identical" with specimens which he collected in Zealand, and with specimens from Creplin's and Kuchenmeister's collections. Rudolphi's (1810, p. 124) specimens from *Otis tarda*, however, Krabbe determined as different from the specimens from chickens.

This seems to be the earliest exact reference to this species, which, therefore, rests upon Krabbe's (1869) study of the material which Rudolphi (1810, pp. 123-126) determined as Goeze (1782, pp. 386-390) *Taenia infundibuliformis*. Unless original specimens of authors before Rudolphi can be studied again, and unless it can be shown by this means that Rudolphi's (1810) specimens were not really identical with Goeze's *infundibuliformis*, this specific name may at present be applied to the parasites as determined by Krabbe. It is useless to revert to the names prior to *infundibuliformis*, 1782, unless the originals upon which those names were based can be restudied. Bellingham (1844, p. 319) records this species for *Anas boschas*, *A. boschas dom.* and *Fringilla domestica*. The form which Dujardin (1845, p. 586) determined as *infundibuliformis* is referred to *Davainea casticillus*. Krabbe found this worm (*Dr. inf.*) in 25 out of 200 chickens in the region of Copenhagen. Magnin (1881A, pp. 33-

35) states that he found *T. infundibuliformis* in large numbers in the epidemics of syngamosis among pheasants, but it is evident that the form he referred to was his *T. agama*. Bremser also records it from pheasants, but his observation should be confined. Megnin records it for pigeons and in Goura, but those observations also need confirmation, for Megnin remarks that the specimen from Goura had three rows of hooks upon the suckers, (? *Davainea cesticillus*, q. v. p. 48). Piana (1882, p. 392) found this parasite the most common tapeworm of chickens. Grassi & Rovelli (1889, p. 404; 1892, pp. 33-34, §9) state that they found the larval stage in the house fly (*Musca domestica*), but they did not prove their point experimentally. Crety (1890, pp. 5-8) records *Coturnix communis* as a new host, and remarks upon the anatomy of the parasite. Unfortunately the figures are unsatisfactory, and the description is, therefore, not of such value as it otherwise would be; from his description the following characters are taken:

Diagnosis: (*T. infundibuliformis*) Strobila to 100mm. Head very small, spheroidal, 0.387mm broad; rostellum armed with 20 hooks upon its cupola-like extremity; length of rostellum 0.137mm, breadth 62 μ to 75 μ ; hooks 23 μ long; suckers 0.215mm by 0.156mm. Neck very short, 0.313mm in length; middle segments 0.48mm long, posterior segments 0.901mm long. Genital pores —. Male genitalia: Testicles 16 to 20 in number, 29 μ to 44 μ in diameter, situated in median field; vas deferens begins about the middle of the segment, first portion slightly sinuous, lateral portion very tortuous; cirrus pouch globose, 71 μ in diameter; cirrus armed with numerous small spines. Female genitalia: Receptaculum seminis 106 μ by 39 μ , situated near the ovary; ovary globose, near anterior margin, occasionally irregularly divided into two halves; oviduct runs from ovary, in median line, distally; vitellogene gland in about the proglottid is globose, occasionally irregularly divided into two portions, vitello-duct runs cephalad from its median portion; shell gland very small, between ovary and vitellogene gland; uterus forms very quickly, in the mature proglottid it occupies the entire median field and is composed of a large cavity imperfectly divided into numerous small cells (—egg capsules?). Ova 55 μ by 46 μ , with 3 shells; oncosphere 33 μ , hooks 17 μ . Krabbe: hooks 12 μ to 17 μ .)

Pasquale (1890, p. 909) records the worm for chickens in Massowah. Ralliet (1893, p. 302) well remarks

that the generic position of this species is doubtful. (See addendum, p. 637.)

I refrain from discussing this form further, except to remark that practically nothing is definitely known about the species. Crety's description is the only one which can be given the dignity of a diagnosis, and yet that was not based upon originals. The earlier descriptions, which take no account of the internal anatomy of the segments, are almost useless so far as zoological descriptions are concerned. Were it not for the fact that the original host (chickens) is known, I have the most serious doubt whether it would ever be possible to recognize this form; and whether even the numerous specimens recorded from chickens as *T. infundibuliformis* are to be considered as such is, in my opinion, an open question. I have specimens of worms from pigeons (*Columba domestica*) and from turkeys (*Meleagris gallopavo mexicana*), which I should like to determine as *Dr. infundibuliformis*, but it seems to me that this specific name, like *Taenia expansa* of older authors, is only a Latinized form of expressing one's doubts or ignorance as to what species is in the hands of a given worker, while as for the supposed life history, with the fly as intermediate host, although I am not willing to deny the correctness of the hypothesis, I do insist that it is only an hypothesis, with little back of it, and that it is now time to call a halt on such speculative work and to distinguish between what is shown experimentally to be fact, and what might possibly be shown to be fact. (See also *Taenia nigropunctata*.)

E. Suckers armed: genera *Davainea*, *Echinocotyle*, and *Ophryocotyle*.

Genus *DAVAINEA* R. Blanchard & Railliet, 1891.

(? 1893, *Chapmania* Monticelli.)

Diagnosis: Worms of small or medium size. Head rounded, surmounted by a rostellum or hollowed by a depression, but armed in either case with a double row of numerous small hooks possessing a special form (prong and dorsal root short, ventral root very long, giving them the form of a hammer). Suckers rounded, bordered with several rows of small hooks which are instable or persistent. Genital pores generally unilateral but occasionally irregularly alternate; in the former case (unilateral pores), the ova are generally arranged in groups, in egg capsules; ovary in some species develops into the uterus; eggs also isolated, scattered through the parenchyma; embryos without pyriform body.

Type species: As the type species has evidently never been proposed, I propose *D. proglottina* (Davaine, 1860) R. Blanchard, 1891, as type.

Development: As yet little known; the larvae of some species, however, have been found in certain arthropods and mollusks.

Habitat: Intestine of birds and mammals.

Blanchard (1891B, pp. 428-440) recognizes fourteen species as belonging to this genus, and thinks that *T. cantaniana* and *T. clavulus* may also be placed here. Some of the forms Blanchard includes here are well established, others rest upon weak characters.

Monticelli (1893, pp. 16-17) has recently proposed a new genus *Chapmania* which seems to be very closely related to, if not identical with *Davainea*. His diagnosis reads as follows

Head rounded, small, with a protractile anterior sucker armed on its anterior margin with a crown of very minute hooklets. Suckers rather large, unarmed. Proglottids campanulate. Genital pores unilateral. Testicle single. Ovary bilobed, dendritic.

Monticelli took Zschokke's (1888, pp. 26, 41-46) *Taenia argentina* as basis for his genus, and considered

this species identical with Chapman's *Taenia tauricolis*. In this latter point Monticelli is probably in error, while as for the genus, it certainly rests upon too weak characters to be recognized at present. The "anterior sucker" is, of course, the invaginated rostellum and sac; the only valuable character remaining is the single testicle. The bilobed dendritic ovary, the form of the segments, etc., must all be rejected as generic characters.

The exact status of the genus and the ? one or ? two species, (*tauricollis* and *argentina*) must be left undecided for the present.

- | | | | |
|----|---|--|-----------------------------------|
| | { | Genital pores alternate | 2 |
| 1. | { | Genital pores generally unilateral,
occasionally alternate; rostellum
with about 200 hooks 6μ long | <i>D. tetragona</i> , p. 619 |
| | { | Genital pores unilateral | 4 |
| 2. | { | Segments not over 5 in number;
strobila 1.5mm long or less; rostellum
with about 80 hooks 7μ long;
found in chickens | <i>D. proglottina</i> , p. 614 |
| | { | Segments numerous, and strobila
much longer than 1.5mm | 3 |
| 3. | { | Rostellum with about 100 hooks 8μ
long; found in chickens and (?)
pigeons | <i>D. echinobothrida</i> , p. 618 |
| | { | Rostellum with 208 hooks 7μ to 8μ
long; found in chickens | <i>D. cesticillus</i> , p. 617 |
| | { | Rostellum with about 800 hooks 11μ
long; found in quails | <i>D. circumvallata</i> , p. 615 |
| 4. | { | Rostellum with 150 hooks 12.8μ long;
found in pheasants | <i>D. Friedbergeri</i> , p. 621 |
| | { | Rostellum with ca. 60 hooks 11μ
long; found in pigeons and (?)
ducks | <i>D. crassula</i> , p. 623 |

a. Genital pores irregularly alternate

19. DAVAINEA PROGLOTTINA (Davaine, 1860) R. Blanchard, 1891.

(1860, *Taenia proglottina* Davaine; 1881, "T. proglottidina Dav."
of Piana.)

[Pl. XV, figs. 194-198; Pl. XVI, figs. 199-202.]

Diagnosis: 0.5mm to 1.55mm long by 0.18mm to 0.50mm broad. Head club shape to quadrangular, 140μ to 250μ long by 135μ to 200μ broad, rather rounded in front and slightly constricted in

back to form neck (108 μ broad); apex armed with retractile hemispherical rostellum 55 μ in its antero-posterior diameter and 60 μ to 85 μ in its lateral diameter; base of rostellum armed with about 80-95 hooklets measuring 6.5 μ to 7.5 μ . Suckers circular, small (25 μ to 35 μ), armed with a single row of hooklets (6 μ), with rather large, bilobed base. Strobila composed of 2-5 segments, first segment only about 56 μ long, the following segments increasing in length and width. Genital pores irregularly alternate, situated at the anterior angle. The second segment possesses well-developed male organs and the anlagen of the female organs. In the third segment the testicles are atrophied, the female organs (median posterior vitellarium, two ovaries, recept. sem., vagina) well developed, but no uterus present. In the fourth segment all the genital glands are atrophied, and the segment is filled with numerous isolated eggs (not in egg capsules); ova 35 μ to 40 μ ; hooks of oncosphere 10 μ to 11 μ . The segments have a great tendency to separate more or less completely; the last segment, after separating, remains in the intestine and grows to 2mm long by 1.25mm broad (larger than the entire worm).

Development: Larval stage is found in slugs (*Limax cinereus*, *L. agrestis*, and *L. variegatus*, and develops from the oncosphere in less than twenty days; fed to chickens, the cysticeroid becomes adult with 4 segments at the end of eight days.

Host: Chickens (*Gallus domesticus*).

Geographical distribution: France (Rennes by Dujardin), in le Nord by Davaine, in Loiret by Lucet, in Indre-et-Loire by R. Blanchard, and Italy by Grassi & Rovelli.

Epidemics: Lucet observed a serious epizootic enteritis in fowls produced by this parasite in Loiret (Railliet, 1893, p. 305).

The life history of this worm has been experimentally demonstrated and this is one of the few tapeworms of fowls which can be said to be comparatively well known from a scientific standpoint.

20. DAVAINEA CIRCUMVALLATA (Krabbe, 1869) R. Blanchard, 1891.

(1819, *Taenia lineae* Rud., pars; 1869, *T. circumvallata* Krabbe; 1890, *T. pluriuncinata* Crety.)

[Pl. XVI, figs, 203-211.]

Diagnosis: Strobila 40mm to 150mm long. Head pyriform 0.627mm to 0.8mm long by 0.598mm to 0.65mm broad. Rostellum

armed with a double row of about 800 minute hooklets, of two different sizes, the larger and smaller alternating, the larger hooks $11\ \mu$ (Krabbe), $16\ \mu$ (Crety); smaller hooks $8\ \mu$ (Krabbe), $12\ \mu$ (Crety). In the earlier stages (see below *T. pluriuncinata*) the suckers are armed with 6-8 concentric rows of instable hooks which vary in size, but of similar form. Suckers small, 0.186mm to 0.196mm in diameter. Neck present, thin. Anterior segments 0.195mm broad by 0.40mm long (after Crety, 1890, p. 2, the figures should undoubtedly be reversed); middle segments 2mm to 3mm broad by 1mm long; posterior segments 1.5mm long by 2.5mm broad. Genital pores irregularly alternate in about the middle of the lateral margin. Male genitalia: In posterior portion of segment; testicles 15-20 in number, $45\ \mu$ in diameter, distributed regularly in median field; the common vas deferens takes origin in about the middle of the segment, medium portion more or less simple, lateral portion convoluted; upon entering the cirrus pouch it swells into a vesicula seminalis, $53\ \mu$ long by $39\ \mu$ broad, distinct only in the younger segments; cirrus covered with extremely minute spines, visible only with an immersion lense. Female genitalia: In anterior portion of segment. Ovary median near anterior margin, at first transverse, in the older segments it becomes globose and occasionally irregularly divided into two lateral halves, connected by a median portion which leads into the oviduct; in middle proglottids transverse diameter of ovary 0.186mm ; oviduct short, runs distally; vitellogene gland distal of ovary, in youngest segments appears as a globular sac next to ovary, in older segments further removed from it and much smaller than it, occasionally divided; vitellogene gland proximally; shell gland very small, situated between ovary and vitellogene gland; vagina swells into a receptaculum seminis $58\ \mu$ by $39\ \mu$ near the ovary; uterus forms rapidly, suppresses genital glands, eggs arranged 4-6 or more in egg capsules. Ova $28\ \mu$ by $24\ \mu$; hooks of oncosphere $11\ \mu$ to $17\ \mu$ (Krabbe), $3\ \mu$ to $4\ \mu$ (Crety), oncosphere $11\ \mu$.

Type specimen: Berlin museum.

Life history: Unknown.

Host: Migratory quail (*Coturnix coturnix*) by Rudolphi and Crety; (*C. dactylisonans*) by Ninni [Stossich].

Geographical distribution: Italy, by Rudolphi, Crety, and Ninni.

Blanchard (1891B, p. 434) looks upon Crety's *Taenia pluriuncinata* as synonymous with *D. circumvallata*. Crety's description of *T. pluriuncinata* is as follows:

Diagnosis: Strobila up to 105mm long. Head very small 0.313mm broad. Rostellum armed with a double row of alternately larger and smaller hooks, the larger 8 μ , the smaller 5 μ long. In form very similar to those of *T. circumvallata*: suckers very small, 98 μ in diameter, armed with 6-8 concentric rows of hooks, the latter varying in size, but of similar form. Neck 2.5mm long, thin. Young segments 0.323mm broad by 0.2mm long; middle segments trapezoid, 3mm broad; posterior segments 2mm long; middle segments trapezoid, 3mm broad, posterior segments 2mm broad by 1mm long. Genital pores irregularly alternate; genital apparatus (very sufficiently described); cirrus pouch pyriform, 127 μ by 20 μ ; ova in egg capsules same as in *T. circumvallata*; diameter of ova 22 μ by 16 μ ; oncosphere 9 μ .

Host: Migratory quail (*Coturnix coturnix*.)

Whether Blanchard is correct in his opinion can be determined only by a comparison of specimens, but in the meantime one is bound to admit that *T. pluripunctata* can hardly be admitted as a species upon its present diagnosis.

21. *DAVAINEA CESTICILLUS* (Moltn, 1858) R. Blanchard, 1891.

(1845, "*Taenia infundibuliformis* Goetze," 1782, of Dujardin; 1858, *T. cesticillus* Molin; 1881, *T. infundibuliformis* pars of Megnin.)

[Pl. XVII, figs. 212-216.]

Diagnosis: Length, 9mm to 45mm (according to Molin), 100mm to 130mm (according to others). Head globular, 0.5mm to 0.55mm broad; rostellum convex or hemispherical, not prominent, 0.28mm to 0.32mm broad, armed with about 208 hooks 7 μ to 8.8 μ long, arranged in two rows; these hooks have a very short dorsal and a long ventral root; suckers 10 μ to 11 μ not prominent. Neck very short (Duj.) neck absent (Railliet). Anterior segments 3-5 times as broad as long, being broader than the head, but very short; the following segments increasing gradually in size and becoming nearly as long as broad, borders overlapping. Genital pores irregularly alternate. Eggs elliptical 75 μ to 85 μ ; hooks or oncosphere 16 μ to 17 μ (Railliet) 18 μ to 23 μ (Dujardin). Development unknown.

Hosts: Chickens.

Geographical distribution: France (by Dujardin); Italy (by Molin, Grassi, Rovelli); Denmark (by Krabbe); Turkestan (by Fedtschenko); Abyssinia (by Pasquale). **Epidemics:** None recorded.

Dujardin (1845, pp. 586, 609, Pl. IX, fig. H, 1-2) erroneously determined this worm as *T. infundibuliformis*; Molin (1858, p. 139) described it as *T. cesticillus*. Krabbe (1869, pp. 342-343) found it in 16 out of 200 chickens in Denmark, and mentions a somewhat similar worm from Siebold's collection, taken in Egypt by Bilharz. Piana (1882) records *T. cesticillus* in Italy and Pasquale (1890) says it is the most common form at Massowah (Abyssinia), where he in one instance took about 300 from one chicken. Grassi & Rovelli (1892, p. 88) suspect that the intermediate host is a lepidopteron (butterfly) or a coleopteron (beetle), but this is wild speculation. Stossich (1890A, p. 29; 1890B, p. 53) records the same species in two different publications, once as being collected in Venice by Ninni, and a second time as being rather rare in chickens in Trieste. Blanchard (1891B, p. 434) looks upon part of Megnin's *T. infundibuliformis* as belonging here; the worm in question has, according to Megnin (1881A, pp. 27-44) 3 rows of hooks on the suckers.

For Neumann's (1888 and 1892) combination *T. cesticillus* var. *phasianorum* which he attributes to Megnin (1887, p. 828), vide p. 53 (*Taenia infundibuliformis* var. *phasianorum* Megnin, 1887, p. 825 ff., under *T. Friedbergi*).

22, DAVAINEA ECHINOBOTHRIDA (Megnin, 1881) R. Blanchard, 1891. (1880, *Taenia infundibuliformis* of Megnin (pars); 1880, *T. echinobothrida* Megnin, nomen nudum; 1881, *T. echinobothrida* Megnin.)

[Pl. XVII, figs. 217-218.]

Diagnosis: 50mm to 100mm long, 1mm to 4mm broad. Head small, cuboid, its summit presenting an infundibulum armed with about 100 hooks, 8 μ long, arranged in a double row. Suckers large, armed with 7 circular rows of hooks, the hooks of the middle row being the largest; with age these hooks fall and the suckers gradually become indistinct. Neck nil. Anterior segments very thin, 50 times broader than thick; following segments increasing gradually in size, the posterior border overlapping, so that the margin of the strobila appears serrate. Eggs spherical, 90 μ in diameter, arranged in groups of 6-7 in roundish egg capsules. Development unknown.

Hosts: Chickens (Megnin), ? pigeons (Megnin—possible another species of worm according to Railliet), and ? pheasants (see Blanchard).

Geographical distribution: France by Megnin. Epidemics: Megnin states that this did not produce any serious effect in its hosts.

The types of this species should be compared with *D. tetragona* and *T. bothrioplitis*, as the worms are very similar, if not identical. The character of the genital as a specific difference I can hardly admit for this form. (See the discussion under *D. tetragona*.) Megnin states that the hooks of the middle rows of the suckers are the largest and this, if the observation is confirmed, would separate the species from *T. bothrioplitis*.

b. Genital pores unilateral, occasionally alternate.

23. *DAVAINEA TETRAGONA* (Molin, 1858) R. Blanchard, 1891.

(1858, *Taenia tetragona* Molin; 1881, *T. bothrioplites* Piana (nomen nudum); 1882, *T. bothrioplitis* Piana.)

[Pl. XVII, figs. 219-227; Pl. XVIII, figs. 228-235.]

Diagnosis: 12mm to 90mm long (Molin) or to 200mm (Piana) or to 250mm (Krabbe), by 1.6mm to 3mm broad. Head small, tetragonal; retractile rotellum armed with a double row of about 200 hooks, 6 μ long. Suckers circular, armed with seven or eight concentric rows of hooks of varying size. Neck very long. Anterior segments very short; the following subquad-rangular, the posterior edges overlapping. Genital pores unilateral or irregularly alternate, situated in or about the middle of the margin. Eggs arranged irregularly in groups of 5-20 in egg capsules.

Development: According to Piana, the larval stage (*Monocercus Davaineae tetragonae*) develops in snails (*Helix carthusianella* or *H. maculosa*).

Hosts: Chickens.

Geographical distribution: Italy (by Molin, Piana), Turkestan (by Fedtschenko), Abyssinia (Pasquale), America (Washington, D. C., by Moore).

Epidemics: Italy by Piana; Washington, D. C., by Moore.

I include *T. bothrioplitis* in the species *D. tetragona* and retain *D. echinobothrida* as a distinct species, chiefly in deference to the opinion of my friends R. Blanchard and Railliet. Personally I do not see why the species *D. tetragona* should be recognized, or why two of these forms should be united while the third is kept distinct, for the descriptions of all three forms

are incomplete, and, as will be shown in the following historical review, any arrangement of the three worms can be looked upon at present only as provisional. The historical review is given in detail, as these three (or one?) species represent very important parasites.

Molin (1858, p. 139) first described as *Taenia tetragona* some tapeworms which he found in chickens in Padua in December, 1857, as follows:

Caput tetragonum, minimum, acetabulis quatuor angularibus, alveolo ad basim rostellii excavatum; rostellum inerme, brevissimum, obtuso-conicum, in alveolum retractile; collum breve; articuli supremi brevissimi; postremi subquadrati, imbricati; aperturæ genitales marginales, secundae, in apice papillae prominulae. Longit. 0.012-0.090; lat. ad 0.002.

Habitaculum. Phasianus Gallus: in intestino tenui, Decembri, Patavii (Molin).

Like most of Molin's descriptions, this diagnosis gives us but little information concerning the parasite he had before him. It should be noticed, however, that he (probably erroneously) describes the rostellum as unarmed, the neck as short (a character of little or no value), the posterior segments subquadrate and imbricate, the genital pores as unilateral, the length of the worm as 12mm to 90mm, breadth as 2mm. In other words, there is neither a single distinctive character nor a collection of characters given in this diagnosis. In his second paper (1860, pp. 254-255; Taf. VII, 5-8) Molin repeats this diagnosis, gives four figures of the worm which are almost useless, except fig. 7, in which the genital pores are figured in the middle of the lateral margin, and in which some irregularly-shaped masses are drawn, which evidently represent egg capsules. He also adds three observations to the effect that he collected 42 specimens from one chicken, of which number only 2 were mature, the others being very small. He describes a mosaic structure of the segment caused by egg capsules, each of which contains from 5 to 20 ova. Although the rostellum is unarmed, the form differs in organization from the other unarmed forms. These are all of the characters ever given by Molin to the species, and it must, indeed, be admitted that they are not sufficient to determine any worm with certainty. Molin's diagnosis, without the type specimens, is therefore useless.

As far as any original observations are concerned Molin's species *T. tetragona* then rested for a number of years. In 1880 Megnin (1880, p. 119) mentioned *T. echinobothrida* as a nomen nudum. In 1881 two parasites of chickens, very similar to if not identical with *T. tetragona*, were described as new. Megnin described and figured *T. echinobothrida* as new species with the characters given in the diagnosis above (p. 618.) A careful study of both figures and description shows that the most important characters at present to be considered are the hooks upon the rostellum, said to be about 100 in number, 8 μ long, the rows of hooks upon the suckers (6-7 rows), those of the middle row being the largest; genital pores irregularly alternate; eggs 90 μ in diameter, spherical, arranged in groups of 6-7 in roundish egg capsules.

In March of the same year¹ (1881) Piana (1882, pp. 387-391, I plate) presented a paper before the Accademia delle Scienze di Bologna, in which he described as a new species *T. bothrioplitis*, a cestode which he found causing serious damage to poultry, producing tubercles in the intestine. The chief zoological characters taken as a basis for the species are as follows:

Head 0.35mm in diameter; retractile hemispherical rostellum armed with hooks (number not given, but evidently ca. 200, form shown in drawing); suckers with seven or eight concentric rows of hooks (form as per drawing), hooks not all of same size; neck very long, containing ovoid calcareous corpuscles; genital pores unilateral, situated somewhat below (distally) the middle of the lateral margin; cirrus short, pyriform; eggs in egg sacs.

Piana states that Rivolta and Delprato (in Ornitojatria, 1880, T. I., f. 5a—not accessible to me) picture the head of a cestode which produced similar nodules in the intestine of a chicken. Piana found 2 cysticercoïds in *Helix* (whether in *H. carthusianella* or *H. maculosa* is not clear to me) which agree quite closely with the head of the parasite found in chickens; no experiments were made to demonstrate that this cysticercoïd is the larval form of the worm in question, but their specific

¹The date of publication of the volume for 1881 is given upon the cover as 1882, but a preliminary notice of this paper appeared in the Rendiconto in 1881. This preliminary notice, however, is altogether too incomplete to hold should the question of priority be raised between Megnin's *T. echinobothrida* and Piana's *T. bothrioplites*. Further, as Piana cites Megnin's article in the final paper, Megnin's name must be given precedence, should these two forms prove identical. Piana's *T. bothrioplites* of 1881 is to all intents and purposes a nomen nudum, and his species *T. bothrioplitis* should be dated 1882.

identity is assumed from their similarity. Piana was acquainted with Megnin's paper, but separated his form from Megnin's species chiefly on account of the form of the hooks on the suckers, the number of hooks on the rostellum, and the arrangement of the genital pores. Krabbe (1882, pp. 361-364, Tab. II, figs. 55-60) published as *Taenia tetragona* Molin, some cestodes which Fedschenko had found in chickens in Turkestan. He admits the total inadequacy of Molin's figures and descriptions, but determines his specimens as *T. tetragona* on account of the egg capsules. The characters given are as follows:

Length to 250mm, breadth, 1.6mm; posterior segments, 1.2mm long by 1.6mm broad. Head provided with a short and broad retractile rostellum, surrounded by about 200 hooks arranged in a double row; hooks measured $6\ \mu$ long from the apex of the prong to the end of the dorsal root; ventral root $11\ \mu$ long; suckers surrounded by several rows of similar instable hooks of different form from those of *T. australis*. Genital pores unilateral; cirrus smooth, $21\ \mu$ long by $8\ \mu$ thick. Eggs arranged in egg sacs, 10-12 ova in a group, 40 to ca. 90 groups in a segment.

Since Krabbe's paper authors have as a rule accepted *T. tetragona* as a good species. Blanchard (1891B, pp. 433, 436) recognized *D. echinobothrida* as a distinct species; recognized *D. tetragona* (Molin) as valid, and made *T. bothrioplitis* a synonym of *D. tetragona*. Grassi & Rovelli (1892, p. 84) claim to have recognized both *T. tetragona* Molin and *T. bothrioplitis* Piana, and state that they have found both forms; *T. echinobothrida* Megnin they did not find, but they think it is possibly identical with *T. bothrioplitis* Piana. Railliet (1893, pp. 306-307) has followed Blanchard (1891).

From the above it is questionable whether Molin's specific name *tetragona* can be retained, unless the originals can be found and redescribed, for the description given by Molin is unrecognizable without the types. It might possibly be retained upon the ground that it is impossible to show that *T. tetragona* of present authors is not identical with *T. tetragona* Molin. I refrain temporarily from suppressing the name, as I hope the types may be re-examined. Krabbe's description of *T. tetragona* can hardly be taken into consideration in this question, as there is nothing to show that his specimens are identical with Molin's forms, and as Krabbe himself admits the uselessness of Molin's description and figures. The differences between the species described by these three authors (Megnin,

Piana, and Krabbe) are very slight and can for the most part be explained by contraction, insufficiency of material, and lack of details. The description of the hooks of the suckers of *T. echinobothrida* (as being so simple) should, I believe, be taken with reserve. The hooks are very small and are not easily studied. The fact that the genital pores are described as irregularly alternate by Megnin and unilateral by Piana and Krabbe is not, in my opinion, a serious difference in this genus. This opinion, radical as it may appear, is based upon the following observations:

The worms which Dr. Moore found producing a nodular disease in chickens give rise to the same pathological conditions as the form described by Piana, and agree with Piana's species in regard to the armed rostellum, the form and size of the hooks, both on the rostellum and suckers, and in almost every other character mentioned by Piana. The genital pores vary in different specimens. In some specimens they are entirely unilateral; in other specimens all but one or two may be on the same side of the worm; in fact it is often necessary to mount the entire strobila before it is possible to find an alternating pore; in still other specimens the pores are extremely irregular. The specimens with irregularly alternate genital pores agree in all other respects, so far as I can see, with Piana's form. The only difference between these specimens and Megnin's description appears to be (1) the number of hooks upon the rostellum (Megnin estimates them at about 100, the American forms possess ca. 200-208); (2) the form of the hooks on the suckers (possibly due to misinterpretation as the form of hooks Megnin describes is otherwise unknown in this group); and (3) the arrangement of the hooks on the suckers (in Megnin's form the largest hooks are in the center row, in the American form the largest hooks are those of the external row). This latter point of difference should not be given too much weight, as Megnin evidently made no microtome sections, and this point could hardly be established definitely otherwise.

In short, I incline to the belief that *tetragona*, *echinobothrida*, and *bothrioplitis* all represent one and the same species.

c. Genital pores unilaterial.

24. *DAVAINEA FRIEDBERGERI* (von Linstow, 1878) R. Blanchard, 1891.
(1878, *Taenia Friedbergerei* von Linstow [May 16]; ? 1878, *Taenia agama* Megnin [August]; ? 1878, *T. infundibuliformis* var. *phasianorum* Megnin [September]; 1888, *T. cesticillus* var. *phasianorum* Neumann.)

[Pl. XVIII, figs. 236-242.]

Diagnosis: trobila up to 200mm and more long by 2mm to 3mm wide. Head pyriform, 0.386mm broad by 0.30mm long; rostellum armed with a double row of hooks, 75 in each row, 12 μ long; suckers elliptical, armed with 4-5 rows of hooks, of which those on the middle row are smallest. Neck thin, 2mm to 3mm long. Anterior segments very short, the following gradually increase in length, the distal borders projecting so as to give a serrate appearance to the worm; in the posterior sixth the segments become moniliform, the last segments almost globular, frequently orange in color. Genital pores unilaterial, in middle of the margin. Ova 34 μ to 38 μ , oncospheric hooks 6.5 μ .

Development: Unknown; Friedberger and Megnin think that ants ("*Formica rufa?*") form the intermediate host, but experiments (Friedberger) were negative.

Hosts: Pheasants (*Phasianus colchicus*).

Geographical distribution: Germany and France.

Epidemics: Friedberger (1877, pp. 99-112) gives quite an extensive account of an outbreak of disease among pheasants which he attributed to the presence of the large number of tapeworms. A remarkable difference in the development of the young pheasants was noticed. Many of them became sick. The appetite remained good for the most part, but the animals grew dull and their feathers became ruffled. Suddenly the animals would wake up, run around, and take food; then they would quiet down again, close their eyes, and finally die.

Several post-mortems were made, and in all cases numerous tapeworms were found in the intestine. A

purulent, desquamative, intestinal catarrh and general anaemic condition were constant.

In August, 1878, Mègnin (1878A, p. 825) described as a new species (*T. agama*, afterwards (September, 1878B, p. 927) proposing to make it a variety (*T. infundibuliformis* var. *phasianorum*), a tapeworm which he found creating considerable trouble in the pheasantries near Paris and Fontainebleau. He gave the following characters:

Not over 60mm long; head small, with about 100 hooks; neck variable, long and filiform or short. Head not over 1-4mm broad; body 1mm to 3mm broad. Ovary fills the entire posterior half of the body without being localized in each segment; segments detach themselves as round discs, rather thick, and 1.7mm to 2mm in diameter, filled with eggs, collected in egg-sacs, about 7 eggs being present in each sac and about 80-100 sacs in each segment. Mègnin suggests that ants form the intermediate host.

The parasites injured their hosts by stopping up the bowels, but good results in treatment resulted from administering powdered Kamala mixed with the food. In the second note Mègnin states that the pores are unilateral.

Neumann (1888, p. 433; 1892A, p. 471; 1892B, p. 485) erroneously attributes the combination *Taenia cesticeillus* var. *phasianorum* to Mègnin (1887, p. 828); (this reference given by Neumann should undoubtedly read 1878, p. 928, as there were only 823 pages in the *Recueil* of 1887, and Mègnin apparently did not publish upon this species in 1887, i. e., so far as I have been able to trace). Railliet (1893, pp. 308-309) thinks it probable that Mègnin's species is identical with the worm described by Friedberger (1877) and named by von Linstow (1878).

25. DAVAINEA CRASSULA (Rudolphi, 1819) Railliet, 1893.

(1819, "T. sphenoccephala Rud.," 1810 of Rudolphi; 1819, T. crassula Rud.,
 (? 1789, Taenia serpentiformis i. T. turturis Gmelin; ? 1800, Alysseminthus Columbae Zeder; ? 1803, Halysis Columbae (Zeder, 1800) Zeder; ? 1810, Taenia sphenoccephala Rud.; ? 1891, Davainea Columbae (Zeder, 1800) R. Bl.)

[Pl. XVIII, figs. 243-246.]

Diagnosis: 200mm to 400mm long by 4mm broad. Head oval, rostellum obtuse, armed with about 60 hooks 10 μ to 11 μ long. Suckers rounded, armed with spines. Neck rather long. Anterior segments very short, the following segments a little longer and very wide, the posterior segments infundibuliform. Genital pores unilateral. Eggs united in groups of 10-12 in capsule. Development unknown.

Hosts: Domestic pigeon (*Columba livia domestica*); European rock pigeon (*Columba livia*); turtle dove (*Turtur turtur*); rock partridge (*Caccabis saxitilis*); ? tame duck (*Anas boschas dom.*); parrot (Psittacus erithacus) [perhaps *D. leptosoma*?]. Epidemics: None recorded.

