It is deplorable that the fact of an ordinary engineer, chancing to see in a local paper a photograph of a so-called prehistoric fish-trap, and associating it with the previously unknown fate of one of Spain’s boldest seamen, should in any sense be offensive to a scientist. An engineer knows that when he takes his sharpest pencil and runs it along the edge of his best tee-square, the resulting line does not lie evenly between its extremities. A huntsman knows his dog only follows the scent by continually getting off it; and I have a suspicion that a scientist only advances knowledge by seeing things that his predecessors failed to see, or viewed through a fog.

ON AUSTRALIAN AVIAN ENTOZOA.

By T. Harvey Johnston, M.A., B.Sc., Assistant Government Microbiologist.

(From the Government Bureau of Microbiology, Sydney, New South Wales).

[Read before the Royal Society of N. S. Wales, June 1, 1910.]

In this note there is an endeavour to bring together under each host a list of endoparasites recorded as occurring in birds in Australia as well as the references to their occurrence. These have been allotted under their respective headings as Protozoa, Trematoda, Cestoda, Nematoda, and Acanthocephala. Many of our birds have a geographical range extending far beyond Australia, some of them being common Old-world forms. Many parasites have been described from some of these hosts, but unless the entozoa were taken from birds from the Australian region, they
have been neglected in this account. The term Australia is being used in a wide sense so as to include forms from New Guinea and the adjacent islands such as Bismarck Archipelago and the Aru Islands.

Following the scientific name of each bird, there will be found its number (indicated as M.) in Gregory Matthews'1 Hand-list. As this ornithologist follows R. Bowdler Sharpe's Hand-list of Birds2 in regard to genera and species, his list may be considered as authoritative in regard to the correct nomenclature of the birds in question. Then follows its number (H.) in the second edition of Robert Hall's Key.3 Thus the host in question may be readily placed. The popular name given is in most cases taken from Hall's List. The range of each bird may be found by consulting either of these works, more especially the former.

My thanks are due to my colleague at the Bureau, Dr. J. Burton Cleland, who has very materially assisted me with specimens of birds and helminths; to Mr. A. J. North, Ornithologist to the Australian Museum, Sydney, who has kindly identified many birds for me and has helped me in regard to certain points in avian synonymy; to Dr. F. Tidswell, the Director of the Bureau; to Mr. G. P. Darnell-Smith, also of this Bureau; and Mr. A. S. Le Souef, Curator of the Royal Zoological Gardens, Sydney, and Mr. T. Steel, for kindly sending me specimens.

It may not be out of place to mention that this paper is part of a scheme to more fully investigate our bird-life.

2 R. Bowdler Sharpe, "A Hand-list of the Genera and Species of Birds," (British Museum Publications, the volumes extending over many years.) I have consulted this work for information concerning nomenclature.
Dr. Cleland¹ has undertaken to examine the stomach contents with a view to finding out the economic value of these birds (from an agricultural standpoint) and has just published some interesting information along these lines. We are endeavouring conjointly to study our avian haematozoa, while I am more particularly interested myself in the helminths, especially the cestodes.

In addition to the parasites enumerated, there is now at my disposal a goodly number of tapeworms from various Australian birds, but as these are not yet worked up no reference is being made to them in this paper. Many of the following references‡ are also to be found in Linstow,² Fuhrmann,³ and Sweet.⁴

Order CASUARIIFORMES.

(A) Family DROMÆIDÆ.

1. Dromaeus novae-hollandiae, Lath. (M. 1, H. 764). Emu.


This species was very briefly described by Krabbe as Taenia australis, his specimen coming from an Emu which had died in the Copenhagen Zoological Gardens after having been there a considerable time. This led Krabbe to remark that the cestode might be proper to this bird, or that this

¹ Cleland, “Examination of Contents of Stomachs and Crops of Australian Birds, Agric. Gazette, N. S. Wales, xxi, 1910, pp. 401-5; and in the Emu, ix, April, 1910.

All works which I have not been able to consult, but which are mentioned in this paper will be designated thus ‡.
might have been a case of "accidental" infection during its stay in the Gardens.

Blanchard\(^1\) recognised from Krabbe's figures that this parasite belonged to the genus *Davainea*. Krefft merely mentioned the worm. I formally recorded its occurrence in this host in New South Wales, and have recently examined specimens of *D. australis* collected from the intestine of an Emu in the Strelley River district (North-west of West Australia) by Dr. J. B. Cleland.


This parasite was collected in Eastern Australia.

(B) Family *Casuariideae*.

2. *Casuarius casuarius*, Linn. (Syn. *C. galeatus*, Bonn.)

This species does not live on the mainland, but is restricted to New Guinea and the adjacent islands. The Australian representative is *C. australis*, Wall.

Nematoda:—*Sclerostomum (= Strongylus) boularti*, Mégnin, \(^1\) *Journ. d. l'Anat. et Physiol.*, Paris, xx, 1884, p. 455—found in the trachea, (locality ?)

