

	Minimum	Maximum	Average
10 adult males	7 mm.	17 mm.	12.0 mm.
7 adult females	8	23	12.5
13 immature males	2	8	4.5
18 immature females	4	8	6.7

6. The wing length of adult birds is generally, though not invariably, greater than that of first-year birds. Wings of adult males taken in mid-winter from New York state, Pennsylvania and Washington, D. C., averaged approximately 13 mm. longer than the wings of immature males from the same localities. Adult females, which are 6 to 8 mm. shorter in wing length than the adult males, have wings 12 to 16 mm. longer than the immature females from the same localities. Individual variation is, however, considerable in the crow, and several immature female specimens were actually larger than small adult males. Obviously wing measurements are of little value in themselves except as they may add weight to a tentative determination based on other characters.

Age determinations like subspecies determinations are often dependent on fine distinctions and should be based upon not one but many features. The six characters described in this paper should not be used individually, but they should supplement one another. By applying them in this manner a high percentage of conformity can be obtained, so that very few specimens had to be discounted as indeterminate.

*Division of Zoology, University of California, Davis, California, January 23, 1936.*

## ABNORMALITIES IN BIRDS

WITH FOUR ILLUSTRATIONS

By HAROLD MICHENER and JOSEPHINE R. MICHENER

### PART I. TUMORS

Of the approximately 30,000 passerine birds we have banded over a ten-year period, about 150, a small fraction of one per cent of the total, have had tumors on the feet, legs and, more rarely, on the wings at the bases of the first primaries and on the top of the head just back of the beak. These tumors—large, rough, wart-like swellings—often cause great enlargements at one or both ends of the tarsus and in extreme cases along the whole length of the tarsus. Sometimes parts of toes or whole toes are lost, and the feet are left useless except as props. This disease seems to be mildly contagious among wild birds since it occurs in epidemics—the most severe of which extended over most of the year 1934 and a few months of 1935. As the swellings subside their exteriors become dry scabs which, when they come off, leave smooth, white skin. Later this acquires the appearance of normal skin. With the few birds in which we could follow the disease cycle from beginning to end its duration was from one to five months, with most of the cases indicating the longer period. There is not space for case histories.

We have found these tumors on Mockingbirds (*Mimus polyglottos*), California Thrashers (*Toxostoma redivivum*), Audubon Warblers (*Dendroica audubonii*), California Purple Finches (*Carpodacus purpureus californicus*), House Finches (*Carpodacus mexicanus frontalis*), Willow Goldfinches (*Spinus tristis salicamans*), Gambel Sparrows (*Zonotrichia leucophrys gambelii*), and song sparrows (*Melospiza melodia*) without any evidence that any one species is more susceptible than the others. Apparently the same disease was common in the aviaries of southern California

during the 1934 epidemic, where, we are told, it was very contagious, with deaths as high as fifty per cent of the birds in an aviary in some cases. In the treatment of caged birds, dealers report that iodine or a mixture of iodine and glycerine, applied to the affected parts, has been used with considerable success.

Dr. J. J. Parsons took a tumorous foot of one of our birds to Dr. B. F. Sturdivant, pathologist at St. Luke Hospital, Pasadena, who submitted to Dr. Parsons the following report:

The tumor is irregular in shape and approximately .7 cm. in diameter. On gross section it is firm in consistency and white in color.

Histologically, the tumor is a papilloma arising from a squamous epithelium. The tumor shows areas of old hemorrhage, areas of cloudy swelling, and necrosis. In some areas there is an inflammatory reaction which is evidently due to an old infection. Many of the epithelial cells show fatty degeneration. The lesion is akin to the ordinary wart.

In our present knowledge we believe that these lesions are not true tumors but are the result of some unrecognized irritant or infection. This type of tumor has been produced experimentally in many animals by the application of irritants to the skin, notably coal tar. (Note: Could this tumor be the result of the bird having walked in automobile grease?)