Little more is known of this worm than the actual fact that the parasites described under the synonymy above are found in pigeons.

Zeder (1800, pp. 281-282) found a worm in the turtle dove which he named *Alysseminthus columbae*, changing the name three years later to *Halysis columbae*. This worm Rudolphi (1810, pp. 94-95) renamed *Taenia sphenoccephala*, so there is evidently no doubt that these three terms are synonymous. Rudolphi includes in his literature a worm which Goeze (1782, p. 394) mentioned in a footnote as having been found in the turtle dove and which Gmelin (1790, p. 3070) quoted from Goeze as *Tenia turturis* under *T. serpentiformis*. It is entirely an assumption that Goeze's form is identical with Zeder's worm, although Gmelin's name refers to Goeze's species. Rudolphi (1819, pp. 154, 506-508) described as *T. sphenoccephala*, evidently considering them identical with his *sphenoccephala* of 1810, some worms obtained by Bremser; these were preserved in the Berlin Museum, were restudied by Krabbe and pronounced identical with Rudolphi's supposed new species (1819, pp. 702-704) *Taenia crassula*, types of which Krabbe also examined.

T. sphenoccephala Rud., 1819 and *crassula* Rud., 1819, are evidently the earliest specific names to which we can refer with certainty, although the earlier names may be looked upon as probable but unidentifiable synonyms. According to page-priority *T. sphenoccephala* should stand, but as that is an uncertain earlier synonym, and as Railliet has already used *crassula*, I retain the latter name for the present.

There are certain other species which must be considered in connection with this genus, but most of which are but little known at present. The following characters are taken from Krabbe (1869) and Blanchard (1891, pp. 434-438):

A. Avian parasites:

Davainea struthionis (Parona, 1885)—Syn. 1810, *Taenia struthio cameli* Rudolphi, nomen nudum; 1819, *T. struthionis* Rudolphi, nomen nudum; 1819, *T. struthionis* Rudolphi, nomen nudum; 1885, *T. struthionis* Parona; 1893, *T. (Davainea) struthionis* von Linstow.) Parona's description of this parasite from ostrichs is not accessible to me.

Davainea insignis (Stuedener, 1877) R. Bl., 1891 (Syn. 1877, *Taenia insignis* Studener). 100mm to 130mm long; rostellum armed with double crown of minute hooks; suckers also armed with gyreniform hooks, smaller than those of the rostellum, points directed inward; host: *Carpophaga oceanica*. (Original not at my disposal, I quote from R. Blanchard, 1891, pp. 434-435.)

Davainea australis (Krabbe, 1869) R. Bl., 1891 (Syn. 1869, *Taenia australis* Krabbe). Strobila 400mm long, 1.2mm broad; rostellum with a double row of 340-360 hooks 12 μ to 14 μ long; suckers with hooks, 5 μ to 11 μ long; genital pores unilateral; host: *Dromaius Novae-Hollandiae*.

Davainea urogalli (Modeer, 1790) R. Bl., 1891. (Syn. after Krabbe 1869, p. 344; 1846, *Taenia tumens* Mehlis; 1850, *T. microscops*). Strobila 300mm long; rostellum with double crown of ca. 100 hooks 10-11 μ long; genital pores unilateral; hosts: *Tetrao urogallus*; *Tetrao tetrix*; *Cacabis saxatilis*; *Centrocerus urophasianus*; *Tetraogallus himalayanus*.

Davainea frontina (Dujardin, 1845) R. Bl., 1891. (Syn. after Krabbe, 1869; 1810, *Taenia crateriformis* Rudolphi, pars; 1845, *T. frontina* Dujardin.) Strobila 100mm long by 1mm broad; head 380 μ broad, rostellum 126 μ surrounded by a double crown of about 300 hooks 8 μ long; suckers 140 μ in diameter, armed

with a large number of small hooks; genital pores unilateral; hosts: *Orlulus galbula*, *Picus viridis*, ? *P. major*.

Davainea circumcincta (Krabbe, 1869) R. Bl., 1891. (1869, *Taenia circumcincta* Krabbe). Strobila 120mm long by 2mm broad; rostellum armed with a double crown of about 300 hooks 11 μ to 12 μ long; suckers armed; genital pores ?; eggs in egg sacs; host: *Ardea garzetta*.

Davainea leptosoma (Diesing, 1850) R. Bl., 1891. (1850, *Taenia leptosoma* Diesing.) Strobila 160mm long by 2mm broad; rostellum with a double (?) crown of hooks 11 μ to 13 μ long; hooks on suckers?; genital pores unilateral; host: *Psittacus erithacus*.)

B. Mammalian parasites

Davainea madagascariensis (Davaine, 1870) R. Bl., 1891. (1869, *Taenia madagascariensis* (Davaine), found in man.

Davainea Salmoni Stiles, 1895, found in *Lepus sylvaticus* and *Lepus melanotis*.

Davainea retractilis Stiles, 1895, found in *Lepus arizonae*.

Davainea contorta Zschokke, 1895, found in *Manis pentadactyla*.

Genus ECHINOCOTYLE R. Blanchard, 1891.

Diagnosis: Body short and thin. Head elliptical or subspherical, provided with a long rostellum capable of being completely retracted, and armed with a single row of 10 hooks; dorsal root much longer than feeble ventral root. Suckers armed with three series of hooks, whose prongs point posteriorly; one series situated in the longitudinal axis of the sucker, one series on the borders of each side. Type species, *E. Rosseteri* R. Bl., 1891.

Development: Cysticeroid (*Cercocystis*) in the cavity of Ostracodes.

Hosts: Domestic ducks (*Anas boschas dom.*); Bengal ducks.

26. ECHINOCOTYLE ROSSETERI, R. Blanchard, 1891.

(1891, "Taenia lanceolata Goeze" of Rosseter.)

[Pl. XIX, figs. 247-251.]

Diagnosis: Strobila (young specimens) 1.5mm long with 26 segments present; breadth, 0.18mm. Head subspherical, 85 μ to 155 μ long by 75 μ to 105 μ broad; rostellum long, with single crown of 10 hooks on extremity, hooks measure 31 μ to 38 μ long; suckers oblong, 67 μ to 90 μ by 27 μ to 32 μ ; muscular wall

much reduced, concavity nearly effaced and visible only on account of the hooks; 100-130 hooks on each sucker with base 7 μ to 8 μ , prong 3 μ to 4 μ . Neck 90 μ to 140 μ by 45 μ to 70 μ . One specimen with 20 segments, last segment 153 μ long by 195 μ broad. Genital pores near anterior corner of segment; cirrus pouch large, extending over half way across the segment.

Type specimens: Collection Rosseter; Collection Stiles.

Life history: Cysticercoïd in *Cypris cinera* Brady.

Hosts: Adults in tame duck (*Anas boschas dom.*), experimentally by Rosseter; Bengal duck (*Anas sp ?*) by Rosseter.

Geographical distribution: Canterbury (Kent), England, by Rosseter.

Rosseter (1891A., p. 438) presented a communication to the Royal Microscopical Society stating that he had infected ducks with a cysticercus and thus raised *Taenia lanceolata*. There were from 180-200 minute hooks on the head. A fuller account is given in his second paper, in which Rosseter (1891B., pp. 224-228) states that he examined the Cypridae of a pond near Canterbury for cysticercoïds, and noticed that *Cypris cinera* Brady contained two species of parasites. One was the larval form of *Taenia coronula* (= *Dieranotaenia coronula*); a less common form occurred in about 2 per cent. of those examined.

The latter form is oval, invaginated anteriorly and provided with a long caudal appendage; cyst is not fenestrated. While developing, its substance submits to active contractions, but when fully developed to a point where it can be transmitted to vertebrates it remains quiescent; rostellum invaginated, bearing a crown of 10 hooks 32 μ long, of which three-fifths are occupied by the dorsal root; ventral root rather truncate; prong short and slightly curved. Suckers oval, armed with about 132 hooklets, arranged symmetrically around the suckers; the hooks are very delicate, about 5 μ long.

A large number of crustaceans were fed to a duck daily from February 19 to March 21. Upon killing the duck a considerable number of tapeworms, which showed the same characters as the cysticercoïd, were found in the upper portion of the small intestine. The largest was 1.27mm long; the greater number of specimens possessed 17 segments. Male organs were well developed, but the female organs were not visible. Rosseter believed that the adult parasite which he had thus developed was *Taenia lanceolata* Goeze.

Blanchard (1881B., pp. 420-428, figs. 1-2) examined some of Rosseter's material and recognized that this form was not identical with *T. lanceolata*. He compared it with all the

other species recorded for ducks, and with other avian tape-worms possessing 10 hooks on the head and unilateral genital pores, and concluded that Rosseter's cestode represented the type (*E. Rosseteri* R. Bl.) of a new genus (*Echinocotyle* R. Bl.). He added that Rosseter had recently informed him that he had sometime previous to the discovery of the cysticeroid placed some ducks imported from Calcutta on the pond in which he had discovered the parasites; upon making an autopsy on one of these ducks Rosseter found it infested with *Echinocotyle*. Blanchard concluded from this that the Bengal ducks imported the parasites with them and infected the pond in question. Blanchard discusses the adult worm, and from this description the specific diagnosis given above is written. Rosseter (1892, pp. 361-366, Pls. XXII-XXIII) again discusses this species and figures it.

Regarding the supposed introduction of this parasite into England by ducks from Calcutta, the idea advanced by Blanchard seems very plausible. At the same time however, Blanchard states (p. 424) that neither he nor Rosseter have been able to examine any adult specimens. Now, had the Bengal ducks brought the parasites with them, would not the duck examined by Rosseter have been infested, in all probability, with the adult form, although they unquestionably could also have become infected with a new generation from the crustaceans? I hardly see why the fact that two Bengal ducks were placed upon this pond a short time before Rosseter discovered the parasites in the crustaceans bears anything more than a possible (but not necessary or probable) connection with the presence of this species in England; the parasite has not yet been recorded from Bengal.

Genus *OPHYOCOTYLE* Friis, 1869.

[Pl. XIX, figs. 252-255.]

Diagnosis: Head enlarged anteriorly, without rostellum, but with several infundibula whose borders are armed with a very large number of small hooks; suckers armed with several transverse rows of hooks; genital pores irregularly alternate. Type species: *O. proteus* Friis, 1869. Development unknown.

Hosts: Birds.

No members of this genus are known from domesticated birds or from very closely allied wild birds,

but two species, *O. proteus* Friis, 1869 (Syn. 1875, *O. Lacazii* Villot), and *O. insignis* Lonnberg, are described from wild birds.

{ Infundibulum divided into 5 parts; strobila 10mm
to 25mm long, with about 19 segments; hooks on
suckers arranged in three rows; found in
Tringa alpina, Charadrius hiaticula, Calidris
arenaria, Larus canus, Limosa rufa*O. proteus*.
{ Infundibulum not divided, but its order undu-
lated;; strobila 50mm to 100mm and more long;
{ found in Haematopus ostreaeagus*O. insignis*.

GENUS INCERT. TAENIA S. L.

A number of other tapeworms have been described from domesticated fowls, but their generic position can not be determined with the data at hand.

27. TAENIA CANTANIANA Polonio, 1860.

[Pl. XX, fig. 256.]

Polonio (1860, pp. 21-22) describes a supposed new species of tapeworm as follows:

1. *T. Cantaniana* Polonio. Caput globosum, centro unbonatum; acetabulis cruciatim oppositis ob majorem capitis circum; collum nullum; corpus retrorsum dilatatum, articulis supremis campanaeformibus, sequentibus campanaeformibus imbricatis trapezoidalis; aperturæ genitales marginales. Long. 0.013.

Habitaculum: Meleagris Gallopavo, in intestina, Octobri Patavi (Polonio).

In his second paper (1860, p. 221) this form is cited and is figured on Taf. VII, 2 (vide Pl. XIX, fig. 256 of this paper). The pores are evidently unilateral. Von Linstow (1878, p. 122) includes this among the parasites of the pheasant *Phasianus colchicus*, but does not give his authority.

All subsequent remarks upon this species are based upon Polonio's statements. Blanchard (1891B pp. 439-440) thinks this form may possibly belong to the genus *Davainea*, and takes the following characters from Polonio's figure:

Suckers large and round; the head seems to be surmounted by a very short rostellum, probably retractile. The neck is quite long, distinctly separated from the head. Segments num-

ber about 60. Genital pores unilateral; cirrus pouch visible in twenty-sixth to forty-fifth segments; forty-sixth to sixtieth segments are gravid. The eggs, so far as can be judged from the figure, are scattered and isolated as in *D. proglottina*.

I can not see that Polonio's description and figure are sufficient to compel or even to allow the recognition of this specific name. If the types can be obtained and restudied, it would of course be proper to re-describe them under the specific name *cantaniana*, but until those types can be found it is useless to waste time speculating as to the possible generic or specific relations of the parasite. I propose to ignore the species entirely, on the ground that the specific name has not been accompanied by a recognizable description or figure.

28. *Taenia Delafondi* Railliet, 1892.

(1891, "Taenia spheenocephala Rud.," 1810, of Megnin.)

[Pl. XX, figs. 257-262.]

Diagnosis: Strobila 7cm to 13cm long, 3mm to 4mm broad. Head hemispherical, rostellum and hooks absent. Suckers large. Neck 0.5mm or more long, at first as broad as head, enlarging distally. Proximal segments very short, following segments slightly longer and very broad, lateral margins convex. Genital pores irregularly alternate, situated near the anterior quarter of the lateral border; two lateral rafeified uteri visible as two longitudinal rows of opaque spots; another submedian series formed by recaptaculum seminis; testicles rather numerous. Ova globular 62 μ to 65 μ hooks of oncosphere 11 μ long. Development: Unknown.

Type specimens: In Alfort collection.

Hosts: Domestic pigeons (*Columba livia domestica*) by Delafond, Railliet, Megnin, and von Linstow. Geographical distribution: France and Germany.

This appears to be a very peculiar form. Its systematic position, as well as its synonymy and anatomy, seem to me extremely uncertain.

Dujardin proposed this name for a tapeworm found in chickens, but the description is so insufficient that the species should be ignored entirely. The original description reads :

"Je proposerai de nommer *Taenia exilis* un autre taenia de la poule, bien different aussi des precedents, mais dont je n'ai pas encore eu la tete; il est long de 20mm a (?), large de 0.15mm en avant, et de 0.95mm en arriere, forme d'articles courts, transverses; les orifices genitaux sont unilateraux; les penis sont lisses, assez longs, larges de 0.015mm precedes par une ample vesicule seminale, remplie des spermatozoides en echeveau; les oeufs, presque globuleux, ont trois enveloppes; l'externe longue de 0.056mm a 0.065mm; la moyenne de 0.054mm; l'interne de 0.032mm; l'embryon, long de 0.025mm, a des crochets long de 0.0125mm."

Airlong (1875, pp. 427-431) claims to have found the same worm, although it is not at all evident why he should think his form identical with Dujardin's species. He gives the following characters:

Head is 0.48mm long by 0.60mm broad, suckers orbicular 0.20mm diameter; rostellum short 43 μ in diameter, with a simple crown of 60 hooks 8 μ long; neck 5mm long by 0.15mm broad; segments much broader than long; anterior segments 0.33mm to 0.37mm by 49 μ to 50 μ , then 1mm by 0.12mm; middle segments 1.5mm (anterior border) to 1.8mm (posterior border) by 0.6mm. Genital pores unilateral in anterior third of segment. Penis 36 μ by 6 μ . Eggs globular, outer membrane 58 μ to 64 μ , inner membrane 30 μ to 32 μ ; hooks of oncosphere 16 μ .

30. *TAENIA IMBUTIFORMIS* Polonio, 1860.

(1893, *Mesocestoides imbutiformis* (Polonio, 1860) Railliet.)

[Pl. XX, fig. 263.]

Diagnosis: 8mm long, head small, suckers circular. Neck absent. Posterior portion of strobila thick, anterior segments linear; following segments bell or funnel shaped; posterior segments linear bell-shaped. Genital pores situated on one of the surfaces of the segments. Development: Unknown.

Hosts: Wild geese (*Anser anser*) by Polonio, 1860; von Linstow (1878, p. 155) records it in domesticated ducks (*Anas boschas dom.*), but I can not trace his authority.

Geographical distribution: Padua (by Polonio). Polonio is apparently the only author who has seen this worm.

Polonio (1860A, p. 22) gives the following as original diagnosis:

3. *T. imbutiformis* Polonio. Corpus retrorsum incrassatum; caput minimum; acetabulis orbicularibus anticis; collum nullum; articuli supremi lineares, posteriores campanulato-imbutiformes, ultimi campanulati, aperturæ genitales laterales ellipticae. Long, 0.01.

Habitaculum: *Anser ferus*, in intestinis. Octob. et Nov. Patavii (Polonio).

Polonio (1860B, p. 121) simply mentions the parasite in his list, and gives a very unsatisfactory figure of the worm. In this figure a prominent body near the lateral margin is looked upon as the genital pore. This body has much more the appearance of a testicle, cirrus pouch, or of a receptaculum seminis than it has of a genital pore. I am therefore inclined to doubt very much whether this species is correctly placed by Railliet (1893, pp. 313-314) in the genus *Mesocestoides*. Furthermore, the form is altogether too insufficiently described to be recognizable. The figure shows extreme contraction near the head.

31. *TAENIA MEGALOPS* Nitzsch, 1829.

(1825, *Taenia anatis marila* Creplin.)

[Pl. XX, figs. 264-267.]

Diagnosis: Strobila up to 52mm long by 0.5mm broad proximally, and 0.75mm broad distally. Head very large, rather tetragonal, 1.4mm broad; suckers 0.57mm to 0.64mm in diameter; rostellum absent (?) or not prominent and (?) without hooks. Anterior segments very short, 12 times as broad as long; posterior segments twice as broad as long, "narrowed at the base, spread in form of a bell," colored yellowish by small longitudinal lines. Genital pores unilateral. Penis smooth, tubular, 70 μ by 23 μ "situated on a very prominent and swollen tubercle." Ova globular with 2 membranes; outer membrane 47 μ , inner 38 μ in diameter; oncosphere 32 μ , hooks 15 μ ; the

eggs are scattered through the median portion of the segments. Development: Unknown.

Hosts: Tame duck (*Anas boschas* dom.); Brazilian teal (*A. braziliensis*); European teal (*A. crecca*); pintail (*Dafila acuta*); white-headed duck (*Erismatura leucocephala*); tufted duck (*Aythya fuligula*); European scaup duck (*A. marila*); African teal (*A. nyroca*).

The chief character for this worm is the large head, but it seems extremely doubtful whether this should be taken as the basis of a species. The parasite certainly can not be recognized with certainty from the present description, and should be considered as a doubtful species until some of the original specimens can be restudied.

32. *TAENIA NIGROPUNCTATA* Crety, 1890.

[Pl. XX, figs. 268-270.]

Diagnosis: Strobila to 140mm in length. Head small, 0.382mm broad; (?) rostellum and hooks absent; suckers 0.166mm by 0.137mm. Neck short, about same breadth as head. Young segments rectangular, 0.5mm long by 1mm broad; older segments almost quadrangular, 2mm long by 1.5mm broad; mature segments 2.5mm to 3mm long by 1mm broad. Genital pores irregularly alternate, slightly posterior to the middle of the margin. Male genitalia: in posterior portion of segment, testicles 12 in number, diameter 58 μ , equally distributed at sides of the uterus; vas deferens convoluted in its lateral portion and inflated to vesicula seminalis 0.176mm by 0.098mm within the cirrus pouch; cirrus pouch pyriform, 0.313mm by 0.137mm. Female genitalia: Ovary vitellogene gland, shell gland? At anterior border of the segment a spot is observed in the median line; from this a median stem runs distally and is divided near the height of the pore into two portions; the posterior portion, at least, represents the uterus. Ova 62 μ , with 3 shells; oneosphere 46 μ by 40 μ ; hooks 15 μ .

Host: Migratory quail (*Coturnix coturnix*).

33. *TAENIA* sp. Conard, MS.

[Pl. XXI, figs. 275-276.]

Mr. Henry S. Conard (Haverford College) has recently studied some tapeworms from chickens, evi-

dently finding more than one species. He has kindly placed the following abstract of his work upon one of these forms at my disposal, prior to the publication of his article.

Head round-conical, somewhat four-angled, broader than long (0.098mm to 0.136mm long; 0.11mm to 0.192mm broad). Acetabula round to elliptical, 0.06mm in diameter, directed slightly forward. Neck distinct, terete, 0.5cm long. Proglottides trapezoidal, broader than long. Genital apertures marginal, always on the right-hand side of the segment, slightly in front of the middle. The male organs comprise a testis; vesicula seminalis, cirrus sac and cirrus, vesicula and cirrus being the most prominent organs of the whole segment. Cirrus very short, roughened with minute prickles about perpendicular to its surface. Female organs consist of a narrow vagina, large receptaculum seminis, and a common ovary and uterus (See von Linstow, 1893). Vagina and cirrus sac are in the same transverse plane and pass dorsal to both longitudinal canals. Length 35mm; breadth 0.046mm to 0.47mm; thickness 0.046mm to 0.113mm. Number of segments about 600, becoming as much as 0.39mm long. Egg about 0.026mm in diameter; embryos ellipsoidal, 0.016mm in diameter; embryo ellipsoidal, 0.016mm by 0.0225mm; hooks about 0.008mm long.

Hab: In small intestine of common fowl, shortly back of gizzard.

Mr. Conard looks upon this form as a species of *Davainea* "with unilateral pores," although he has not as yet found any hooks upon the head. Final decision regarding the form must be reserved until the appearance of Mr. Conard's paper.

FIMBRIARIA Frollich, 1802.

1892, Epision Linton.)

[Pl. XXI, fig. 271.]

This genus was proposed first by Frollich, and later by Linton, for tapeworm with an anterior hammer-like extremity. The scolex is generally (? always) wanting. Three species *F. malleus* (Goeze, 1782) Frollich, *F. mi-*

trata, and *E. plicatus* have been described, but most authors include them all under the general term *Taenia malleus*, which some writers look upon as a pathological condition rather than a distinct species or genus.

34. *E. malleus* has been recorded from a large number of wild birds as well as from domesticated fowls, but so far as known it does not play any important pathogenic role. (See Dujardin, p. 587, for the earlier literature.)

IDIogenES Krabbe, 1868.

[Pl. XXI, figs. 272-274.]

The genus *Idiogenes* with the type and only species *I. otidis* was proposed by Krabbe for a tapeworm in which the scolex is wanting; the anterior segments become calciform and function as a pseudo-scolex. (For an anatomical description see Zschokke, 1889, pp. 114-127, Pl. III, figs. 39-47.)

This avian tapeworm had not yet been recorded from poultry.

-ADDENDUM.

During the final proof reading of this paper, I have received a recent article by Railliet (1896), in which several new propositions are made concerning certain parasites mentioned in this report.

Dipylidiinae: The name of the subfamily, *Cystodotaeniae*, is changed to *Dipylidinae*. This change is in accordance with the International Code and should be adopted, the word, however, being written *Dipylidiinae*.

Choanotaenia: Railliet proposes a new genus, with *Taenia infundibuliformis* Goeze as type, in the following words:

Le *Taenia infundibuliformis* Goeze, que j'avais place provisoirement dans le genre *Drepanidotaenia*, s'en distingue par le grand nombre des testicules, et d'une maniere generale par la constitution de l'appareil reproducteur (Crety). Il merite donc de devenir le type d'un nouveau genre *Choanotaenia* (de *χάων* entonnoir). Ch. *infundibuliformis*, intestin de la poule. (P. 159.)

Although I recognized the great difference in organization between *T. infundibuliformis* (as described by Crety) and the other species of *Taenia* which have been placed in *Drepanidotaenia*, and am inclined to consider it generically distinct from these worms (see p. 612), and although I have the highest regard for the opinion of my colleague and for his keen foresight, particularly in systematic questions, I prefer to reserve judgment upon his new genus until its type species and a few allied forms are more thoroughly understood, especially as it appears to me that *T. Infundibuliformis*, as determined by various authors, is rather a heterogenous and collective species.

Dicranotaenia sphenoides: Railliet correctly suppresses the specific name *cuneata* Linstow nec Batch (see p. 595).

EXPLANATION OF CHART.

In the following chart I have given the records of the tapeworms found in the domesticated poultry and in the allied wild birds. The sign \mathbb{C} signifies that the parasite is recorded only for domesticated birds, \times for wild birds. \odot both domesticated and wild birds.

The names of the hosts are given at the left, those of the parasites at the top. The first row of numbers refers to the numbers in the A. O. U. check list of North American birds, the second column of numbers





to the corresponding numbers in von Linstow's Compendium of Helminthology (1878, 1889).

For the revision of the host names I am indebted to Drs. Fisher and Palmer, of the Division of Ornithology. As many of the host names used by helminthologists are not used by modern ornithologists, these gentlemen have traced out the proper names of the birds in question from the host names given in helminthological articles.

In noting the species of parasites under the various hosts, it has been extremely difficult to determine what records should be accepted and what ones should be rejected. As nearly all of the older records are based upon determinations by external form instead of internal anatomy, I believe the time has come when we should begin an entirely new series of records of hosts.¹

All records of tapeworms, except in the case of type specimens where the determination has been made solely upon external form, should, I believe, be taken only as approximate and provisional.

¹This can easily be accomplished if helminthologists will designate all new records in some way. In the Revision of the Adult Cestodes of Cattle, Sheep, and Allied Animals, and also in my recent article on *Fasciola magna*, I have commenced such a new series of host determinations for the parasites of the domesticated animals by starring (*) the parasites under each host in those cases where I have examined the species of parasites from the host in question (or from material said to have come from that host, as *T. denticulata*, for instance. This latter record is, in my opinion, erroneous.)

DESCRIPTION OF PLATES.

Plate I, Figs. 1-11.—*Cotugnia digonopora*.

- Fig. 1. Head and neck. x8.
 Fig. 2. Head and neck in press preparation. Zeiss 2, A.
 Fig. 3. View of armed rostellum, enface, press preparation; cgl., ? glandular cells of rostellum. Zeiss 3, C.
 Fig. 4. View of hooks on rostellum. Zeiss 2, 1-12.
 Fig. 5. Side view of isolated hook. Zeiss 3, 1-12.
 Fig. 6. Four young segments with genital Anlagen. x8.
 Fig. 7. Three young segments: d., vas deferens; ov., ovary. Zeiss, 1, a³.
 Fig. 8. Segments from middle of strobila with organs more completely developed: d., vas deferens; t., testicles; tp., cirrus pouch; ov., ovary. Zeiss I, a³.
 Fig. 9. Still older segments in which the "ovarie capsules" (=egg sacs) are developing: ag., genital pore; co., "ovarie capsules"=egg sacs; d., vas deferens; ov., ovary; p., cirrus; tp., cirrus pouch; v., vagina. Zeiss 1, a³.
 Fig. 10. End segments with oncosphere: ag., genital pore; co., eggs.
 Fig. 11. Longitudinal section of mature segment: co., "ovarie capsules"=egg sacs; em., oncosphere; ie, eggshell; g., eggshell; pr., parenchyma. Zeiss 2, 1-12.

All figures from Pasquale, 1890, figs. 1-11.

Plate II, Figs. 12-29.—*Cotugnia bifaria* and *Amabilia lamelligera*.

[Figs. 12-17.* *Cotugnia bifaria*, after Monticelli, 1891, Taf. VIII, figs. 8-13.]

- Fig. 12. Head and anterior segments, greatly enlarged. Monticelli, fig. 8.
 Fig. 13. Young segments, enlarged on same scale. Monticelli, fig. 9.
 Fig. 14. Middle segments enlarged on same scale. Monticelli, fig. 10.
 Fig. 15. End segments, enlarged on same scale. Monticelli, fig. 11.

Fig. 16. Segment mounted in glycerine and acetic acid, showing genital organs; ag., genital pore; df., vas deferens; ov., ovary; rse., vesicula seminalis; t., testicles; v., vagina. Greatly enlarged. Monticelli, fig. 12.

Fig. 17. Armed cirrus, greatly enlarged. Monticelli, fig. 13.

[Figs. 18-20. *Amabilia lamelligera*. Owen's (1835) original figures.]

Fig. 18. Adult strobila, natural size. Owen's fig. 21.

Fig. 19. "Four segments of the same magnified." Owen's fig. 22.

Fig. 20. "Longitudinal section of 3 posterior segments, showing the ova collected near the base of the lemniscus." Owen's fig. 23.

Plate III, Figs. 21-36.—*Dicranotaenia coronula*, *Dicranotaenia aequabilis*, *Dicranotaenia furcigera*, and *Taenia conica*.

[Figs. 21-28. *Dicranotaenia coronula*: 21-24 after Krabbe, 1869; 25-28 after Mrazek, 1890.]

Fig. 21. Anterior portion of scolex with hooks. x240. After Krabbe, 1869, Tab. VIII, fig. 216. Host: Domesticated duck.

Fig. 22. Isolated hook. x920. After Krabbe, 1869, Tab. VIII, fig. 217.

Fig. 23. Isolated ovum with oncosphere. x240. After Krabbe, Tab. VIII, 1869, fig. 218.

Fig. 24. Isolated hook. x920. After Krabbe, 1869, Tab. VIII, fig. 219. From Coll. Siebold. Host: European golden eye (*Glaucionetta clangula*).

[Figs. 25-28. Cysticeroids from *Cypris ovum* and *C. compressa*.

Fig. 25. Fully developed larva, showing the scolex invaginated in the cyst; and the long tail with the 6 oncospheric hooks; ex., excretory system; h., cuticle; cu? "pores of the cuticle" or ? muscles; hp., hypodermis; p., parenchyma of neck, with calcareous corpuscles. After Mrazek, 1890, Tab. V, fig. 11.

Fig. 26. Another view of a cysticeroid. After Mrazek, 1890, Tab. V, fig. 12.

Fig. 27. a-c. Isolated hooks. After Mrazek, 1890, Tab. V, fig. 13a-c.

Fig. 28a-c. Oncospheric hooks. After Mrazek, 1890, Tab. V, fig. 14a-c.

[Figs. 29-30. *Dicranotaenia aequabilis*.]

Fig. 29. Five hooks from the rostellum. x240. After Krabbe, 1869, Tab. VIII, fig. 212, from Rudolphi's original material in the Berlin Museum.

Fig. 30. Isolated hook from the rostellum. x920. After Krabbe, 1869, Tab. VIII, fig. 213, from specimen in Creplin's collection.

[Figs. 31-34. *Dicranotaenia furcigera*.]

Fig. 31. Isolated hook from the rostellum. x20. After Dujardin, 1845, Pl. IX, Fig. A. Host: Wild duck.

Fig. 32. Isolated hook from the rostellum. x920. After Krabbe, 1869, Tab. VIII, fig. 206, from Nitzsch's original material. (See Rudolphi, 1819, p. 528.) Host: Mallard.

Fig. 33. Ovum with oncosphere. x240. After Krabbe, 1869, Tab. VIII, fig. 207, from Nitzsch's original material.

Fig. 34. Ten hooks on rostellum. x240. After Krabbe, 1869, Tab. VIII, fig. 205, from material collected in Iceland in 1863. Host: Mallard.

Fig. 35-36. *Taenia conica*=? *Dicranotaenia furcigera*.]

Fig. 35. Natural size: a, head; b, rostellum; c, body. After Molin, Tab. VII, fig. 1.

Fig. 36. Enlarged. After Molin, 1861, Tab. VII, fig. 2.

Plate IV, Figs. 37-53.—*Dicranotaenia sphenoides* and *Drepanidotaenia lanceolata*.

Figs. 37-42. *Dicranotaenia sphenoides*.

Fig. 37. Strobila, natural size. After von Linstow, 1872, Taf. III, fig. 9a, of *Taenia cuneata*.

Fig. 38. Scolex and anterior segments, enlarged. After von Linstow, 1872, Taf. III, fig. 9, of *T. cuneata*.

Fig. 39. Isolated hook from the rostellum. After von Linstow, 1872, Taf. III, fig. 10, *T. cuneata*.

Fig. 40. Cysticercoid from an earthworm. Koritska, oc. 3, obj. 4. After Grassi & Rovelli, 1892, Tav. IV, fig. 12.

Fig. 41. Transverse section of the same: cav., "cavity of the gastrula;" cis., cyst; par. est., external wall; par. int., internal wall; ros., rostellum; ven., sucker. Koritska, oc. 3, obj. 7. After Grassi & Rovelli, 1892, Tav. IV, fig. 11.

Fig. 42. Three hooks (b, c, and d) from rostellum of *T. cuneata*; Koritska, oc. 3, obj. 8; a fourth hook (a) greatly enlarged. After Grassi & Rovelli, 1892, Tax. IV, fig. 13.

[Figs. 43-53. *Drepanidotaenia lanceolata*.]

Fig. 43. Original type figure. After Bloch, 1782, Tab. 1, fig. 5.

Fig. 44. Anterior portion, enlarged. After Bloch, 1782, Tab. 1, fig. 6.

Fig. 45. Worm from a goose. Natural size. After Goeze, 1782, Tab. XXIX, fig. 3.

Fig. 46. The eight hooks upon the rostellum. x240. After Krabbe, 1869, Tab. VI fig. 143.

Fig. 47. Two isolated hooks. x920. After Krabbe, 1869, Tab. VI, fig. 144.

Fig. 48. Extruded cirrus. After Feuereisen, 1868, Taf. X, fig. 8.

Fig. 49. Cirrus pouch with cirrus. After Feuereisen, 1868, Taf. X, fig. 9.