Order COLUMBIFORMES.

(A) Family *Columbidae*.


(B) Family *Treronidae*.


Cestoda:—*Cittotaenia Kuvaria*, Shipley, "Entozoa" in Willey's "Zoological Results," v, 1900, p. 552. (New Britain.)

Shipley described this worm as *Coelodela Kuvaria*, making it the type of a new genus *Coelodela*. Fuhrmann showed that this was a synonym of *Cittotaenia*.


This Filariid was taken from the orbital cavity of the above pigeon and originally described as *Ancyracanthus ophthalmicus*. Ransom removed it into the genus *Ceratospira*.

(C) Family *GOURIDÆ*.


Crisp recorded the occurrence of “hydatids (*Echinococci*) in the liver and other viscera” of one of these birds which had died at the London Zoological Gardens. Linstow quotes Crisp’s reference, but sets down the parasite as *Echinococcus gourae coronatae*, by which he means merely *Echinococcus* from *Goura coronata*.

(D) Family *PERISTERIDÆ*.


The locality from which the parasite was collected is not stated, though the geographical distribution of the host is

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3 V. Linstow, “Compendium der Helminthologie,” 1878, p. 120.
given. As a number of other parasites collected from various birds in New Guinea are described in the same paper, it may be assumed that Papua was the locality from which this cestode was obtained.

No parasites have, as far as I know, been described from pigeons (native) from the mainland of Australia.

Order RALLIFORMES.

Family Rallidæ.


Trematoda:—Distomum sp., Krefft, Trans. Entomol. Soc. N.S. Wales, 11, 1871, p. 213. (N.S. Wales or Queensland.)

Order PODICIPEDIDIFORMES.

(A) Family Podicipedidæ.


Cestoda,—i. Taenia novaehollandiae, Krefft, l.c., p. 216. (New South Wales or Queensland.)

ii. Taenia paradoxa, Krefft, l.c., p. 217. (New South Wales or Queensland.)

These two parasites were very imperfectly described and roughly figured by Krefft. Neither belongs to the genus Taenia, but until the types have been re-examined, their systematic position is not known. Krefft described the forms as infesting the intestine of the little grebe Podiceps australis. The generic name is evidently meant for Podiceps. I cannot find any reference to the specific name. This difficulty seems to have occurred to Professor Fuhrmann,¹ who lists the tapeworms under Lophaethia cristata, Linn., (M. 67, H. 741) the tippet-grebe. Mr. A. J. North kindly informed me that Krefft's P. australis is really P.

The name *Taenia paradoxa* is preoccupied having been used by Rudolphi in 1809 for a cestode infesting species of *Scolopax, Charadrius*, and *Gallinago*. Rudolphi’s parasite (= *Choanotaenia paradoxa*, Rud.) is quite distinct from Krefft’s species, which, like his *T. novaehollandiae*, possesses doubled genitalia in each segment, a fact not mentioned by Krefft in regard to his *T. paradoxa*. The types are so badly preserved that it is difficult to say whether *T. paradoxa* and *T. novaehollandiae* are distinct, and accordingly I have refrained from re-naming *T. paradoxa*, Krefft, until I have made out the anatomy of both species.

Many parasites have been described from *L. cristata* from other parts of the world, but not from Australia.

Krefft does not give a definite locality for most of his specimens.

**Order SPHENISCIFORMES.**

**Family Spheniscidae.**

11. *Aptenodytes sp.* A penguin.


This parasite was obtained from the stomach of an Antarctic penguin. Baird does not mention any scientific name for the host. Krefft\(^2\) merely quoted Baird’s reference. Diesing\(^3\) placed the parasite under *Aptenodytes sp*. Lin-

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1 Loc. cit., p. 88.
stow\(^1\) and Fuhrmann\(^2\) have followed Diesing. Krefft and Sweet\(^3\) have given the host as a penguin, following Baird. Krefft called the worm \(T. \text{cederi}\). The common penguin in Antarctica appears to be the Emperor penguin, \(Aptenodytes fosteri\), Gray (M. 68, H. —), this being as far as I know the only species of that genus found in those regions. Probably the assumption that Baird’s specimen came from an \(Aptenodytes\) is correct. Fuhrmann\(^4\) in 1899 suggested that \(T. \text{zederi}\) might be a synonym of \(Tetrabothrius macrocephala\), Rud., but in 1908 he\(^5\) regarded it as an undefined species.

Order PROCELLARIIFORMES.

(A) Family Puffinidae.


This species was taken by the Challenger Expedition, from \textit{Priocella graciloides} and from the Cape Petrel, \textit{Daption capensis}, Linn. (M. 101, H, 688), the latter bird being captured in the South Atlantic and consequently, is not included here. The parasite was described by Linstow as \(Tetrabothrius auriculatum\), Linst., but Fuhrmann\(^6\) has shown that both this species and \(Taenia sulciceps\), Baird, are synonyms of \(Tetrabothrius heteroclitus\), Dies.