The areas of degeneration and necrosis can readily be accounted for by constant trauma attendant upon the continual use of the foot.

In some respects it seems that this disease is much like the bird-pox T. E. Musselman found so prevalent among the chipping sparrows at Thomasville, Georgia, in 1923 (Auk, 48, 1928, pp. 137-147). However, we feel that his descriptions do not fit the conditions we have observed. With three exceptions we found no indication of blood sacs which would subside with the emission of drops of blood when pricked with a needle. Dr. Parsons suggested that the differences between these Georgia and California diseases might be no greater than are sometimes the different manifestations of the same diseases of man in widely separated places.

E. L. Sumner, Sr. (News from the Bird-Banders, W. B. B. A., 6, 1931, pp. 2-3) reports 31 cases of morbid growths on the heads at the bases of the bills of Spotted Towhees (*Pipilo maculatus*), Golden-crowned Sparrows (*Zonotrichia coronata*), Fox Sparrows (*Passerella iliaca*), and Song Sparrows trapped by him in Berkeley, by Joseph Malliard in Marin County, and by Miss Grace Tompkins in Palo Alto. His description and the report on one of these birds by Dr. K. F. Meyer of the Hooper Foundation, San Francisco, which Mr. Sumner quotes, indicate that the disease in these birds was not the same as that observed in ours. Mr. Sumner's report suggests a close relationship between these morbid growths and head injuries received in the traps, but in oral discussion of this part of the present paper as it was read before the 1935 annual meeting of the Cooper Ornithological Club, Mr. Sumner stated that he is now of the opinion that no such relationship exists, since there have been no further observations of morbid growths of that kind even though the normal amount of head injuries continues to be experienced. In this opinion we fully concur because of the complete absence of such growths on the heads of the many thousands of birds that we have recaptured.

The tumors described have been more numerous than any of the other abnormalities observed in our birds and have been much more commonly observed on the feet and legs than on the wings and head.

#### PART 2. SICKNESS

The sick birds in our records are conspicuously fewer in number than the injured birds. This fact probably does not mean that illness is rare among birds but rather that a sick bird is at so tremendous a disadvantage that it has little time to appear in the traps after the sickness is recognizable to us and before it dies of the disease or is dispatched by some predator.

We have had no case of recovery where illness has progressed to the point of causing the bird to sit with feathers fluffed and unable to eat, but we have had, not uncommonly, birds obviously ill but able to eat which would use our traps as easy sources of food. Some of these have grown steadily weaker until flight was almost impossible and then have come no more, while others have recovered.

The maladies of birds probably are quite as numerous as those of mammals. While we are not qualified to discuss them in detail we do know that there are respiratory disorders and that symptoms of intestinal disturbances are among the most common recognizable by us. There are eye diseases of varying severity and with varying results. Birds blind in one eye keep in good condition and seem to take advantage of the food supplies in our traps but they soon drop from our records, probably falling victims to predators in most cases. Tumors are common, both those of the limbs and those of the softer parts of the body, the former being most numerous as already described.

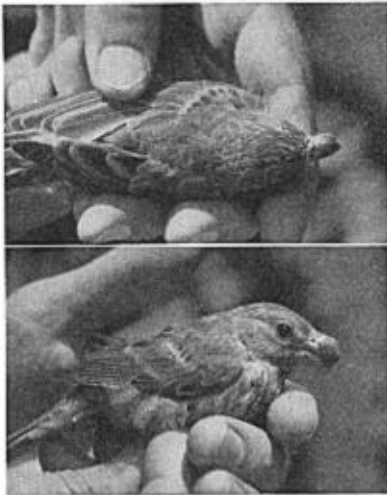


Fig. 22. Accumulation of gummy material on beak of House Finch.

