

garden and other clubs, which come here or assemble in other places. As many as 45 such talks have been given each March and April, the peak of the banding season.

* Contribution No. 26; *Passenger Pigeon*, Spring Issue, 1960

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FOOT ABNORMALITIES OF WILD BIRDS

By C. M. HERMAN, L. N. LOCKE, and G. M. CLARK

Although foot abnormalities are frequently observed among birds trapped for banding, little work has been done to establish the causes of these lesions. Early banders believed that such abnormalities were due to trauma or were the effect of freezing weather. Actually, a large number of mechanical and infectious agents are capable of producing crippling injuries, and laboratory examination should be made to determine which agent is involved in a particular case. This paper discusses the various foot abnormalities we have found during the course of our studies at the Patuxent Wildlife Research Center since 1952.

POX: Foot pox is a manifestation of a pox virus infection (Shattuck, 1898; Musselman, 1928; Worth, 1956). This viral disease is characterized by the production of variable-sized proliferative nodules on the head, edge of the wing, and legs. These nodules begin as small pinkish thickenings, about 1 mm in diameter, and rapidly enlarge to a spherical pea-sized growth. As the nodule becomes larger, it usually turns brownish, and as it bleeds easily, scabs form readily. Histologically, this nodule is composed of greatly thickened epidermal tissue, venous channels, and supportive connective tissue. The epidermal tissue often is arranged in whorls, with extensive proliferation of the stratum germinativum layer of the epidermis. Eosinophilic cytoplasmic inclusion bodies, typical of avian pox, are seen in the polygonal cells of this layer. The inclusion bodies, or Bollinger bodies, are spherical to ovoid in shape and range from 5 μ to 15 μ x 20 μ . These Bollinger bodies contain large numbers of small spherical bodies, the Borrel bodies, which are the infective virus particles. This microscopic picture is one of the diagnostic criteria for pox.

Foot pox has been reported from several species of the Fringillidae. Baldwin (1922), in summarizing his bird-banding experiences at Thomasville, Georgia, reported that nearly 10 percent of the chipping sparrows (*Spizella passerina*) had diseased claws. Talbot (1922), working in the same area the following year, reported that 71 of 287 chipping sparrows, nearly 25%, had diseased claws. Musselman (1923, 1928) found that 42% of the chipping sparrows "were suffering or had suffered from an active infection." Musselman (1928) showed that this infection was due to a pox. Worth (*ibid*) showed that foot disease of the slate-colored junco (*Junco hyemalis*) was due to a pox virus and that the virus could be transmitted to chickens, squabs (*Columba livia*), blue jay (*Cyanocitta cristata*), white-throated sparrow (*Zonotrichia albicollis*), fox sparrow (*Passerella iliaca*), and song sparrow (*Melospiza melodia*). He was unable to infect an adult pigeon, a mourning dove (*Zenaidura macroura*), English sparrows (*Passer domesticus*), or tree sparrows (*Spizella arborea*). He also was unable to infect laboratory rabbits, white mice or one human volunteer. He also found natural infections in the blue jay and the chimney swift (*Chaetura pelagica*) as well as in birds of the Fringillidae.

At the Patuxent Wildlife Research Center, we have obtained laboratory confirmation of naturally occurring pox infections in the mockingbird (*Mimus polyglottos*), cowbird (*Molothrus ater*), common grackle (*Quiscalus quiscula*), as well as in several species of sparrows. Pox nodules were found on the feet of the cowbirds and the grackles (Fig. 1), but not on the feet of either of two infected mockingbirds. Although Stafseth (1931) found that pox often produced nodules on the feet of domestic pigeons several outbreaks of pox among mourning doves have been characterized by production of nodules on the head, particularly involving the eyelids. Pox foot lesions have been seen on doves in Alabama and Florida. Pox is a severe disease of mourning doves and can produce heavy losses in infected flocks (Kossack and Hanson, 1954; Locke *et al*, 1960; Rosen, 1959).

Pox is a serious disease in commercial poultry but insufficient studies have been conducted to definitely determine whether songbirds may be a reservoir of pox isolates that could produce infection in poultry, or whether the poultry infection could be transmitted to wild birds.



Figure 1. Pox nodule on knee of Cowbird.

Transmission: The virus of pox is extremely resistant to drying. Beaudette (1941) found that a scab obtained from a wild turkey contained infective virus after being kept refrigerated for nearly 8 years. Other workers have found infective virus persisting for several months in dried scabs obtained from the pox nodules.