(B) Family Diomedeidae.


\(^1\) Linstow, “Compendium der Helminthologie,” 1878, p. 175.

This was described very briefly by Linstow from specimens collected in the Pacific Ocean, probably to the north of Australia. The inclusion of this and the following parasites from this host in our known Australian entozoan fauna is thus doubtful. Fuhrmann\(^1\) gave much fuller account of the worm in 1899.


Linstow examined some headless fragments also obtained by the Challenger and described them as belonging to a new species *Taenia diomedeae*, Linst., though he stated that this might be identical with *Taenia sulciceps*, Baird,\(^2\) a parasite collected from *Diomeeda exulans*, Linn. Fuhrmann\(^3\) showed that *T. diomedeae*, Linst., *T. sulciceps*, Baird, and *Tetrabothrium auriculatum*, Linst., were all synonymous with *Prosthecoctyle* (i.e. *Tetrabothrius*) *heteroclitata*, Dies.

Nematoda:—*Ascaris diomedeae*, Linstow, l.c., 1888, p. 6.

This round worm was taken from the stomach.


These specimens were collected by Dr. Willey during his expedition to the islands lying to the north-east of Australia. The species in question was described by Fuhrmann as *Prosthecoctyle diomedeae*, and published along with

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some further notes by Shipley, in the latter's account of the entozoa collected by Willey. *Prosthecoctyle* is now generally regarded as a synonym of *Tetrabothrius*.


This interesting worm was also collected by Willey.

Order LARIFORMES.

Family LARI.DÆ.


Though several parasites have been described from this host, the above mentioned is the only reference known to me, dealing with the identification of forms collected in Australia.


Trematoda:—*Holostomum Hillii*, Johnston, (S. J.), *l.c.*, 1904, p. 111. (New South Wales.)

Order CHARADRIFORMES.

Family CHARADRIDÆ.


Linstow¹ described a tapeworm *Taenia increscens*, Linst. obtained from this bird in New Zealand by the Challenger Expedition. It is still imperfectly known and I am not including it in this list of Australian entozoa.


I have taken from the intestine of this bird some small cylindrical distomid trematodes (Echinostomum sp.) whose anterior end is provided with a circlet of hooks. (Near Sydney, N. S. Wales.)

   The white headed stilt.
   Trematoda:—Monostomum sp.

Dr. Cleland collected a number of flukes belonging to the Monostomidae and apparently to this genus. They were found in the oesophagus and in the body cavity of the bird. I cannot state which was the correct habitat, as there was a perforation of the wall of the alimentary canal. (Murray River, South Australia).

Cestoda:—i. Taenia coronata, Krefft, l.c., p. 220. (N.S.W.)
   ii. Taenia rugosa, Krefft, l.c., p. 223. (N.S.W.)

Both of these species are insufficiently described, and have not as a consequence, been assigned to their true genera. Fuhrmann\(^1\) lists them under the imperfectly known forms.

In regard to T. rugosa, Krefft, the specific name rugosa was already preoccupied in the genus Taenia being used by Diesing\(^2\) for a tapeworm from the small intestine of a Brazilian monkey, Cebus (Eriodes) hypoxanthus. Consequently Krefft’s species requires re-naming. I would suggest that this worm be dedicated to my friend, Mr. Charles Hedley, Assistant Curator of the Australian Museum, Sydney. As I hope to point out in a later communication, this parasite in not a Taenia, but belongs to the family Acoleidae, and probably to the genus Acoleus. Accordingly the helminth may be listed temporarily as Acoleus hedleyi, nom. nov. Dr. Cleland has recently

\(^1\) Fuhrmann, Zool. Jahrb., Suppl. l.c., 1908, p. 93.
collected the same species from the intestine of the above named stilt, at Tailem Bend, Murray River, South Australia.

The name *Taenia coronata* was already used by Creplin for a cestode which also infests Charadriid birds (*Edicenemus crepitans*, Temm. and *Aegialites nivosa*, Cass). A comparison between Krefft’s species and the description of *T. coronata*, Crepl. (= *Choanotaenia coronata*, Crepl.) as given by Diesing¹ and Krabbe, shows them to be distinct. As a specific name, *australiensis* might be given. A brief examination of Krefft’s type leads me to regard it as a *Dilepis*. Both *Acoleus hedleyi* and *Dilepis australiensis* will form subjects for further study, as the Curator of the Australian Museum has kindly given me access to the type material.

iii. *Davainea sp.*

I have identified as belonging to this genus some very small tapeworms of about two mm. in length, and consisting of about a dozen segments, collected by Dr. Cleland from a bird shot at Tailem Bend, Murray River, South Australia.

iv. *Hymenolepis sp.*

A rather small unarmed species of this genus was also collected by Dr. Cleland from the intestine of the same bird. (Murray River, South Australia.)