A form of disease which we at first classed with the tumors was found on the bills of a considerable number of House Finches from 1926 to 1928, inclusive. The upper mandibles carried accumulations of gummy material, usually on the basal two-thirds but in extreme cases covering the whole mandible and rising above it as much as the depth of the mandible (see fig. 22). The nostrils were not covered. If one of these accumulations were removed, a slightly bloody pus could be seen oozing from the base of the upper mandible and the remainder of the bill was bright and clean. Thus it appears that this condition was an accumulation of material discharged from a diseased bill, rather than an abnormal growth of tissue. These were found on birds trapped for the first time, so they could not have come from abrasions received in the traps and probably not from abrasions received elsewhere, since there has been no evidence that trap abrasions, of

which there have been many, have been followed by these accumulations.

We include among our sick birds a very small group that, without any injury or apparent illness, suddenly drop dead in our hands. These cases have occurred almost entirely among California Towhees and Gambel Sparrows. When one of these birds suddenly becomes limp in our hands it is released instantly and usually recovers, but, among the many trapped, once or twice a year an individual will behave normally in the trap but when taken in hand will drop dead. One Gambel Sparrow even died suddenly in the gathering cage although it had never been touched and had entered the gathering cage with no trouble and without any possibility of injury.

We have instances of birds so weakened by infestations of mites that, in our opinion, they would have died. These usually have been young birds brought to us with the report that they had fallen from nests; and it might well be that the restlessness due to the mites had brought about that result. One young Mockingbird was able to grow up under our care after the mites were removed. It was released when grown.

One curious disease, for such we feel it must be, is the loss of the feathers of one or more tracts at a time other than the normal molt. This is not a common occurrence, but we have had several instances of it. A male House Finch on November 19 had the entire feather tract of the right side of the breast bare. A female on April 1 had the back of the head entirely without feathers. By April 20 the feathers were gone from the top of the head, where the skin was whitish and rough. This condition extended along the back of the neck from which the feathers could be plucked easily. An immature House Finch on July 18 had the whole under side without feathers. A male California Purple Finch on March 6 had the back of the head bare, and an adult male Black-headed Grosbeak (*Hedymeles melanocephalus*) on July 19 had the right side of the breast without feathers while on the left half the feathers were in good condition.

Our outstanding example of such loss of feathers was that of a male House Finch which was first trapped when immature on June 28, 1930. It was in our traps again on January 10 and 12, 1932, when nothing abnormal was noticed about its plumage. The next time it was in the traps, April 12, 1932, it was entirely bare except for all the feathers on the wings and head, the remiges and four or five under tail coverts and a few feathers on the legs. There was no sign of new, starting feathers. On April 19 new feathers were starting on each side of the breast. On the 20th these feathers were a little longer and more distinct. On the 24th the breast feathers were bursting out of the quills, showing no red, and the feathers of the back were starting, showing more growth at the middle of this feather tract than at the ends. On April 28 and 29 a tiny bunch of feathers on each flank just posterior to the thigh was growing. The feathers on the breast were brown, as were those on the back which were growing out at the anterior end of the tract and not at the posterior end. Between the wings the back feathers were one-half inch long.

On May 6 a very few feathers were starting on the back posterior to those previously described. On May 12 the feathers of the breast had grown to normal length. The back was covered except for the rump. Feathers had grown out in the little feather tracts just back of the legs. On May 25 two of the back feathers which were noted as starting on May 6 were yellow. On June 5 the skin of the breast between feather tracts was covered with thin, white scales. On June 9, June 13 and July 11 no more feathers had grown and the skin on the rump was sunburned; at least it was much darker and redder than normal.

On August 5, feathers had begun to grow on the bare areas. Those on the flanks and belly were one-half inch long. The tail coverts were from one-half to three-fourths of an inch long and the red rump feathers, just starting to break out of the quills, were about one-half inch long. New wing coverts were starting and the new feathers, that had grown after the bird was first found so nearly naked, were being molted; thus new feathers were coming in along the whole lengths of the feather tracts that had previously had feathers on the anterior ends only. The new breast feathers then coming in appeared to be more of an orange than the old feathers of the head and throat, and when the bird was next captured on March 13, 1933, completely feathered, it was noted as of a lighter red than indicated by its head almost a year before. It has been found that, at the molt, House Finches usually, though not always, acquire new plumages containing as much or more red than the old (Michener and Michener, *Condor*, 33, 1931, pp. 12-19). The idea has been advanced that those acquiring new plumages less red than the old do so because of lowered vitality. The history of this bird's plumage seems to strengthen that hypothesis.

