Tetrastes sewerzowi secunda subsp. nov.

Type, adult male, U. S. National Museum, No. 277457, near Tatsienlu, Szechwan, China, alt. 12000 feet, July 28, 1923, collected by David C. Graham.

Similar to *Tetrastes sewerzowi* Przewalski, but the brown bars above and on the chest near hazel instead of buffy brown; the lesser and greater wing-coverts and the scapulars with a rather broad white shaft spot at the tip; the incipient neck-ruff with a few white spots; below the black bars seem to be broader, especially on the upper chest; and the flanks are more tawny. Wing, 161; culmen, 14; tarsus, 37; middle-toe, 34.5 mm.

Remarks.—Two of the specimens examined are males and one is a female. The two males are in molt and are acquiring new tails. The second male is more of a hazel brown than the type. The specimen marked as a female, I suspect, is really a young male, as it seems to be acquiring a black throat. It is more tawny than the other two specimens, has the white spotting on the wing-coverts and scapulars much reduced, and the white bars on the breast broader.

The Szechwan specimens all came from 11,000 to 12,000 feet altitude near Ü Long Kong, a place about ten miles from Tatsienlu, on the small river that flows northward into that town and were taken between July 28 and August 3.

U. S. National Museum,
Washington, D. C.

DISEASES OF THE RUFFED GROUSE.

BY ALFRED O. GROSS.

DURING the course of life history studies now being made at Bowdoin College, Brunswick, Maine, and in field work conducted in southeastern New York for the Roosevelt Wild Life Forest Experiment Station, Syracuse, New York, certain diseases of the Ruffed Grouse have come to my attention. Since these diseases may have an important bearing on the periodic fluctuation in the numbers of the Ruffed Grouse it seems desirable to make a preliminary report on the birds examined. Thus far 17 birds in the flesh, 9 males and 8 females, have been received; 2 from New York,

5 from Connecticut, 1 from Rhode Island, 1 from Massachusetts, and 8 from Maine. In addition to the entire birds, 44 stomachs have been examined for the presence of the stomach worm *Dispharynx*. The major part of the stomach material was received from Dr. John C. Phillips, and from members of hunting clubs in Massachusetts and New York. It is earnestly hoped that the report of these diseases will stimulate a further interest in the examination of all Ruffed Grouse found dead and of any birds killed which present symptoms of disease. The problem of the "Grouse Disease" is not a simple one and we need the cooperation of every one who is interested in the welfare and future of the Ruffed Grouse. Of the 17 birds noted above, 8 were killed and 9 were found dead. Of the latter, 2 had met death by violent plunges into buildings and 1 by flying into telephone wires. Two of the birds found dead died as the result of injuries received in some unknown way, and they seemed to be normal as far as the presence of any disease was concerned. None of the 9 birds found dead had been shot so far as could be determined. The cases of parasites and diseases among the 17 birds are as follows: *Dispharynx* 6, Pulmonary Mycosis 2, Tuberculosis 3, Ascaridia 1, and 1 bird apparently died from the effects of a large abnormal growth dorsal to the abdominal viscera. All of the 44 stomachs examined were free from parasites. Following is a brief statement of the diseases noted:

DISPHARYNX PARASITISM.

Dispharynx is a parasitic nematode worm which usually becomes established in the proventriculus and in later stages spreads to the muscular walls of the stomach. This parasite was noted in the Ruffed Grouse by Dr. A. A. Allen in specimens which he examined at Cornell University, Ithaca, New York. In the Bulletin of the American Game Protective Association, Vol. 13, No. 1, January, 1924, and in other articles Dr. Allen refers to this worm under the name *Dispharagus*. According to Dr. B. H. Ransom of the U. S. Biological Survey, Washington, D. C., the genus *Dispharynx* Dujardin, 1845, is not in good standing, as it appears to be a synonym of the genus *Acuaria* Bremser, 1811. This genus belongs to the family *Acuariidae* in the super-family Spiruroidea.