Order ARDEIFORMES.

(A) Family *CICONIIDÆ* (*CICONIÆ* in “Matthews’ Handlist”)


There is a slight doubt as to the true host of this parasite.

¹ Diesing, l.c., p. 537.  * Krabbe, l.c., p. 275.
Trematoda:—*Distomum sp.*, Krefft, *l.c.*, p. 213. (New South Wales or Queensland.)


Trematoda:—*Distomum sp.*, Krefft, *l.c.*, p. 213. (N.S.W. or Queensland).

Nematoda:—*Ascaris sp.* (an immature female) Linstow, *Arch. f Naturg.*, lxiii, 1897, p. 283. (Bismarck Archipelago.)

Nicholls¹ mentioned finding tapeworms in this host in Victoria, but the reference has no scientific value.

Many entozoa are known from some members of this family which are found in Australia, e.g. *Ardea cinereae*, Linn., *Herodias timoriensis*, Less., etc., but since they have not been recognised in Australia, they are not included in this list.

**Order ANSERIFORMES.**

**Family ANATIDÆ.**


ii. **Monostomum sp.**

I have some large flukes (family *Monostomidae*) belonging to this genus, taken from the pharynx of a black swan in Victoria, by Mr. A. S. Le Souef.

Krabbe\(^1\) in 1869 described a cestode *Taenia liophallos* (=*Hymenolepis liophallos*, Krabbe) from Leuckart’s collection, taken from this host. He\(^2\) also gives a very brief account of *Taenia micrancriostrota*, Wedl.\(^3\) (=*Hymenolepis micrancriostrota*, Wedl.) described from material collected in Hungary. Linstow\(^4\) recorded both of these tapeworms under this host. Fuhrmann\(^5\) does not place either of these under this bird, but under *Cygnus musicus*, Bechst. Ransom\(^6\) lists the two under *Olor cygnus*, Linn. Sharpe\(^7\) regards both *C. musicus* and *O. cygnus* as synonyms of *Cygnus cygnus*, Linn.

Besides the above cestodes, a nematode, *Heterakis vesicularis*, Rud. (=*H. papillosa*, Bloch) has been recorded by Schneider\(^8\) as being taken from the caecum of *Chenopsis atrata* in the Zoological Gardens, Berlin. He mentioned that the bird had lived a long time in the Gardens and consequently the occurrence of this parasite in Australia did not necessarily follow. In 1906, Linstow\(^9\) gave an account of another nematode *Heterakis circumvallata*, Linst., from this bird (Königsberg Museum) but no locality is given.

Both Sharpe\(^7\) and Matthews\(^10\) give the range of this bird as “Australia generally and Tasmania.” It has been

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2. Krabbe, l.c., p. 43.
4. Linstow, “*Compendium der Helminthologie,*” 1878, p. 150.
8. Schneider, “*Monographie der Nematoden,*” 1866, p. 76.
10. Matthews, “*Handlist of the Birds of Australasia,*” 1908, p. 34.
introduced into Europe, and has apparently become parasitised by helminths which occur normally in other birds. I am omitting the cestodes and nematodes from this list of Australian avian entozoa.


Cestoda:—i. *Taenia cylindrica*, Krefft, *l.c.*, p. 220. (N.S.W. or Queensland.)


iii. *Taenia bairdii*, Krefft, *l.c.*, p. 224. (N.S.W. or Queensland.)

iv. *Fimbriaria pediformis*, Krefft, *l.c.*, p. 222. (N.S.W. or Queensland.)

Unfortunately none of Krefft's species are recognisable from his figures and descriptions, and but for the fact that his types (or at any rate most of them) have been preserved, one would be justified in disregarding them. The three first mentioned cestodes are very imperfectly described. Their true generic position is unknown. The fourth species which was described as *Taenia pediformis*, also infests the teal (*Nettium castaneum*, Eyton). Fuhrmann¹ suggests that this species is probably a synonym of *Fimbriaria fasciolaris*, Pall. A cursory examination of the single specimen of *T. pediformis* now in the Australian Museum, Sydney, leads me to think that Fuhrmann is right. A thorough examination of Krefft's type would decide the question of identity. Miss Sweet² wrongly quotes Krefft in reference to the occurrence of *Taenia malleus*, G., (i.e. *Fimbriaria fasciolaris*, Pall.) in Australia.


This sporozoan infests the red-blood corpuscles. It was first published under the name *H. nettionis*, a "lapsus calami" for the genitive *H. nettii*.

Cestoda:—*Fimbriaria pediformis*, Krefft, *l.c.*, p. 222. (N. S. Wales or Queensland.)

Krefft gives *Anas punctata* as the host of this worm. Mr. North informed me that the name of this species is *N. castaneum*, Eyton. Linstow does not mention this host in the Supplement to his Compendium.