Fig. 50. Isolated segment: a, cirrus pouch; c, testicle; i, vitellogene gland; k, ovary; m, receptaculum seminis and vagina. After Feuereisen, 1868, Taf. X, fig. 17. Some misinterpretations have undoubtedly been made in this figure. The genital system must be restudied.

Fig. 51. Head and anterior segments. x100. After Railliet, 1886, fig. 163A; also Railliet, 1893, fig. 195A.

Fig. 52. Ovum with oncosphere. x300. After Railliet, 1886, fig. 163B; also Railliet 1893, fig. 195 B.

Fig. 53. Head and anterior segments. x100. After Megnin, 1881, Pl. IV, fig. 3.

Plate V, Figs. 54-66.—*Drepanidotaenia lanceolata* and *Drepanidoteania fasciata*.

[Figs. 54-55. *Drepanidotaenia lanceolata*.]

Fig. 54. Transverse section of segment. x20. After Megnin, 1881, Pl. IV, fig. 6.

Fig. 55. Isolated cirrus. x50. After Megnin, 1881, Pl. IV, fig. 7.

[Figs. 56-66. *Drepanidotaenia fasciata*.]

Fig. 56. Rostellum with 5 of the 8 hooks. x240. After Krabbe, 1869, Tab. VII, fig. 156.

Fig. 57. Isolated hook. x920. After Krabbe, 1869, Tab. VII, fig. 157.

Fig. 58. Head with extended rostellum possessing 8 hooks. After Feuereisen 1868, Taf. X, fig. 1. ("*T. setigera*" = *Drep. fasciata*.)

- Fig. 59. Isolated hook. After Feueereisen, 1868, Taf. X, fig. 2.
 ("T. setigera"=Drep. fasciata.)
- Fig. 60. Cirrus pouch. After Feueereisen, 1868, Taf. X, fig. 4.
 ("T. setigera"=Drep. fasciata.)
- Figs. 61-62. Cirrus from above and from the side. After
 Feueereisen, 1868, Figs. 5, 6. ("T. setigera"=Drep.
 fasciata.)
- Figs. 63-66. Isolated segments: a, cirrus pouch; b, genital pore;
 c, testicles; d, cirrus; e, vas deferens and vesicula
 seminalis; g, vagina; h, genital cloaca; i, vitellogene
 glands; k, ovary; m, receptaculum seminis; n, uterus
 (?). After Feueereisen, 1868, Taf. X, figs. 10-13. Feuer-
 eisen has probably misinterpreted some of these
 organs and they should be restudied.

Plate VI, Figs. 67-76.—*Drepanidotaenia fasciata*.

- Fig. 67. Body of *Cyclops agilis*, containing a larval tapeworm.
 After Mrazek, 1890, Tab. V, fig. 1.
- Fig. 68. Larval tapeworm, with enormously long tail, isolated
 from the crustacean. After Mrazek, 1890, Tab. V,
 fig. 2.
- Fig. 69. (? Side view.) After Mrazek, 1890, Tab. V, fig. 3.
- Fig. 70. Cysticeroid, with anterior portion of the tail. After
 Mrazek, 1890, Tab. V, fig. 5.
- Figs. 71-72. Hooks from rostellum, greatly magnified. After
 Mrazek, 1890, Tab. V, figs. 7-8.
- Figs. 73-75. Hooks as seen in position on the rostellum. After
 Mrazek, 1890, Tab. V, figs. 6 and 9a-b.
- Fig. 76. After Mrazek, 1890, Tab. V, fig. 10.

Plate VII, Figs. 77-91.—*Drepanidotaenia fasciata* and *Drepani-
 dotaenia gracilis*.

[Figs. 77-79. *Drepanidotaenia fasciata*.]

- Fig. 77. Cysticeroid with anterior portion of tail. After
 Mrazek, 1890, Tab. V, fig. 4.
- Fig. 78. Cysticeroid with extended head; the oncospheric hooks
 are still visible in the tail. After Mrazek, 1891, Tab.
 V, fig. 1.
- Fig. 79. Isolated hook from rostellum. After Mrazek, 1891,
 Tab. V, fig. 2.

[Figs. 80-91. *Drepanidotaenia gracilis*.]

- Fig. 80. "*Taenia collo longissimo*." After Bloch, 1872, Taf. III,
 fig. 3. Is perhaps identical with *Drep. gracilis*.

- Fig. 81. Head of same, enlarged. After Bloch, 1782, Taf. III, fig. 4.
- Fig. 82. Anterior portion of head, showing the arrangement of the hooks upon the rostellum. x240. After Krabbe, 1869, Tab. VIII, fig. 154.
- Fig. 83. Isolated hook. x920. After Krabbe, 1869, fig. 155.
- Fig. 84. Strobila, natural size. After von Linstow, 1872A, Taf. XXI, fig. 3. Host: Goosander.
- Fig. 85. Head. x90. After von Linstow, 1872A, Taf. XXI, fig. 5.
- Fig. 86. Isolated hook. x500. After von Linstow, 1872A, Taf. XXI, fig. 2.
- Fig. 87. End of proglottid with extruded cirrus. x150. After von Linstow, 1872A Taf. XXI, fig. 4.
- Fig. 88. Head of *Taenia gracilis tadornae* from the common sheldrake (*Tadorna tadorna*). After Lonnberg, 1889, Pl. I, fig. 1.
- Fig. 89. Free cysticeroid in the perch (*Perca fluviatilis*). x350. After von Linstow, 1872A, Pl. XXI, fig. 1.
- Fig. 90. Excretory system of the head and neck. After Mrazek, 1891, Tab. V, fig. 16. Zeiss 3, D.
- Fig. 91. End cell of excretory system. After Mrazek, 1891, Tab. V, fig. 17. Zeiss 3, F.

Plate VIII, Figs. 92-99.—*Drepanidotaenia gracilis*.

- Fig. 92. A cysticeroid in process of development. A differentiation is noticed into the body and the tail, and a small knob is noticed on the anterior extremity. The 6 oncospheric hooks are present in the tail. After Mrazek, 1891, Tab. VI, fig. 25.
- Fig. 93. Another stage of the cysticeroid. An invagination is noticed on the anterior extremity; the middle portion of the body is occupied by a cavity filled with a spongy tissue. After Mrazek, 1891, Tab. VI, fig. 26.
- Fig. 94. Cysticeroid with the anterior portion of the tail: h., peripheral hyaline layer; e., excretory canals; pr., vibratory cells (see Pl. VII, fig), "Pronephriostomes." Zeiss 3, D. After Mrazek, 1891, Tab. V, fig. 13.
- Fig. 95. Normal form of hook. Zeiss 3, F. After Mrazek, 1891, Tab. V, fig. 14.
- Figs. 96-98. Three hooks, with variously arranged chitin. Zeiss 3, D. After Mrazek, 1891, Tab. V, fig. 15a-c.
- Fig. 99. A cysticeroid with extended head: r., rostellum; c., cyst; pr., tail with oncospheric hooks. Zeiss 1, D. After Mrazek, 1891, Tab. VI, fig. 18.

Plate IX, Figs. 100-111.—*Drepanidotaenia anatina*.

- Fig. 100 Rostellum with 5 of the 10 hooks. x240. After Krabbe, 1869, Tab. VI, fig. 114.
- Fig. 101. Isolated hook. x920. After Krabbe, 1869, Tab. VI, fig. 115.
- Fig. 102. Ovum. x240. After Krabbe, 1869, Tab. VI, fig. 116.
- Fig. 103. Transverse section of a portion of one segment, to show the anatomy: h., testicles; vd., vas deferens; bk., fertilization canal; ut., uterus; lm., longitudinal muscles; s. bl., vesicula seminalis; gz., ganglion cells; p. s., praeputial sac; c., cirrus; cb., cirrus pouch; l. k., longitudinal canals; (small dorsal canal; large ventral canal); r. sem., receptaculum seminis; ov., ovary; eig., oviduct; d. st., vitellogene gland; d. g., vitello-duct; sch. dr., shell gland; af., canal of same. After Schmidt, 1894, Taf. VI, Fig. C.
- Fig. 104. Ovum with oncosphere. After Schmidt, 1894, Taf. VI, fig. 1.
- Fig. 105. The oncosphere has developed into a round mass in which a cavity appears. After Schmidt, 1894, Taf. VI, fig. 2.
- Fig. 106. Stage in which the round mass has become elongate; ebl., terminal vesicle. After Schmidt, 1894, Taf. VI, fig. 3.
- Fig. 107. Stage with anlage of the rostellum and suckers; the body has become constricted into the scolex, cyst, and tail; the excretory system is partly developed. After Schmidt, 1894, Taf. VI, fig. 4.
- Fig. 108. Transverse section in the second period of development. After Schmidt, 1894, Taf. VI, Fig. a.
- Fig. 109. Longitudinal section of a later stage of the second period of development. After Schmidt, 1894, Taf. VI, Fig. b.
- Fig. 110. Extended cysticeroid; s., anterior point of rostellum; r., rostellum; ex., excretory organ; h. r., posterior rostellum sac., ebl., terminal vesicle. After Schmidt, 1894, Taf. VI, Fig. B.
- Fig. 111. Two isolated hooks from the rostellum. After Mrazek, 1891, Tab. VI, fig. 20.

Plate X. Figs. 112-124b.—*Drepanidotaenia anatina* and *Drepanidotaenia sinuosa*.

[Figs. 112-115. *Drepanidotaenia anatina*.]

- Fig. 112. Cysticeroid with anterior portion of the tail: rm., circular muscles; p., (third), parenchymatic layer; h., fourth layer=neck; hr., posterior rostellum sac; r., rostellum; ex., excretory system. After Schmidt, 1894, Taf. VI, Fig. A.
- Fig. 113. Cysticeroid with anterior portion of the tail; h., peripheral layer; ku., cuticle; vl¹., muscular fibers; pch¹., parenchymatic layer; vl²., second layer of fibers; pch²., internal parenchymatic layer (=neck) with calcareous corpuscles (v); e., excretory apparatus; pr., caudal appendage; j., nuclei of cells in the tail; hc., hooks of oncosphere. Zeiss 3, D. After Mrazek, 1891, Tab. VI, fig. 19.
- Fig. 114. Isolated young hook. After Mrazek, 1891, Tab. VI, fig. 21.
- Fig. 115. Ten hooks taken from the outline of cyst of cysticeroid, showing the hooks in position on the rostellum. After Mrazek, 1891, Tab. VI, fig. 22.

[Figs. 116-124b. *Drepanidotaenia sinuosa*.]

- Fig. 116. A young worm, natural size. After Zeder, 1800, Tab. III, fig. 5.
- Fig. 117. Distal end of a young worm enlarged. a, b, two knobs. After Zeder, 1800, Tab. III, fig. 6.
- Fig. 118. An adult worm, natural size. After Zeder, 1800, Tab. III, fig. 7.
- Fig. 119. Short segments enlarged. After Zeder, 1800, Tab. III, fig. 8.
- Fig. 120. Scolex enlarged: f, the long rostellum with hooks; c c, d d, suckers; a a, b b, neck. After Zeder, 1800, Tab. III, fig. 9.
- Fig. 121. Two large segments, enlarged: a a, b b, the "vermiform sacs;" c c, cirri; d, posterior corners of the segments. After Zeder, 1800, Tab. III, fig. 10.
- Fig. 122. Isolated eggs, enlarged. After Zeder, 1800, Tab. III, fig. 11.
- Fig. 123. Rostellum of *Drep. sinuosa* x240. After Krabbe, 1869, Tab. VII, fig. 151.

Fig. 124. Two isolated hooks. x920. a, from a parasite in the domesticated duck; b, from a parasite in the mallard. After Krabbe, 1869, Tab. VII, fig. 152a-b.

Plate XI, Figs. 125-139.—*Drepanidotaenia sinuosa*.

- Fig. 125. Segment with genital organs and extruded cirrus. x35. After Krabbe, 1869, Tab. VII, fig. 153.
- Fig. 126. Bloch's original figure of "*Taenia collari nigro*," from the domesticated duck; possibly identical with *Drep. sinuosa*. After Bloch, 1782, Taf. IV, fig. 11.
- Fig. 127. Anterior portion of the same, enlarged. After Bloch, 1782, Taf. IV, fig. 12.
- Fig. 128. Segments from the middle of the same, enlarged. After Bloch, 1782, Taf. IV, fig. 13.
- Fig. 129. Cirrus. x210. After Dujardin, 1845, Pl. 9, Fig. D. Host: Goose.
- Fig. 130. A cyclops *viridis* containing 3 cysticercoids of *Drep. sinuosa*: vc., eggs. Zeiss 3, A. After Mrazek, 1891, Tab. V, fig. 7.
- Fig. 131. Isolated cysticercoid, to show the proportional sizes of the cyst and the tail. Zeiss 3, A. After Mrazek, 1891, Tab. V, fig. 8.
- Fig. 132. Isolated hook, greatly enlarged. Zeiss 3, F. After Mrazek, 1891, Tab. V, fig. 10.
- Fig. 133a-c. Young stages of hooks. Zeiss 3, F. After Mrazek, 1891, Tab. V, fig. 11.
- Fig. 134. Two isolated hooks of a cysticercoid which otherwise corresponds in form to *Drep. sinuosa*. The form and size (35 μ) of these hooks resemble those of *Drep. setigera*. Zeiss 3, F. After Mrazek, 1891, Tab. V, fig. 12.
- Fig. 135. Cysticercoid with anterior portion of tail, drawn from life. Zeiss 3, D. After Mrazek, 1891, Tab. V, fig. 9.
- Fig. 136. Two isolated hooks from fully developed scolex of cysticercoid. Zeiss 3, F. After Hamann, 1889, Taf. I, fig. 9.
- Fig. 137. The 10 hooks of the rostellum in position. Zeiss 3, F. After Hamann, 1889, Taf. I, fig. 10.
- Fig. 138. Calcareous corpuscles from the parenchyma of the scolex. Zeiss 3, F. After Hamann, 1889, Taf. I, fig. 11.
- Fig. 139. A hook of the oncosphere from the tail of a cysticercoid. After Hamann, 1889, Taf. I, fig. 12.

Plate XII, Figs. 140-152.—*Drepanidotaenia sinuosa*, *Drepanidotaenia setigera*, and *Taenia Krabbei* Kowalewski nec Moniez.

[Figs. 140-146. *Drepanidotaenia sinuosa*.]

Fig. 140-142. Three successive stages in the development of the cysticeroid in *Gummarus pulx*. Zeiss 1, A. After Hamann, 1889, Taf. I, figs. 4, 5, 6.

Fig. 143. Median longitudinal section through fig. 140. Zeiss 4, A. After Hamann, 1889, Taf. I, fig. 7.

Fig. 144. Median longitudinal section through a stage nearly corresponding to fig. 142. Zeiss 4, 4. After Hamann, 1889, Taf. I, fig. 8.

Fig. 145. Fully developed cysticeroid, surrounded by its tail, s, and a cyst h. Zeiss 3, A. After Hamann, 1889, I, fig. 1.

Fig. 146. The same without surrounding cyst. Zeiss 3, A. After Hamann, 1889, Taf. I, fig. 3.

[Figs. 147-150. *Drepanidotaenia setigera*.]

Fig. 147. Scolex with 6 of the 10 hooks. x240. After Krabbe, 1869, Tab. VI, fig. 117. Host: Domesticated goose.

Fig. 148. Isolated hook of same. x920. After Krabbe, 1869, Tab. VI, fig. 118.

Fig. 149. Isolated hook from Rudolphi's 1819, p. 700B, "*Taenia* Tab. VI, fig. 120.

sinuosa"=*Drep. setigera*. x920. After Krabbe, 1869,

Fig. 150. Cirrus. x240. After Krabbe, 1869, Tab. VI, fig. 119.

[Figs. 151-152. *Taenia Krabbei* Kowalewski nec Moniez.]

Fig. 151. Two isolated hooks of a tapeworm, which Krabbe (1869, p. 290) found in a goose and determined as "*T. setigera*?"; this form has since been described as *T. Krabbei* by Kowalewski, 1895. x920. After Krabbe, 1869, Tab. VI, fig. 121.

Fig. 152. Two isolated hooks from *T. Krabbei* Kowalewski, 1895 [nec Moniez, 1879.] x1000. After Kowalewski, 1895, Tab. VIII, fig. 27.

Plate XIII, Figs 153-164.—*Drepanidotaenia sinuosa* and *Drepanidotaenia setigera*.

Fig. 153. *Drepanidotaenia sinuosa*. Cysticeroid with anterior portion of tail; a, b, c, d, layers of the cuticle. Glycerine preparation. Zeiss I, D. After Hamann, 1889, Taf. I, fig. 2. Host: *Gummarus pulx*.

[Figs. 151-164. *Drepanidotaenia setigera*.]

- Fig. 154. Adult worm, natural size. After Frolch, 1789, Tab. IV, fig. 1.
- Fig. 155. Head of same, enlarged, with (a) rostellum and (b) suckers. After Frolch, 1789, Tab. IV, fig. 2.
- Fig. 156. Three young segments of same, greatly enlarged. After Frolch, 1789, Tab. IV, fig. 3.
- Fig. 157. Six segments from posterior end, enlarged, with (a) extruded or (b) partly extruded cirri. After Frolch, 1789, Tab. IV, fig. 4.
- Figs. 158-160. Three isolated segments with genital organs: a, cirrus pouch; c, testicles; e, vas deferens with vesicula seminalis; g, vagina; i, vitellogene gland; k, ovary; m, receptaculum seminis. After Feuerstein, 1868, Taf. X, figs. 14, 15, 16, of "*Taenia fasciata*."
- Fig. 161. Hook from scolex. After Feuerstein, 1868, Taf. X, fig. 3.
- Fig. 162. Transverse section of segment: p., cirrus; v., vagina; l. m., longitudinal muscles; k., excretory (longitudinal) canals; ov., ovary. Hartnack 2. 2. After Lonnberg, 1889, Taf. 1, fig. 7.
- Fig. 163. Cysticeroid, with very long tail, from *Cyclops brevicaudatus*. After von Linstow, 1892B, fig. 1.
- Fig. 164. Hook from the same. After von Linstow, 1892, fig. 2.
- Plate XIV, Figs. 165-186.—*Drepanidotaenia tenuirostris* and *Drepanidotaenia infundibuliformis*.

[Figs. 165-172. *Drepanidotaenia tenuirostris*.]

- Fig. 165. Cysticeroid with tail. x325. After Hamann, 1889, Fig. A. From the body cavity of *Gammarus pulex*.
- Fig. 166. Calcareous corpuscles of same. x800. After Hamann, 1889, Fig. B.
- Fig. 167. Hooks from the rostellum. x800. After Hamann, 1889, Fig. C.
- Fig. 168. Cysticeroid with long tail. Zeiss 3. A. After Mrazek, 1891, Tab. V, fig. 3.
- Fig. 169. Cysticeroid with anterior portion of tail. Zeiss 3. D. After Mrazek, 1891, Tab. V, fig. 4.
- Fig. 170. Two hooks of same. Zeiss 3. F. After Mrazek, 1891, Tab. V, fig. 5.
- Fig. 171. The same, greatly magnified. After Mrazek, 1891, Tab. V, fig. 6.
- Fig. 172. Very young stage of cysticeroid of *Drep. tenuirostris* (?). The oncospheric hooks are preserved. After Mrazek, 1891, Tab. VI, fig. 24.

[Figs. 172-186. *Drepanidotaenia infundibuliformis*.]

- Fig. 173. Goeze's original figure of worm, natural size. After Goeze, 1782, Tab. XXXI, A, fig. 1.
- Fig. 174. Head of same, enlarged, showing hooks and suckers. After Goeze, 1782, Tab. XXXI, A, fig. 2.
- Fig. 175. Posterior segments, enlarged. After Goeze, 1782, Tab. XXXI, A, fig. 3.
- Fig. 176. Posterior segments with eggs, enlarged. After Goeze, 1782, Tab. XXXI, A, fig. 4.
- Fig. 177. Eggs, enlarged. After Goeze, 1782, Tab. XXXI, A, fig. 5.
- Fig. 178. An inverted piece of chicken's intestine, with numerous tapeworms attached. After Goeze, 1782, Tab. XXXI, A, fig. 6.
- Fig. 179. Scolex with hooks. x240. After Krabbe, 1869, Tab. X, fig. 287.
- Fig. 180a-c. Three isolated hooks. x920. Fig. 180c from Kuchenmeister's collection. After Krabbe, 1869, Tab. X, fig. 288a-c.
- Fig. 181. Cirrus. x240. After Krabbe, 1869, Tab. X, fig. 289.
- Fig. 182. Egg. x240. After Krabbe, 1869, Tab. X, fig. 290.
- Fig. 183. Head of "*T. infundibulum*." x80. After Cobbold, 1859, Pl. LXIII, fig. 25.
- Fig. 184. Rostellum. After Crety, 1890, fig. 5.
- Fig. 185. Isolated hooks. After Crety, 1890, fig. 6.
- Fig. 186. Mature egg. After Crety, 1890, fig. 8.

Plate VX, Figs 187-198.—*Drepanidotaenia infundibuliformis* and *Davainea proglottina*.[Figs. 187-193. *Drepanidotaenia infundibuliformis*.]

- Fig. 187. Bloch's "*Taenia articulata convideis*." After Bloch, 1782, Tab. III, fig. 1.
- Fig. 188. Head of same, enlarged. After Bloch, 1782, Tab. III, fig. 2.
- Fig. 189. Transverse section of mature proglottid. After Crety, 1890, fig. 15.
- Fig. 190. Part of a longitudinal section of the larval stage from the body cavity of a fly: cav., "cavity of the gastrula;" lac., "primitive cavity;" sco., scolex; ven., sucker. Koritski 3, 8. After Grassi & Rovelli, 1892, Tav. IV, fig. 14.
- Fig. 191. Cysticeroid partly extended: par. int., internal wall; par. est., external wall; sco., scolex. Koritska, 3, 4. After Grassi & Rovelli, 1892, Tav. IV, fig. 15.

Fig. 192. Anterior extremity of fig. 191. Koritski, 3, 8. After Grassi & Rovelli, 1892, fig. 16.

Fig. 193. Segments from Rudolphi's specimen of "Taenia infundibuliformis" in *Otis tarda*. After Krabbe, 1868, Tab. III, fig. 5. See text p. 44.

[Figs. 194-198. *Davainea proglottina*.]

Fig. 194. Adult worm: g., ovary; p., cirrus pouch; r., receptaculum seminis; t., testicle; v., vagina; vi., vitellogene gland. x95. After R. Blanchard, 1891B, fig. 4.

Fig. 195. Head of same with extended rostellum and one partly detached segment. After R. Blanchard, 1891B, fig. 5.

Fig. 196. Head with retracted rostellum; the first segment is forming from the neck. After R. Blanchard, 1891B, fig. 6.

Fig. 197a-b. Three isolated hooks: a, from rostellum; b, suckers. After R. Blanchard, 1891B, fig. 7.

Fig. 198. Isolated egg. After R. Blanchard, 1891B, fig. 8.

Plate XVI, Figs. 199-211.—*Davainea proglottina* and *Davainea circumvallata*.

[Figs. 199-202. *Davainea proglottina*.]

Fig. 199. Cysticercoid, in which the oncospheric hooks are still visible: ros., rostellum; ven., suckers; Koritska 3, 8. After Grassi & Rovelli, 1892, Tav. IV, fig. 7. (Fresh specimen.)

Fig. 200. The same, preserved: boc., opening of the cysticercoid; cav., "cavity of the gastrula;" lac., "primitive lacune;" sco., scolex. Koritska, 3, 8. After Grassi & Rovelli, 1892, Tav. IV, fig. 8.

Fig. 201. Longitudinal section: boc., opening of cysticercoid; cav., "cavity of the gastrula;" sco., scolex. Harnack, 2, 7. After Grassi & Rovelli, 1892, Tav. IV, fig. 9.

Fig. 202. Young cysticercoid: ven., sucker; cod., tail. Koritska, 3, 5. After Grassi & Rovelli, 1892, Tav. IV, fig. 10.

[Figs. 203-211. *Davainea circumvallata*.]

Fig. 203. Ovum. x240. After Krabbe, 1869, Tab. X, fig. 295.

Fig. 204. Head and neck: pr., rostellum; r, line of hooks; v, sucker; c, neck. After Crety, 1890, fig. 9.

Fig. 205. Hook from rostellum. After Crety, 1890, fig. 10.

Fig. 206. Ovum. After Crety, 1890, fig. 11.

- Fig. 207. Frontal section of side of segment, through the cirrus pouch and vagina: ci., cirrus; va., vagina; sg., genital sinus; sb., cells of subcuticula. After Crety, 1890, fig. 12.
- Fig. 208. Longitudinal section through egg sac: m, external capsule; c, granular content; ov., ovum. After Crety, 1890, fig. 13.
- Fig. 209. Scolex of "*T. pluriuncinata*." x ca. 50. a, hook from rostellum; b, hook from sucker; pr., rostellum; v, sucker; s, head; c, neck. After Crety, 1890, fig. 4.
- Fig. 210. Ovum of same. After Crety, 1890, fig. 7.
- Fig. 211. Frontal section of segment of same: cl., ventral canal; ct., transverse canal; ur., egg sacs. After Crety, 1890, fig. 14.

Plate XVII. Figs. 212-227.—*Davainea cesticillus*, *Davainea echinobothrida*, and *Davainea tetragona*.

[Figs. 212-216. *Davainea cesticillus*.]

- Fig. 212. Strobila. After Molin, 1861, Pl. VI, fig. 10.
- Fig. 213. Anterior portion of same, and two posterior segments (middle portion of worm ff, omitted): A, head; b, ring surrounding the rostellum; c, rostellum; d, sucker; E, anterior portion of segmented body; ff, dotted line of omitted segments; GG, two posterior segments; h, extruded pen's; i, vulva. After Molin, 1861, Pl. VI, fig. 11.
- Fig. 214. Hook from rostellum of Dujardin's "*T. infundibuliformis* Goeze." x210. After Dujardin, 1845, Pl. IX, Fig. H. 2.
- Fig. 215. Hook from rostellum. x920. After Krabbe, 1869, Tab. X, fig. 293.
- Fig. 216. Ovum. x240. After Krabbe, 1869, Tab. X, fig. 294.

[Figs. 217-218. *Davainea echinobothrida*.]

- Fig. 217. Strobila, natural size. After Megnin, 1881A, Pl. V, fig. 1.
- Fig. 218a-d. Head with appendages: a, head and neck; b, armature of suckers; c, hook from sucker; d, hook rostellum. After Megnin, 1881A, Pl. V, fig. 2.

[Figs. 219-227. *Davainea tetragona*.]

- Fig. 219. Head D, with rostellum (a) and suckers (c), followed by neck (E). Enlarged. After Molin, 1861, Tav. VII, fig. 6.

- Fig. 220. Three posterior segments A, showing genital pores (c) and egg sacs (b). England. After Molin, 1861, Tav. VII, fig. 7.
- Fig. 221. Isolated egg sac with (a) transparent membrane; b, granular substance; c, embryo in ovum (d). Enlarged. After Molin, 1861, Tab. VII, fig. 8.
- Figs. 222-223. Head and neck showing armed rostellum and armed suckers. x35. After Krabbe, 1882, Tab. II, figs. 55, 56. From material collected by Fedtschenko in Turkestan.
- Fig. 224. Hook from rostellum of same. x920. After Krabbe, 1882, Tab. II, fig. 59.
- Fig. 225. A segment showing two longitudinal canals, several testicles, vas deferens cirrus pouch and genital pore. x35. After Krabbe, 1882, Tab. II, fig. 57.
- Fig. 226. Posterior segment, showing genital pore and egg sacs. x35. After Krabbe, 1882, Tab. II, fig. 58.
- Fig. 227. Female genital organs: vg., vagina; r s., receptaculum seminis; bd trsv., transverse collecting canal; cl. ov., opening of the ovarian tubules; c. s., seminal canal; ovd., disc., descending oviduct; glv., vitellogene gland; vt. ld., vitello-duct; ovd. asc., ascending oviduct; sb. ovd., opening of the ascending oviduct; sbc. vtdl., opening of the vitello-duct; ootp., ootyp with shell gland. After Diamare, 1893, fig. 4.

Plate XVIII, Figs. 228-246.—*Davainea tetragona*, *Davainea Friedbergeri* and *Davainea crassula*.

[Figs. 228-235. *Davainea tetragona*.]

- Figs. 228-229. Supposed larvae of "Taenia bothrioplitis" (= *Davainea tetragona*) from a snail (*Helix*). Treated with acetic acid. After Piana 1882, Figs. F, 8, A., and F, 8, B, reduced.
- Fig. 230. Piece of the intestine of a fowl showing the nodules (reduced one-third). After Moore, 1895, fig. 1a.
- Fig. 231. The mucosa of the intestine showing ulcerated areas; also several small and one larger tapeworm attached to the intestine (reduced one-third). After Moore, 1895, fig. 1b.
- Fig. 232. A cross section of the intestine illustrating the thickening of the wall, due to a large number of the nodules; also a portion of a tapeworm which has penetrated the mucous membrane (enlarged). After Moore, 1885, fig. 1c

- Fig. 233. A cross section of a nodule containing a sequestrum situated in the outer or longitudinal muscular layer (circular layer of the muscular wall not affected). After Moore, 1895, fig. 2a.
- Fig. 234. A section showing a tapeworm and a necrotic mass within the muscular wall. After Moore, 1895, fig. 2b.
- Fig. 235. A portion of a cross section of the intestine showing the head of a tapeworm within the muscle and one lying between the villi with its head resting on the basement membrane of the mucosa. Enlarged. After Moore, 1895, fig. 2c.

[Figs. 236-242. *Davainea Friedbergeri*.]

- Fig. 236. Hook from rostellum. After Friedberger, 1877, fig. 1.
- Fig. 237. Hooks from the suckers. After Friedberger, 1877, fig. 2.
- Fig. 238. Hook of oncosphere. After Friedberger, 1877, fig. 3.
- Fig. 239. "*T. infundibuliformis* var. *pharisarum*," seu "*T. agama*"=? *Davainea Friedbergeri*. Natural size. After Megnin, 1878, Pl. IV, fig. 1.
- Fig. 240. View of head of same, en face, showing armed rostellum and 4 armed suckers. x120. After Megnin, 1878, Pl. IV, fig. 4.
- Fig. 241. Hook from rostellum of same. x725. After Megnin, 1878, Pl. IV, fig. 4.
- Fig. 242. Segments of same species. x20. After Megnin, 1878, Pl. IV, fig. 4.

[Figs. 243-246. *Davainea crassula*.]

- Fig. 243. "Eggs" (=Egg sacs) magnified. After Rudolphi, 1819, Tab. III, fig. 19.
- Fig. 244. Hook from rostellum. x920. After Krabbe, 1869, Tab. X, fig. 301. From Rudolphi's original specimens.
- Fig. 245. Anterior end of worm, showing rostellum and two suckers. x35. After Krabbe, 1882, Tab. II, fig. 66. From material collected in Turkestan by Fedtschenko.
- Fig. 246. Hook from rostellum of same. x920. After Krabbe, 1869, Tab. II, fig. 67.

Plate XIX. Figs. 247-255.—*Echinocotyle Rosseteri* and *Ophryocotyle proteus*.

[Figs. 247-251. *Echinocotyle Rosseteri*.]

- Fig. 247. Strobila. x120. After R. Blanchard, 1891B, fig. 1.

- Fig. 248. Head with extended rostellum. x500. After R. Blanchard, 1891B, fig. 2.
- Fig. 249a-b. Hooks: a, from rostellum, x400; b, from sucker, x2,500. After R. Blanchard, 1891B, fig. 3.
- Fig. 250. Isolated segment: 1, evaginated cirrus with spines; 2, genital tubercle; 3, orifice of same with sphincter; 4, cirrus pouch, with ring of minute sharp spines; 5, seminal canal; 6, mass of spermatozoa. x600. After Rosseter, 1892, Pl. XXIII, fig. 8.
- Fig. 251. Cysticeroid taken from the body cavity of *Cypris cinerea*; a hooks on rostellum; b, hooks on suckers. x360. After Rosseter, 1892, Pl. XXII, fig. 1.
- Figs. 252-255. *Ophryocotyle proteus*. After Friis, 1869, taken from R. Blanchard, 1891B, fig. 20.
- Fig. 252. Strobila.
- Fig. 253. Head and neck with retracted infundibulum.
- Fig. 254. Head and neck with extended infundibulum.
- Fig. 255. Sucker with armature.

Plate XX, Figs. 256-260.—*Taenia cantaniana*, *Taenia Delafondi*, *Taenia imbutiformis*, *Taenia megalops*, and *Taenia nigropunctata*.