In the 1925 winter issue of the *Maryland Conservationist* Dr. Allen corrects the name *Dispharagus* and states: "A review of the literature and a study of the worm by Miss Elizabeth L. Keyes indicates that it should be called *Acuaria spiralis* Mol. unless it is a new species." In order to justify the use of the name *Dispharynx* and to avoid confusion in the nomenclature of this parasite, the following statement by Dr. Ransom, the foremost authority on this group, is important. "In 1912 Railliet, Henry and Sisoff divided the genus *Aucaria* into five sub-genera, two of these sub-genera being *Dispharynx* and *Cheilospirura. Cheilospirura* had already been made a genus by Diesing in 1861, and has been quite commonly accorded generic rank. *Dispharynx* is still used as a subgenus by many writers, but has been used as a genus, and would be used by writers who are inclined to disregard sub-genera and to recognize sub-genera as of generic rank or else disregard them entirely. We are inclined to accord generic rank to *Cheilospirura* and *Dispharynx,* but at the same time we would recognize the more extensive genus *Acuaria* as used by writers who disregard these two names either as genera or sub-genera. We would prefer to use the two genera *Cheilospirura* and *Dispharynx* and in any case would not use the generic name *Dispharagus.*"

According to Dr. Allen *Dispharynx* has been the cause of death of some of the birds he has reared in captivity, and as the parasite has a wide distribution in wild birds he thinks it is one of the most important factors concerned with the present scarcity of Ruffed Grouse. In nearly all of the cases of *Dispharynx* examined at Bowdoin College, the infection was in its initial stages and I doubt if in any of the 6 cases could the death of the bird be attributed solely to the presence of the worms. The specimens infested with *Dispharynx* are as follows:

No. 16. Adult male killed near Brunswick, Maine, on November 5, 1923, by C. G. Weymouth. Weight 632 grams. Crop contents: 217 leaves of clover, 19 grams; 86 alder buds, 22 grams; 51 birch buds, 6 grams; miscellaneous leaves, 2 grams; total, 49 grams. Infection slight; only a few worms present.

No. 17. Adult male that killed itself by flying violently against the Science Building, Brunswick, Maine, April 14, 1924. Bird found by Mr. R. Pike and donated by him to the laboratory.

Weight 654 grams. Crop contained 3.3 grams of buds and blossoms of the maple. Proventriculus infested with several worms.

No. 21. Juvenal male that killed itself by flying against Hyde Hall, Bowdoin College, Brunswick, Maine, October 28, 1924. Weight 460 grams. Infection slight.

No. 28. Adult male killed on Pound Ridge, Westchester County, New York, on November 2, 1924, by Charles E. Hope of White Plains, New York. Infection slight; only 5 worms found.

No. 29. Adult male found dead in a frozen condition near Stratford, Fairfield County, Connecticut, on November 22, 1924, by George Bartlett and sent to Bowdoin College by Mr. J. W. Titcomb of the Connecticut State Board of Fisheries and Game, Hartford, Connecticut. Bird greatly emaciated, weighing only 486 grams. The proventricular walls were filled with these worms but none were found in the walls of the stomach. *Dispharynx* was combined with Pulmonary Mycosis.

No. 31. Adult male found under a laurel bush at the base of the Taghkanic Mountains, 6 miles north of Millerton, Dutchess County, New York, on November 23, 1924. Bird discovered by Frederic L. Conklin and was sent to me by Dr. W. A. Knapp of Millerton, New York. Fifteen worms were found in dissecting the walls of the proventriculus. *Dispharynx* was combined with Avian Tuberculosis.

The above 6 cases of *Dispharynx* represent four distinct localities and three different States, indicating that the infections are not local but distributed over a very extensive area. According to Dr. Ransom all of the worms are of one species, apparently a new species, of *Dispharynx*. It is interesting to note that all of the above cases of the parasite were in male birds. As noted above, *Dispharynx* was not the sole cause of death of any of these birds. Birds Nos 16 and 28 were shot. Birds Nos. 17 and 21 killed themselves by flying into buildings. It would be extremely interesting to examine other birds which have killed themselves in a similar manner as some relation might be found to exist between the so-called "crazy flight" and the presence of the stomach worms. Dr. Allen informs me that he has examined a similar case. The parasites undoubtedly cause a severe irritation that might be the initial cause of this peculiar behavior. During the past season

the Maine newspapers reported numerous cases of birds flying into buildings of towns and cities but I was unable to secure any of them for examination.

Birds Nos. 29 and 31 were found dead, but both of these cases were complicated by the presence of other diseases which apparently were the primary cause of death. The *Dispharynx*, however, probably weakened the resistance of these two birds so that the diseases could more readily become established.

PULMONARY MYCOSIS.