Cestoda:—*Taenia flavescens*, Krefft, *l.c.*, p. 219. (N.S.W. or Queensland.)

This tapeworm also occurs in *Anas superciliosa*.


Cestoda:—*Diploposthe tuberculata*, Krefft, *l. c.*, p. 215. (N.S.W. or Queensland.)

This tapeworm was indifferently described by Krefft as *Taenia tuberculata*. Monticelli¹ regarded it as a synonym of *Taenia bifaria* v. Sieb. In 1891 Blanchard² suggested that it might belong to the genus *Ophryocotyle*. Diamare³ in 1900 referred to the imperfect account given by Krefft. Fuhrmann⁴ in 1906 showed that *T. bifaria* was identical with *Diploposthe laevis*, Bloch, and stated that *T. tuberculata* was almost certainly a *Diploposthe* and perhaps synonymous with *D. laevis*, though the wide difference in the geographical distribution of the hosts in each case led

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him to regard it as being probably a different species. My examination of Krefft’s material shows that the parasite is a typical Diploposthe, but I am not yet certain of its identity or otherwise, with D. laevis. Fuhrmann1 in 1908 listed it as a different species, viz., D. (?) tuberculata, the specific name being evidently a misprint for tuberculata.


Cestoda:—Taenia moschata, Krefft, l.c., p. 223. (N S.W. or Queensland.)

An imperfectly known form.

Order PELICANIFORMES.

Family PLOTIDÆ.

31. Plotus novae-hollandiae, Gould (M. 242, H. 729.) The darter.

Nematoda:—Ascaris sp., Krefft, l.c., p. 213. (N.S.W. or Queensland.)

No parasites appear to have been identified from Australian material collected from members of other families (e.g. Phalacrocoracidae, Pelicanidae, etc.) belonging to this order of birds.

Order ACCIPITRIFORMES.

Family FALCONIDÆ.

32. Circus spilothorax, Salvad. and D'Alb. A harrier.

Nematoda:—Heterakis dolichocerca, †Stossich, Boll. Mus. Genova, 1902 No. 106. (New Guinea.)

33. Astur fasciatus, Vig. and Horsf. (syn. A. approximans, Vig. and Horsf.). (M. 258, H. 24.) The goshawk.

Acanthocephala:—Echinorhynchus sp.

I have taken this worm, a comparatively long and thin parasite, from the intestine. (Near Sydney, N.S.W.)


Nematoda:—*Ascaris australis*, Linstow, *Arch. für Naturg.*, lxiii, 1897, p. 282. (Bismarck Archipelago.)

The parasite was taken from the stomach of this bird. The same species has been described as inhabiting the intestine of an owl, *Ninox odiosa*, Scl. (vide infra).

35. *Falco lunulatus*, Lath. (M. 277, H. 15.) The little falcon (white-fronted falcon).

Nematoda:—*Filaria sp.*

Some long nematodes collected by Dr. Cleland from the mesentery of this falcon at Burracoppin, West Australia in 1907, belong to this genus.


Nematoda:—*Filaria guttata*, Schneider, "Monogr. d. Nematoden," 1866, p. 92. (South Australia.)

Order STRIGIFORMES.

Family Bubonidae.


The specimens were taken from the body cavity, and since they were immature, could not be specifically determined.

ii. *Ascaris australis*, Linstow, l.c., p. 282. (Bismarck Archipelago.)

As mentioned above, this parasite occurs also in a hawk *Baza bismarckii*, Sharpe.


Keartland¹ mentions that he found great numbers of thread worms between the skin and the skull of this bird, but his reference is of no value for the purpose of this paper.

Order PSITTACIFORMES.

(A) Family LORIIDÆ.

39. Lorius erythrothorax, Salvad.

40. Trichoglossus novae-hollandiae, Gmel. (syn. T. swainsoni, Jard. and Selby). (M. 301, H. 468). Blue-bellied lorikeet or Blue Mountain lorikeet.

Bancroft found embryo-filariae (Microfilaria) in the blood of this bird.

(B) PSITTACIDÆ.

41. Eclectus pectoralis, Müll. The purple-breasted parrot.
   Nematoda: — Hystrichis sp.?

I have a few specimens of a nematode (Strongylidae) apparently belonging to this genus, taken from this host by Mr. A. S. Le Souef, the parrot coming originally from New Guinea.

(C) Family CYCLOPSITTACIDÆ.

42. Cyclopsittacus suavissimus, Sclater (syn. S. nanus, De Vis.)

43. Cyclopsittacus diophthalmus, Hombr. and Jacq.
ON AUSTRALIAN AVIAN ENTOZOA.

(D) Family Cacatuidæ.

44. Cacatua roseicapilla, Vieill. (M. 324, H. 489.) The Rose-breasted Cockatoo (Galah).

Cestoda: — Davainea leptosoma, Dies. (Australia.)