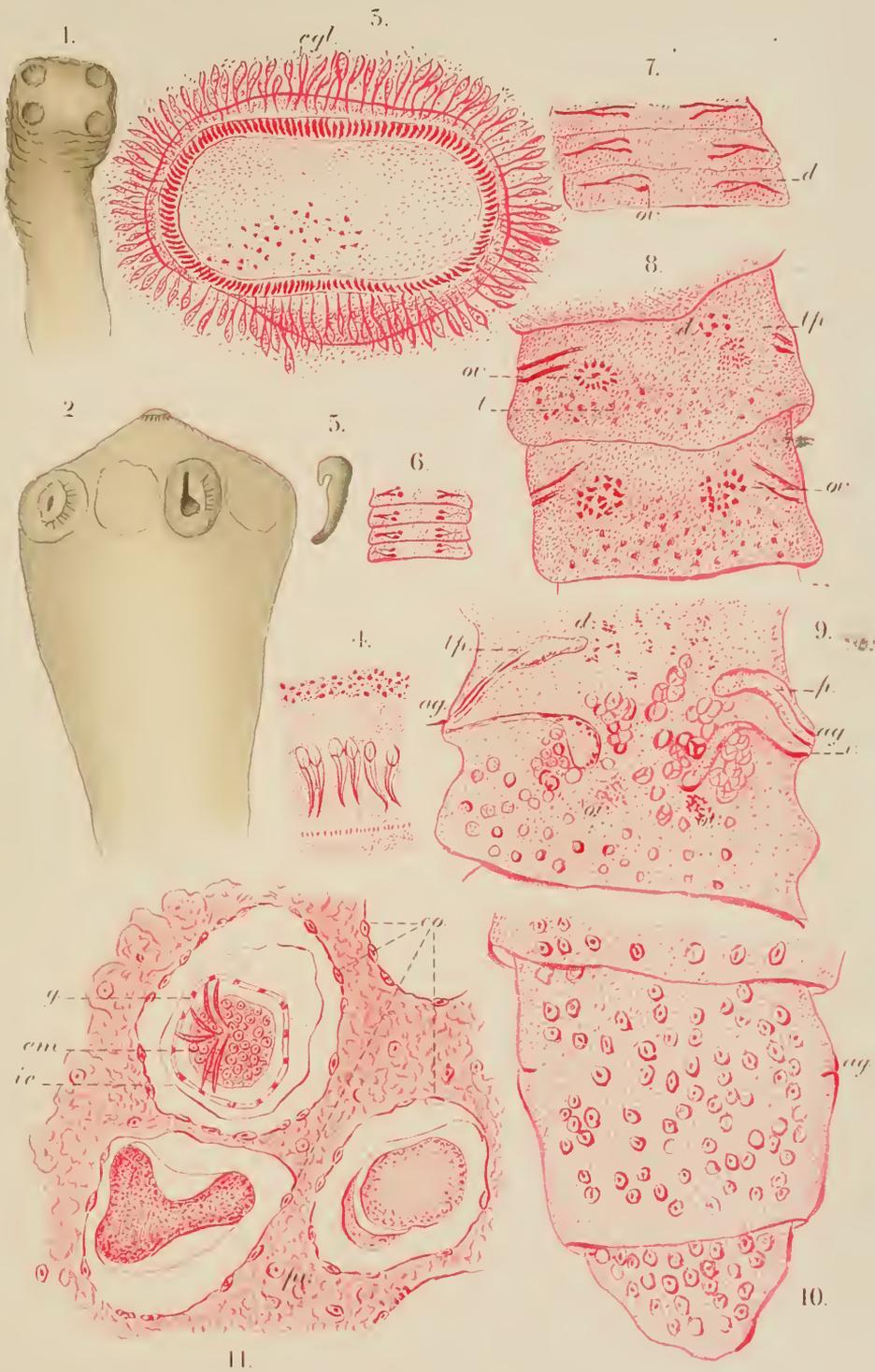
- Fig. 256. *Taenia cantania*: a, head; b, suckers; c, organ taken by Polonio for the "genital pore?"; d, well-developed eggs. After Polonio, 1860, Tav. VII fig. 2.

[Figs. 257-262.—Megnin's (1891, Figs. A-F.) figures of "*Taenia sphenocephala*"=Railliet's *Taenia Delafondi*.]

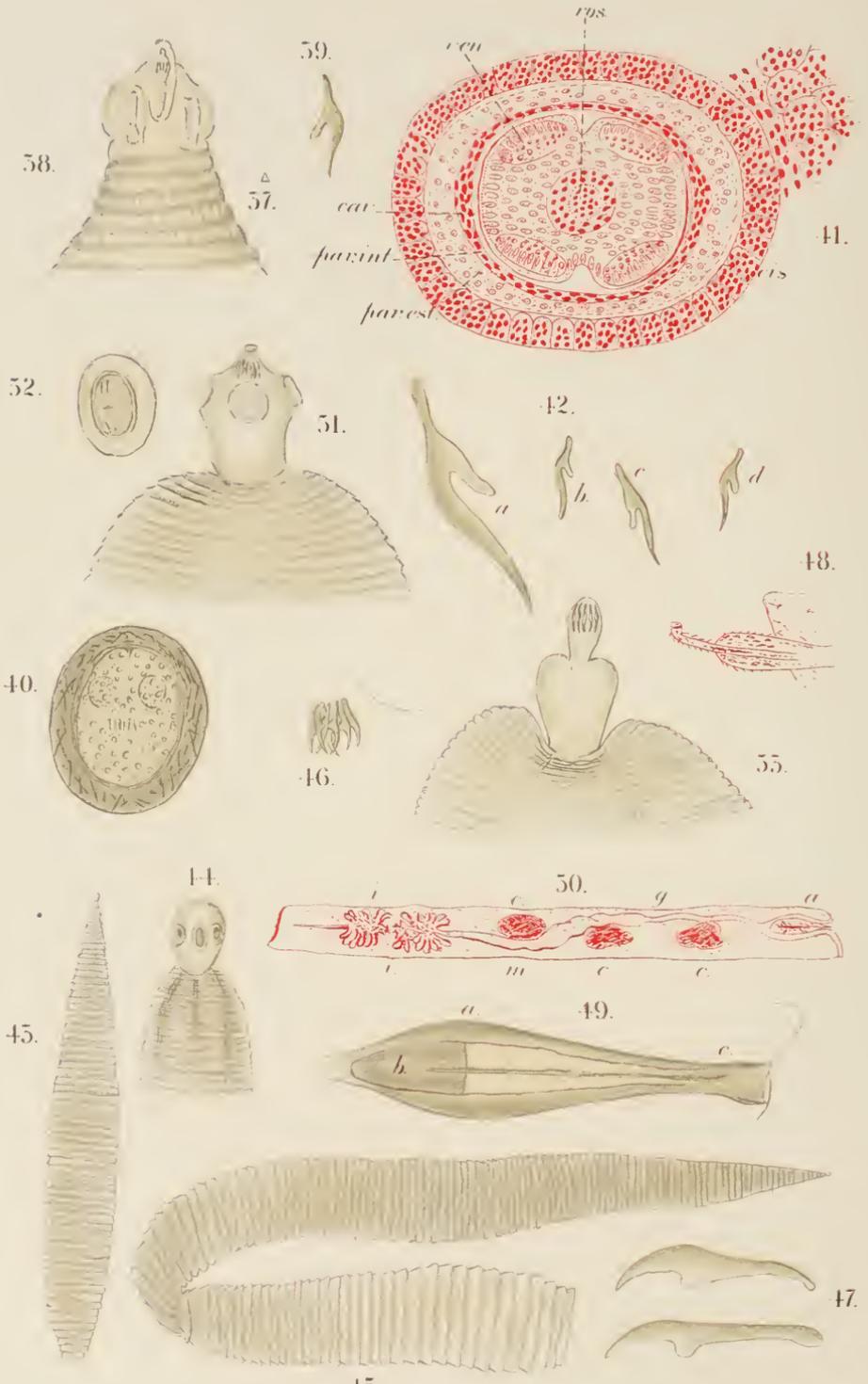
- Fig. 257. Strobila natural size.
- Fig. 258. Head and neck. x60.
- Fig. 259. Three sexually segments. x11.
- Fig. 260. Eggs. x375.
- Fig. 261. Isolated oncosphere.
- Fig. 262. Segmenting egg.
- Fig. 263. *Taenia imbutiformis*: a, suckers; b., middle portion; c, caudal portion; d. "genital pores" (?). After Polonio, 1860, Tav. VII, fig. 3.

[Fig. 264-267.—*Taenia megalops* from Brazilian teal (*Anas braziliensis*). Coll. Vienna Museum.]

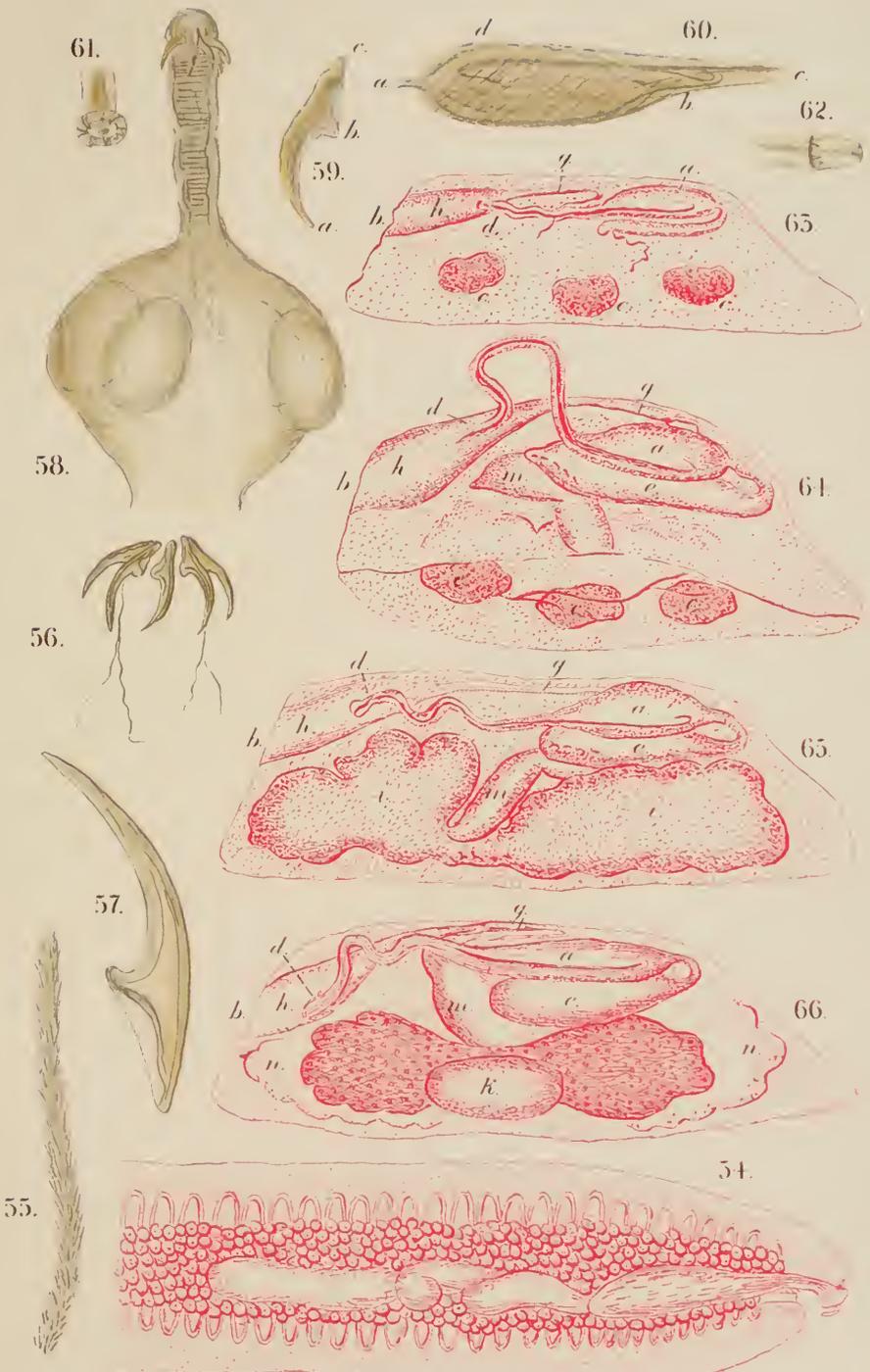
- Fig. 264. Strobila natural size. Original.
- Figs. 265-267. Three views of head, enlarged. Original.



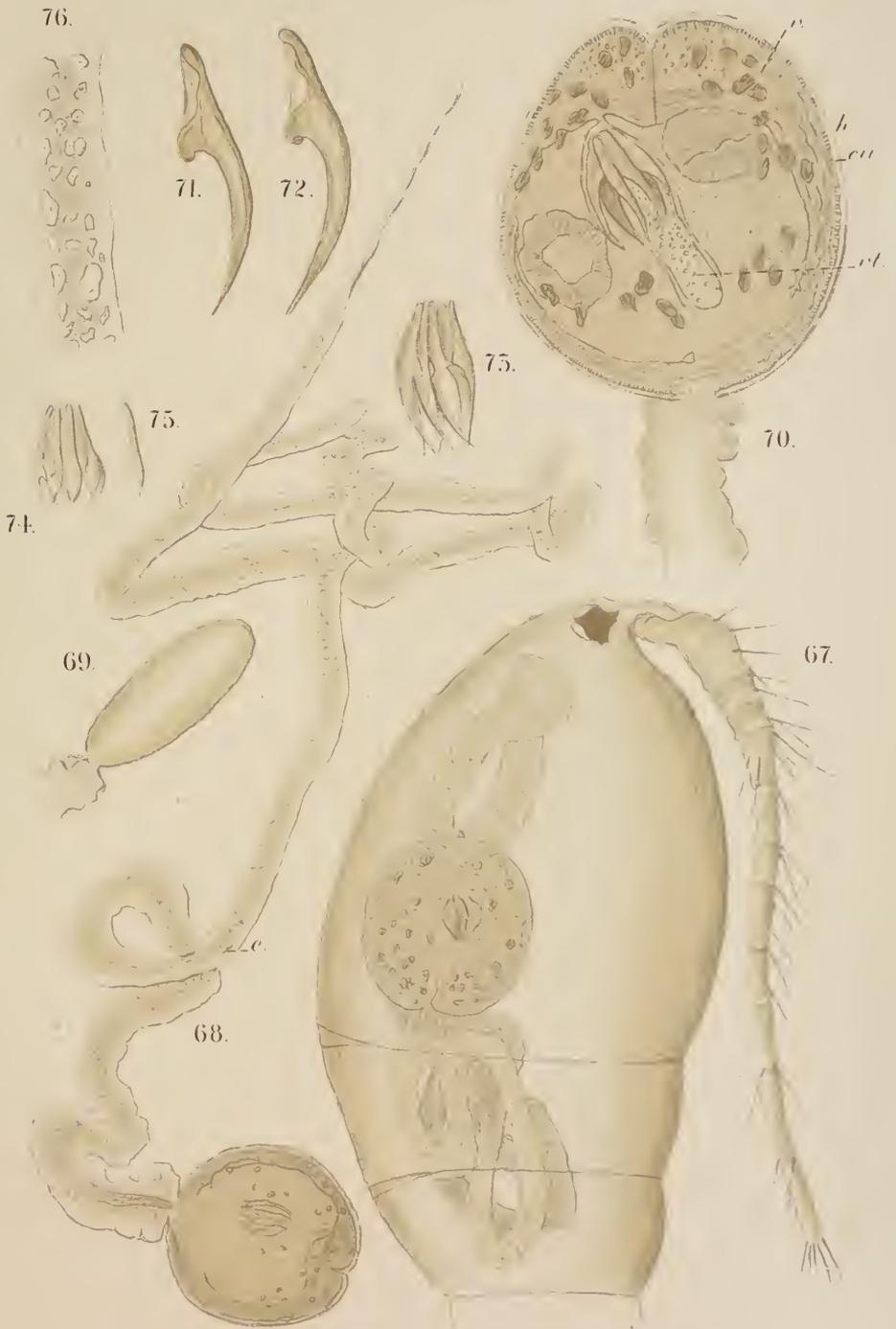
I-II. COTUGNIA DIGONOPORA



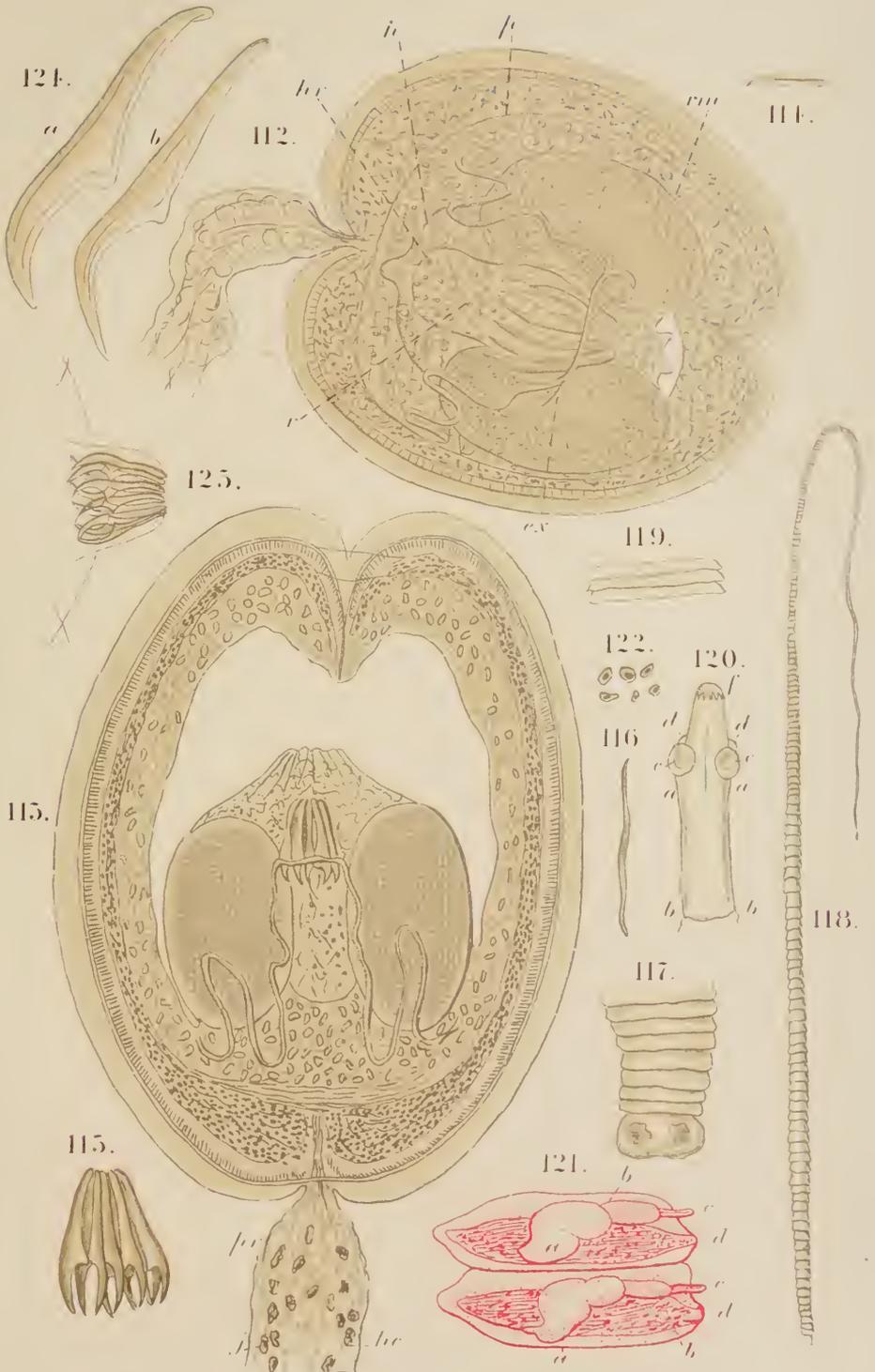
37-42. DICRANOTÆNIA SPHENOIDES.
 43-53. DREPANIDOTÆNIA LANCEOLATA.



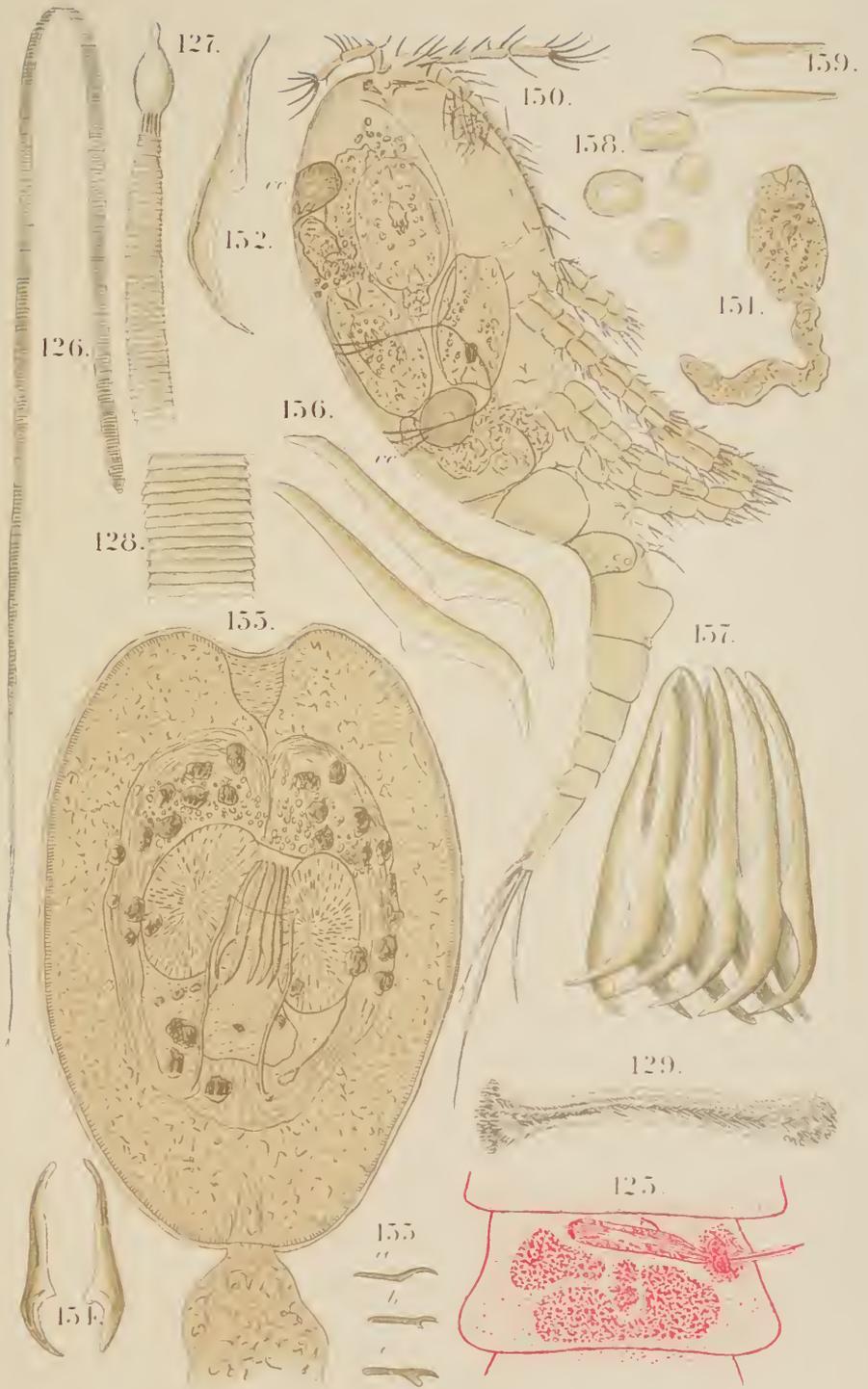
54-55. DREPANIDOTÆNIA LANCEOLATA.
 56-66. DREPANIDOTÆNIA FASCIATA.



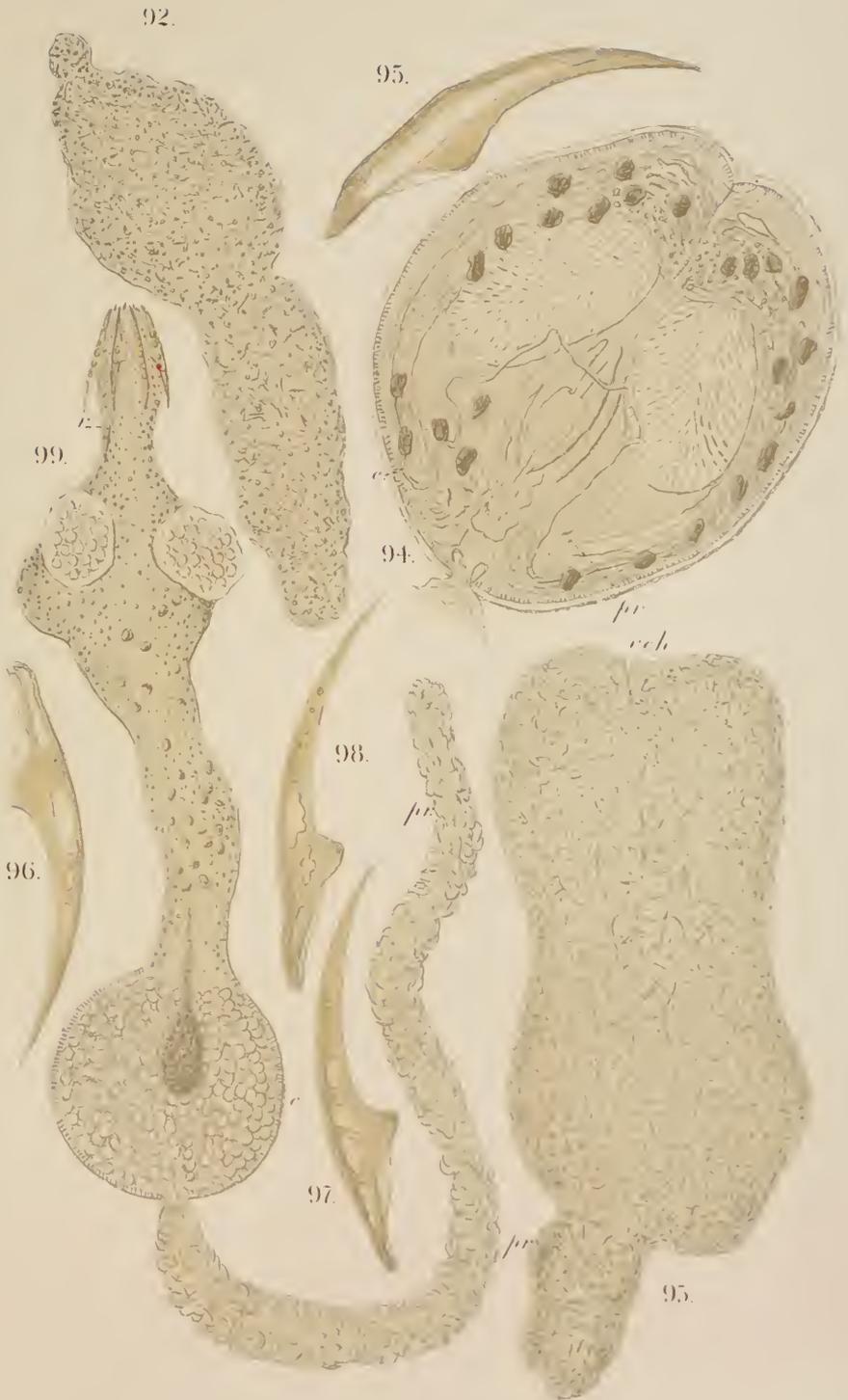
67-76. DREPANIDOTÆNIA FASCIATA.



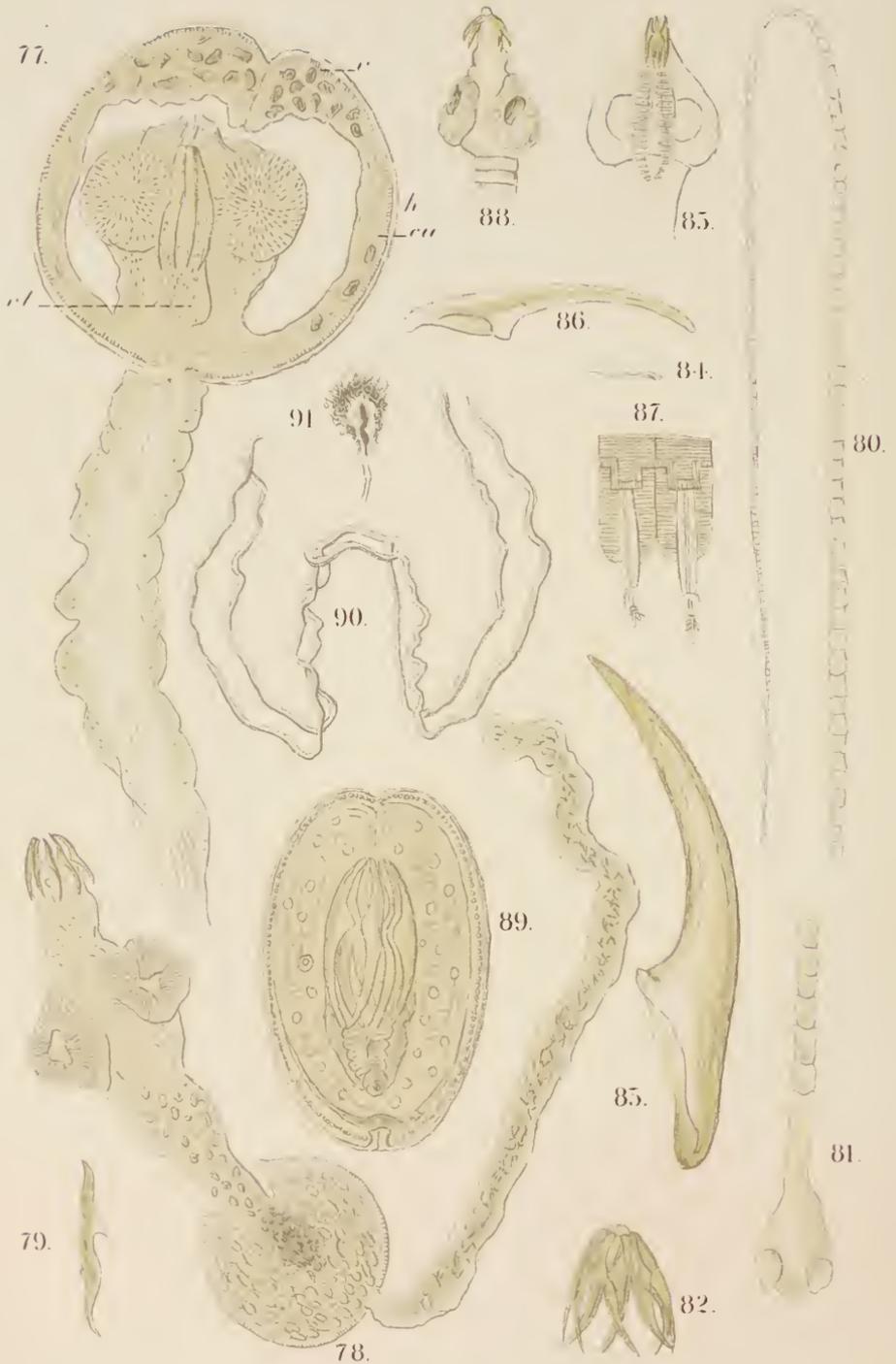
112-115. DREPANIDOTÆNIA ANATINA
 116-124. DREPANIDOTÆNIA SINUOSA.



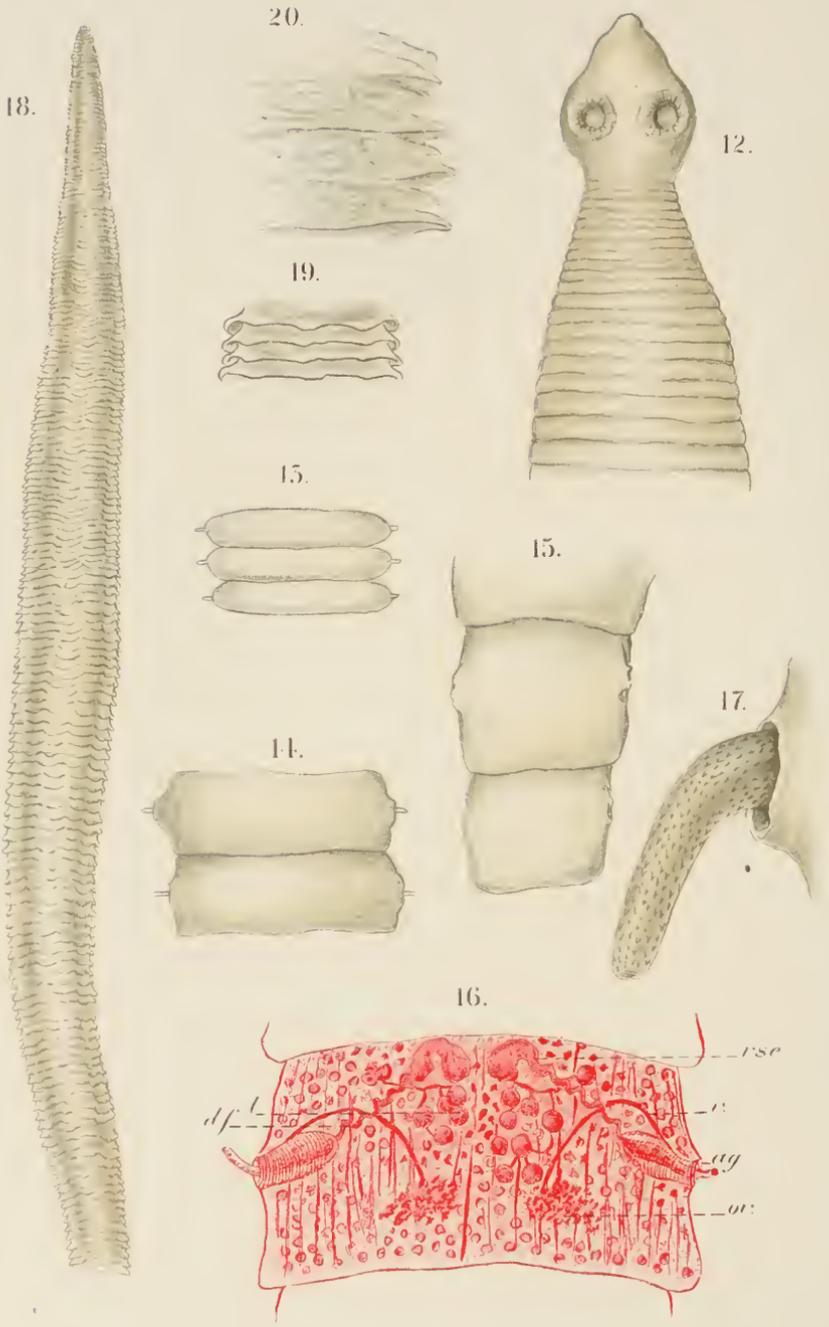
125-139. DREPANIDOTÆNIA SINUOSA.



