

Helminths collected from the Domestic Fowl (*Gallus domesticus*) and the Domestic Pigeon (*Columba livia*) in Natal.

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DISEASE conditions in birds in South Africa constitutes a subject about which, until recently, little was known. With the growth of the industry and the ever-increasing poultry population, the problem of prevention of diseases in birds is one which yearly becomes more and more important.

Of perhaps even greater importance to Natal, with its subtropical climate, is that section which deals with internal parasites, as these take a yearly toll from the young stock in life and reduced vitality which is far greater than most breeders would believe.

As an initial step in the campaign against these parasites in birds, Sir Arnold Theiler, Director of Veterinary Education and Research, suggested to the author that a collection should be made of all the helminths found in birds which were submitted to the Allerton Research Laboratory for examination, and with the assistance of my colleague, Mr. D. T. Mitchell, Officer in Charge of the Laboratory, who, realizing the importance of the study of this section of the work, placed all the "raw material" submitted at my disposal, a beginning was made.

It is only to be regretted that, owing to the abundance of ordinary routine work to be dealt with, justice could not be done to the vast amount of available material, and some valuable information was lost.

This report is therefore intended only to record the species of helminths collected by the writer from Natal poultry during 1924-25.

SOURCE OF THE MATERIAL.

The material was collected from various sources. Some of it was obtained on the post-mortem of live or dead birds sent in by poultry-keepers from different parts of Natal. Material from the Cape and the Transvaal was also examined.

The greatest percentage of dead birds sent in from the country districts arrived in a too advanced stage of putrefaction to allow of an accurate diagnosis of the species of tape-worms present. Intestines wrapped in cloth soaked in a 1-2 per cent. solution of formalin, and forwarded in a tin, arrived in excellent condition. This is probably one of the most satisfactory means of sending pathological material to the veterinary research laboratories for examination.

Most of the material examined was collected locally and from the flock on the station.

The helminths mentioned in this report can safely be considered as occurring throughout the greatest part of this Province and the rest of South Africa.

METHODS OF COLLECTION AND PRESERVATION.

To ensure that no species escaped notice, mucosal scrapings from the whole of the intestinal tract were examined with the aid of a dissecting microscope. This procedure could not be carried out in every case, and I therefore include in the appended Table 1 only those cases where a fairly thorough examination was possible. The detection of minute helminths like *Davainea proglottina*, *Hymenolepis inermis*, *Trichostrongylus tenuis*, and the species *capillaria* demands a very close examination.

The nematodes, after repeated washings in normal saline to free them of as much of the adhering mucus as possible, were preserved by dropping them into a boiling solution of glycerine-alcohol (glycerine 10 parts; 70 per cent. alcohol 90 parts) and leaving them to boil until straightened out.

The procedure with the cestodes was that recommended by Megnin (1924). Bouin's fluid proved an excellent fixative, and lacto-phenol an indispensable clearing agent.

SPECIES COLLECTED.

All the below-mentioned species were collected between the middle of November, 1924, and middle of May, 1925.

One hundred and forty-two fowls and six pigeons were examined. Every one of these was found to be infested with one or more species of helminths.

A list of the species collected, several of which have probably never been recorded from South Africa, is given below. Remarks have been added where necessary.

CLASS NEMATODA.

Genus *Heterakis* Duj., 1845.

Heterakis papillosa (Block, 1782) Rail., 1885.

This nematode, normally inhabiting the caecae, was present in every one of the hundred and forty-two fowls examined. The degree of infestation varied considerably.

Genus *Ascaridia* Duj., 1845.

Ascaridia lineata (Schneider, 1866) Trav., 1913.

The harm caused by this parasite, the second commonest, to young stock in Natal must be considerable. The degree of infestation varies enormously. In one case about seven hundred specimens, accompanied by at least five times their number of immature forms, were collected from the small intestine of an emaciated cockerel.

This species, normally limited to the middle third of the small intestine, has often been collected from the gizzard, proventriculus, crop, oesophagus, and slit in the hard palate of birds dead for some time. The two worms resembling the lungworm of sheep, recorded by Canham (1925) from the crop of a dead fowl, were probably specimens of this species. In no case have these worms been observed to migrate into the large intestine after the death of the host. Three

chickens, kept in a specially constructed fly-proof cage and fed on earthworms dug up in runs stocked with birds heavily infected with *A. lineata*, *H. papillosa*, *D. proglottina*, *A. sphenoides*, and *H. inermis*, and also, but to a lesser degree, with *Trichostrongylus tenius*, *Capillaria retusa*, *Cheilosporira hamulosa*, *Tetrameres fissispina*, *D. tetragona*, and *D. cesticillus*, proved on post-mortem six weeks later to harbour the species *A. sphenoides*, *A. lineata*, and *Trichostrongylus tenius*. As the earthworms were thoroughly washed in tap water prior to being cut up and fed to the chickens, it seems probable that the embryonated eggs of *A. lineata* and the infective stage larvae of *Trichostrongylus tenius* must have gained access in the ingesta contained within the alimentary canal of the earthworms.