I have not been able to find the reference to the occurrence of this tapeworm in above-named cockatoo, and am giving this reference, fide Fuhrmann¹ (1908).

A good deal of discussion has taken place regarding the correct nomenclature of one of the above cestodes, Moniezia trichoglossi. It was originally described by Linstow² from fragmental material collected by the Challenger Expedition from Trichoglossus novae-hollandiae. He regarded it as a new species, and called it Taenia trichoglossi. In 1900, Diamare³ described a parasite from Cyclopsittacus suavissimus and Lorius erythrothorax, which he named Paronia carrinoi, this being the type of a new genus Paronia. In 1901, he⁴ mentioned that P. carrinoi was probably identical with T. trichoglossi, but thought that his name should stand as the correct one on account of the imperfect description of the latter. In 1901 Fuhrmann⁵ after having examined Linstow's original material, stated that these two worms were identical, and that the genus Paronia was probably synonymous with Moniezia. He however retained the name P. carrinoi. In 1902,⁶ he gave a much fuller account of the parasite, definitely assigning it to Moniezia. In a footnote to this paper, Dr. M. Braun (p. 122) mentioned that if T. trichoglossi were found to be identical with P. carrinoi, then in spite of the insufficient original description the former name must stand. In other words he

² Linstow, 1888, l.c., p. 14.
⁴ Diamare, l.c., xxx, 1901, p. 369.
believed that the name should be *Paronia* (i.e. *Moniezia*) *trichoglossi*. Meanwhile Linstow, in a short note on this subject, pointed to the fragmentary and scolex-less condition of his material and the imperfect knowledge of cestode anatomy in 1888 as reasons for his incomplete descriptions. He went on to say that he did not regard *T. trichoglossi* as a specific name but merely as a name to indicate an undefined *Taenia* from *Trichoglossus*. Fuhrmann in 1908 gave a very brief summary of the above discussion, and accepted *M. carrinoi*, Diani., as the true name. I have listed the parasite under Linstow’s name, as it seems to me that Braun’s contention is right even in the face of Linstow’s remarks, and that the correct name is *Moniezia trichoglossi*, Linstow. In his original account, Linstow himself called it a new species, consequently his giving it a binomial name and a description, though short and incomplete, is sufficient ground for retaining his name for the cestode, especially as his types were still available. Had the specimens been lost, then the species might reasonably have been disregarded as not being identifiable from the account. But the re-examination of the types having led to the establishing of identity between it and the later described *M. carrinoi*, the latter name must fall into synonymy.

Order COCCYGES.

Family CUCULIDÆ.


This parasite, a female, was taken from the body cavity of the above mentioned cuckoo.

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Order CORACIIFORMES.

(A) Family Podargidae.


Bancroft found embryo-filariae (Micofilaria sp.) in the blood.

(B) Family Coraciidae.

47. Eurystomus pacificus, Lath. (syn. E. australis, Swainson). (M. 381, H. 441.) The dollar-bird or roller.

Nematoda: — Filaria sp., Bancroft, l.c., p. 61. (Queensland.)

Filarial embryos (Microfilaria) were seen in the blood.

(C) Family Alcedinidae.


Protozoa: — Halteridium sp. (N.S. Wales.)

I have seen a blood-film containing this sporozoan.


49. Halcyon (Saurophaga) saurophaga, Gould. A kingfisher


50. Halcyon (Sauropatis) sanctus, Vig. and Horsf. (M. 391, H. 452). The sacred kingfisher.

Acanthocephala: — Echinorhynchus horridus, Linstow, Arch. f. Naturg., lxiii, 1897, p. 290. (Bismarck Archipelago.)

I have seen a specimen of Echinorhynchus sp. taken from this host in New South Wales, but have not examined it sufficiently to be able to compare it with E. horridus.
Order PASSERIFORMES.

(A) Family MUSCICAPIDÆ.

51. Petroeca goodenovii, Vig. and Horsf. (M. 444, H. 93.)
The red-capped robin.

Cestoda:—Hymenolepis sp. (Hallett’s Cove, South Australia).

Imperfect scolexless fragments were taken by me from a specimen collected by Dr. Cleland.

52. Myiagra rubecula, Lath. (syn. M. plumbea, Vig. and Horsf.) (M. 488, H. 143.) The leaden flycatcher.

Nematoda:—Filaria sp., Bancroft, l.c., p. 61. (Queensland.)

This Microfilaria was found in the blood.


Protozoa:—Halteridium sp.

A sporozoan found by Dr. Cleland and myself in the blood of this bird (N.S. Wales).

(B) Family CAMPOPHAGINÆ.


