Snowy Owls which participated in this invasion fared no better at the hands of gunners than did those of earlier invasions such as those of 1926–27 and 1930–31. In fact so large a number of the birds were shot that from the standpoint of survival it were better that they had taken their chances on a reduced food supply in their normal home than to have faced the barrage of shot from hunters' guns to which they were subjected in the invaded territory.

Of necessity, in an inquiry of this type, cooperation must be had from numerous individuals and agencies. In addition to the persons definitely mentioned in this report, my thanks and obligation are acknowledged to a large number of correspondents and collaborators without whose response the investigation would have been impossible of accomplishment.

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A FUNGUS INFECTION OF THE LUNGS AND AIR SACS OF A COMMON MALLARD

BY C. COURSON ZELIFF

INFECTION of the lungs, air sacs and even other organs of domesticated birds by the fungus or mold *Aspergillus* is not uncommon. "Brooder pneumonia" is the name applied to the disease by poultrymen when the air passages are involved. The scientific name for the disease is aspergillosis. The endings "iasis" or "osis" are frequently affixed to the scientific or generic name of an organism to designate the disease caused by it. There are numerous species or kinds of this fungus, some do not produce disease, for example one may be found on moldy bread, along with other molds. *Aspergillus fumigatus* is the complete scientific name for the species causing "brooder pneumonia" or aspergillosis in many kinds of birds. The common name indicates that young birds frequently have the disease but it may occur in mature birds as well.

This fungus or mold is said to exist in straw, dusty grain and other organic matter, from which it may invade weakened or undernourished birds. A scientific name applied in a broad way to infections by fungi or molds, as they are commonly known, is mycoses (singular mycosis). Many fungi (singular fungus) attack animals, both wild and domesticated, and also man. Some cause athlete's foot and ringworm, which are well known. The latter name is misleading since there is nothing worm-like connected with the disease. It is because of the inaccuracy and confusion in use of

common names for organisms and diseases in various localities, that the more uniform scientific term or name of world wide uniformity is the choice of scientists. The scientific terms are chosen largely from Greek or Latin and mean nearly the same thing. For example "mycosis" is partly from the Greek word "mykes," which means fungus.

A dead female common mallard (*Anas platyrhynchos*) was recovered from the College Pond at State College recently by Dr. P. F. English, Associate Professor of Wildlife. An autopsy of the bird by Assistant Professor Merrill Wood, an ornithologist, revealed yellowish white nodules or masses in the lungs and air sacs of the abdomen. These cheesy nodules (Fig. 1.), varying from an eighth to three-quarters of an inch in diameter and concentric in pattern were sent to the writer for examination. It was suggested that some parasite, possibly an immature stage of a worm was enclosed in each. Unfortunately the writer did not see the entire internal organs of the bird or obtain a photograph of them. Gordon and Stoner (1942) give illustrations of the infected liver and stomach of a Snowy Owl having aspergillosis.

Diagnosis of aspergillosis can only be accurately made by securing some of the mold or fungus from the tissue of an infected animal. The usual technique is to add a drop of 10–30% potassium or sodium hydroxide to a mount of the tissue, which results in clear cut or transparent specimens. This is done by pressing a small amount of the tissue between a microscopic slide and cover glass. Water, alcohol or formalin may be used as substitutes but equal transparency will not be obtained. Sectioning of a nodule for finer details is worth while but was not carried out in this case since a microtome for slicing was not at hand. Culturing or growing the fungus as is done for bacteria would also aid in accurately identifying the species. Special equipment and living material rather than preserved, as was sent the writer, are also necessary for such technique. Since such technique has been completed for this fungus in research investigations and also because too many scientific terms are involved in the complete discussion of the disease or pathology (Fox, 1923) the writer feels that complete details are well omitted here.

A portion of one of the tubercles as examined under the microscope (Fig. 2) reveals it as consisting in part of tissue of the bird and an interwoven mass of filaments or hyphae of a mold or fungus. A mass of these hyphae constitute a mycelium or the body of the fungus. The hyphae can be seen projecting from the edge of the mount. The dark, spherical structures in the mycelium or mass are one type of reproductive structure of the fungus. Along the edge these appear as stems, having a spherical tip and brush-like