92-99. DREPANIDOTÆNIA GRACILIS



77-79, DREPANIDOTÆNIA FASCIATA 80-91, DREPANIDOTÆNIA GRACILIS.

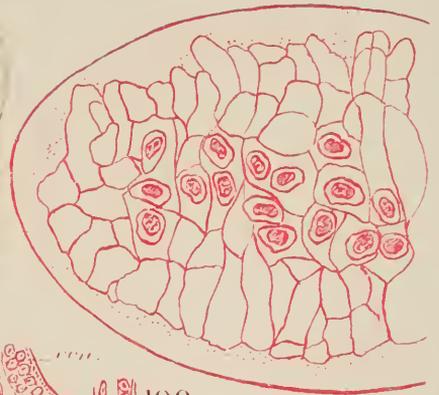
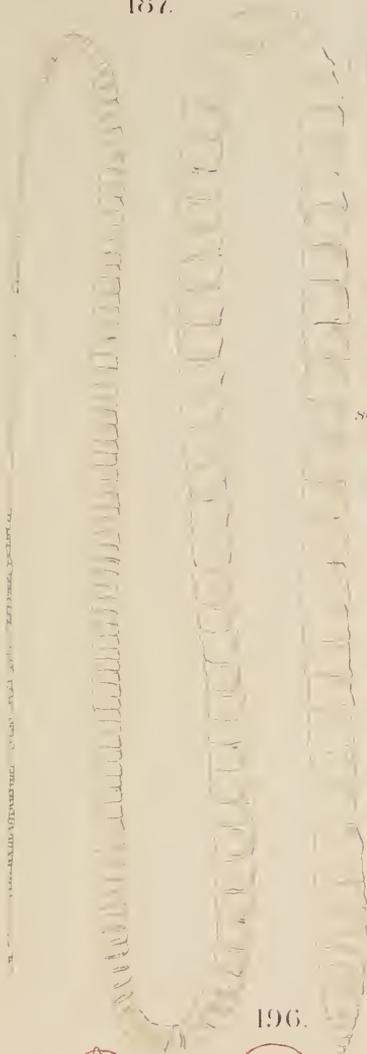


12-17. COTUGNIA BIFARIA. 18-20. AMABILIA LAMELLIGERA.

187.

188.

189.



195.

196.



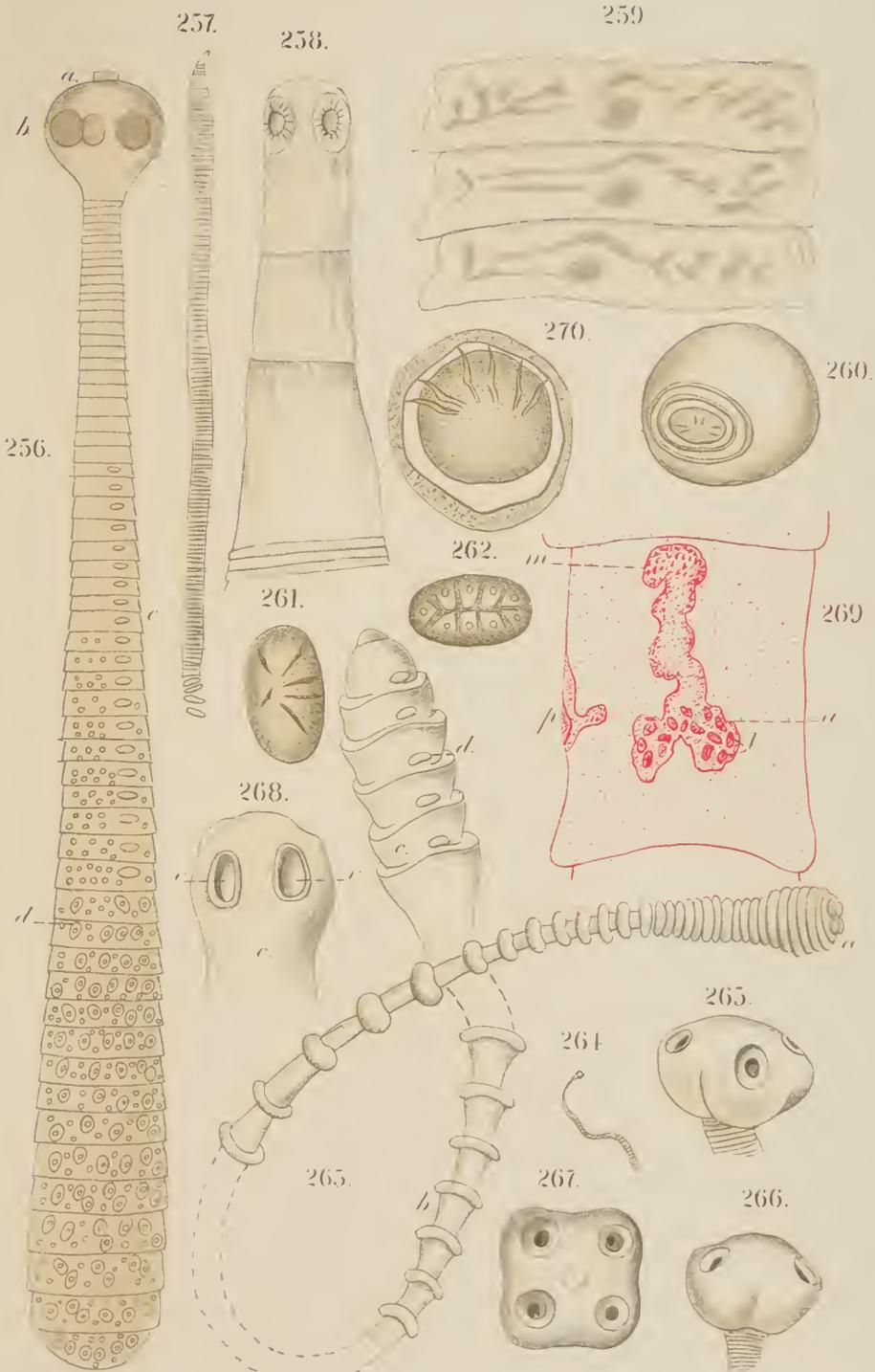
198.

194.

195.

187-193. DREPANIDOTÆNIA INFUNDIBULIFORMIS.

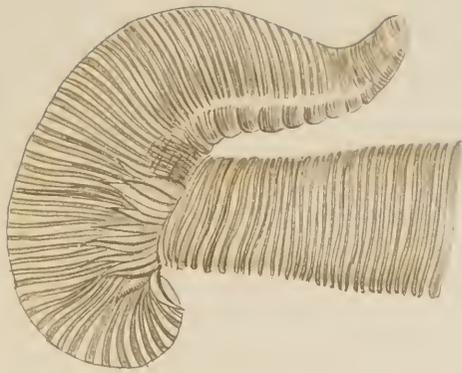
194-198. DAVAINEA PROGLOTTINA.



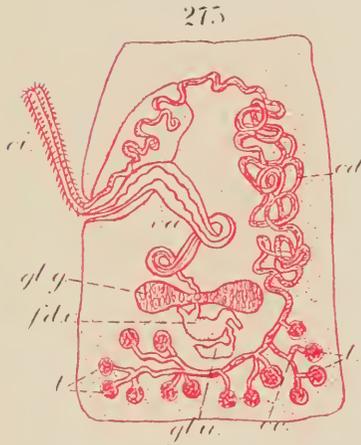
256. TÆNIA CANTANIANA 257-262. TÆNIA DELAFONDI.
 263. TÆNIA IMBUTIFORMIS. 264-267 TÆNIA MEGALOPS.
 268-270. TÆNIA NIGROPUNCTATA



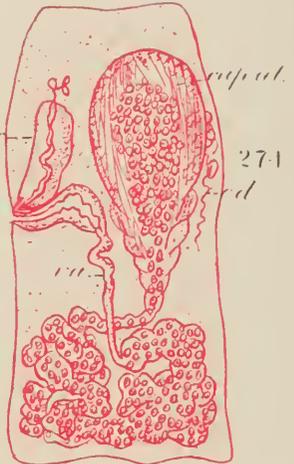
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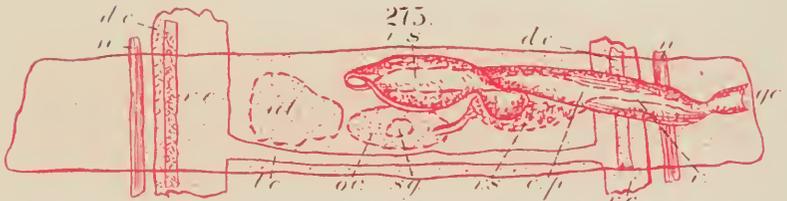
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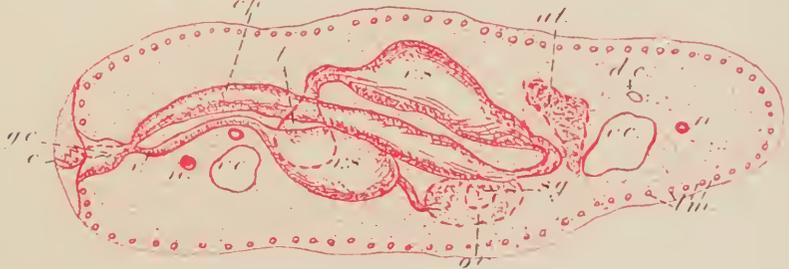
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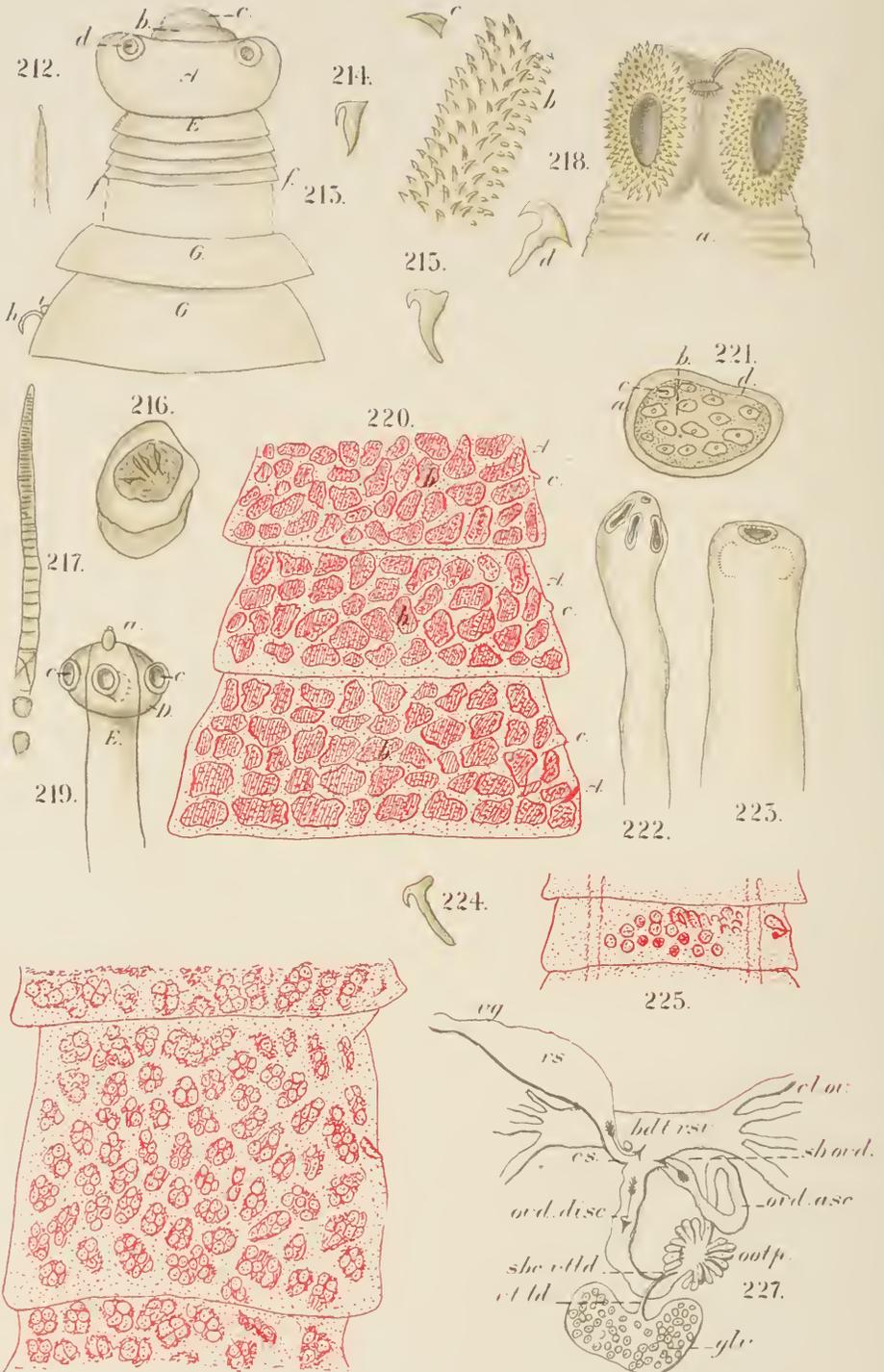


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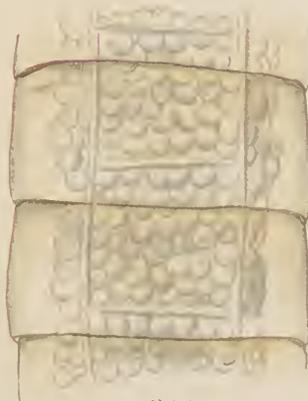
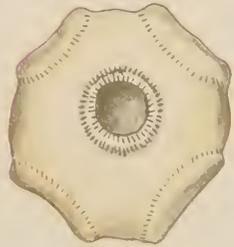
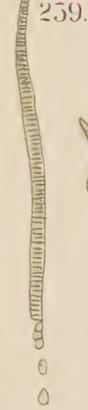
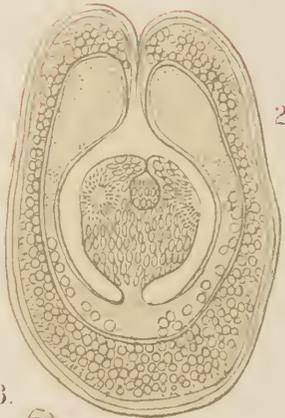
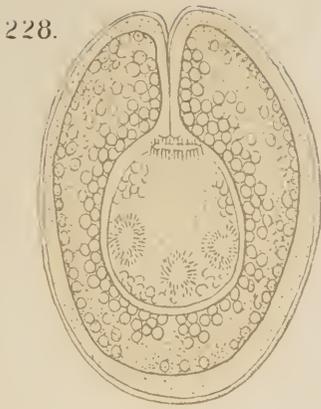


276.

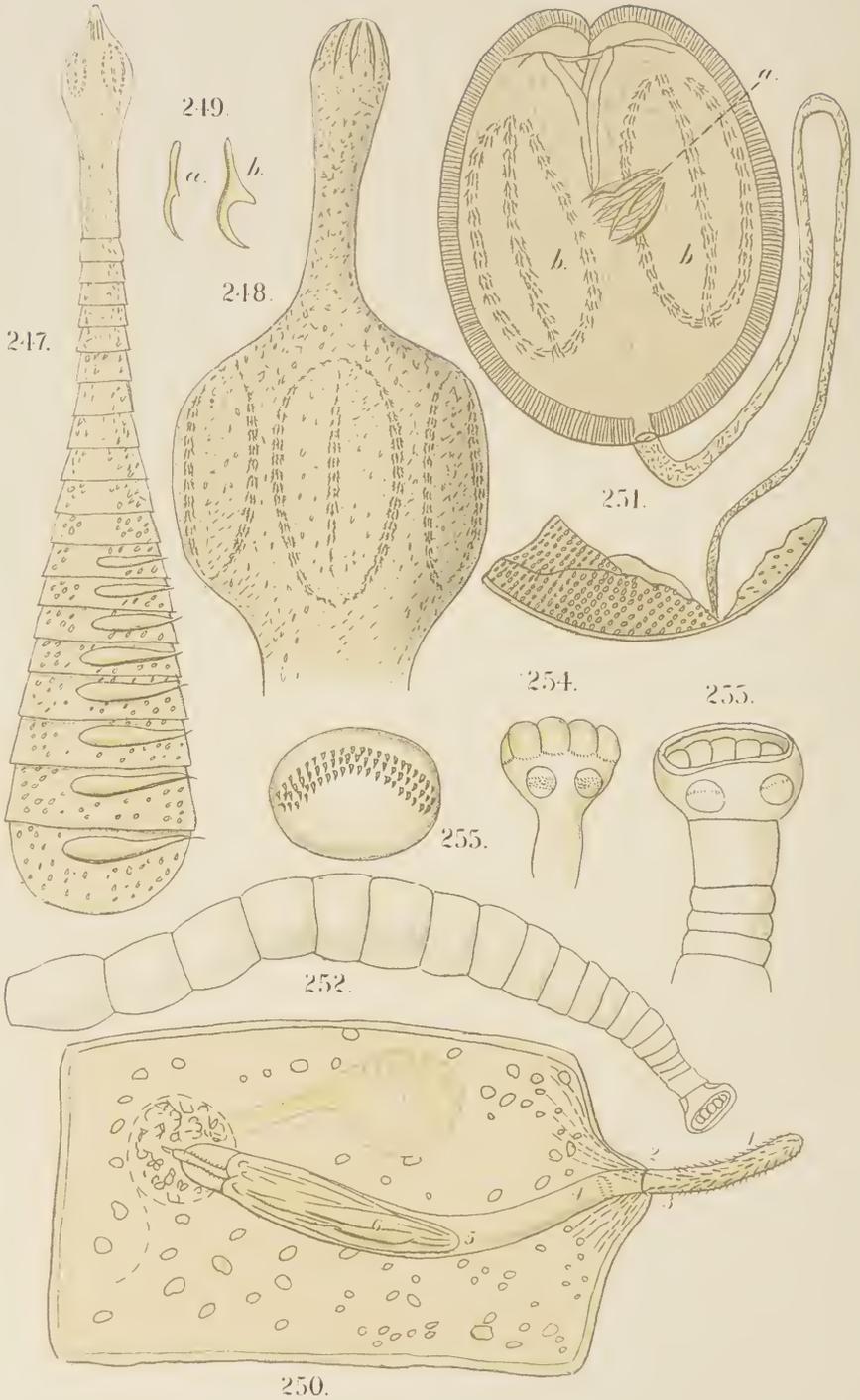
271, FIMBRIARIA MALLEUS. 272-274, IDIOGENES OTIDIS
275-276, TÆNIA SP. OF CONARD.



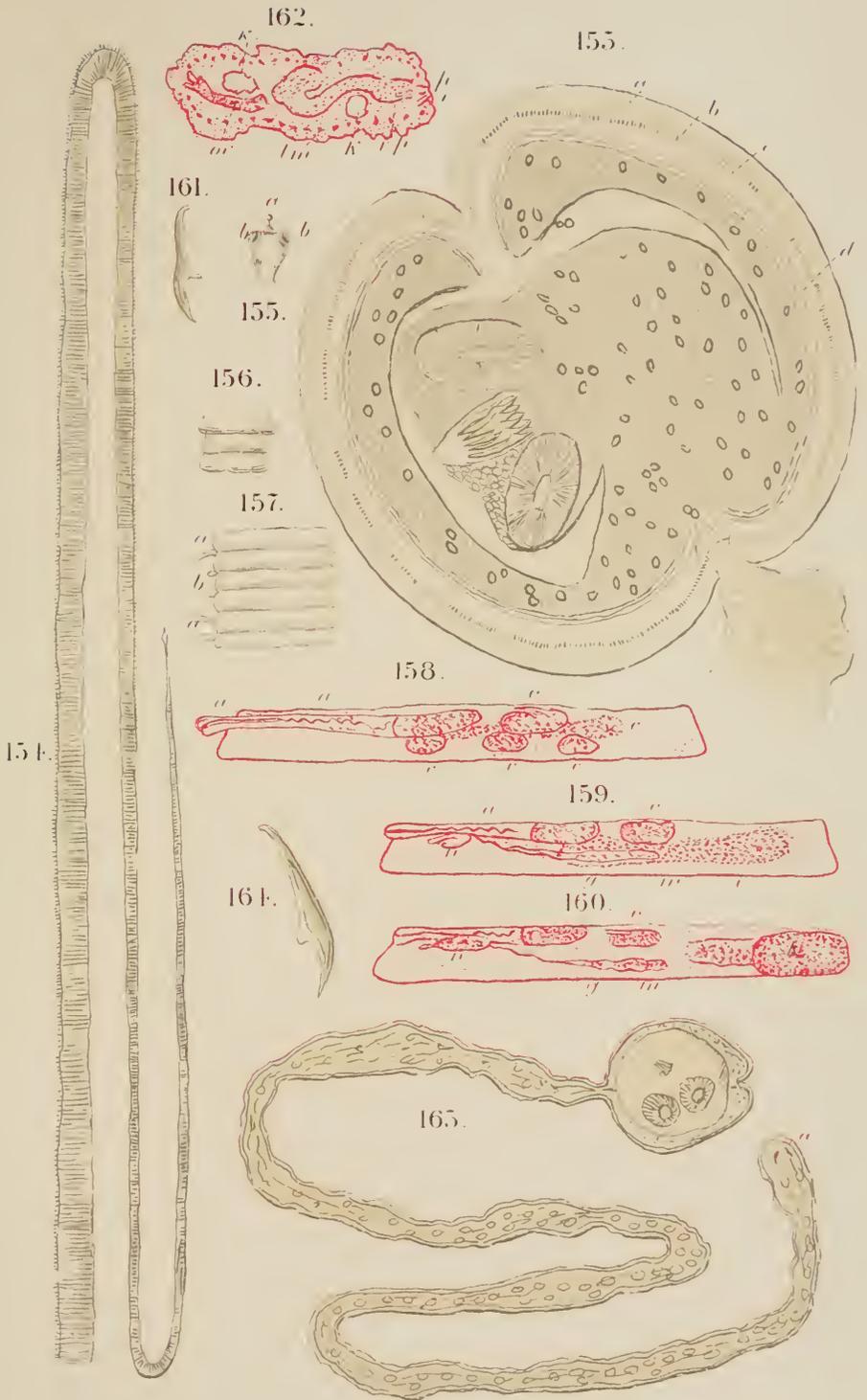
212-216. DAVAINEA CESTICILLUS. 217-218. DAVAINEA ECHINOBOTHRIDA.
 219-227. DAVAINEA TETRAGONA



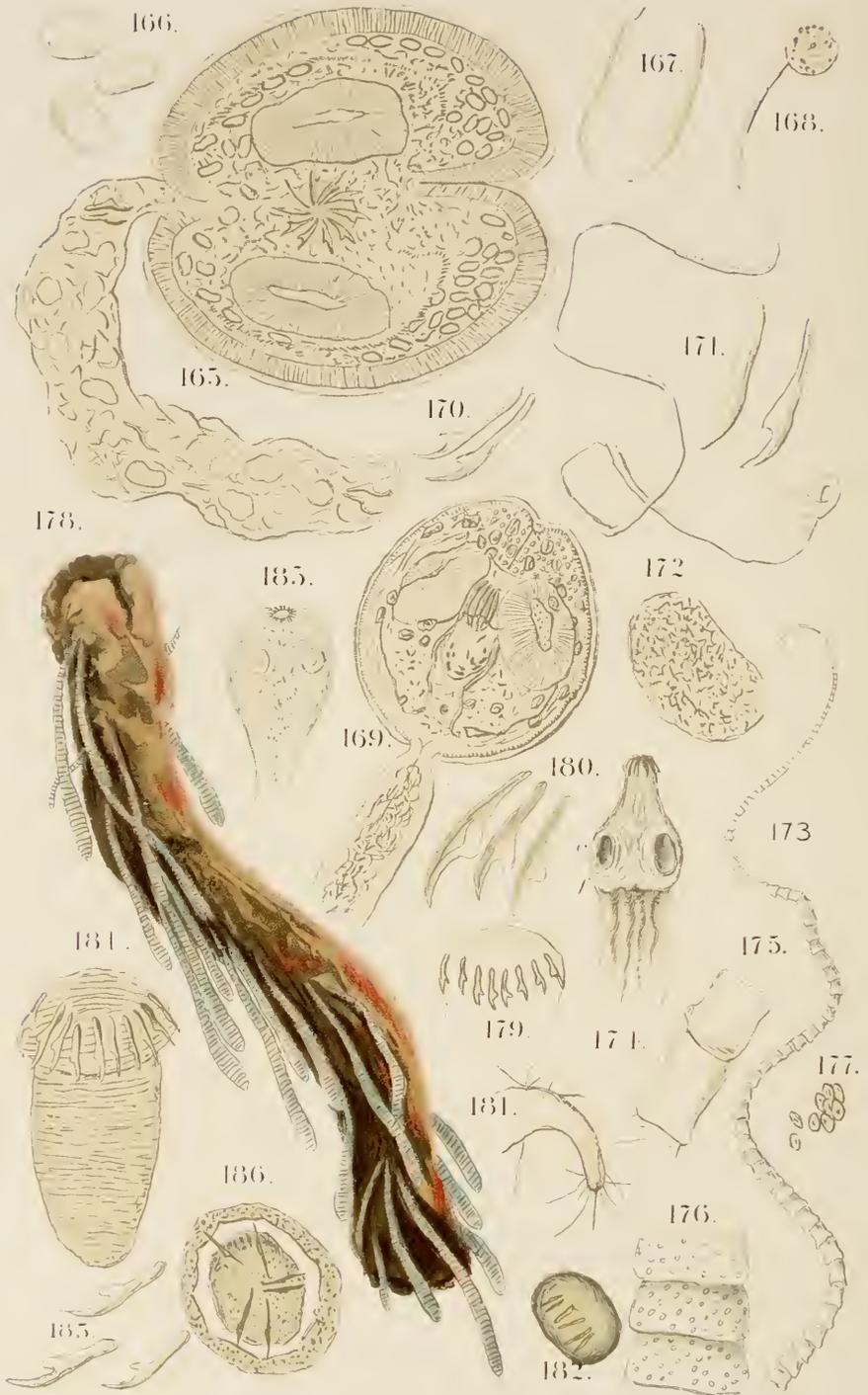
228-235 DAVAINEA TETRAGONA 236-242. DAVAINEA FRIEDBERGERI, 243-246. DAVAINEA CRASSULA.



247-251, ECHINOCOTYLE ROSSETERI. 252-255, OPHRYOCOTYLE PROTEUS



153. DREPANIDOTÆNIA SINUOSA. 154-164 DREPANIDOTÆNIA SETIGERA.



165-172 DREPANIDOTÆNIA TENUIROSTRIS.
 173-186. DREPANIDOTÆNIA INFUNDIBULIFORMIS.

- [Figs. 268-270. *Taenia nigropunctata*. After Crety, 1890.]
- Fig. 268. Head: v, sucker; c, neck. After Crety, 1890, fig. 3.
- Fig. 269. Isolated segment: l, eggs; m, ovary; p, genital pore; u, uterus. After Crety, 1890, fig. 1.
- Fig. 270. Egg with oncosphere. After Crety, 1890, fig. 2.
- Plate XXI, Figs. 271-274.—*Taenia malleus*, *Idiogenes otidis* and *Taenia* sp. Conard, MS.
- Fig. 271. *Taenia malleus*, head and anterior segments. After Goeze, 1782, Tab. XXX, fig. 3.
- [Figs. 272-274. *Idiogenes otidis*.]
- Fig. 272. Pseudoscolex and anterior portion of strobila. The first four segments form the pseudoscolex. After Zschokke, 1888, Pl. III, fig. 39.
- Fig. 273. Segment with male and female organs: cd., vas deferens; c. e., vas efferens; ci., cirrus; t., testicles; f. d. v., end of vagina (receptasulum seminis); gl. g., ovary; gl. v., vitellogene gland; va., vagina. After Zschokke, 1888, Pl. III, fig. 42.
- Fig. 274. Segment with developed uterus: cap. ut., superior uterine cavity; c. d., vas deferens; p. d. c., cirrus pouch; va., vagina. After Zschokke, 1888, Pl. III, fig. 46.
- [Figs. 275, 276. Two diagrams of *Taenia* sp. from chickens. After Conard, unpublished.]
- Fig. 275. Dorsal view; fig. 276. transverse section: n., nerve; d. c., dorsal canal; v. c., ventral canal; t. c., transverse canal; g. c., genital cloaca with pore; c., cirrus; c. p., cirrus pouch; v. s., vesicula seminalis; t., testicle; ut., "probably uterus" (or testicle?); v., vagina; r. s., receptaculum seminis; ov., probably ovary; s. g., probably shell gland; l. m., longitudinal muscles.

CHAPTER VIII.

SOME EGGS.

The five accompanying plates contain twenty-nine figures of eggs, natural size, of the following species, all of which occur in Pennsylvania as natives:

PLATE I.

SHARP-SHINNED HAWK.

BARN OWL.

SCREECH OWL.

GREAT HORNED OWL.

SPARROW HAWK.

PLATE II.

MARSH HAWK.

RED-TAILED HAWK.

COMMON CROW.

PLATE III.

COOPER'S HAWK.

BARRED OWL.

BLUE JAY.

LONG-EARED OWL.

PLATE IV.

BROAD-WINGED HAWK.

GOSHAWK.

RED-SHOULDERED HAWK.

SAW-WHET OWL.

PLATE V.

TURKEY BUZZARD.

BALD EAGLE.

DUCK HAWK.



SHARP-SHINNED HAWK.



BARN OWL.



SCREECH OWL.



GREAT HORNED OWL



SPARROW HAWK.



SPARROW HAWK



MARSH HAWK.



MARSH HAWK.



RED-TAILED HAWK.



RED-TAILED HAWK.



AMERICAN CROW.



AMERICAN CROW



COOPER'S HAWK.



COOPER'S HAWK.



BARRED OWL



BLUE JAY



BLUE JAY



AMERICAN LONG-EARED OWL



BROAD-WINGED HAWK.



BROAD-WINGED HAWK



GOSHAWK.



RED-SHOULDERED HAWK.



RED-SHOULDERED HAWK



SAW-WHET OWL



TURKEY BUZZARD.



TURKEY BUZZARD.



BALD EAGLE.



DUCK HAWK.



DUCK HAWK.

The many changes of plumage which birds have are fully explained in former chapters, and as there are, with certain species, great variations in their eggs—a nest will sometimes contain eggs wholly different in markings—it has been deemed best to show how marked these variations are with several of our common birds. The author is very greatly indebted to Messrs. Ward, of Rochester, New York, for having kindly selected and loaned from their collection the specimens from which the accompanying illustrations have been made.

CHAPTER IX.

THE DESTRUCTION OF NOXIOUS ANIMALS.

This chapter contains several papers which deal with a number of subjects of especial interest. The Bounty Records given here, although unfortunately not complete, are without doubt more accurate than any which have been printed or ever can be published in connection with the notorious bounty act of 1885. This statement is made because in a number of counties the records were destroyed after the data given in this chapter were compiled.

The scalp act of 1897, which allows premiums for Wildcats, Foxes and Minks, is given in full. The author of this Measure, Representative G. W. Campbell, of Fayette county, prepared it with particular care, and persons who may attempt to practice fraud under it will likely get into a great deal of trouble.

Some of the best methods known to trappers and hunters, of capturing and destroying wild animals which commit so much damage in the poultry yard, and to game and song birds, are quite fully explained.

The section devoted to Heads is one which, with the carefully prepared illustrations made from specimens on which bounties were paid, shows clearly the great necessity of having some public document that will enable officials and scalp-hunters to recognize one animal from another. It is ridiculous, to say the least, that the taxpayers of any county in this Common-

wealth should pay premiums for heads of game birds, domesticated fowls, Shrikes, Whip-poor-wills, Sea Gulls, etc., because local officials may, through ignorance, accept them as Hawks or Owls. House cats and cur dogs, Squirrels and other mammals should never again be used to answer for Wildcats, Wolves, Minks and Weasels.

The citizens of this State are, it appears, strongly in favor of paying bounties, and while such a feeling exists it is but proper that this work should be prepared, not only to correct wrong impressions, which are so widespread about many birds and mammals, but, at the same time, show what species are chiefly responsible for the enormous destruction of poultry, game and small song birds.

SOME BOUNTY RECORDS.

The tabulated bounty records which appear on succeeding pages were paid under the act of June 23, 1885, and the amended act of 1889 which repealed that portion of the act of '85 that allowed bounties for Hawks, Owls and Weasels. These laws caused an enormous expenditure of money. It is believed to be a conservative estimate to state that fully \$150,000 were paid out in bounties, and considerably more than half of this amount was expended for birds of prey or other kinds of feathered animals which were believed to be Hawks and Owls. It has been absolutely impossible to secure from a number of counties any records which would show the number of each species of bird or mammal on which premiums were paid. In the majority of cases this is due to the fact that county officers did not preserve the bounty certificates after their accounts were audited at the end of each year. The writer has expended a great deal of time, considerable money and experienced a lot of trouble to obtain all the facts possible in connection with recent scalp acts, and as a result the records which follow are undoubtedly the most complete that have ever been published in connection with the scalp act of June 23, 1885.