This parasite has been taken from the body cavity of Coracina sclateri, Cisticola exilis and Calornis metallica, in the Australian region as well as from a great number of song-birds in other parts of the world. Linstow in 1897 recorded the worm as Filaria tricuspis, but in 1905 he removed it to the genus Aprocta. Quite recently Railliet and Henry have placed the species under Diplotriaena.

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(C) Family Timeliidæ.

   Acanthocephala: — *Echinorhynchus sp.*
   I have taken specimens from birds collected by Dr. J. B. Cleland (Sydney).

   Nematoda: — *Filaria sp.*, Bancroft, l.c., p. 61. (Queensland.)
   *Microfilaria* seen in the blood.

   Protozoa: — *Halteridium sp.* (Hallett's Cove, Adelaide, S. Australia.)
   This parasite has been detected by Dr. Cleland and myself in the red blood corpuscles of this bird. It possesses large pigment granules.
   Acanthocephala: — *Echinorhynchus sp.*

   Specimens were collected by Dr. Cleland at Hallett's Cove, near Adelaide, South Australia. They were encysted in the subcutaneous tissues of the neck and throughout the body, also in the fascial layer between the thoracic muscles, sometimes deeply embedded, apparently also occasionally in the muscle-substance itself surrounded by a small area of disintegration. This parasite occurs in similar situations in *Pomatorhinus rubeculus* and *Climacteris wellsi* in West Australia, and in *Aphelocephala leucopsis* in S. Australia.

   Acanthocephala: — *Echinorhynchus sp.*
This parasite was identified by me from material collected by Dr. Cleland on the Shaw River in the north-west of West Australia. Their position was remarkable, the worms being embedded in the subcutaneous tissues and in the superficial muscles, reminding one of the Trematode Mono-stomum fuba, Bremser, which lives in a similar situation in many passerine birds in Europe.

(D) Family TURDIDÆ.


Protozoa:—Halteridium geocichlae, Cleland and Johnston, Journ. Roy Soc. N.S.W., xliii, 1909, p. 85. (N.S.W.)

This sporozoon infests the erythrocytes of the blood.

Nematoda:—Filaria sp. (Microfilaria sp.)

I have seen filarial embryos in a blood film made by Dr. Cleland. (N.S.W.)

Acanthocephala:—Echinorhynchus sp.

A specimen has been identified by me from material collected by Dr. Cleland from the intestine of this bird. (N.S.W.)

(E) Family SYLVIIDÆ.

60. Cisticola exilis, Vig. and Horsf. (M. 552, H. 186.) The grass warbler.


This parasite lives in the body cavity and also infests Coracina sclateri, Calornis metallica, and other birds, mainly passerines. (See No. 54.)

(F) Family LANIIDÆ.


Nematoda:—Filaria sp., Bancroft, l.c., p. 61. (Queensland.)
Bancroft recorded the occurrence of embryos in the blood of this host. Dr. Cleland and I have also met with a *Microfilaria* in blood films from a local bird. (N.S.W.)


Nematoda:—*Filaria* sp., Bancroft, *l.c.*, p. 61. (Queensland.)

The embryos (*Microfilaria*) were seen in the blood, the adults inhabiting the peritoneal cavity.

*(G) Family Certhiidae.*


Acanthocephala:—*Echinorhynchus* sp.

This parasite lives in the subcutaneous tissues of the neck of this host. It also occurs in *Pomatorhinus rubecululus*, *P. superciliosus* and *Aphelocephala leucopsis*. The specimens were collected by Dr. Cleland on the Shaw River in the north-western portion of West Australia.

*(H) Paridae.*


Acanthocephala:—*Echinorhynchus* sp. (Hallet's Cove, S. Australia.)

This encysted parasite was collected by Dr. Cleland from the subcutaneous and superficial muscular tissues. It occurs in certain other birds such as *Pomatorhinus* and *Climacteris*.

*(J) Family Zosteropidae.*


Protozoa:—*Halteridium* sp.

This haematozoon has been frequently met with by Dr. Cleland and myself in blood films taken by us from this host (N.S.W.)

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1 Kindly identified by Mr. Gregory Matthews for Dr. Cleland.
Family Meliphagidae.

   Protozoa: — Halteridium sp.

This blood parasite has been seen by Dr. Cleland and myself (N.S.W.)

   Cestoda: — Choanotaenia sp. (See also No. 69.)

Collected by Dr. Cleland at Milson Island, Hawkesbury River.

68. Ptilotis chrysoth, Lath. (M. 775, H. 336.) The yellow-faced honey-eater.

A blood parasite (N.S.W.)

69. Ptilotis leucotis, Lath. The white-eared honey-eater.
   (M. 778, H. 339).
   Cestoda: — Choanotaenia sp.

A long thin tapeworm infests Ptilotis leucotis, P. chrysoth, Meliornis novae-hollandiae and M. sericea. Its scolex is small and unarmed, but otherwise its characters closely resemble those of the genus Choanotaenia. Specimens were taken from P. leucotis by Dr. Cleland at Milson Island, Hawkesbury River (N.S.W.).