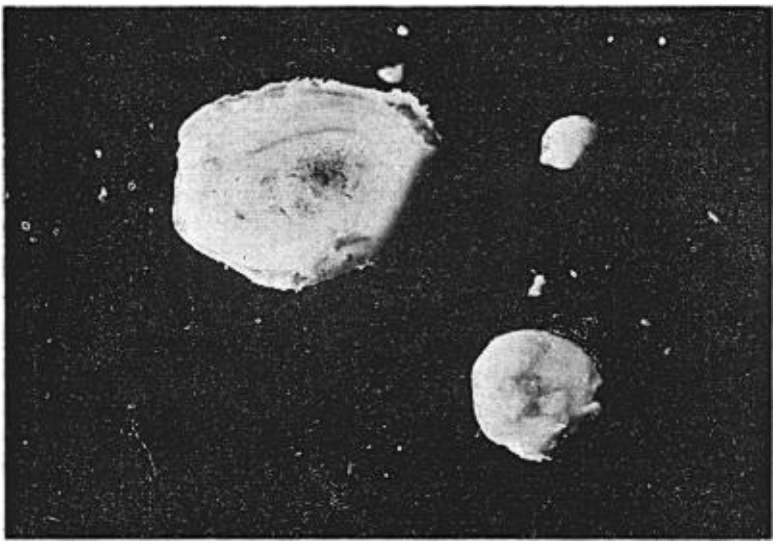

FIG. 1. Photograph of three tubercles or nodules from the lungs and air sacs (X 7.)

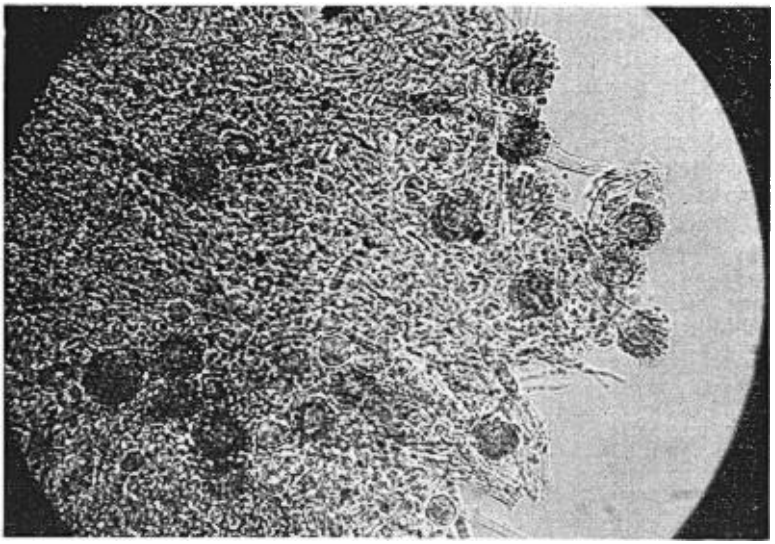

FIG. 2. Photomicrograph of a compressed portion of a nodule showing mycellium and reproductive structures of the fungus. (X 375.)

border. The brush-like portion consists largely of spores which disseminate the fungus and cause the infection of new hosts or animals. The shape of the "head," as it is sometimes called, is characteristic for the fungus, *Aspergillus*.

A complete description of the symptoms of the disease and its effect on the organs will be omitted because of the technical terms involved. Internally, as previously stated, an invasion of the lungs, air sacs and other organs may occur. Enzymes are secreted which cause disintegration or digestion of the tissues attacked. In aspergillosis the lungs of a bird are said to be more diseased than in tuberculosis. The nodules look much like those found in the latter disease but a mycelium is not found in the former.

Among the external sysmptoms are a foul odor in advanced stages of the disease, a loss of weight or "going light" an expression used by many poultrymen. The mallard with this disease is smaller and lighter in weight than normal. An infected bird breathes with difficulty, sneezes, gasps for breath and later dies. The mortality rate may reach 90% in domestic flocks. Further details are given by the authors listed in the references at the end of this article.

Captive birds, in zoological gardens, often become infected. Water birds are more susceptible. Aspergillosis in wild birds not in captivity seems to have been given very limited study. The Snowy Owl autopsied or examined by Gordon and Stoner was kept in captivity some time before its diseased condition was observed and hence the disease may have been caused by contaminated food eaten after its capture. Possibly more cases of aspergillosis occur in wild birds than is suspected.

Aspergillosis may also occur in man. In India the fungus grows in the external ear. Possibly the mycoses of the external ears of individuals who have been bathing in the waters about the Solomon Islands may be due to this fungus. Reports of this have occurred in recent publications.

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