Ascaridia columbae (Gmel., 1790) Trav., 1913.

This species was obtained from three of the six pigeons examined. In two cases they were present in considerable numbers and were the probable cause of death of their hosts. In one of these two cases they had migrated as far cranially as the crop, and several living specimens were lodged between the horny inner lining and the musculature of the gizzard. The absence of haemorrhage or any signs of inflammation signifies that entrance was only effected after the death of the host.

Genus *Trichostrongylus* Looss, 1905.

Trichostrongylus tenius (Mehl., 1846) Rail. and Henry, 1909.

Another common intestinal parasite of the fowl here is *T. tenius*. It was only met with in small numbers in the small intestine.

Genus *Ornithostrongylus* Trav., 1914.

Ornithostrongylus quadriradiatus (Stev., 1904) Trav., 1914.

Three of the pigeons harboured this species. One pigeon had undoubtedly died from a heavy infestation with this species. The small intestine showed a marked muco-enteritis of undoubted verminous origin. The owner of this bird complained of having lost several birds this summer from the same complaint.

The worms were of a reddish dark colour, and undoubtedly suck blood.

In addition, this bird harboured a few specimens of *Davainea*, but owing to advanced decomposition these could not be identified with certainty, as the heads were missing. A few *capillaria* were also present.

Genus *Capillaria* Zed., 1880.

Capillaria retusa (Rail., 1893) Trav., 1915.

Another species frequently met with in the small intestine of the domestic fowl is *Capillaria retusa*.

Capillaria columbae (Rud., 1819) Trav., 1915.

Five pigeons harboured this species of *Capillaria*. In two cases they were present in great numbers without any apparent effect on the health of the birds.

Genus *Tetrameres* Creplin, 1846.*Tetrameres fissispina* (Dies., 1860) Trav., 1914.

A very high percentage of the birds examined harboured this parasite. In one very bad case no less than a hundred and fifty females could be seen encysted in the wall of the proventriculus of a leghorn cockerel bought alive on the Pietermaritzburg market by the writer.

Dr. Martinaglia, of this Division, informed me that this parasite is of common occurrence in the Transvaal. Canham (1925) refers to it in a recent publication as stages of worms embedded in the muscular part of the stomach (proventriculus) of a white leghorn pullet from Potchefstroom. The writer has observed it in fowls on a farm in the Worcester (Cape) District.

Three females of this species were also collected from the proventriculus of a guinea-fowl from a farm near this laboratory.

Genus *Cheilospirura* Dies., 1861.*Cheilospirura hamulosa* (Dies., 1851) Dies., 1861.

More than 50 per cent. of the fowls examined had this nematode encysted in the muscular wall of the posterior pouch-like dilatation of the gizzard. The presence of these worms may weaken the wall to such an extent as to cause it to rupture, with the ultimate formation of a sac. This sac gradually fills up with ingesta forced into it by the muscular contractions of the gizzard. Finally, it occupies the whole of the abdomen, giving it a tense and firm feel on palpation. In one of the cases noted here this sac measured 120 mm. in length with a maximum circumference of 300 mm.

CLASS CESTODA.

Genus *Amoebotaenia* Cohn, 1899.*Amoebotaenia sphenoides* (Rail., 1892) Cohn, 1899.

This is one of the most common cestodes infesting the domestic fowl in this Province. It was found firmly attached to the mucosa throughout the whole length of the duodenum. Some fowls were very heavily infested with this species. On one occasion the writer counted up to three thousand, leaving several still attached to the mucosa.

To determine whether the cysticercoids noticed by Grassi and Rovelli (1889) in an earthworm (*Allobophora foetida* Eisen), and believed by them to represent the larval stage of *A. sphenoides*, were actually those of *A. sphenoides*, adult earthworms dug up in runs inhabited by birds heavily infected with *A. sphenoides* were fed to three chickens. These chickens were kept in a fly-proof cage from the time that they were hatched, and throughout the experiment were fed only on cereals and green lucerne.

The three chickens were first fed on washed and cut up earthworms on the 9th January, 1925. They were then weekly fed on earthworms until the 18th February, 1925.

The first chicken was killed on the 4th March, and seven matured specimens of *A. sphenoides* were collected. The second chicken was killed on the 16th March, and ten adult specimens were present in the duodenum. The third chicken harboured five matured specimens. In addition, these chickens also harboured a few matured specimens of *Ascaridia lineata* and *Trichostrongylus tenius*, as already stated elsewhere.

The three chickens kept as a control proved on post-mortem to be free of helminths.

Genus *Hymenolepis* Weinl., 1858.

Hymenolepis carioca (Magalh., 1898) Ransom, 1902.

This cestode was occasionally met with in young stock. It was confined to the jejunum.

Hymenolepis inermis Yoshida, 1910.

There was collected from the duodenum of several fowls an unarmed hymenolepis, which corresponds in all essential details with *H. inermis* Yoshida, 1910.