THE BOUNTY ACT OF 1885.

The scalp act of June 23, 1885, under which so many birds, etc., were slain reads as follows:

"An act for the destruction of Wolves, Wildcats, Foxes, Minks, Hawks, Weasels and Owls in this Commonwealth.

"Section 1. That for the benefit of agriculture and for the protection of game within this Commonwealth, there is hereby established the following premiums for the destruction of certain noxious animals and birds, to be paid by the respective

counties in which the same are slain, namely; for every Wildcat, two dollars; for every Red or Gray Fox, one dollar; for every Mink, fifty cents; for every Weasel, fifty cents; for every Hawk, fifty cents; and for every Owl, except the Arcadian, Screech or Barn Owl, which is hereby exempted from the provisions of this act, fifty cents."

"Section 2. It shall be the duty of any person having killed any animal or bird mentioned in the first section of this act, and who is desirous of availing himself of the premiums therein provided, to produce such slain animal or bird before any magistrate, alderman or justice of the peace of the county in which the same was killed, and make affidavit of the time and place of killing the same: Provided, That the pelt, if entire from the tip of the nose of any such animal, may be produced in lieu of the same when so preferred; and upon the reception of any such animal or pelt, or bird, it shall be the duty of such magistrate, alderman or justice of the peace, in the presence of said person killing such animal or bird, and one elector of the county, to cut off the ears of such animal or the head of such bird, and in the presence of said persons burn the same.

"Section 3. Upon the destruction of the ears or heads as aforesaid, the magistrate, alderman or justice of the peace shall give to the person producing such animal or bird, a certificate of compliance with the provisions of this act directed to the commissioners of the county in which such animal or bird was slain, which certificate shall contain the following facts: the kind of animal or bird killed; when, where and by whom killed, and the date by whom and in the presence of what elector the ears of said animal or head of said bird was destroyed, and upon the production of such certificate the said commissioners shall give an order upon the county treasurer for the payment of the premium or premiums provided by this act, and it shall be the further duty of the magistrate, alderman or justice of the peace taking the affidavit, provided in the second section of this act, to file the same forthwith, or cause the same to be filed in the office of the commissioners of the county, and upon filing the same, the said magistrate, alderman or justice of the peace shall receive from the county treasurer, the sum of twenty cents, in full compensation for all services under this act."

SCIENTIFIC MEN PROTESTED.

This unjust and expensive act had only been in force a few months when naturalists and other scientific

gentlemen residing in the borough of West Chester began to oppose it most vigorously; indeed the first efforts made to have the noxious "Scalp Act of 1885" repealed were begun in Chester county, when early in 1886 the members of the West Chester Microscopical Society, under the leadership of such prominent and able gentlemen as Dr. Jos. T. Rothrock, Dr. Jesse C. Green, Ex-congressman Washington Townsend, Addison May and others called a special meeting, with the view of creating sentiment to bring about the repeal of that portion of the act which allowed premiums for the heads of beneficial birds. This society published in February, 1886, a pamphlet containing strong resolutions condemning the act, with numerous letters from some of the most eminent ornithologists in the United States, together with a brief description of the birds of prey and their food habits. This report was widely circulated throughout Pennsylvania, and as many of the leading newspapers of the State quoted quite extensively from it a sentiment was soon started in almost every county of the Commonwealth in favor of, at least, the beneficial species of Hawks and Owls.

OTHERS LABORED TO REPEAL IT.

The members of the State Board of Agriculture, through Secretary Thos. J. Edge, assisted by the writer, who at that time had made dissections of over 1,900 stomachs of Hawks and Owls, labored most industriously to show the economic value of the raptorial birds, and secure the repeal of that part of the odious measure which prompted the destruction of certain birds which were of the greatest value to farmers and fruitgrowers.

THEIR EFFORTS WERE SUCCESSFUL.

These commendable efforts which, as previously stated, originated among scientific men in West Chester, resulted in the abrogation, at the Legislative session of 1887, after a most spirited contest, of that portion of the act which related to Hawks and Owls. Secretary Thos. J. Edge and the writer corresponded with county commissioners, prominent farmers, naturalists and sportsmen throughout the State, and a condensation of this correspondence, both for and against the repeal, follows:

WHY IT SHOULD BE REPEALED.

We believe the act should be repealed on account of the following reasons:

1. It causes a drain upon the treasuries of the respective counties which is not warranted by the results produced.
2. Collectively considered the Hawks and Owls by the destruction of injurious rodents and insects, confer a benefit which is much more than an offset for the poultry, game and small wild birds, which certain of these birds of prey destroy.
3. The Cooper's Hawk, the Sharp-Shinned Hawk, the Goshawk, the Duck Hawk, the Pigeon Hawk and the Great Horned are detrimental, but if a bounty should be placed on the heads of these birds all species of Hawks and Owls would be destroyed by scalp-hunters.
4. The payment of all bounties should be discontinued until officials can acquaint themselves with birds and mammals so that premiums will not be paid for heads of Chickens, Turkeys, Pheasants, Robins, Sparrows, etc., under the belief that they are Hawks and Owls; and on the other hand officials should know enough about mammals that the ears of Opossums, Red Squirrels, house Cats, cur Dogs or pieces of Buffalo skins, Mule hides, etc., should not be accepted by them for such detrimental animals as Wolves, Wildcats, Foxes, Minks and Weasels.
5. Increased duties are imposed upon county officers for which no additional compensation has been provided.

6. In a number of cases county officials have been imposed on and bounties illegally drawn.

7. It encourages a certain class to follow hunting as a means of livelihood, and to the exclusion of other labor.

8. Self-interest would lead to the destruction of the detrimental birds and mammals.

9. Farmers and poultry-raisers need no bounty to induce them to trap and kill birds and other wild animals which destroy their poultry.

10. The repeal of the act will, by the increase of the birds of prey, cause greater destruction to field mice, which do much mischief on the farm.

11. The payment of bounties for any purpose is based upon wrong principles and should be discouraged.

WHY THE ACT SHOULD NOT BE REPEALED.

We believe the act should not be repealed because:

1. This being the first year of its action, the total amount paid will be greatly in excess of that of any subsequent year, and owing to the increased scarcity each year, the amount annually paid will every year be less.

2. By a repeal the good effects of bounties already paid would be practically lost.

3. The destruction of these birds and other animals is a great protection to game; Pheasants, Quail and Wild Turkeys, besides many kinds of Wild Ducks, Snipe and Woodcock, in the way of feathered game, are destroyed by both Hawks and Owls and many of these game birds are also killed by Foxes, Wildcats, Minks and Weasels. Great numbers of Rabbits are annually devoured by the Hawks, Owls and other animals for which premiums are paid; the Wildcats destroy many Deer, and Squirrels are also killed by Hawks, Owls, Foxes, etc. Game of all kinds would, no doubt, be much more plentiful if all Hawks, Owls, Foxes, Minks, Wildcats and Weasels were killed.

4. If Hawks and Owls do not disturb poultry and game, why is it that all kinds of domesticated fowls, Pheasants, Quail, Rabbits, etc., show signs of alarm and hurry to cover when a Hawk or an Owl comes near them?

5. If Hawks and Owls are such great destroyers of insects and Mice, why is it they will so readily abandon the pursuit of these pests and get into traps baited with Chickens or small birds?

6. Many experienced Quail and Pheasant hunters claim that they often find these game birds by watching for places where Hawks are waiting, and in the majority of cases the covey of Quail or Pheasants will be discovered in the vicinity where Hawks are. Hawks will follow day after day a flock of Quail and often, especially in severe snowy weather, kill all the birds.

7. Hawks, particularly the smaller species, kill large numbers of small song birds, which are valuable as insect destroyers.

8. All laws are liable to abuse and violation, and this one is no exception to the general rule.

9. The effect of a continuance of the law as it now is will be to increase the production of poultry and decrease its price.

WHERE SKUNKS WERE PAID FOR.

The records on succeeding pages indicate that in the county of Clinton, bounties were paid in the year 1885, 1886 and 1887 for 294 Skunks, and during the same years premiums were allowed in Centre county for 3,370 Skunks. From this it seems evident that both of these counties had local laws in force which enabled the county commissioners to pay for these animals. The Panther, which is included among other animals paid for in 1886 by Centre county, was, no doubt, another species which was covered by a local scalp act or some general law which was repealed in 1889.

A FEW WOLVES.

The Lackawanna county records show that four Wolves were paid for in 1896. Dr. Isaiah F Everhart and Mr. Geo. P. Friant, two well informed naturalists, of Scranton, Lackawanna county, have for many years collected specimens in this section and they are inclined to believe there is some mistake about these animals, as neither of these gentlemen have heard of a genuine wild Wolf in that locality within the last twenty years. Tioga county paid for three Wolves, but as shown elsewhere in this work they had been brought from the far west and liberated in Tioga and killed.

CRAWFORD'S ENORMOUS OUTLAY.

The county of Crawford leads all other counties in the State in the amount of money expended under the act of 1885. This county paid, it is said, between \$10,000 and \$12,000 in bounties and fees to local officials. The incomplete records from Crawford show that nearly 11,000 Hawks and Owls and over 10,500 Minks and Weasels were paid for in about two years. The members of the Senate and House of Representatives from Crawford have always, in recent years, vigorously opposed all bounty measures which have been under consideration in our General Assembly and one of the chief arguments they used was that such legislation, with the lack of popular knowledge of wild birds and mammals, enabled designing persons to practice fraud in numerous ways; Red Squirrels and Chipmunks were killed for Weasels, Butcher-birds and other feathered animals were called Hawks and Owls, and their heads were often of as much value to scalp hunters as the genuine heads.

PIKE AND LYCOMING COUNTIES.

Pike county is one of the best localities in Pennsylvania for game of different kinds, but unfortunately this county is infested with a number of market hunters who are skilled in snaring and trapping game. These poachers, together with Foxes, Wildcats, Minks, Weasels and Hawks of the genus *Accipiter*, with the Great Horned Owl, have almost entirely exterminated Ruffed Grouse during recent years in some parts of Pike and neighboring counties. From best information which can be obtained no efforts were made to practice fraud in Pike county where under bounty laws since 1885, 1,116 Foxes (both species), 132 Wildcats and 297 Minks have been killed for premiums.

The members of the State Board of Game Commissioners have given especial attention to the professional snarers and market hunters in the Pike county district and reports received show that this illegal work has decreased during the past year.

In the county of Lycoming, through the energetic efforts of Game Commissioner Mr. E. B. Westfall, market hunting and the illegal sale of game has been practically stopped. This is fortunate, and if the game-devouring Foxes were thinned out Ruffed Grouse would be much more plentiful and farmers would lose much less poultry. Lycoming county has a large amount of territory especially suited to Ruffed Grouse and if it was not for Foxes, which Mr. Chas. H. Eldon, Taxidermist, of Williamsport, says are increasing rapidly, these birds, as well as other kinds of game and small wild birds, would be much more abundant.

ADAMS COUNTY.

Year.	Hawks.	Owls.	Foxes.	Minks.	Wildcats.	Weasels.
1885, ..	828	1	186	14	8	10
1886, ..	2,976	422	125	81	4	319
1887, ..	1,510	695	134	78	2	194
1889, ..			70	112	7	
1890, ..			264	199	6	
1891, ..			261	138	2	
1892, ..			301	55	4	
1893, ..			315	89	4	
1894, ..			344	78	3	
1895, ..			57	10	1	
1896, ..					25	
Total,	5,314	1 118	2 057	854	66	523

During the first twelve months of act of 1885 Adams county paid \$3,800 in bounties.

ALLEGHENY COUNTY.

This county paid but little bounty under the act of 1885. During sixteen months Allegheny county paid out only \$53.00 in bounties.

ARMSTRONG COUNTY.

Have not been able to get from this county records but there is little doubt that a considerable amount was spent for premiums. During the first thirteen months of the act of 1885 Armstrong county expended in bounties no less than \$1,255.30 for heads of Hawks, Owls, Foxes, Minks and Weasels.

BEAVER COUNTY.

Commissioners' Office
Beaver, Pa., May 28, 1897.

Dear Sir: Your favor of the 27th inst. is just at hand and in reply I would say: prior to the year 1889 I cannot give the information you ask for in detail, but I give such facts as our records show as follows:

1885, total amount paid for premium,	\$15 75
1886, total amount paid for premium,	234 25
1887, total amount paid for premium,	228 25
1888, total amount paid for premium,	50
1889, five minks and eleven foxes,	12 25
1890, 40 minks and 183 foxes,	193 00
1891, 23 minks and 249 foxes,	254 75
1892, 46 minks and 262 foxes,	273 50
1893, 80 minks and 133 foxes,	153 00
1894, 53 minks and 178 foxes,	191 25
1895, 59 minks and 159 foxes,	173 75
1896, 33 minks and 79 foxes,	87 25
Total sum paid,	<u>\$1,817 50</u>

FRANK A. JUDD,
Commissioners' Clerk.

BERKS COUNTY.

Year.	Foxes.	Minks.	Wildcats.	Wolves.	Weasels.	Hawks.	Owls.
1885,	48	.....	4	.....	2	.....	.....
1886,	50	117	10	1	108	999	42
1887,	35	76	3	.....	100	479	52
1889, .....	.....	.....	1	.....	.....	.....	.....
1890,	68	22	5	.....	.....	.....	.....
1891,	86	40	2	.....	.....	.....	.....
1892,	95	41	4	.....	.....	.....	.....
1893,	102	80	1	.....	.....	.....	.....
1894,	72	51	.....	.....	.....	.....	.....
1895,	56	58	.....	.....	.....	.....	.....
Total,	612	485	30	1	210	1,478	94

No bounties were paid in Berks county, according to records, in 1888 or 1896. Eleven "Catamounts" paid for in 1885, 1886 and 1887 are included in column under Wildcats.

BLAIR COUNTY.

Year.	Foxes.	Minks.	Weasels.	Wildcats.	Hawks.	Owls.
1885,	23	4	7	.....	20	3
1886,	160	74	155	1	390	72
1887,	185	28	36	.....	71	15
1888,	1	.....	.....	.....	.....	.....
1889,	47	4	.....	.....	.....	.....
1890,	293	35	.....	2	.....	.....
1891,	307	37	.....	1	.....	.....
1892,	250	41	.....	1	.....	.....
1893,	169	36	.....	.....	.....	.....
1894,	216	41	.....	1	.....	.....
1895,	96	41	.....	.....	.....	.....
Total,	1,047	341	198	6	481	90

BRADFORD COUNTY.

Year.	Foxes.	Wildcats.	Weasels.	Minks.	Hawks.	Owls.
1886,	302	10	641	345	841	232
1887,	209	10	343	212	144	117
1890,	235	6	1	315	.....	.....
1891,	234	9	.....	462	.....	.....
1892,	291	10	.....	695	.....	.....
Total,	1,271	45	985	2,029	925	349

BUCKS COUNTY.

Year.	Foxes.	Minks.	Weasels.	Hawks.	Owls.
1886,	19	69	111	654	58
1887,	21	47	71	276	43
1888,* .....	.....	.....	.....	.....	.....
1889,	3	6	.....	.....	.....
1890,	16	9	.....	.....	.....
1891,	38	17	.....	.....	.....
1892,	47	52	.....	.....	.....
1893,	107	88	.....	.....	.....
1894,	117	59	.....	.....	.....
1895,	37	14	.....	.....	.....
1896,	50	73	.....	.....	.....
Total,	455	434	182	930	101

*No premiums paid.

BUTLER COUNTY.

Year.	Foxes.	Minks.
1891,	64	338
1892,	49	400
1893,	59	219
1894,	88	205
1895,	39	180
1896,	30	120
Total,	329	1,462

The bounty records of previous years could not be found in county commissioners' office. Butler paid from about November 1, 1885, to November 1, 1886, \$833.75 for Hawks, Owls and other animals.

CAMBRIA COUNTY.

Year.	Foxes.	Minks.	Weasels.	Wildcats.	Hawks.	Owls.
1885, ...	286	11	9	31	12	3
1886, ...	793	207	180	47	62	98
1887, ...	373	135	84	11	44	81
1888, ...	9	2	2	3	2	3
1889, ...	32	20	.....	5	.....	.....
1890, ...	490	188	.....	4	.....	.....
1891, ...	541	132	.....	4	.....	.....
1892, ...	438	120	.....	11	.....	.....
1893, ...	124	28	.....	12	.....	.....
1894, ...	.....	.....	.....	6	.....	.....
1895, ...	.....	.....	.....	2	.....	.....
Total,	3,086	843	275	136	120	185

In 1893 the county commissioners declined to pay any bounties on Foxes and Minks, claiming the act of 1889 to be unconstitutional. A "case stated" was submitted to the court

for an opinion, and March 25, 1895, opinion of the court was filed sustaining the county commissioners. No appeal having been taken to a higher court this county has not paid any bounties under act of 1889, except for Wildcats; no Wolves having been killed in the county from 1885 to 1896, inclusive.

CAMERON COUNTY.

Year.	Foxes.	Wildcats.	Minks.
1894,	63	24	20
1895,	65	25	30
1896,	55	9	3
Total,	183	58	53

The total amount of money paid in Cameron county for Foxes, Minks and Wildcats from 1890 to 1896, inclusive, is given as follows:

1890,	\$129 82
1891,	160 50
1892,	173 15
1893,	171 45
1894,	131 00
1895,	139 45
1896,	84 50
Total sum paid,	\$989 87

These amounts include fees of justice of peace.

After the act of 1885 was passed Cameron county paid to November 1, 1886, at least \$130 in premiums, and from November 1, 1886, to 1890, it is said, a considerable additional amount was paid, but these certificates could not be found by commissioners' clerk, Mr. Franklin Housler, who sent me the records given above.

CENTRE COUNTY.

Year.	Foxes.	Minks.	Weasels.	Wildcats.	Skunks.	Hawks.	Owls.	Panther.
1885,	612	2	4	20	1,245	16	.....	.....
1886,	362	147	168	14	1,355	381	56	1
1887,	348	99	93	24	770	90	42	.....
1888,	65	.....	.....	13	.....	.....	2	.....
1889,	65	20	.....	38	.....	.....	.....	.....
1890,	511	70	.....	21	.....	.....	.....	.....
1891,	590	133	.....	37	.....	.....	.....	.....
1892,	474	110	.....	16	.....	.....	.....	.....
1893,	471	91	.....	17	.....	.....	.....	.....
1894,	443	148	.....	38	.....	.....	.....	.....
1895,	145	52	.....	14	.....	.....	.....	.....
Total, ...	4,086	872	265	252	3,370	487	100	1

CHESTER COUNTY.

Year.	Hawks.	Owls.	Foxes.	Minks.	Weasels.
1885,	30	.....	1	6	5
1886,	908	108	111	231	334
1887,*	445	79	16	434	212
1890, .....	.....	.....	5	6	.....
1891, .....	.....	.....	4	.....	.....
1892, .....	.....	.....	1	7	.....
1893, .....	.....	.....	7	6	.....
1894, .....	.....	.....	29	15	.....
1895, .....	.....	.....	19	5	.....
1896, .....	.....	.....	27	14	.....
Total,	1,383	187	220	723	551

*January 1 to March 18 only, were bounties paid in 1887.

No bounties were paid in Chester county in 1888 and 1889. The above records include a small number of Nighthawks.

CLARION COUNTY.

Year.	Wildcats.	Foxes.	Minks.	Weasels.	Hawks.	Owls.
1885,		21	11	4	7	3
1886,		285	143	299	440	62
1887,	1	146	62	106	38	11
1888,	6	.....	1	1	.....	.....
1889,	12	57	7	.....	.....	.....
1890,	5	269	54	.....	.....	.....
1891,*	5	.....	.....	.....	.....	.....
1892,	4	.....	.....	.....	.....	.....
1893,	9	.....	.....	.....	.....	.....
1894,	3	.....	.....	.....	.....	.....
1895,	4	.....	.....	.....	.....	.....
1896,	4	.....	.....	.....	.....	.....
Total,	43	778	278	410	485	76

*Ceased paying all bounties except on Wildcats.

During the first twelve months of the act of 1885 Clarion county paid \$944 in bounties.

CLEARFIELD COUNTY.

Year.	Foxes.	Wildcats.	Minks.
1890,	17	.....	5
1891,	149	37	31
1892,	817	83	118
1893,	404	74	89
1894,	456	98	98
1895,	298	96	87
1896, .....	.....	42	.....
Total,	2,141	430	428

Wildcats or Catamounts, as many call them, are very plentiful in Clearfield county, and many complaints have come to this Department about the great damage they do poultry, game, etc.

AMOUNT OF MONEY EXPENDED BY CLEARFIELD
COUNTY.

In consequence of the fact that the bounty certificates for the years 1885 to 1890, inclusive, were destroyed, it was impossible to secure the number of each kind of animal for which premiums were given by Clearfield county, except for the years 1891 to 1895 inclusive. The total money expended is given below:

In 1885, \$344.05; 1886, \$1,716.45; 1887, \$874.85; 1888, \$35.00; 1889, \$182.00; 1890, \$848.30; 1891, \$1,090.35; 1892, \$1,112.25; 1893, \$730.25; 1894, \$974.50; 1895, \$748.75. Total, \$8,656.75.

In consequence of a court decision declaring that certain parts of the present bounty law were unconstitutional, no bounties were paid in Clearfield county after January 15, 1896, except on Wildcats for which \$92.50 were expended from January 6 to March 31, inclusive.

CLINTON COUNTY.

Year.	Foxes.	Minks.	Weasels.	Wildcats.	Skunks.	Hawks.	Owls.
1885,	160	25	.....	7	120	4	.....
1886,	162	53	40	11	182	134	25
1887,	119	23	6	27	92	19	12
1888, .....	.....	.....	.....	11	.....	.....	.....
1889,	11	.....	.....	16	.....	.....	.....
1890,	160	43	.....	32	.....	.....	.....
1891,	207	47	.....	60	1	.....	.....
1892,	187	33	.....	21	.....	.....	.....
1893,	232	29	.....	34	1	.....	.....
1894,	213	27	.....	32	.....	.....	.....
1895,	135	12	.....	30	.....	.....	.....
1896, .....	.....	.....	.....	17	.....	.....	.....
Total,	1,586	292	46	298	396	157	37

COLUMBIA COUNTY.

Year.	Amount of money paid for all ani- mals.
1885,	\$87 50
1886,	771 90
1887,	413 60
1888,	4 00
1889,	27 60
1890,	240 65
1891,	301 00
1892,	255 50
1893,	205 50
1894,	176 25
1895,	114 00
Total sum paid,	\$2,596 90

No bounties were paid in Columbia county in 1896, and records are not in shape to show different kinds of animals on which bounties were paid.

CRAWFORD COUNTY.

Year.	Minks.	Weasels.	Foxes.	Hawks.	Owls.
1885,	101	122	25	221	58
1886,	4,093	4,183	223	7,896	530
1887,	1,021	1,060	20	1,976	103
1888,	2	3	.....	5	1
1889,	1	2	.....	4	.....
1891, .....	.....	.....	1	.....	1
Total,	5,218	5,370	271	10,102	693

No bounties were paid in Crawford county after 1891. About \$12,000 were paid in this county, it is said, under this act of 1885; and it is reliably stated that after the act of June 23, 1885, went into effect Red Squirrels and Chipmunks were as eagerly hunted by some scalp hunters as were Minks and Weasels.

CUMBERLAND COUNTY.

Year.	Wildcats.	Foxes.	Minks.	Weasels.	Hawks.	Owls.
1885,	2	152	14	5	20	9
1886,	10	102	125	176	464	71
1887,	3	69	84	92	124	60
1888,	4					
1889,	1	92	7			
1890,	2	159	75			
1891,		369	110			
1892,		373	127			
1893,		283	71			
1894,	2	168	40			
1895,	2	109	43			
Total,	26	1,876	696	273	608	140

No bounties paid in 1896.

DAUPHIN COUNTY.

Year.	Foxes.	Minks.	Weasels.	Wildcats.	Hawks.	Owls.
1885,	90	2	5		15	3
1886,	46	41	80	2	694	36
1887,	63	43	35	3	161	60
1888,				1		
1889,	22	6		5		
1890,	115	29		1		
1891,	91	42		4		
1892,	102	40		1		
1893,	83	48				
1894,	85	49		2		
1895,	69	60		2		
Total,	766	360	120	21	870	99

DELAWARE COUNTY.

This was probably the only county in the State where many of the alleged noxious animals—Foxes, Minks, Weasels, Hawks and Owls—were of frequent occurrence, that the citizens showed little or no disposition to kill these animals for bounty. The county of Delaware has not, I am informed, paid out in bounties during the last ten years much above fifty dollars. During the first sixteen months of the act of 1885, Delaware county only expended \$10.20. Foxes are not at all rare in some sections of Delaware county but through the efforts of the members of the Rose Tree and other clubs these sly animals are well protected.

ELK COUNTY.

During the latter part of 1885 and about ten months in 1886 Elk county paid upwards of \$500 bounties, chiefly on Foxes, Wildcats, Minks and Weasels. All of these animals, likewise birds of the genus *Accipiter*, are quite numerous in Elk county where they destroy much poultry and game, as well as many species of small wild birds. Wildcats and Foxes are both increasing in this county, and as they increase Deer, Grouse, Rabbits and song birds are decreasing.

ERIE COUNTY

Year.	Foxes.	Weasels.	Minks.	Hawks.	Owls.
1885,	19	30	58	18	20
1886,	111	334	231	827	108
1887,	51	526	371	116	103
Total,	181	890	660	961	231

FAYETTE COUNTY.

No records received from this county. During the first twelve months of the 1885 act Fayette county paid about \$650 in bounties. From about January 1, 1886, to July 1, 1886, Fayette county paid for 278 Hawks; 80 Owls; 82 Foxes; 24 Minks, and 6 Wildcats.

FOREST COUNTY.

No records received from this county. During first fourteen months of act of 1885 Forest paid \$350 in bounties. Wildcats and Foxes are common in Forest county and they destroy annually much poultry and game, especially Pheasants and Rabbits. This county paid in about six months from January 1, 1886, for 110 Foxes; 37 Hawks and 2 Owls.

FRANKLIN COUNTY.

Year.	Hawks.	Owls.	Wildcats.	Foxes.	Minks.	Weasels.
1885,	22	2	14	210	67	9
1886,	268	49	8	247	60	30
1887,	595	77	11	296	109	62
1888,	1		5			
1889,			10	71	6	
1890,			8	423	88	
1891,			9	408	66	
1892,			14	407	162	
1893,			15	326	135	
1894,			22	320	95	
1895,			29	204	46	
1896,			51			
Total,	886	128	196	2,912	834	102

FULTON COUNTY.

Year.	Foxes.	Minks.	Weasels.	Wildcats.	Hawks.	Owls.
1885,	15	11	18	2	353	20
1886,	152	80	82	12	810	90
1887,	103	85	63	20	152	91
1888, .....	.....	.....	.....	2	.....	.....
1889,	50	32	.....	4	.....	.....
1890,	295	160	.....	12	.....	.....
1891,	261	155	.....	9	.....	.....
1892,	213	101	.....	8	.....	.....
1893,	150	80	.....	6	.....	.....
1894,	163	90	.....	8	.....	.....
1895,	70	40	.....	5	.....	.....
1896, .....	.....	.....	.....	1	.....	.....
Total,	1,472	834	163	89	1,315	201

GREENE COUNTY.

Year.	Foxes.	Weasels.	Minks.	Hawks.	Owls.
1885,	3	3	1	2	1
1886,	93	585	68	601	197
1887,	44	398	57	348	176
Total,	140	986	126	951	374

The records do not show that any bounties were paid in Greene county after the year 1887.

HUNTINGDON COUNTY.*

Year.	Foxes.	Weasels.	Minks.	Wildcats.	Hawks.	Owls.
1886,	408	135	94	15	748	126
1887,	20	10	1	2	20	3
1892,	247	.....	40	10	.....	.....
1893,	596	.....	93	15	.....	.....
1894,	585	.....	230	14	.....	.....
1895,	665	.....	928	39	.....	.....
1896,	1,112	.....	1,341	32	.....	.....
Total,	3,633	145	2,727	127	768	129

*Many more animals were paid for from 1885 to 1896, but records in county commissioners' office do not show what they were. In 1885, \$25.65; in 1886, \$239; in 1890, \$1,294.20 and in 1891, \$1,025.50 were paid in premiums.

INDIANA COUNTY.

Year.	Foxes.	Minks.	Wildcats.	Amount of Bounty Paid.
1885, .....	.....	.....	.....	\$215 80
1886, .....	.....	.....	.....	144 25
1887, .....	.....	.....	.....	607 65
1894,	40	45	.....	51 25
1895,	185	82	5	214 50
Total,	225	127	5	\$1,234 45

The commissioners refused to pay any bounties during the years 1888, 1889, 1890, 1891, 1892, 1893 and 1896. The county records unfortunately do not show what kinds of wild animals the \$967.70 was given for in the years 1885, 1886 and 1887, or while the act of June 23, 1885, was in active operation. In a period of about six months from January 1, 1886, this county paid premiums for 350 Foxes; 250 Weasels; 300 Hawks and 150 Owls.

JEFFERSON COUNTY.

Year.	Foxes.	Minks.	Wildcats.
1885,	155	130	13
1886,	950	798	78
1887,	320	270	26
1888,			16
1889,			40
1890,	358	333	35
1891,	233	164	13
1892,			10
1893,			5
1894,			14
1895,			12
1896,			8
Total,	2,016	1,695	270

During the years 1889, 1892 to 1896, inclusive, bounties were only paid in Jefferson county on Wildcats.

LACKAWANNA COUNTY.

Year.	Foxes.	Minks.	Weasels.	Wolves.	Wildcats.	Hawks.	Owls.
1885,	69						
1886,	102	63	40		24	243	29
1887,	100	80	82		24	84	18
1888,					13		
1889,	13	16			19		
1890,	102	67			10		
1891,	68	72			8		
1892,	95	148			13		
1893,	70	100			31		
1894,	130	137			19		
1895,	101	71			29		
1896,	108	84		4	16		
Total,	958	838	122	4	206	327	47

LANCASTER COUNTY.*

Year.	Hawks.		Owls.		Wildcats.		Foxes.		Minks.		Weasels.	
	No.	Amount.	No.	Amount.	No.	Amount.	No.	Amount.	No.	Amount.	No.	Amount.
1885,	193	\$32 40	10	\$5 20	...	...	35	\$31 00	29	\$14 50	33	\$16 80
1886,	900	621 90	313	216 80	...	...	26	31 00	43	28 00	90	62 40
1887,	533	353 80	268	186 70	...	...	91	100 60	141	96 50	160	110 70
1888, .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1889, .....	.....	.....	.....	.....	.....	.....	56	67 75	45	21 75	.....	.....
1890, .....	.....	.....	.....	.....	.....	.....	17	20 00	.....	.....	.....	.....
1891,	1	.....	.....	.....	.....	.....	41	50 75	30	14 50	.....	.....
1892, .....	.....	.....	.....	.....	4	\$6 75	80	98 00	54	27 00	.....	.....
1893, .....	.....	.....	.....	.....	2	4 50	78	97 00	45	21 90	.....	.....
1894, .....	.....	.....	.....	.....	1	2 25	55	67 50	32	16 00	.....	.....
1895, .....	.....	.....	.....	.....	1	2 25	65	81 25	29	14 20	.....	.....
1896, .....	.....	.....	.....	.....	.....	.....	58	72 50	58	27 70	.....	.....
Total, ...	1,627	\$1,068 60	591	\$408 70	8	\$15 75	602	\$717 35	506	\$282 05	283	\$189 90

*The head of a common house cat was sent to the office of the writer by a justice of the peace, of this county, who believed it to be a Wildcat.

LAWRENCE COUNTY.

Year.	Money Paid.
1885,	No payments.
1886,	\$734 00
1887,	427 50
1888,	No payments.
1889,	No payments.
1890,	\$195 35
1891,	234 95
1892,	534 75
1893,	426 75
1894,	No payments.
1895,	No payments.

The following letter explains why more explicit data cannot be secured from this county:

Commissioners' Office,
New Castle, Pa., Nov. 18, 1885.

Dear Sir: In reply to yours of November 7 would say we destroyed all the scalp premium certificates on file in this office last summer when we refitted the vault with metallic shelving, Am sorry we cannot furnish you the certificates, but if it would be any use to you we can give you the amount paid for that purpose.

Respectfully yours,

C. W. CRAWFORD,

Clerk.

LEBANON COUNTY.

Year.	Foxes.	Minks.	Weasels.	Wildcats.	Hawks.	Owls.
1885,	20	.....	.....	1	8	.....
1886,	38	9	27	2	272	52
1887,	64	4	20	1	29	12
1888, .....	.....	.....	.....	1	.....	.....
1889,	1	.....	.....	2	.....	.....
1890,	25	.....	.....	1	.....	.....
1891,	28	.....	.....	.....	.....	.....
1892,	43	.....	.....	.....	.....	.....
1893,	25	3	.....	2	.....	.....
1894,	36	10	.....	4	.....	.....
1895,	19	3	.....	4	.....	.....
1896, .....	.....	.....	.....	2	.....	.....
Total,	299	29	47	20	309	64

LEHIGH COUNTY.