In one instance it seemed that flat flies (*Hippoboscidae*) were responsible for

the loss of the head feathers of a young, hand-reared Mockingbird. Its favorite perch was in a window in front of which all the birds were banded and the flat flies leaving the birds alighted on the window panes. It was noticed that the feathers of the Mockingbird's head were getting thin and rough in appearance, and upon closer examination the fore part of the top of the head was found to be matted with flat flies, about ten being removed. All the feathers fell off of this part of its head and were not replaced until the molt.

Isolated cases of various other ailments appear in our records: a badly swollen crop, extreme emaciation, a head twisted 90 degrees from normal with apparent paralysis.

It is evident from the above that we do not know much about the sicknesses that afflict birds. However, we wish to suggest that this is a field of study worthy of extended research, that such research will require experts in various types of diseases, and that a banding station operating the year around is a suitable means for providing the research material.

#### PART 3. INJURIES

It is not unusual to see birds in the field with one kind of injury or another and yet surviving apparently with little or no inconvenience. In our ten years of banding, many injuries of this type, though a very small number compared with the number of birds banded, have been observed and recorded. In addition to these there have been a few injuries recorded from which the birds did not recover, or by which they were so thoroughly handicapped that it is probable they did not survive for long. However, the great majority of the injuries observed and dealt with in the following discussion should be thought of as injuries from which a bird can survive rather than injuries which may kill a bird. Many injuries must mean such certain death that we rarely if ever see birds still alive which have been so afflicted. With this preliminary statement we will discuss the injuries we have recorded as rather incidental observations while carrying on our work of banding and other more emphasized lines of research. The causes of the injuries have usually been a mystery and probably many minor injuries have escaped observation.

The most common injuries are those of the legs. These range from missing toe joints to legs that have been entirely torn off, with the less severe in the great majority. Broken legs either hang as useless, dead and shriveled hindrances, or heal in distorted positions either useless or usable only as props. But the thing that is most clearly apparent is that in any case an injured leg is no major loss to a bird. It gets along with almost any degree of leg injury. Of course this would not hold true for some species but we have none such in our records.

Among the birds that we have handled, deformed bills are almost as common as injured legs. Most of these, doubtless, are due to injuries. The birds seem able to adapt themselves to very severe injuries of this type.

Head injuries of varying degrees of severity, including eye injuries, though less common are fairly common and sometimes amazingly severe to be survived. Injuries of the sides and abdomen are rare and these, even if not very deep, reach vital spots. Injuries of the wings can be classed as very rare, the rarest of all. The rapidity with which birds recover from injuries often seems quite remarkable.

Frequently a bird receives more than one type of injury probably at the same time. A California Thrasher was captured having its right hind toe gone, its right tarsus much thickened, bent, and deformed, and the two mandibles crossed at the tips. Sometimes a bird is captured having injuries so severe that we think it should be killed. A House Finch had lost the entire bill. The tongue protruded, with the end wounded and dry.

An instance of a leg that had been broken and healed in a much deformed condition was that of a California Jay (*Aphelocoma californica*) whose left tarsus had been broken at or near the proximal end and the foot rotated 180 degrees about the axis of the tarsus so that the hind toe pointed forward. All the toes were partly closed. The foot was used as a prop. This bird stayed around our yard for many months and was particularly annoying to the nesting mockingbirds. If we had trapped it again, we would have disposed of it; but once in a trap was enough for it. It became very wet on a windy, rainy day and came to a covered porch for shelter. Probably it could not keep itself in a dry place in the trees against the force of the wind on account of its crippled foot.