Although the pox virus is not able to penetrate unbroken skin, it readily invades cuts or abrasions in the skin or mucosa. Pecking injuries or injuries from such things as wire or cages can provide skin abrasions through which the virus can readily establish itself.

The virus also can be transmitted by the mosquitoes *Culex pipiens*, *Aedes aegypti*, and *Aedes vexans* (Biester and Schwarte, 1952). Outbreaks of pox in the late summer and early fall are usually mosquito-borne; whereas outbreaks in the winter presumably are spread by contact between an infected bird and a susceptible bird, or by contact between a susceptible bird and contaminated material.

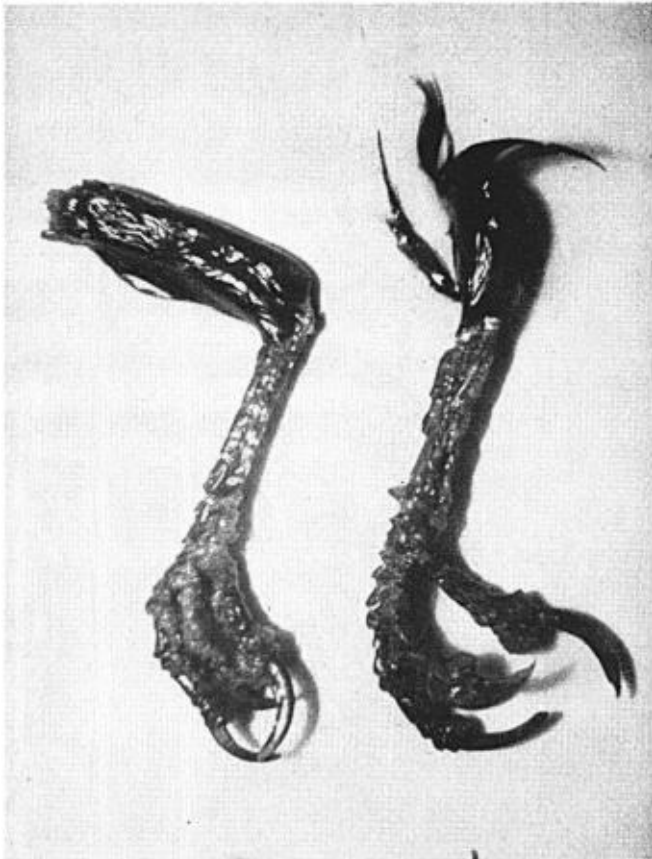


Figure 2. Scaly-leg. Redwing (left) and Grackle.

Some strains of passerine pox, notably the Kikuth strain, produce serious losses among canaries. Such strains produce a systemic viral infection when inoculated intramuscularly, often without the production of cutaneous pox lesions. The virus can be demonstrated in the internal organs of the infected canaries. It is possible that serious losses may occur among wild passerine birds due to systemic pox virus infections.

SCALY-LEG: This condition is caused by mites of the genus *Cnemidocoptes*, which tunnel into the skin of the bird's leg. There is excessive proliferation of the epithelium, with formation of scales and crusts. The entire foot takes on a scaly, encrusted appearance.

The mites live their entire life cycle within these epithelial tunnels. Transmission occurs primarily by contact between an infected bird and another bird. The mites are almost spherical, and have extremely short, stubby legs. Scaly-leg mite infestations are well known in poultry and occasionally are seen in canaries and budgerigars. Olive and Schultz (1952) reported