Year.	Hawks.	Owls.	Foxes.	Minks.	Weasels.
1885,	7	.....	63	6	.....
1886,	189	149	73	31	27
1887,	39	13	22	40	30
1888, .....	.....	.....	.....	2	.....
1890, .....	.....	.....	24	24	.....
1891, .....	.....	.....	36	30	.....
1892, .....	.....	.....	32	26	.....
1893, .....	.....	.....	46	38	.....
1894, .....	.....	.....	36	59	.....
1895, .....	.....	.....	44	58	.....
1896, .....	.....	.....	39	50	.....
Total,	235	162	415	364	57

No bounties paid in Lehigh in 1889.

LYCOMING COUNTY.

No bounty records have been obtained from this county, many of the early ones being destroyed by a flood. During the first year that the act of 1885 was in active force Lycoming county paid \$1,039 in bounties, a large part of which was for beneficial Hawks and Owls. Foxes, Wildcats and the Common Weasel are common, especially Foxes, in certain sections of Lycoming and they do much damage to poultry and game. In a period of about six months from January 1, 1886, this county paid for 700 Hawks and Owls, and 250 Foxes.

McKEAN COUNTY.

From date of act (June 23, 1885), to November 1, 1886, this county paid \$1,023.50 in bounties for different kinds of animals. A considerable additional amount has been paid in McKean in bounties since the date

above given, or until 1893. After 1893 bounties were not paid in McKean county for any animals until 1897, when Judge A. G. Olmsted ruled "That a bounty of \$2.00 be paid on each Wildcat." Wildcats and Foxes are numerous in this county and they do much damage to game and small wild birds. During first six months of 1886 McKean county paid for 17 Wildcats; 137 Foxes; 115 Minks; 120 Hawks; 81 Owls, and 22 Weasels.

MERCER COUNTY.

No bounty records have been received from Mercer, which, in the first few months of the act of 1885, was one of the banner counties in paying premiums, as indicated by an outlay of \$2,319.70. This is one of the districts in Pennsylvania where the clover-loving and burrowing Woodchuck gives the farmers so much trouble, and at nearly every session of the Legislature the representatives from this county make an effort to have a bounty placed on this troublesome animal. A letter received from Mercer county commissioners in June, 1886, contains this information:

"Our people did not become apprised of the passage of the act to which you refer until some time after its approval, and as a result we did not have any certificates presented until after the first of December, 1885. Since that time we have paid out \$1,300, and of this amount fully \$1,000 has been for Hawks and Owls; mostly Owls. Have not paid for more than ten or 12 Foxes."

MIFFLIN COUNTY.

No bounty records received from this county. In the first eight months that act of 1885 became generally known, Mifflin paid \$357.60 in bounties. This is a num-

ber one locality for Pheasants, Wild Turkeys and Rabbits, but the prowling Foxes and sneaking Wildcats keep them thinned out, and they also destroy much poultry.

MONTGOMERY COUNTY.

Year.	Hawks.	Owls.	Minks.	Weasels.	Foxes.
1886,	106	8	17	12	.....
1887,	140	23	1	5	.....
1889, .....	.....	.....	1	.....	.....
1892, .....	.....	.....	9	.....	2
1893, .....	.....	.....	6	.....	4
1894, .....	.....	.....	5	.....	6
1895, .....	.....	.....	16	.....	6
1896, .....	.....	.....	20	.....	17
Total,	246	31	75	17	35

No Wildcats in this county; no bounty records found for 1888, 1890 and 1891.

NORTHAMPTON COUNTY.

No records obtained from Northampton where, during first few months that act of 1885 was generally known, \$381.60 were paid in bounties.

PERRY COUNTY.

This county paid from December, 1885, to November 1, 1886, \$1,140.25 in bounties; since then a very considerable sum has been expended but detailed information concerning it I have not been able to secure. From December, 1885, to July 6, 1886, Perry paid premiums as follows: 465 Hawks; 62 Owls; 453 Foxes; 130 Minks and 52 Weasels.

PIKE COUNTY.

Year.	Foxes.	Hawks.	Owls.	Wildcats.	Weasels.	Minks.
1885,	18	12	3	2	1	1
1886,	163	196	12	7	12	40
1887,	86	48	9	14	46	14
1888, .....	.....	.....	.....	14	.....	.....
1889,	16	.....	.....	12	.....	6
1890,	133	.....	.....	7	.....	29
1891,	122	.....	.....	10	.....	16
1892,	147	.....	.....	20	.....	54
1893,	185	.....	.....	18	.....	44
1894,	117	.....	.....	4	.....	54
1896,	129	.....	.....	24	.....	34
Total,	1,116	256	24	132	59	292

POTTER COUNTY.

Year.	Hawks.	Owls.	Wolves.	Wildcats.	Foxes.	Minks.	Weasels.
1885,	4	.....	.....	24	98	62	.....
1886,	125	48	.....	34	575	325	15
1887,	100	50	.....	36	450	225	10
1888, .....	.....	1	.....	13	.....	.....	.....
1889, .....	.....	.....	.....	6	7	3	.....
1890, .....	.....	.....	1	1	68	34	.....
1891, .....	.....	.....	.....	25	.....	.....	.....
1892, .....	.....	.....	.....	30	.....	.....	.....
1893, .....	.....	.....	.....	36	.....	.....	.....
1894, .....	.....	.....	.....	21	.....	.....	.....
1895, .....	.....	.....	.....	25	.....	.....	.....
1896, .....	.....	.....	.....	13	.....	.....	.....
Total,	229	99	1	264	1,198	649	25

SCHUYLKILL COUNTY.*

Year.	Foxes.	Minks.	Weasels.	Owls.	Hawks.
1885,	86	.....	.....	.....	.....
1886,	255	192	94	.....	.....
1887,	144	115	95	1	1
1888,	9	1	.....	.....	.....
1889,	8	12	.....	.....	.....
1890,	113	58	.....	.....	.....
1891,	126	43	.....	.....	.....
1892,	121	66	.....	.....	.....
1893,	180	91	.....	.....	.....
1894,	182	79	.....	.....	.....
1895,	108	53	.....	.....	.....
1896,	72	10	.....	.....	.....
Total,	1,404	700	189	1	1

*Numerous Hawks and Owls were killed in this county of which no records are on file.

SNYDER COUNTY.

Year.	Wildcats.	Foxes.	Minks.	Weasels.	Hawks.	Owls.
1885, .....	.....	94	6	.....	30	6
1886,	1	94	89	90	520	130
1887, .....	.....	101	68	33	135	39
1889, .....	.....	16	10	.....	.....	.....
1890, .....	.....	141	86	.....	.....	.....
1891, .....	.....	93	107	.....	.....	.....
1892,	1	103	141	.....	.....	.....
1893,	4	55	147	.....	.....	.....
1894,	2	37	113	.....	.....	.....
1895, .....	.....	50	69	.....	.....	.....
1896, .....	.....	67	97	.....	.....	.....
Total,	8	851	933	123	685	175

No bounties paid in Snyder in 1888.

SOMERSET COUNTY.*

Commissioners' Office,
Somerset, Pa., June 11, 1897.

The amount of bounty paid by Somerset county each year since 1885 for scalps is as follows:

1885,	\$450 05
1886,	1,995 25
1887,	940 05
1888,	60 45
1889,	159 60
1890,	1,006 90
1891,	809 95
1892,	833 95
1893,	649 10
1894,	26 35
1895,	13 50
1896,	18 00

Total sum paid, \$6,963 15

The above statement shows the amounts paid for scalps since 1885. Hoping this will be satisfactory,

Yours respectfully,

J. G. EMERT,
Clerk.

SULLIVAN COUNTY.

Year.	Hawks.	Wildcats.	Foxes.	Minks.
1886,	228	23	94	26
1887,	137	31	74	18
1888,		12	1	
1889,		26		
1890,		16	81	
1891,		13	96	34
1892,		26	102	14
1893,		22	107	54
1894,		18	116	77
1895,		24	128	68
1896,		13	122	112
Total,	365	224	921	403

*In about six months from January 1, 1896, Somerset paid bounties as follows: 14 Wildcats; 69 Owls; 410 Hawks; 250 Weasels; 215 Minks and 270 Foxes.

SUSQUEHANNA COUNTY.

In about ten months after act of 1885 became generally known to residents of Susquehanna county bounties amounting to \$1,200 were paid. Considerable money has since been expended but a detailed statement concerning same has not been obtained. Susquehanna in 1885 paid for 19 Foxes; 4 Minks; 5 Weasels, and 6 Hawks and Owls, and in 1886 from January 1, to July 5, for 217 Foxes; 171 Minks; 83 Weasels; 223 Hawks, and 55 Owls.

TIOGA COUNTY.

Tioga county paid in first twelve months under act of 1885, \$1,169 for "scalps." A large sum has been paid since then but no detailed statement concerning same has been obtained.

UNION COUNTY.

Year.	Foxes.	Minks.	Weasels.	Wildcats.	Hawks.	Owls.
1885,	111	.....	.....	.....	6	1
1886,	59	47	52	2	390	171
1887,	85	48	22	.....	476	71
1889,	14	6	.....	2	.....	.....
1890,	75	34	.....	2	.....	.....
1891,	71	69	.....	3	.....	.....
1892,	70	57	.....	5	.....	.....
1893,	75	93	.....	6	.....	.....
1894,	66	66	.....	5	.....	.....
1895,	61	87	.....	5	.....	.....
Total,	687	507	74	30	875	243

VENANGO COUNTY.

Year.	Foxes.	Minks.	Weasels.	Wildcats.	Hawks	Owls.
1886,	58	183	483	2	416	57
1887,	77	163	226	2	79	23
1888,	6	.....	3	.....	.....	.....
1890,	185	228	.....	.....	.....	.....
1891,	112	119	.....	1	.....	.....
1892,	122	143	.....	2	.....	.....
1893,	105	114	.....	.....	.....	.....
1894,	214	279	.....	7	.....	.....
1895,	52	174	.....	.....	.....	.....
Total,	931	1,403	712	14	495	80

WASHINGTON COUNTY.

Year.	Amount paid for all animals.
1890,	\$500 00
1891,	480 75
1892,	490 20
1893,	187 25
Total sum paid,	\$1,658 20

Previous to 1890 no records have been retained in county commissioners' office; no records of name and number of each animal kept at any time. During first year the act of 1885 was in active force Washington county paid for all kinds of animals \$727.50.

WARREN COUNTY.

Dear Sir: In reply to your letter of inquiry of May 28th, I will say that the amounts paid for bounty for the years named is as follows: For 1885, \$226; for 1886, \$1,524.40; 1887, \$707.10; 1888, \$37.50; 1889, \$64.60; 1890, \$18.15; since which time this county has not paid any bounty.

The Commissioners took the ground in 1887 that the law was not constitutional and have refused to pay since, except such amounts as had been paid out by justices to those claiming bounty, and simply refunded to them.

Our accounts are such that to fully answer your inquiries would necessitate assorting each voucher filed, which would require considerable time and some expense, but if required will make such a report.

Respectfully yours,

J. B. JACKSON,

Clerk.

WESTMORELAND COUNTY.

1885,	\$291 50
1886,	784 80
1887,	588 40
1888,	17 70
1889,	
1890,	210 20
1891,	286 40
1892,	220 05
1893,	292 15
1894,	252 90
1895,	234 90
1896,	230 30

Total sum paid, \$3,409 30

Commissioners' Office,
Greensburg, Pa., May 31, 1897.

Dear Sir: Enclosed please find statement of the amount paid out each year for the killing of Hawks, Owls, etc. I am unable to give you the number of each kind killed as the way the records have been kept here they do not give the number and kind, but only give the total amount for each year.

Very truly yours,

HUGH HENDERSON.

WYOMING COUNTY.

Year.	Minks.	Foxes.	Wildcats.	Weasels.	Hawks.	Owls.
1886,	87	103	10	132	21	.....
1887,	90	106	4	130	18	6
1889,	50	43	9	.....	.....	.....
1890,	164	95	14	.....	.....	.....
1891,	149	100	12	.....	.....	.....
1892,	309	113	13	.....	.....	.....
1893,	212	104	6	.....	.....	.....
1894,	135	78	7	.....	.....	.....
Total,	1,196	742	75	262	39	6

The bounty certificates for 1885 and 1887, when bounty was paid cannot be found, and in 1895 and 1896 the commissioners refused to pay bounty for any of the above-named animals.

OTHER RECORDS.

Bounty records from some of the following named counties were burned in the recent fire which destroyed my office. Those from the remainder of the counties could not be obtained in time to go in this chapter:

Bedford,	Montour,
Carbon,	Northumberland,
Juniata,	Philadelphia,
Luzerne,	Wayne,
Monroe,	York

THE SCALP ACT OF 1897.

At the session of 1897, in consequence of the widespread sentiment in favor of bounties, there was a determined effort made to pass a scalp bill, which would allow premiums for Hawks, Owls, Herons, English Sparrows, Crows and Kingfishers. These efforts, of course, were strongly opposed in committee and on the floor of the Legislative halls, and, as a compromise, the following act was passed and approved July 9, 1897:

AN ACT

For the destruction of Wildcats, Foxes and Minks in this Commonwealth, and providing for the payment of bounties on the same, officers' fees, and fixing a penalty for violation of the same.

Section 1. Be it enacted, etc., That for the benefit of agriculture and protection of game within this Commonwealth, there is hereby established the following provisions for the destruction of certain noxious animals, to be paid by the respective counties in which the same are slain, namely: For every Wildcat, two dollars; for every Fox, Red or Gray, one dollar; for every Mink, fifty cents.

Section 2. It shall be the duty of any person, having killed any of the animals mentioned in the first section of this act, who is desirous of availing himself of the premiums therein provided, to produce such slain animal before any magistrate, alderman or justice of the peace of the county in which the same was killed, and make affidavit of the time and place of killing the same: Provided, That the pelt if entire from the tip of the nose of any such animal may be produced in lieu of such animal when so preferred; and upon the reception of any such animal or pelt, it shall be the duty of the said officer, in presence of said person killing such animal and one elector of the county, to cut off the ears of such animal, and in the presence of such persons burn the same.

Section 3. Upon the destruction of such ears, the said officers shall give to the person producing such animal or pelt a certi-

ificate of compliance with the provisions of this act, directed to the commissioners of the county in which such animal was slain, which certificate shall contain the following facts: The kind of animal, and when, where and by whom killed, and the date by whom and in the presence of what elector the ears of such animal were destroyed; and upon the production of such certificate the said commissioners shall give an order upon the county treasurer for the payment of premium or premiums provided by this act, and it shall be the further duty of the said officer taking the affidavit provided for in the second section of this act, to file the same forthwith, or cause the same to be filed, in the office of the commissioners of the county; and, upon filing the same, the said officer shall receive from the county treasurer the sum of twenty-five cents as full compensation for all his services under this act.

Section 4. If any person shall wilfully and fraudulently collect any premium or premiums provided in this act, or shall aid, abet or assist in any official capacity or otherwise in the same, he, she, or they shall be guilty of a misdemeanor, and, upon conviction thereof, he, she or they shall be sentenced to pay a fine of not exceeding five hundred dollars, and undergo an imprisonment in the county jail of the proper county not exceeding one year, both, or either, at the discretion of the court.

Section 5. All acts or parts of acts inconsistent herewith, be and the same are hereby repealed.

If this act is faithfully carried out there should be no fraud practiced under it, and individuals who may desire to manufacture "scalps" of mammals from skins of wild or domesticated animals, will no doubt hesitate about engaging in such ventures when they know the penalty imposed by section four.

While it is a well-known fact that the writer is not an advocate of unwise scalp acts, it must be admitted that this measure provides premiums only for mammals which are a great nuisance. Foxes, Wild-cats and Minks are common and they destroy a large amount of poultry, game, and small wild birds every year.

METHODS OF CAPTURING BIRDS OF PREY.

Ofentimes certain of the birds of prey, as shown on preceding pages of this work, become very troublesome, and the farmer, poulterer or stockman is often obliged, in order to protect himself from serious losses, to adopt means whereby he can rid himself of the feathered depredators. Some of the methods employed in this and other States to destroy Hawks, Owls and Eagles are as follows:

SHOOTING.

When the scalp act of 1885 was in force, great numbers of Hawks were killed by hunters who approached the birds on horseback, in wagons or in sleighs. In one day a hunter shot sixteen Hawks; they were: 3, Cooper's; 3, Sparrow; 2, Red-shouldered; 2, Rough-legged, and 6, Red-tailed. If Hawks are shot at and missed two or three times when thus approached, they become very shy and will seldom allow a wagon or sleigh to get near them. At first, however, these birds can easily be approached by vehicles drawn by a quiet horse, so that the gunner can get within 20 or 30 yards before they fly; and often you can drive or ride directly under them when perched on trees. It is much easier to shoot from a sleigh than a wheeled vehicle. When you use the latter it is best to jump out on the ground before shooting and take the bird on the wing. It is better to go on horseback after Hawks and Eagles than in a sleigh or wagon. Never attempt to shoot when sitting on the horse unless you know the animal will not be frightened at

the report of the gun; and if you make it a rule to slip off the horse before you shoot it will be more satisfactory in many ways.

THE GRASS SUIT.

Hawks, Eagles and other wary birds can frequently be approached quite easily by the hunter attired in grass suits such as are shown in the accompanying illustrations. The writer has employed this disguise with good success in capturing birds of prey, Herons, Shore birds and Ducks. In approaching birds in this dress especial care must be used to prevent your gun from being seen, and if the barrels are bright it is best to paint or cover them with some colored material similar in hue to the suit which is of a dead-grass color. When the game you are slowly and cautiously approaching looks toward you, you should remain motionless until it—if it be a Hawk or Eagle—turns its head in another direction, then move a little nearer or crouch down as shown in illustration "Waiting for a Shot." Usually, by a little careful maneuvering and circling around, the Hawk or Eagle can be approached sufficiently close to enable you to get a good shot. Two men, one attired in a grass suit and the other in ordinary dress, can have better success than a single person in a grass suit in quest of Hawks or Eagles. The man in plain clothes can attract the birds' attention, yet keep several hundred yards, if need be, from it, and his companion in disguise can approach it much more easily.

A good rifle shot can readily destroy Hawks, etc., by using any of the above-described methods. The late Truman Yarrall, of Willistown, Chester county, Pa., was an expert rifle shot; he approached his vic-



GRASS SUIT.



WAITING FOR A SHOT.

tims on horseback, and would shoot them at from 60 to 150 yards distance. This gentleman believed that birds of prey, with a very few exceptions, were the worst foes that poultry and game had to contend against, and all large-sized Hawks and Owls fell before his unerring aim, which caused the death, during the last twenty years of his life, of between 1,500 and 1,600 Hawks, besides a large number of Owls and a few Eagles. Friend Yarnall, when seventy-four years of age, killed, in one winter, 72 out of 74 Hawks that he shot at with his muzzle-loading rifle that carried about 100 bullets to the pound. One hundred and seventy-six Hawks was the greatest number he ever killed in any one year. Rifle-shooting, however, in a populous farming community, is dangerous and, if practiced, too great care cannot be taken. Indeed, it is the safest plan to not do it.

WHEN SNOW COVERS THE GROUND.

When the ground is covered with snow the grass suit, of course, cannot be used as a disguise, and if a horse and sleigh is not obtainable, a dress of pure white material—muslin or any other light weight goods, consisting of pants, loose blouse, hat and white gloves—is a disguise that will enable the hunter, with reasonable caution, to approach on foot birds of prey in the same manner as when attired in the grass suit. The gun barrels should be covered with white material, paint, chalk or muslin case.

SHOOTING HAWKS FROM BLINDS.

The author is indebted to Dr. Isaiah F. Everhart, the well-known traveler and naturalist, of Scranton, Pa., for an account of a unique method of killing birds of prey when migrating, which is adopted by farmers

and other country people in Lackawanna county, where, it is said, several hundred Hawks are slain every year in the autumn. I have been informed that as many as 100 dead Hawks have been seen about this blind at one time.

Scranton, Pa., June 7, 1897.

"B. H. Warren, M. D.,

"Harrisburg, Pa.

"My Dear Doctor: In reply to your letter requesting information respecting the fall migration of Hawks, I am sorry to say that I am not as well informed on the subject as the matter requires. About eight miles north from Scranton, Pa., over a depression of mountain ranges running northeast and southwest, during the fall months, especially October and November, the Hawks have a favorite crossing place going in their migrations. For the past several years the county people have been in the habit of shooting them from blinds on the crest of the Mount of Erush. The mode is as follows: The birds can be seen coming a long distance across the valley or along the mountain side; when within a half mile or so a dead chicken or Hawk is thrown high into the air; If seen by the Hawk it will come straight as an arrow for the supposed prey and can be easily shot.

"The migrations are greatest during the latter part of October and the first part of November, when the wind blows strong from the north or northwest; the number of Hawks shot in one day has been from twenty to thirty, while a hundred or so may be seen that are not attracted to the blinds.

"The principal species are the Red-tail and the Goshawk and Cooper's Hawk, the latter predominating. Occasionally a Golden Eagle falls a victim to the deception; last fall two were killed, while a number were seen to pass. The Bald-headed Eagle cannot be allured, but passes in contempt all efforts to deceive his majesty.

"In the spring migrations north they do not follow this exact course, but are seen high in the air, generally over the crest of the mountain, circling high on their journey.

"I. F. EVERHART."

SHOOTING HAWKS AT ROOSTS.

Another method of shooting Hawks from blinds was, some years ago, very successfully followed by a

Philadelphia taxidermist of my acquaintance who killed, in one winter, about a hundred of these birds, chiefly Red-tailed, Red-shouldered and Rough-legged species, which frequented the meadows in the daytime and at night roosted in neighboring woods. His plan was to go to the woods and, by seeing the droppings under the trees, he could locate places where the birds slept. After having marked these places the man would hide in blinds made of boughs and fallen limbs, brush, etc., and when the birds returned in the evening they were shot. On bright moonlight nights, he informed me, he often killed Hawks by walking from one tree to another which he had previously marked. The stomachs of thirty-five of these Hawks, he thus destroyed in one month, were examined, and, with two exceptions, to-wit: a Red-tail that had remains of a chicken and two Cooper's Hawks which had small birds, all of these birds of prey had in their viscera only small rodents, Meadow Mice chiefly, and insects, principally grasshoppers, and a few frogs. Do you think agricultural or game interests were benefited by the slaughter of these beneficial birds?

TRAPPING BIRDS OF PREY.

Eagles, Hawks and Owls, as well as numerous other kinds of birds, can be trapped. The following are some of the most usual means adopted to capture the raptorial birds.

Birds of prey as well as some predatory mammals will often kill poultry or game and devour a portion of it, and then go off and return again to feed upon the remainder. A steel trap, fastened by a chain to a large stone, spring pole, or fence rail, and placed on or at one side of the slain animal will generally re-

sult in the capture of the destroyer, particularly if it be a raptorial bird.

Hawks and some other birds of prey can be easily caught by setting a steel trap on the top of a tree stump or pole and placing a bait under the trap. A Mouse, small bird, or chicken can be used. Sometimes a live chicken or pigeon tied near the pole or stump on which the trap rests is used to lure the Hawk or Owl, which often will fly to the elevated perch before swooping down upon it. The detrimental species of Hawks are not as apt to be caught by steel traps with live bait as are the beneficial species: especially the Red-tail species. Steel traps set in grass fields or meadows slightly covered with grass and weeds, and baited with dead mice or English Sparrows tied to the pan, often serve as attractive baits to catch Hawks and Owls.

The Cooper's Hawk, Sharp-shinned Hawk and Goshawk, are the three species in this State which are a scourge to the poultry yard. They all, as well as the Duck Hawk, it is said, can be destroyed by the "plank and wire" Hawk trap, a Yankee invention that is easily constructed. It consists of a piece of plank two and a half to three feet square, set with stiff and sharp-pointed perpendicular wires each about eighteen inches to two feet long. This is placed on the ground in a conspicuous place and the plank is covered with grass and dirt, or, in winter, with snow (if ground is covered with snow) and a live chicken or pigeon is secured to the centre. The Hawk seeing this pounces down to be impaled on the sharp-pointed upright wires. The Great Horned Owl, Barred Owl, Snowy Owl, and Eagles have, it is said, been successfully captured by this contrivance.

METHODS OF CAPTURING MAMMALS.

This paper contains brief descriptions of certain methods which may be employed by farmers and poultry raisers to capture different species of mammals which prey upon the inhabitants of their poultry yards.

It is not the intention of the writer to give in this work an exhaustive account of the great number of artful devices, etc., which skillful trappers and poachers employ to catch wild animals. Those who desire such information can get it by consulting books which are devoted entirely to the art of trapping.

While it is true that many kinds of good traps can be made by hand, the best kind of a trap for general use is a good steel trap. Experienced hunters and trappers claim that none are superior to the celebrated "Newhouse Steel Traps," manufactured by the Oneida Community, Kenwood, New York. These traps are graded by numbers. No. 1 has a spread of jaws of four inches; it is designed, especially for Muskrats, Mink and other animals of similar size. Size No. 2 is a little larger; the spread of jaws is five inches. This will hold a Fox, Raccoon or Opossum. It will also hold a Wildcat, but for this powerful animal a No. 3, which has a spread of jaws of five and a half inches and powerful double springs, is better.

Many persons seem to think the pan of the steel trap should be baited. The pan, except in exceptional cases, should never be baited. The pan is intended for the foot of the animal, and the bait should be

placed so that the animal will not notice the trap, but in endeavoring to reach the bait will step on the pan.

TO TRAP A WILD CAT.

Wildcats may be caught in a steel trap placed at the entrance of a pen made of stakes, arranged in a V-shaped manner at the base of a fallen log or by an old stump, in slashings where these animals live. The pen is usually covered over the top with some brush. The bait, a head of a chicken, Pheasant, Rabbit, or even a piece of fresh beef, is hung inside of the pen, and the trap, attached to a strong chain, to one end of which is fastened a small, strong log or pole, weighing, say, six to eight pounds, which, when dragged along, will not stop the animal by its weight, but which will seriously retard its progress. Sometimes a strong spring pole is used. This, when the animal gets into the trap, draws both the trap and its captive up into the air and out of reach of the ground. Wildcats are also sometimes caught in wire snares and dead-falls. This animal may be caught with a steel trap hidden under snow, leaves or moss, and a bird or other bait suspended from a twig above the trap as shown in the illustration "How to Fool a Fox." Some say it is best to place a thin piece of paper over the open jaws of the trap so as to keep dirt, moss or snow from preventing the trap working easily.

TO CATCH A MINK.

Minks follow the water and they hunt around every nook and corner for food. The steel trap is placed near the edge of the water, about an inch under the water's surface, directly in front of a rock or high

bank, where Minks are known to frequent. The bait—a fish, frog, bird or head of a chicken—is hung about eighteen inches above the trap. The bait should always be so placed that it cannot be reached from the bank or rock without the animal steps into the trap to reach it.

The trap may also be placed on the land and covered with leaves, snow, moss, etc., but be careful that the covering will not stop the jaws from closing properly, and hang the bait, which can be scented with fish oil or a mixture of equal parts of peppermint, sweet oil and honey. Traps can also be set in shallow water, and a twig can be stuck in the water near the trap from which the scented bait can be suspended. A trap can be set at the foot of a tree, covered, and the prepared bait hung above it. The carcass of a Muskrat, a favorite article of food, by the way, of the Mink, a dead chicken, fish or chunk of fresh beef can be fastened to a string and dragged along the ground to your trap. When a Mink strikes the trail thus left he will usually follow it until caught. This is a plan often pursued by professional trappers who run a line of traps along water courses.

HOW TO TRAP AND KILL WEASELS.*

For winter trapping, the most successful is the Newhouse double-spring Fox trap. Make two holes in leaf of trap, get any kind of a small bird (English Sparrow is best), tie string around body of bird, under feathers of back and wings, and tie fast under leaf of trap; set trap under rocks, in a bed of dry ground, where snow or rain cannot reach it, and cover all but leaf and bird with gravel. The Weasel will take hold of

*The instructions concerning best methods of destroying Weasels given here are those employed by Mr. Hugh Malloy, of Freeland, Luzerne county, Pa., who is undoubtedly the most successful hunter of these animals in the State. I have quoted Mr. Malloy's methods substantially as he sent them to me.—B. H. Warren.

bird and pull and press at it and the trap will catch him by the head every time. A Mouse or fresh beef-steak will also do for bait. When you find a dead Rabbit which a Weasel has killed and dragged to the nearest tree that is hollow at the butt, cut a stick two feet long, tie hind legs of Rabbit to one end of stick, stand end of stick, with Rabbit on, up in the opening of the tree, put other end on the ground inside of the tree; set steel trap under head of Rabbit; Weasel will follow trail of Rabbit on ground, and in trying to pull the Rabbit off the stick will get in the trap. Set trap lightly.

HOW TO POISON WEASELS WITHOUT DANGER TO OTHER ANIMALS.

When you are hunting Rabbits and shoot one, cut the head off at once while the blood is warm; put strychnine in head, place it in a Rabbit or Groundhog hole, or under a rock, put stone in mouth of hole, leaving space large enough for the Weasel to enter, and it is sure death for either Weasel, Mink or Skunk.

I found several dead Rabbits one day while hunting Foxes. I always carry a small bottle of strychnine, while hunting. I put some in the wound in each Rabbit's neck and fastened it in the hole. In the spring I found, around the mouth of the hole, five Weasels, four brown and one white, dead. You can also take English Sparrows, cut them on breast, put strychnine in the opening and place Sparrow in the hole; you will have game very plentiful on the grounds the next season.

You can also use the wire trap in winter by putting live Sparrows in it and feeding them with bird seeds, oats and wheat; all other kinds of live bait will die with cold except the Sparrow.

HOW TO CATCH WEASELS IN SUMMER.

Take wire trap; it must be well-bound with extra wires or Weasel will bite the wires together and get out. Put oats, corn, peanuts, fresh meat and half of apple or piece of turnip, as food and drink, for Mouse, Chipmunk or Squirrel; set trap on the mountain, between rocks, or large live bait will go in after the food. The Weasel will see the Chipmunk, Squirrel or Mouse in trap, and will go in and kill the bait and cannot get out.

When the Weasel is caught, put trap in water, until it is covered over and Weasel will drown. Set trap for other Wea-

sels. You must feed your live bait about three times a week. Live Sparrows will do all right at any time of the year. If there are no Mice or Chipmunks when you set your trap, you must catch them with a wire trap at home or some other place and put them in the trap. Always keep good, lively bait in your trap and you will be sure to catch Weasels. Do not become discouraged if you have a trap set for several weeks without getting a Weasel; keep feeding your bait and if there are any Weasels within three or four miles of the place, you will be sure to get them. Remember, if you are a hunter, that killing one Weasel on your hunting grounds will save hundreds of game.

GREAT INCREASE OF GAME.

Until 1893 I only knew how to catch Weasels in winter with dead bait; when weather got warm I could not trap any. In 1893 I began experimenting with wire trap; I found that they would go into the trap and kill the bait, but that the trap could not hold them; but that difficulty I overcame. When I could only catch them in winter, they were always plentiful the next fall; but now I catch all I can in winter and summer, before they have their young and after they have their young, and the result is, farmers are successfully raising poultry again and game has increased 900 per cent.

In 1896 there were over 10,000 Rabbits shot within three-fourths of a mile of Freeland, a town of 7,500 population.

TO TRAP THE SKUNK AND RACCOON.

The Skunk is caught in numerous devices, and, as it is not at all wary, little trouble is experienced in trapping it. Steel traps, box traps and dead-falls, are the usual methods employed in this region for their destruction. A steel trap can be placed at the entrance of their burrows, covered over lightly with earth, leaves, etc., and piece of meat, eggs, or mice placed around it.

Raccoons may be caught by placing a steel trap, chained to a log, on the edge of a stream or pond which these animals are known to frequent; the trap should be set an inch or two below the water's sur-

face. The bait: a fish, frog, head of a Pheasant, Turkey or Chicken, scented with oil of anise, and hung about two feet and a half above the trap. The 'Coon can also be caught in the V-shaped pen trap, with bait scented with oil of anise, and placed far back in the pen and the trap covered over at entrance.

SOME METHODS OF DESTROYING RATS.

Rats are found in all sections of the State, and the damage they do in the poultry yard, besides committing great injuries in other ways, is frequently far greater than that done by all other preying animals.

Rats are particularly cautious, which, in conjunction with their remarkable cunning, oftentimes make it a difficult and, at times, almost an impossible task to catch or destroy them.

Common house cats, like Weasels, that often live about barns and other out-buildings, frequently do great service in ridding the places of both Rats and Mice, but sometimes both the cat and Weasel will kill chickens. The Weasel, when it begins to destroy poultry, spares neither old or young and in a short time will slay a great number. Some farmers say they like to have Weasels live about their barns and haystacks, but when these animals frequent such places the poultry is always in more or less danger of being attacked.

SHOOTING.

The writer has for several years past been able, with the aid of a shot gun, to drive Rats away from his premises, where, at irregular intervals, they came from neighboring buildings. About eight years ago the stable at my home was literally overrun with

Rats. Poison, two good cats, and steel traps failed to make any perceptible impression on them. Finally I took a shot gun and whenever a Rat was seen to poke its head out of a hole or from under a chicken house or run across the lawn a load of fine shot was sent after it. In the course of a week about a dozen were killed. This made them very shy and they were rarely seen about in the daytime, but they remained about the buildings and continued to do much mischief in the night time. I went away from home and was absent two weeks. During this time the Rats had not been shot at and they were often seen about the place in daytime. I determined to adopt a new mode of warfare, as it had been suggested to me that if a Rat was crippled with shot it would be far better than killing it outright. I stationed myself at a point where the animals usually came out, and, in two days, shot six with a .22 auxiliary barrel, the cartridges for which were loaded with about 70 pellets of mustard-seed shot. Two of the animals were very near when shot at and both were unable to get away from the holes, but the others were only crippled and made their escape. Two days after the occurrence the Rats left the place. Since that time the same plan has been adopted when the Rats made their appearance and as soon as two or three wounded ones got away the rest speedily left the premises.