What seemed to be a severe head injury was sustained by a female House Finch. While in a trap the entire top of the skull was laid bare to the bone by a jay on the outside of the trap. When released on that occasion, and on subsequent days, it seemed as active as any bird, flying off instantly, and did not appear at all sick. It was in the traps 8 times on 7 of the 10 days preceding the injury and 12 times on 6 of the 8 days after the injury. The last recapture was on the eighth day after the injury and the bird was apparently normal in its activities although the skull was still as bare as when first injured.

The most puzzling injury (?) we have observed was the case of a House Finch which had no right leg. No scar was visible and feathers were growing over the area where the leg should have been. We could feel no stump of a leg under the skin. We have wondered if this bird really lost its right leg or if it never had one. The external appearances seemed to indicate the latter condition.

#### PART 4. ALBINISM

The enumeration of birds that we have trapped with white or whitish feathers where feathers of other colors normally grow would add little or nothing to the information gathered in the field by nearly every bird observer. Records of some 30,000 birds (exclusive of English Sparrows, *Passer domesticus*) show only 17 with albinism in any degree. This is about .05 of one per cent of the total. From the numerous accounts of birds exhibiting albinism in one form or another, it would be judged a much more common occurrence than these figures show. Indeed, our own observations on English Sparrows indicate that in any locality there may be a flare-up of albinism in a species because of some hereditary factor connected with it. However, it is undoubtedly true that the amount of attention given to albinistic birds is out of all proportion to their number, because of the conspicuousness of the white feathers.

Soon after we began trapping we captured a female English Sparrow having the flight feathers white, except the right first primary which was normal in color. In addition, one of the greater coverts of the left wing, most of the feathers of the posterior part of the back and parts of some of the tail feathers were white. The composite photograph (fig. 23) shows these white feathers. This bird was released because of its



Fig. 23. Composite photograph of partly albinistic English Sparrow.

strange marking and, although recaptured only once, it was observed here almost continuously for several years, with the exception of a short time each winter. In that period many young English Sparrows were captured, or observed in freedom, having varying degrees of white on the wings, back and tail, but none showed as much white as this female. All those captured were killed, the usual fate of our captured English Sparrows. After this female disappeared the number of young with white feathers decreased and soon none at all was seen.

In the summer of 1930 a family of three and possibly four young California Jays, with all the feathers much paler blues and grays and the blue areas much more restricted than normal, came to our station. They had pale gray bills and feet instead of black and the irises were lighter than normal. Two of them were seen to be fed by a normal-colored jay, presumably one of the parents. Nothing is known of the other parent. These young were unusually tame and were captured many times. When one of them was caught in September it was molting and the new feathers were also paler than normal.

The two instances described above indicate hereditary factors in albinism; but the following is not so easy to explain on that basis. A female House Finch was banded as an immature on June 30, 1926. The record contains no mention of any peculiarity of plumage. On April 23, 1930, this bird was recaptured with white feathers on whole head, the sides and back of the neck, and with the outer primary on the right wing white. All other feathers were normal in color. The dark on the forehead (see fig. 24) was gummy dirt, the bases of these feathers showing white. The bill was ivory colored except at the tip. The white head, ivory beak and dark eyes made this bird conspicuous about the yard. It was not seen again so we know only that it had normal feathers as a juvenile

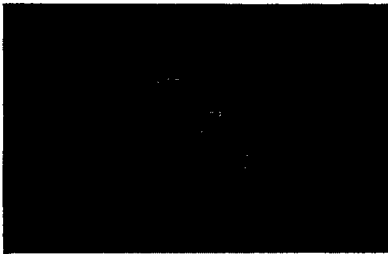


Fig. 24. White-headed House Finch.

and a white head when almost four years old.