Mycosis is a general term applied to infections with Hyphomycetes and in the cases under consideration it concerns the growth of *Aspergillus* in the lungs and air sacs of the birds. Mycosis is well known to breeders of Chickens, Ducks and Ostriches, under the name of Aspergillosis and Brooder Pneumonia. It also occurs among birds confined in zoological parks, but I know of no cases on record where it has occurred in the Ruffed Grouse living in the wild state. The author is indebted to Dr. E. E. Tyzzer of the Department of Comparative Pathology, Harvard Medical School, for the determination of two cases of Pulmonary Mycosis. He reports as follows: "The lesions in the lungs of both birds are acute and consist of leucocytes in association with an abundant growth of mycelium. This fungus has in one place fruited and the appearance is characteristic of *Aspergillus fumigatus.*" The tubercles are very conspicuous even in surface views of the lungs, and range in size from many small ones, 2 to 5 millimeters, to one in bird No. 59 which was 10 millimeters wide and 15 millimeters long. Sections of the lungs revealed numerous growths of tubercles throughout the tissue. A superficial examination of such tubercles suggests the presence of tuberculosis but microscopical preparations do not have the ascid fast bacilli, the giant cells, and other characteristics of the disease, but do show the presence of numerous leucocytes and an abundant mycelial growth." The two specimens in which Dr. Tyzzer has made the diagnosis of Pulmonary Mycosis are as follows:

No 29. Adult male found dead and frozen near Stratford, Fairfield County, Connecticut, on November 22, 1924, by George Bartlett and sent to the Biological Laboratory, Bowdoin College,

by Mr. J. W. Titcomb of the State Board of Fisheries and Game. This bird was in a moulting condition, which may have reduced its resistance to disease. It was greatly emaciated, weighing only 486 grams. The crop contained small acorns of a total weight of 13 grams. This bird was also infested with *Dispharynx* as noted above. In this specimen the lesions had extended to the axillary air sacs and in a lesser degree to the viscera.

No. 59. Found dead in the woods near Union, Knox County, Maine, November 27, 1924, by William C. Gleason, and sent to the Biological Laboratory, Bowdoin College, by Hon. Willis E. Parsons, Commissioner of Inland Fisheries and Game, Augusta, Maine. This bird was also a male and moulting. It was very thin, weighing only 373 grams. It was smaller and the measurements as a whole were less than in the preceding specimens, and it appeared to be a young bird of the year. If this be true, then it indicates the rapidity with which an infection of Mycosis may work. The crop contents consisted of 6 beechnuts, weighing 2.7 grams; frozen apples, 7.1 grams; and bits of leaves, about 0.1 gram; total contents, 9.9 grams. The left lung of this bird is all more or less congested, one giant almond-shaped tubercle being 10 by 15 millimeters in size. Cross sections of the right lung also show numerous cheese-like tubercles throughout the tissue.

As in most of the cases of *Dispharynx* the presence of this disease did not result in the loss of appetite of the victim but the birds ate well up to the time of their death. The fact that one of these birds was found in Maine and the other in Connecticut indicates that Mycosis may be a common and widespread disease during certain years when conditions are favorable for infections and for its growth.

AVIAN TUBERCULOSIS

Avian Tuberculosis like Mycosis is a common disease in poultry and in birds confined in zoological parks and gardens, but is seldom found in the free wild birds. Dr. Morton Grinnell (Avian Tuberculosis, *Forest and Stream* 1887, vol. 27, p. 503) during December, 1886, made a post mortem examination of a male and a female Ruffed Grouse which had been kept in captivity for a period of about six weeks before death. A third specimen died of the same

symptoms but was not examined. According to Dr. Grinnell the organs of the male showing acute disease were the lower part of the small intestine near the cæca, the liver, and probably the spleen. The nodules of the intestine were located in the submucous coat and those of the liver were beneath the peritoneal covering. Under the microscope these bodies proved to be tubercles with the characteristic cheesy broken-down center, surrounded by the giant or aggregated white cells, and in and around these, the colonies of bacilli. The diagnosis of Tuberculous Peritonitis was made. The male bird came from Wisconsin, the hens, one from Michigan and the other from New York, showing a wide distribution.