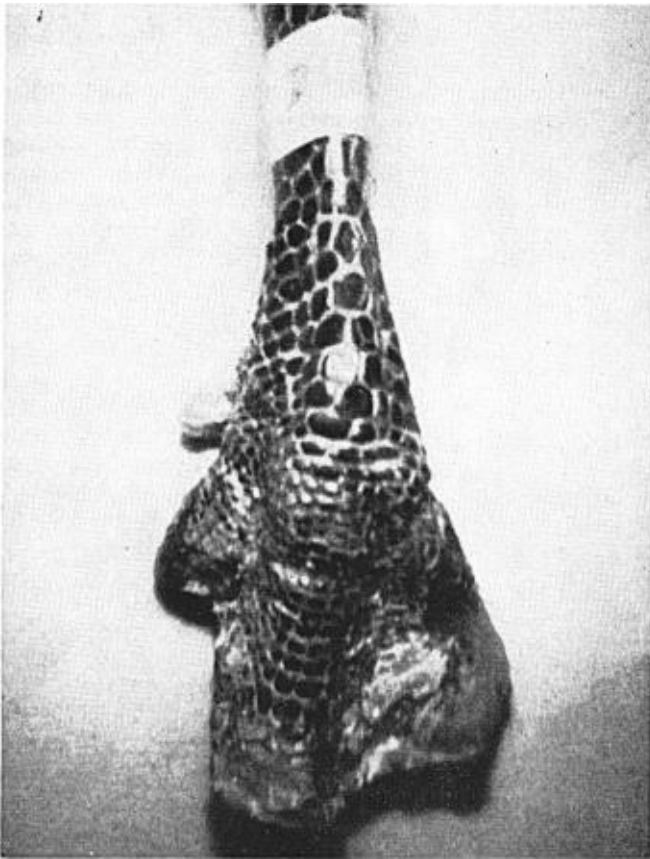


Figure 3. Ergotism in foot of goose.

scaly-leg in the redwinged blackbird (*Agelaius phoeniceus*) in Arkansas. During the course of our study on diseases and parasites of icterids, we observed scaly-leg in common grackles collected at Hanover, Pennsylvania, and Montgomery, Alabama. Infested redwinged blackbirds also were found at Montgomery, Alabama (Fig. 2) and the Patuxent Wildlife Research Center. The mites obtained from these birds are morphologically indistinguishable from *C. mutans*, which attacks chickens. However, adequate biological studies have never been done to determine whether wild birds are the reservoir of the scaly-leg mite of the domestic chicken.

A series of 2,880 legs obtained from juvenile white-winged doves (*Zenaida asiatica*) shot during September, 1959, near Edinburg, Texas, were examined at the Patuxent laboratory. All were found to be free of scaly-leg. Twelve hundred ninety-one mourning dove legs, also collected near Edinburg, Texas, were found to be free of scaly-leg. Rosen (*ibid*) reported the occurrence of scaly-leg in white-winged doves in Imperial County, California.

BUMBLE-FOOT: This is a staphylococcal infection that is sometimes seen in captive birds, particularly when the birds are confined on hard cement floors. The abscess occurs in the pads of the feet. In one case in a whistling swan (*Olor columbianus*) examined at our laboratory, the abscess was on the web of the foot. This abscess was a large, hard, spherical, swelling about 1.5 inches in diameter. When the abscess was incised, a thick yellowish discharge flowed out of the incision. Gram's stained smears of the discharge showed large numbers of Gram positive staphylococci.

During the summer of 1960, staphylococcal foot abscesses appeared in a group of experimental woodcock being kept for pesticide-poisoning studies. These abscesses appeared as thickenings of the metatarsal pads and often spread along the toes, severely crippling the infected bird.

Staphylococci (*Micrococcus*) were demonstrated by Gram's stain and by culture in the pus obtained from these abscesses.

ERGOTISM: Ergot is a fungus, *Claviceps purpurea*, that attacks the grains of several grasses, notably rye, ryegrass, and wheat. This fungus is the source of a large series of potent drugs, some of which can produce a vascular stasis in the legs. Subsequently, a dry gangrenous type of necrosis develops that may lead to loss of toes or even an entire leg.

A series of Canada geese, which had been held in an enclosure on the Lower Souris National Wildlife Refuge, Upham, North Dakota, suffered dry gangrenous necrosis of the web. These geese had been fed barley and allowed to browse on green rye growing in the enclosure. Several of the geese lost part or all of the web of the foot; one goose lost the entire foot (Fig. 3). This type of ergotism cripples but is not as serious as the neural form, which occurs in other species and can be fatal. Ergotism may have been responsible for some crippling foot lesions seen in mourning doves from Pennsylvania. Grain-feeding birds are more apt to be exposed to ergot poisoning.

FREEZING: Freezing produces a vascular stasis followed by dry gangrenous necrosis, with resulting loss of the affected limb. Injuries following freezing occur frequently among over-wintering mourning doves. Such injuries have been seen in mourning doves in Wisconsin (Thompson, 1950), Pennsylvania, Maryland, and Alabama, and probably occur throughout the colder portions of the doves' range. Although this condition could be present in wintering songbirds, there are few reports of it in the literature.