Three feathers taken from the right fourth primary position of a female House Finch, which otherwise had normal coloration, contrasted with a normal right fourth primary from another female house finch, are shown (fig. 25). Feather *a* was plucked on January 1, 1925, *b* on February 23, 1925, and *c* on May 5, 1925. Feather *d* was plucked on one of these dates. There is much more white in *c* than in either *a* or *b*, whereas *b* is only slightly lighter than *a* which, in turn, is considerably lighter than *d* even in the areas that are not white. These feathers are of practically the same length, but *c* is somewhat narrower than any of the others, which are all about the same width.

From a certain locality in Pasadena a white Mockingbird was reported to us independently by several people over a period of several years. According to the reports it was entirely white and was last seen in 1934. In 1935 another Mockingbird which was estimated to have about one-half of its feathers white was seen in the same locality.

A white female Cowbird (*Molothrus ater obscurus*, presumably) was brought to us, having been captured in Pasadena outside an aviary. It was a dirty white all over, including feet and bill, but the eyes were dark. It was given to Dr. Louis B. Bishop for his collection.

It seems that albinism can be divided into two main types. The first is that in which all the plumage, the feet and the bill are lighter than normal, without any

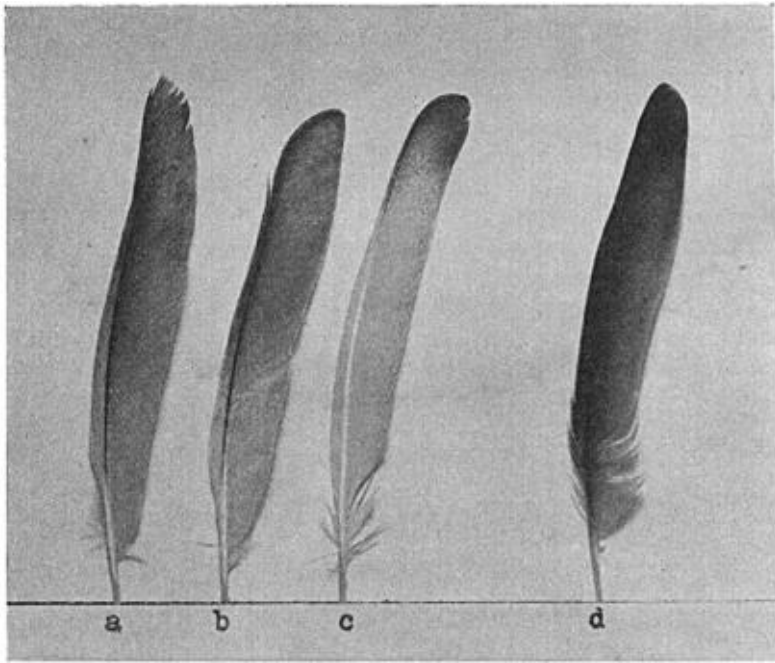


Fig. 25. Feathers a, b, and c are successive albinistic right fourth primaries from a female House Finch; d is a normal right fourth primary from another female House Finch.

particular interference with the normal pattern. In the extreme this may bring about the complete obliteration of the pattern by all the feathers being white, and, perhaps, it is in these extreme cases that the pigmentation of the eyes disappears. We have not observed diminished eye pigmentation except in the California Jays described above, which fall within this class because of their paler plumage. The second type of albinism is that in which one or more spots of white appear where the color is normally other than white, these spots ranging from a part of a single feather to the entire plumage. When these spots occur on the wings they are usually almost bilaterally symmetrical. The feet, legs and beak may also be light. In the birds we have captured, this type of albinism seems to occur much more frequently than the first.

*Pasadena, California, January 5, 1936.*

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#### FOOD OF THE COMMON MALLARD IN THE LOWER FRASER VALLEY, BRITISH COLUMBIA

By J. A. MUNRO

The question of the food supply of waterfowl in British Columbia is one which increasingly is engaging the attention of sportsmen, particularly those who are interested in hunting grounds in the Lower Fraser Valley. That the natural food resources are insufficient to meet the requirements of wintering ducks is an assumption generally accepted. So also is the corollary that the propagation of plant foods, such as wild rice, is desirable.