STRYCHNINE AND ARSENIC.

These dangerous and deadly poisons are often employed with good success to kill Rats. The use of these agents, however, is attended with much danger, and often the animals which eat the poisoned food hide under floors, in walls and other places where they

decompose and occasion great stench. Strychnine, a vegetable poison and very bitter in taste, kills quickly. It is generally used by cutting gashes in pieces of meat and inserting the poison in the incisions which are closed together and the meat is then nailed to a board or plank and placed in runways or other places where Rats go, and where other animals cannot get at it.

Arsenic, a mineral poison, is sweet to the taste; it is often used in conjunction with plaster of paris and mixed with butter which is spread on bread, or it can be mixed with dry cornmeal for the Rats. Strychnine is far more deadly and certain in its action and it destroys its victims quickly. Arsenic, on the other hand, while it causes death, kills more slowly and causes great irritation and inflammation of the stomach, etc. This action of the latter agent has induced many persons to recommend its use in preference to strychnine, as it is claimed the Rats will leave the buildings and go to water to allay their sufferings. I do not recommend the use of either of these poisons for the destruction of Rats or Mice, as the use of such means is attended with great danger and other objections. However, if you do use them it is well to bait the animals for several days with meat or meal so they will become accustomed to it before you arrange the poisoned food for them.

TRAPS.

Different kinds of wire traps are sold by dealers for catching Rats and many of them for a time answer the purpose very well. Various hand-made box-traps, snares and dead-falls are also used more or less successfully to aid in exterminating these rodents. The

steel traps, smallest sized ones, hidden in bran, meal, or covered lightly with dirt and placed in runways are often very effective. When a Rat is caught in a steel trap it is well to smoke it by holding it over burning paper or chicken feathers to remove all traces of the first victim before you set it a second time.

THE WIRE NOOSE.

Rats are sometimes caught with a noose, made from fine brass wire, fastened at one end by a nail above, with the noose hung over the hole they come out of. If this method is employed it is best to have a piece of wire without a noose for several days over the hole and allow the free end of the wire to hang in front or at the side of the hole so the wary Rats will become accustomed to it. They will then be much more likely to get ensnared in the noose when it is set for them.

THE MILK CAN TRAP.

A farmer in Bradford county employs the following method in killing Rats with good success. Concerning it he says: Take a large milk can—such as is used to slip milk—which will hold forty or fifty quarts, place a board alongside of the can, so Rats can run up to the top or mouth of can, and put a piece of board inside of can long enough to reach from top to bottom of the vessel: then scatter corn, wheat, oats or meal over bottom of can. The bait should be replenished for several days so that the Rats will become accustomed to it and know where they can get a good square meal. Then remove the board from the inside. The Rats will run up the outside board and jump into can and cannot get out. As many as eight or ten of these animals have been caught in one night in this

way; and the trap can generally be used for several successive nights before the Rats learn to keep away from it.

THE BARREL TRAPS.

Rat traps made out of ordinary water-tight barrels are perhaps the best kind of traps that can be used to destroy these troublesome household pests. They are made as follows: Take a water-tight barrel and pour into it water to the depth of 12 or 15 inches; then take a very thick and strong piece of paper, dampen it and stretch it over the top of the barrel, and tie or securely fasten it around the top of the barrel with rope, twine, or annealed wire. The paper when it gets dry becomes flat and tightens. Place the barrel in the cellar or barn or anywhere where the Rats can easily jump on it, and put pieces of cheese, meat, cake or any food they like, provided it has no fluid in it to dampen the paper, and allow the Rats to come and visit it for a week or ten days until they become accustomed to regularly visit the barrel for their meals. Of course, the food materials must be renewed on the paper as fast as they are carried off by the vermin. When you are convinced that the Rats are not suspicious of the affair cut two long slits in the paper so as to divide the cover into four parts then glue the bait—same kinds as were used before paper was cut—to the top of paper so that the Rats can see it as they did on many previous occasions. They come fearlessly to the barrel, jump down and go into the water. In this way large numbers are caught. The paper will spring back to its place when the Rats pass through it. Sometimes thin steel springs are attached to sides of barrel and extend to point where slits in paper cross; this is to make it certain that

each piece of paper will fly back in place when the Rats strike it and fall through. If these thin strips of steel are used they should be very light.

Another kind of a barrel trap consists of a water-tight barrel with a platform which is fixed by hinges inside of the barrel so it will fit the opening near the top but not come in contact with the sides. This platform can be locked with nails or screws and baited for several days and placed in the haunts of Rats and the screws or nails can be removed and the bait, fastened to the board platform with fine wire, will attract the Rats to it. When they jump upon the platform it turns over and the animals slide into the water, and if the revolving platform is properly weighted it will assume its proper place.

OWLS DO THE WORK WELL.

While it is true that these and other methods may be employed with more or less success in destroying rodents, experience proves that none of them are superior and few are equal to Owls in ridding cellars and other buildings of both Rats and Mice. When your premises are infested with Rats or Mice and you have a cellar or building which these rodents inhabit, and the place can be kept closed so the bird cannot escape, you can soon get rid of the unwelcome inhabitants by getting a live Great Horned Owl or a Barred Owl, either of which will, in a short time, destroy all the Rats and Mice in the place. The little Screech Owl confined in the same way will destroy Mice and sometimes will attack and kill Rats, particularly young ones.

THE GREAT HORNED OWL AS A RATTER.

Mr. Benjamin M. Everhart, the Chester county botanist and naturalist, who some years ago did a wholesale grocery business in West Chester, Pa., gives the following as his experience with a Great Horned Owl.

"The cellar and building where we had our groceries was literally overrun with Rats. I tried a barrel-trap and caught a good many, but this and other devices made no perceptible decrease in their numbers. One day I obtained a young Great Horned Owl, nearly full feathered, and put him in the cellar where the Rats were doing much mischief. The bird was fed on fresh meat, birds and dead Rats and Mice, and in a short time became, apparently, well contented in his new and dark home, where he grew quite tame and learned to know me. He occupied a perch near the middle of the cellar, and close to the floor above the same. One day I took a lot of wheat, corn and oats and spread them on the floor and covered these over loosely with some straw. This proved to be a most alluring bait for the Rats. They came there to feed and the Owl would fly down and kill and eat them. In a short time he killed or drove off all the Rats."

THE BARRED OWL AND RATS.

Dr. A. K. Fisher, Ornithologist of the Biological Survey, Department of Agriculture, Washington, D. C., says that an acquaintance of his who owns a brewery in New York State, tried in vain for several years to destroy the Rats and Mice which lived in the place where his grains were stored. Finally one day he obtained from a boy a live Barred Owl and put it in the grain room. The Owl got down to business at once and in a few months killed all the rodents in the place.

THE SCREECH OWL AND MICE.

The Screech Owl is fond of Mice and if one is kept in a cellar where these troublesome little pests are it



TO TRAP A FOX.

will soon clear them out. I have on two or three occasions tried this way of dealing with Mice, and each time it was successful.

SOME METHODS OF TRAPPING FOXES.

Foxes are exceedingly wary and they are among the most difficult of all animals to catch in traps. Sometimes, but not often, Foxes are caught in a dead-fall. Senator Lafayette Rowland, of Pike county, where Foxes are numerous, who lost a great many chickens and turkeys from the repeated visits of these sneaking animals, which came from their dens in the mountains about a half mile from his premises and carried off the poultry in the daytime as well as in the night, has practiced a novel plan with good success of capturing them. He describes it as follows:

"I built a slat pen or coop in a woods back of my house and put a rooster and duck in it and left a couple of slats at one end so the Fox, by a little effort, could get in. The first night he came to the coop but did not find the place to go in. He returned the second night and got in and killed the duck but the young rooster got away. I then threw some chickens' heads and meat in the pen and shot some sparrows and threw them with the heads and entrails of ducks and chickens on the ground about the pen and continued to bait the Foxes in this way for about a week. Then I took four strong steel traps and covered them over with moss, leaves and dirt—very loosely placed so covering would not clog the traps and prevent them from holding the Fox—and set them at different places around the pen, where another duck was confined. This plan worked admirably and I caught several Foxes."

THE TRAP AND BED.

To be successful in trapping Foxes, it is absolutely necessary that your steel trap should be clean and free from rust, and it should not be handled with the bare hands; always handle your trap with gloves;

buckskin are probably the best. Foxes are very wary about approaching the most tempting bait when they discover the scent of a human being, and many other animals are likewise afraid of it; hence, when handling traps for any animal, cover your hands with buckskin gloves. In getting a steel trap ready to catch a Fox, it should, as already stated, be perfectly clean and every trace of rust removed; then washed in weak lye, greased and dried. Then it should be well smoked by holding over burning hens' feathers. After this is done some recommend that both the trap and chain should be smeared all over with beeswax. To do this melt the beeswax and smear it with a feather. Attach the free end of the chain to a log, about two or two and one-half feet long and eight or ten inches in circumference, to serve as a drag to impede the Fox when he gets into the trap. But before you fix the trap as described above it is necessary to make a "bed" for it. This is done in the following manner: The bed should be made on level ground and cover a space of about nine or ten feet in circumference and about an inch and a-half deep. The materials used to make the bed are buckwheat chaff, which experienced trappers claim is the best, wheat chaff, or oat chaff; wood ashes and moss are also sometimes used with satisfactory results. This should be baited for at least a week, before a trap is set, with scraps of cheese, pieces of fresh meat, heads of chickens, turkeys, or Pheasants or English Sparrows—heads and all—will answer. This bed, of course, is made in some place where Foxes are accustomed to wander on food-hunting expeditions, and when they become acquainted with the place, the trap should be set and covered up in the chaff; a thin piece of paper should be placed over pan

of trap so that the covering will not prevent it from working properly. Strew some bait on bed about the trap and scatter some also around at some distance from the trap. Avoid walking around or on the bed and do not spit on or about the bed. If you leave any tracks in the snow take a sieve and fill them up with fine snow. In going to and from the trap always step in the same tracks. It is also a good plan, experienced trappers claim, to take a feather and sprinkle over the bed, after trap is set, a little oil of amber, lavender water or musk. The Fox is also often caught with a steel trap carefully hidden, as previously described and the bait a bird—Sparrow, Pheasant or Chicken—suspended above the trap as shown in illustration "How to Fool a Fox."

The entrails of a sheep or Deer can be dragged over the ground for some distance in a field where Foxes come to hunt their food, and then bury them in loose earth and make a small mound over them; cover this with chaff or wood ashes and set a steel trap on either side of the elevation. After placing the traps, scent with lavender water or musk. A bird, fowl or Rabbit can also be used in place of entrails.

Another method, and one shown in the accompanying illustration, is often successfully employed by experienced trappers. The chain must not show anywhere, and it is better to cover chain in water, with mud, stones or gravel. The trap should not be over eighteen inches from the shore, and not more than an inch and a-half under water. A sod just the size of the inside of the trap with open jaws must be cut to rest on the pan. In order to prevent the weight of the sod from springing the trap it is necessary to

support it from below with an upright stick. The bait, a dead duck, snipe or rabbit, is placed on the water outside of the trap and anchored there with a stone or by a peg and twine string. The Fox is very apt to step on the sod that covers the trap to reach this bait when he sees it.

HEADS.

It has been clearly shown on previous pages that, except in the counties of Crawford and Lawrence, there is a strong sentiment in Pennsylvania for the enactment of bounty laws.

At every session of our Legislature for many years past scalp or bounty measures were presented and it was only by the most energetic work both in committee and on the floors of the Senate and House that bills including numerous species of birds and mammals were defeated. The fact that a few species of Hawks and one or two kinds of Owls are very destructive to poultry and game, has caused such a universal prejudice against the raptorial birds that every one which is known by the name "Hawk" or "Owl" is placed on the black list and a bounty is advocated for its destruction.

A FEATHERED PEST.

The English Sparrow is justly despised by farmers, horticulturists, naturalists and all other persons who love and desire to protect our native song and insectivorous birds. The bad habits of the English Sparrow are so well-known that a number of farmers' clubs, Pomona and subordinate grange organizations throughout the State have, in recent years, when called upon to express an opinion concerning this bird, favored, by almost unanimous votes, a bounty to be paid by the State for his miserable head. The enmity against the English Sparrow is so pronounced in our farming communities that at an annual meeting of the

Pennsylvania State Grange, P. of H., the largest, and, by far, the most influential organized body of farmers in the Commonwealth, resolutions were passed urging the State Legislature to allow a bounty of a few cents each on every English Sparrow slain.

There is no doubt whatever that if English Sparrows were all destroyed it would be a great blessing, but this is not feasible through a bounty act. A number of States and counties have tried this method of exterminating this feathered pest and it has always been a failure.

WANT BOUNTIES FOR NUMEROUS ANIMALS.

The data collected by our State Board of Game Commissioners shows plainly that there is a growing sentiment in favor of paying bounties for the Kingfisher, the Fish Hawk, Herons, Bitterns, "Fish Ducks" and even Water Snakes, all of which devour different species of the finny tribes. The writer has, since the latter part of 1885, devoted a great deal of study to the effect of bounty laws and has, during the last eleven years, visited almost every county in the Commonwealth, attending institutes, grange meetings, etc., where abundant opportunity was had to acquaint himself with the views of those who engage in agricultural pursuits. This experience, together with information received through circulars, letters, etc., unfortunately compels the writer to say that at present (April, 1897) if the representatives from the counties* other than Allegheny and Philadelphia (where the average voter seems to pay little or no attention to how his Senator or member of the House votes) were

*Possibly in Crawford and Lawrence counties a majority of the citizens are opposed to paying bounties on account of reasons elsewhere mentioned.

called upon to vote, as a majority of their constituents have said, they would favor bounty acts which, in the main, would cause an enormous money expenditure and also practically exterminate many of our most beneficial animals.

Believing, as I do, that this is the true state of affairs in Pennsylvania, I have prepared this document in such a manner that it will be sought after, and if it reaches, as it should, those who are interested in agriculture, it will, I am confident, do a vast amount of good by correcting many erroneous opinions which exist about different birds and mammals.

Any fair minded and unbiased person must admit that, with all the educational advantages of which this great Commonwealth so proudly boasts, it is lamentable to admit that Zoological science has been so neglected that county officials in numerous parts of the State, when called upon in an official capacity to receive the heads of birds and mammals under scalp acts, were unable to distinguish, in some cases, remains of domesticated animals, such as turkeys, chickens, dogs, kittens, ferrets, mules and colts, from Hawks, Owls, Wolves, Wildcats, Foxes, Minks, Squirrels, Weasels and Rabbits. That this ignorance has existed in recent years there is no doubt, as I have in my possession the heads of a number of animals which were sent to the Smithsonian Institute, Washington, D. C., and to my office, by county officials, as heads of Hawks, Owls, Wildcats, Minks and Weasels, but examination proved them to be, first, in the way of birds:

Pheasant or Ruffed Grouse,
 Sharp-tailed Grouse,
 Common Chicken,
 Wild Turkey (female),

American Herring Gull,
 Shrike or Butcher Bird,
 Nighthawk,
 Whip-poor-will,
 Horned Grebe (male),
 Yellow-billed Cuckoo,
 Common Robin,
 Turkey Vulture.

Second, in the line of mammals, the following:

Opossum,
 Jack Rabbit,
 Fox Squirrel,
 Chipmunk,
 Flying Squirrel,
 Red Squirrel,
 Gray Squirrel,
 Ferret.

The heads of some of these birds and other animals last mentioned have been reproduced on the plates at the end of this chapter. These heads show much better than any pen pictures could do the absolute need of a document which will clearly show the differences between domesticated and wild animals of both furred and feathered kinds.

A BAD CLASS OF CATS.

There is a certain class of common house cats, which, in the course of their noisy and blood-thirsty careers, become dissatisfied with the comforts and trials they have about human habitations.

Some assert these felines have been disappointed in love affairs; others affirm it is because they have, with the assistance of the English Sparrow and hat-bird hunters, practically destroyed all the native birds



OPOSSUM. (LIFE SIZE)





JACK RABBIT. (LIFE SIZE)

in the yards, lawns and orchards they frequent; and, as the young of domesticated fowls are carefully guarded by their owners, these cats thirst for feathered game, and, like hermits, lie away and live in retirement in woods and thickets.

Members of the feline tribe which thus retire to live become exceedingly wild and wary; and they are frequently met with in many sections of the State. They are almost, if not equally, as bad about destroying game, such as Pheasants, Turkeys, Quail and Rabbits, as are the Foxes and true Wildeat or Bay Lynx.

The name of "Wildeat" is applied to these feral representatives of the domestic cat tribe by many hunters and woodsmen, and possibly when heads and ears of such animals have been presented for bounties in some of the counties, it was done with no intention of deception nor with a knowledge that the common house cat was being substituted for the true Wildeat or Bay Lynx.

HISTORY OF HEADS SHOWN ON PLATES.

The ears of several of the mammal heads illustrated on the plates at the end of this chapter are wanting: this is due to the fact that they were cut off and burned by the officials who accepted them and paid bounties for them. These heads are all life size.

OPOSSUM, RABBIT, WILD AND TAME CATS.

The Opossum head, that of a young one about two-thirds grown, was sent to the office of the State Board of Agriculture from one of the counties in Central Pennsylvania, with the statement that it was either a young Wildeat or young Catamount, and as there was a dispute about it among some hunters where it

was shot, the justice of the peace had not burned the head, but had clipped off the ears and sent the rest of the head for identification and to settle the dispute. I also had the heads of two house cats—old and grizzled ones—which had been paid for as Wildcats.

The Jack Rabbit's head has its ears chopped off, and a hunter realized for this 'animal, which was also called a Wildcat, two dollars. There are no Jack Rabbits in Pennsylvania in a wild state; and there is little doubt that this one was purchased at some market, "fixed up," and deliberately presented to deceive some easy, or very ignorant official.

SQUIRRELS AND WEASELS.

Heads, on which premiums had been paid, of both the Fox Squirrel and the light-colored form of the Gray Squirrel, were sent to our office at Harrisburg for identification. The heads of the two Squirrels shown on the plate have been reproduced from mounted specimens, as the heads which I had of these two species were consumed in the recent fire which destroyed my office. The reproduction of normal heads of these two species of Squirrels, which are common in the markets, will no doubt serve in the future to educate officials who may be called upon to identify "heads and ears" which ignorant or dishonest scalp hunters may present for premiums. The heads of the Black Squirrel (Fig. 1), the Flying Squirrel (Fig. 2), and the Chipmunk (Fig. 3),—a partial albino—were sent to Prof. S. F. Baird, Secretary of the Smithsonian Institution, Washington, D. C., by county commissioners or justices of the peace in Pennsylvania for identification. The Black Squirrel was called a "Black



1 FOX SQUIRREL . LIFE SIZE .



2 GRAY SQUIRREL . LIFE SIZE .



1 BLACK SQUIRREL . (LIFE SIZE)



2 FLYING SQUIRREL . (LIFE SIZE)



3 CHIPMUNK . (LIFE SIZE)

Mink," the Flying Squirrel a young Weasel, and the odd-colored Chipmunk a "Weasel."

DOGS AND WOLVES.

There are in this State cur dogs which, in general color and appearance of the head, do not look unlike Wolves. The heads of such animals, from all accounts, have in the past frequently been used by scalp hunters to deceive county officials, who accepted them as Wolves. The resemblance between these cur dogs and Wolves is so great that it is not at all surprising that they were substituted for Wolves, which, as already stated on previous pages, have no doubt been exterminated in this State.

In 1885 or 1886, Prof. S. F. Baird, examined a number of "Wolf scalps" from Pennsylvania, on which premiums had been paid. Investigation showed that these so-called "Wolf scalps" had been made from pelts of Red Foxes and a couple of Woodchucks. Many and probably all of the counties of Pennsylvania which border other States were called upon to pay bounties for animals killed or caught outside of Pennsylvania. Fur dealers say that many of the Foxes and Minks which they buy from hunters in the southern part of New York State have the ears clipped off. The hunters, when questioned about such mutilation, say the animals came from Pennsylvania. This probably, in many instances, is true, but there seems to be very good ground for believing that a good many of the hunters and trappers of the Empire State, when they obtain such animals as Foxes, Minks and Wild-cats, carry them over the State line and obtain bounties which the Pennsylvania lawmakers have provided each county shall pay.

The Scranton Tribune of March 11, 1897, contains the following concerning a "Wolf" on which bounty was recently paid in Lackawanna county:

"John R. Johnson stalked into the commissioners' office yesterday and flourishing an affidavit to the effect that he had killed a Wolf at Waverly January 1, 1897, asked for the ten dollars, which bounty the State allows for the slaughter of the most detested and feared of farm pests.

"The commissioners didn't like to cast any reflections on the powers of the justice of the peace of Waverly to differentiate between the pelt of a Wolf and that of an overgrown dog but they did not hesitate to say that they were at least loth to believe that it would be generally accepted that Wolves are to be found in this region. Commissioner Giles Roberts, who hails from up Waverlyway, vowed that he had never heard of a Wolf being seen in those parts, although there might be some roaming about in raiment other than that which would naturally cover a wolf.

"These misgivings, however, could not hold out against the Johnson's affidavit that he shot a Wolf; Squire Smith's affirmation that it was a Wolf and that its ears had been cut from the pelt, that the ears were cut off and burned in his presence and that it was unmistakably the pelt of a Wolf.

"Johnson got his ten dollars and went forth to shoot more Wolves."

FEATHERED HEADS.

While much deception, through both ignorance and fraud, was practiced by substituting the remains of wild and domesticated animals for the heads and ears of mammals on which bounties were paid, this kind of work was carried to the greatest extent in the way of feathered animals. Owls and Hawks, from which the heads were cut off, were, in some instances, so manipulated by skillful and ingenious scalp hunters, who possessed some knowledge of the art of taxidermy, that in one instance which came to my notice a single Long-eared Owl, was so "worked up" that it netted the hunter one and a half dollars. The neck was cut off



$\frac{7}{8}$

2 ENGLISH SPARROW. ♂

$\frac{1}{6}$

1 TURKEY VULTURE.



1 PHEASANT. ♂



2 SHARP TAILED GROUSE. ♂

close to the body and also at the base of the skull, the flesh of the neck was allowed to remain and the bill of some bird of prey was held securely to one end of the mass by fine wire; the second head was manufactured from breast meat (apparently), and feathers of body with the bill of an Owl. These two bogus heads, with those of a lot of Hawks and Owls and three or four common Weasels, twenty in all, were seen in the office of a justice of the peace, ready to burn when he got a good hot fire started in his stove.

TURKEY BUZZARDS AND SPARROWS.

The Turkey Vulture (Fig. 1), was paid for as an "Eagle-hawk," which was described by the scalp hunter who got the bounty for it as "being very bad on poultry, especially young turkeys." The English Sparrow (Fig. 2), with the heads of some other birds—Hawks and Owls—and an immature male Pine Grosbeak and a common Robin—came to Prof. S. F. Baird from county commissioners or other officials in the western part of Pennsylvania, in 1885 or 1886, as the heads of birds of prey. The fact that these and other remains of both birds and mammals were sent to Prof. Baird and officers of the Pennsylvania State Board of Agriculture for identification shows plainly that the officials who sent them were sincere in the belief that they were heads of some species of bird or mammal mentioned in the scalp act of June 23, 1885.

The heads of the Pheasant or Ruffed Grouse (Fig. 1), and the Sharp-tailed Grouse (Fig. 2), came from Prof. Baird's collection of Pennsylvania heads. The Sharp-tailed Grouse is not found in this Commonwealth in a wild state, but the birds are common in many of our markets.

SEA GULLS, CUCKOOS, ETC.

At least two heads of the American Herring Gull were paid for as Hawks under the act of 1885. The one illustrated was presented to me by Prof. S. F. Baird, and another of the same species, killed along the Susquehanna river, was sent to my office for identification. The Gull received from Prof. Baird was called a "White Hawk." The head of the Yellow-billed Cuckoo (Fig. 3), was also sent to Prof. Baird as the head of a "Small Hawk" of some unknown but detrimental species. The Whip-poor-will (Fig. 1), and Nighthawk (Fig. 2), heads were secured by the writer from justices of the peace, and the heads of a female Wild Turkey (Fig 1), and a common domesticated hen (Fig. 2), were sent to Prof. Baird as "Hawk heads."

The Fish Hawk, from which Fig. 1 has been reproduced, was shot along the Brandywine Creek. The man who offered it for bounty explained how much damage it had done to his chickens, and how, for several days, it had lingered near his dwelling watching for and killing chickens and ducks. On examination this Fish Hawk's stomach showed it contained only the remains of fish. The Cooper's Hawk, in downy dress, (Fig. 2), came from Crawford county where, it is claimed, the eggs of this and other species of Hawks and Owls were collected and hatched out under hens or with incubators.

The illustrations of the adults, male and female, Marsh Hawks, are those of a beneficial species which were killed in considerable numbers by scalp hunters. The heads of the Cooper's Hawks (adult and young or immature) show the species in different plumage. This Hawk is one of the worst feathered pests the poultry raiser has to contend with.



AMERICAN HERRING GULL.

$\frac{7}{8}$



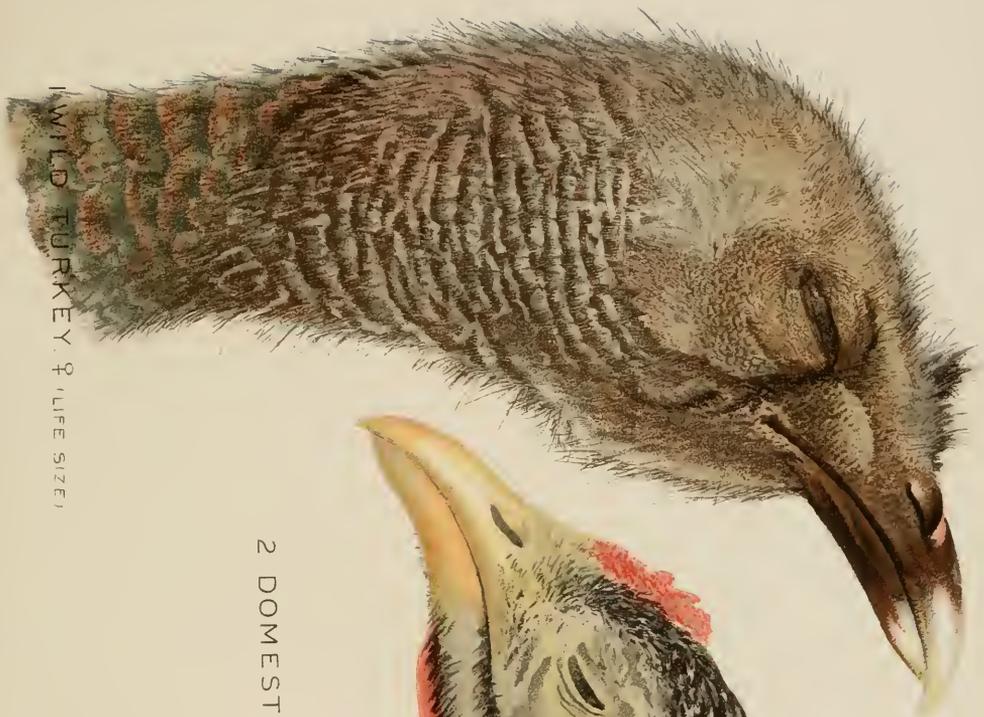
2 NIGHT HAWK. (LIFE SIZE)



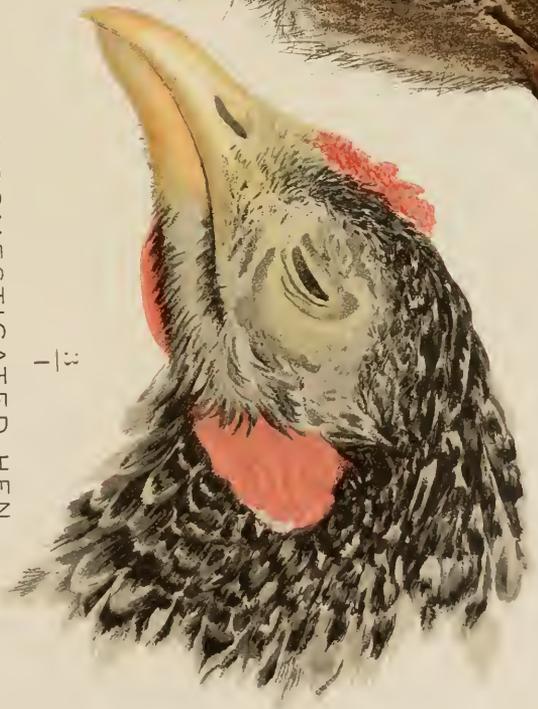
1 WHIP-POOR-WILL.
(LIFE SIZE)



3 CUCKOO. (LIFE SIZE)



WILD TURKEY, ♀ (LIFE SIZE)



2 DOMESTICATED HEN.

$\frac{3}{1}$



1 FISH HAWK.

$\frac{1}{5}$



2 COOPERS HAWK. YOUNG

$\frac{7}{8}$



(MALE)



(FEMALE)

MARSH HAWK (LIFE SIZE)



(ADULT)



(YOUNG)

COOPERS HAWK (LIFE SIZE)



(YOUNG)



(ADULT)

AMERICAN GOSHAWK (LIFE SIZE)



(ADULT)



(YOUNG)

RED SHOULDERED HAWK (LIFE SIZE)

The two heads of Goshawks (adult and young or immature), illustrate another species of the detrimental Hawks which destroy much game, poultry and the smaller kinds of wild song birds. The two heads of Red-shouldered Hawks (adult and young, the latter known to the older ornithological writers as Winter Falcon), illustrate a species which is beneficial, as it rarely preys on poultry or game, but subsists largely on mice, frogs, grasshoppers and beetles.



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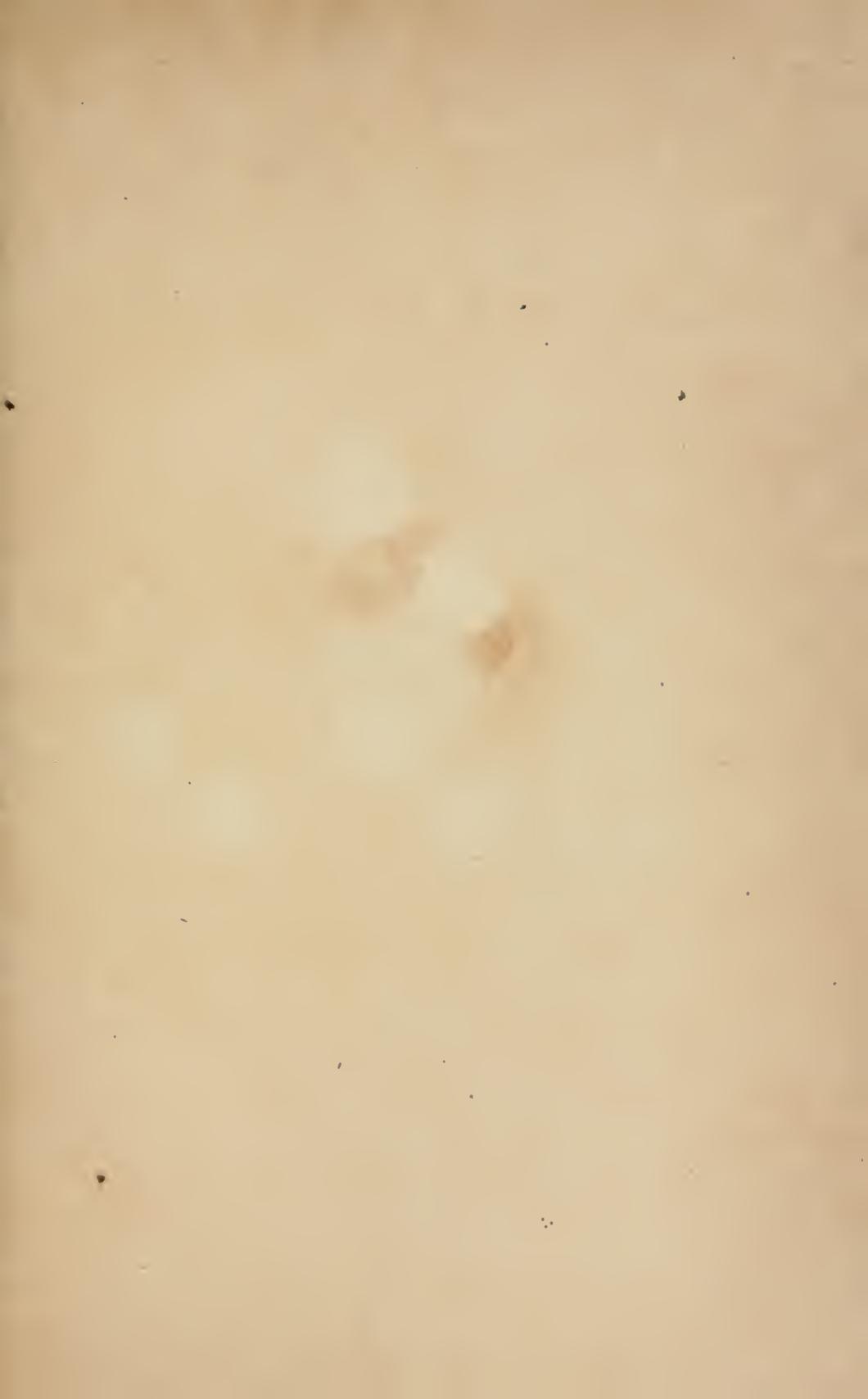
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