I am indebted to Mr. B. B. Burbank for making microscopical preparations from a large series of tissues and for making the preliminary examinations of my material. I am also indebted to Dr. F. N. Whittier, late professor of Bacteriology of Bowdoin College, for the diagnosis of Tuberculosis. Although it is probable the disease found is the Avian type of Tuberculosis we cannot be certain of this as the disease was not suspected until all of the material had been preserved, and hence no inoculations were made either on culture media or in other animals to further test the nature and types of the tubercle bacilli. The bovine and human types of the bacilli, according to Herbert Fox, M.D.,[1] have been found in birds, although not commonly.

Positive determinations were made on three specimens of my material, one from Maine, one from Connecticut and another from New York. The history of these birds is as follows:

No. 25. Female Ruffed Grouse secured at Jackson, Maine, November 12, 1924, by Dr. F. E. Norris and sent to my laboratory by S. H. Howes for examination because of the large numbers of a nematode worm, *Ascaridia lineata* (species?) found in the intestinal cavity. (These worms are frequently found in wild birds but so far as I can ascertain have not been proven to be a serious menace to the host. Nevertheless a thorough investigation should be made of these parasites of which so little is known concerning their pathological effects.) The bird was sent without legs and parts of the wings, hence the weight, 360 grams, cannot be used for comparative purposes. The bird seemed to be in

[1] Fox, Herbert, 1923, Disease in Captive Wild Mammals and Birds, p. 513.

fairly good physical condition. There were acute lesions in the lungs, but the abdominal viscera were not examined.

No. 31. Adult male Ruffed Grouse found dead 6 miles north of Millerton, Dutchess County, New York, by Frederic L. Conklin and sent to me by Dr. W. A. Knapp of Millerton, New York. This bird was also infested with *Dispharynx* as indicated above, and this with Tuberculosis was the apparent cause of death.

No. 78. Female Ruffed Grouse found by Charles Allshouse of Granby, Connecticut. The bird was alive when found but was unable to fly more than a few feet. It was kept in captivity until it died. There were acute lesions of the liver, small intestine and left lung. Weight only 341 grams. Crop empty. Contents of stomach comprised poultry food obtained in captivity.

Tuberculosis, from the standpoint of human welfare, is a most important disease, and if it is common and widespread among wild birds it should receive the attention of all interested in the Grouse problem.

DISEASE NOT IDENTIFIED.

No. 81. Female Ruffed Grouse found by Thomas Lee, February 21, 1925, in a peach orchard near Danbury, Connecticut. Bird sent to State Board of Fisheries and Game by A. J. Williamson, game warden at Bridgeport, Connecticut. Body in bad condition when received by me and apparently had been dead for a long time before it was found. The bird, according to measurements, was an adult but it weighed only 336 grams. Crop empty. Stomach contents only 3.9 grams.

Lying dorsal to the abdominal viscera in the region of the ovary was a large somewhat rounded mass roughly measuring $2\frac{1}{2} \times 3 \times 1\frac{1}{2}$ centimeters. On section this body appeared to be of the nature of coagulum. The ovary is not involved and appears normal. The cæca appear normal and no other lesions are apparent. Dr. E. E. Tyzzer also examined stained sections of the mass in which blood vessels could be distinguished but otherwise, because of poor preservation, without sufficient character for diagnosis.

The examinations thus far made emphasize the importance of making autopsies of the entire bird. Most of the 17 birds received at Bowdoin were sent because disease was suspected, but even so,

there is a surprising number of diseases in this small number of birds. In addition to the diseases mentioned we need to give some attention to external parasites. For example, the blood sucking Hippoboscid fly, *Ornithoponus americanus* (Leach) has been reported from New York and from various localities all over New England this past season. These flies may prove to be the secondary hosts of some of the internal parasites or may prove to be the carriers of disease which would tend to spread and multiply the number of cases. If this be true certain phases of the life history of these insects may be correlated with the periodic decrease in the numbers of Ruffed Grouse. It is also desirable to examine all birds for lice, mites and ticks, and when these parasites are found they should be preserved for microscopical examination. It is also very desirable to have an abundance of living material, both birds and parasites, for extensive experimental work. We need the assistance of all sportsmen and others who are in a position to secure material for our investigations. I wish to express my appreciation for the splendid cooperation already given me by the Conservation Commissions of Connecticut, Massachusetts and Maine. It will be necessary to make examinations of large numbers of specimens and a complete life history and ecological study extending over a period of several years must be completed, before we can hope to make generalizations concerning the conservation and perpetuation of the Ruffed Grouse. The primary purpose of this brief preliminary report is to stimulate interest in the further investigation of all phases of this important ornithological problem.

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