TREATMENT: Although the treatment of sick wild birds probably will not alter the epizootiology of the disease, bird-banders may be interested in attempting to treat individual birds. Several local treatments have been recommended in the literature for pox lesions and scaly-leg. Some of these are listed below.

Pox: Various treatments have been recommended, including application of iodine and tincture of merthiolate to the nodules; use of ophthalmic mercuric oxide ointment on nodules on the eyelid; and application of an ointment consisting of petroleum jelly and powdered sulfur to head nodules. Manwell and Goldstein (1939) found that treatment with mercurochrome was highly effective. They swabbed a 1.5 or 3 percent alcoholic solution of mercurochrome on the developing pox nodules of 26 infected canaries and all but 3 recovered.

Later, Coulston and Manwell (1941) found that use of 1 to 3 percent mercurochrome in 70 percent alcohol to which a trace of acetone had been added was a successful treatment. Kossack and Hanson (*ibid*) vaccinated their captive mourning doves with commercial pigeon-pox vaccine. They reported that vaccination seemed to stop further spread of the disease. However, there has been no experimental evidence to show that mourning dove pox is identical to pigeon pox, and further study is needed before this approach can be recommended.

While the pox virus can be destroyed by several common disinfectants including 70% ethyl alcohol, 0.5% formalin, 0.5% phenol, and 0.5% tricresol under laboratory conditions the infective scabs containing the virus are relatively resistant to chemical disinfectant. For example, the literature (see Biester and Schwarte, 1952) refers to one study in which the virus in an emulsion of pox scabs was still active after 1-1/3 hours in 1% phenol, but not in 2 or 2-1/2 percent phenol. Other workers, cited by the same authors, have found that the routine incubator fumigation technique did not destroy pox virus unless fumigation was carried out for 90 minutes.

Pox virus is so contagious among domestic poultry that the only practicable way to prevent and/or control epidemic outbreaks is by vaccination procedures.

A good cleaning and subsequent disinfection of traps and cages by 70% alcohol or a lysol solution might help control a local problem at a banding site, but it must be remembered that pox is a very contagious disease, and can be spread by both contact and insect vectors.

Scaly-leg: Several treatments have been developed for scaly-leg among poultry. These involve rubbing various ointments into the infected area.

1) A lindane salve containing 0.1 percent active gamma isomer of benzene hexachloride has cured mild to moderate infestations of *C. mutans* in chickens in a single treatment; severe cases required two applications. Wichmann and Vincent (1958) found that local application of lindane salve was non-toxic to budgerigars, but complete immersion of the bird was apt to kill it.

2) Wichmann and Vincent (*ibid*) found that N-ethyl-o-crotonotoluide (10% in a vanishing cream base) was effective and non-toxic to treating *C. pilae* infestations in budgerigars.

3) Used motor oil can be rubbed into the infested area if no better substances are available.

Ergotism: There is no known treatment for an ergotized animal. Prevention lies in avoiding feeding any smutty grains to birds. Since ergot toxins are still potent after at least one year of storage, and are not destroyed by cooking, it is best to completely burn any smutty grain.

SUMMARY

The various foot abnormalities that occur in birds, including pox, scaly-leg, bumble-foot, ergotism and freezing are reviewed.

In addition, our findings at the Patuxent Wildlife Research Center include pox from dove, mockingbird, cowbird, grackle and several species of sparrows. Scaly-leg has been particularly prevalent on icterids. Bumble-foot has been observed in a whistling swan and in a group of captive woodcock. Ergotism is reported from a series of captive Canada geese from North Dakota.

Several drug treatments recommended by others are presented.

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CHICKADEES ON BELL HILL

A TEN-YEAR STUDY OF A LOCAL POPULATION IN BEDFORD, N. H.

By JOHN H. KENNARD

In January, 1953, I received a banding permit and started operating a small banding station, with pull traps on the lawn of my newly built home in Bedford, N. H. The location is on a hill, more than 500 feet from the nearest house, and was about one-half mile from the nearest neighbor feeding birds. Since the beginning of the operation I have been particularly interested in studying the Black-capped Chickadee (*Parus atricapillus*) which is the most constant species in my feeders.

In 1957, after five seasons of banding, I reviewed my material and decided that I did not have enough to warrant publication. However, it appeared at that time that my rate of returns was relatively high, that my local population remained fairly constant and that there was no evidence of "my" chickadees migrating at any time.