H. cantaniana (Pol., 1860) Ransom, 1909, *Davainea oligophora* Magalhaes, 1898, and *H. inermis* Yoshida, 1910, are, according to some authors, identical, but since *H. cantaniana* and *D. oligophora* are described as having armed rostellum, I will retain the name *H. inermis* Yoshida, 1910, for the species so commonly met with in the domestic fowl in Natal. In some cases it must have been present in several hundreds. It was always limited to the duodenum.

Hymenolepis sp.

Another species of unarmed *Hymenolepis* observed in the duodenum differs from the former in being three to four times (30-40 mm.) its length. Complete worms are composed of 800 to 1,400 or more segments. It has a long thin neck, and the rostellum is furnished with cuticular bosses, which are well defined when this structure is fully protruded. As no rostellar hooks were seen in any of the numerous freshly collected specimens examined, this species must be regarded as unarmed.

The eggs measure 62μ to 70μ by 36μ , and the onchospheres 38μ to 40μ by 22μ .

This species is probably identical with *H. exilis* (Duj., 1845) Fuhrmann, 1906.

According to Stiles, 1896, Dujardin's description of *Taenia exilis* is so insufficient that it should be ignored. Since Fuhrmann's publication of 1906 is not available for reference, I refrain from giving an opinion just yet, but must draw attention to the similarity which exists between this species and *Taenia* sp. Conrad (Stiles, 1896).

Genus *Davainea* R. Bl. and Rail., 1891.

Davainea proglottina (Dav., 1860) R. Bl., 1891.

Several of the fowls examined were found to be heavily infected with this minute cestode. It may be interesting to note that the slug *Agriolimax aegristis*, one of the intermediate hosts of this cestode, is very common here. *D. proglottina* is suspected by some workers (De Blick and Baudet) as a cause of "leg weakness" in poultry.

None of the fowls found infected with this species showed any signs of leg weakness, although some were very heavily infected. In no case was this the only cestode present. It was almost exclusively limited to the second half of the duodenum, where it was often noted in company with *A. sphenoides*, *H. inermis*, and *D. cesticillus*.

Davainea cesticillus (Mol., 1858) R. Bl., 1891.

This species is of common occurrence here, and has also been collected by the writer from chickens in the Worcester District (Cape).

It was limited to the last portion of the last half of the duodenum and the first few inches of the jejunum. On four occasions it was in company with *Ch. infundibuliformis*, a species with which it has in the past been confused.

Davainea tetragona (Mol., 1858) R. Bl., 1891.

Another very common species is *D. tetragona*, which normally inhabits the last third of the small intestine. It was occasionally present in considerable numbers in young chickens. Old birds, too, may be heavily infested.

It has also been identified in material obtained from the Cape Province and the Transvaal.

Davainea echinobothrida (Megn., 1880) R. Bl., 1891.

This species differs from the last mentioned in having irregularly alternating genital pores instead of unilateral. If this difference is sufficient for differentiating two valid species, *D. echinobothrida* can be recorded as one of the cestodes occurring in Natal. I was recently informed by Dr. Martinaglia that it is of common occurrence in the Transvaal.

Davainea crassula (Rud., 1819) Fuhrmann.

There were collected from the domestic pigeon several cestodes agreeing in all details except one with the description of *D. crassula* (Rud.) Fuhrmann. It differs from this species in that it has armed suckers. As some of the specimens from rather decomposed birds proved on examination to have unarmed suckers, I take it that *D. crassula* (Rud.) Fuhrmann has armed suckers. The type material have probably lost theirs. It has been noticed that other species of *Davainea* readily lose their spines if the host has been dead for some time prior to collection.

Davainea crassula (Rud., 1819) Clerc.

Several specimens of this cestode were collected from the domestic pigeon.

Genus *Choanotaenia* Rail., 1896.

Choanotaenia infundiluliformis (Goeze, 1782) Rail., 1896).

As one of the less commonly observed cestodes, may be mentioned *Ch. infundiluliformis*. Macroscopically this species may easily be mistaken for *D. cesticillus*. It inhabits the same portion of the small intestine as the latter.

CONCLUSIONS.

1. The domestic fowl (*Gallus domesticus*) in Natal suffers heavily from verminous infestations.
2. Six species of nematodes and nine species of cestodes have been collected from the digestive tract of the fowl.
3. Three species of nematodes and two species of cestodes have been collected from the digestive tract of the domestic pigeon, which may succumb to heavy infestations.
4. *D. crassula* (Rud., 1819) Fuhrmann has armed suckers.
5. Chickens may be infected with *A. sphenoides* by feeding infected earthworms to them.
6. *Agriolimax aegrestis* is a local intermediate host of *D. proglottina*.

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ADDENDUM.

Whilst this paper was in the hands of the printers, the writer collected a few female specimens of a species of *Gongylonema*, probably *G. ingluvicola*, from the mucosa of the crops of two adult fowls and a chicken of about eight weeks old.

It is now evident that the two worms resembling the lungworm of sheep, recorded by Canham (1925) from the crop of a dead fowl, from Potchefstroom, Transvaal, were probably specimens of *Gongylonema*.

This nematode was on two occasions found in company with a species of *Capillaria* probably *C. strumosa*.

The descriptions of these two worms are at present not available.