70. Ptilotis plumula, Gould. (M. 787, H. 349). The plumed or yellow-fronted honey-eater.
   Protozoa: — Halteridium sp.

This haemoproteozoon has been seen by Dr. Cleland and myself in films taken by him from a Western Australian specimen.
The New-holland or whiskered honey-eater.
Protozoa:—*Halteridium meliornis*, Cleland and Johnston,
l.c., p. 85. (N.S.W.)
Cestoda:—*Choanotaenia sp.* (See also No. 69.)
Specimens were collected by Dr. Cleland in Sydney district.
Acanthocephala:—*Echinorhynchus sp.*
I have taken a specimen from the intestine (N.S.W.)

Cestoda:—*Choanotaenia sp.* (See also No. 69.)
Specimens were collected by Dr. Cleland and myself in the Sydney district and by the former at Hawkesbury River.

Nematoda:—*Filaria sp.*, Bancroft, l.c., p. 61. (Queensland.)
An adult was found in the peritoneal cavity whilst embryos (*Microfilaria*) were abundant in the blood.

74. *Acanthochoera carunculata*, Lath. (M. 808, H. 363.)
The red-wattle bird (gill-bird).
Nematoda:—*Ascaris sp.*, Krefft, l.c., p. 213. (N.S.W. or Queensland.)
Krefft merely stated that Mr. G. Masters had taken *Ascaris* from the eye of this host. The worms are very small and probably belong to the *Filariidac* and not to the *Ascaridae*.

Protozoa:—*Trypanosoma sp.*, seen by Dr. Cleland and myself in films kindly forwarded by Dr. Bancroft from Queensland. These films also showed the presence of two different species of *Microfilaria*.
Nematoda—*Filaria sp.*, Bancroft, l.c., p. 61. (Queensland.)
Embryos (Microfilaria) were seen in the blood, an adult being found in the pericardium.

Nematoda:—Filaria sp., Bancroft, l.c., p. 61. (Queensland,)
Embryos were detected in blood films.

77. Tropidorhynchus corniculatus, Lath. (syn. Philemon corniculatus, Lath.) (M. 818, H. 370.) The friar-bird (leatherhead.)
Protozoa:—Halteridium philemon, Cleland and Johnston, l.c., p. 81. (N.S.W.)
This haematozoon was described from a local bird.

(L) Family Oriolidae.

Nematoda:—Filaria sp., Bancroft, l.c., p. 61. (Queensland.)
Embryos in the blood.

(M) Family Dicruridae.

Nematoda:—Filaria sp., Bancroft, l.c., p. 61. (Queensland.)
Embryos in the blood.

(N) Family Eulabetidae.

80. Calornis metallica, Temm. (M. 856, H. 400.) The shining starling.
Nematoda:—Diplotraena tricuspis, Fedtsch. Linstow, Arch. f. Naturg., lxiii, 1897, p. 283; and Mitth., Zool. Samml. Mus. Naturk., Berlin, i, (2) 1899, p. 25. (Bismarck Archipelago.) (See also No. 54.)
This round worm is known to inhabit many other birds, including Cisticola exilis and Coracina sclateri.

(O) Family Ptilorhynchidae.

81. Chlamydodera maculata, Gould. (M. 861, H. 167.)
The spotted bower bird.

This imperfectly known tapeworm was described as *T. chlamydoderae*, this name being evidently derived from the generic name of the host (*Chlamydera maculata* in Krefft). Being a "lapsus calami" it may be altered to *T. chlamydoderae* as Linstow¹ and Fuhrmann² have already done.


(P) Family *Paradiseidae*.


This parasite was imperfectly described by Linstow as *Taenia clavulus*. Blanchard³ in 1891 thought that this species was probably a *Davainea*. Fuhrmann⁴ in 1902 gave a full account of a cestode from certain birds of paradise, which he called *Biuterina paradisea*, making it the type of his new genus *Biuterina*, but in 1908 he⁵ stated that his species was synonymous with *Taenia clavulus*, Linst., after having examined the original specimens collected by the Challenger Expedition. This parasite has been taken from several species of birds of paradise. Miss Sweet¹ misquotes Fuhrmann as her authority for stating that *Aporina alba*, Fuhrm. occurs in *Ptilorchis (sic) alberti*, whereas Fuhr-

¹ Linstow, "Comp. d. Helm.," *Nachtr. 1889*, p. 36.

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mann states that this Anoplocephalid cestode was taken from a Brazilian parrot, *Pyrrhura sp.*


85. *Paradisea apoda*, Linn. The great bird of paradise.


This parasite was found under the skin and in the abdominal cavity. Linstow mentions that it is the same worm as *Filaria sp.* mentioned by Willemoes-Suhm.

ii. *Filaria paradiseae*, Linstow, *l.c.*, p. 11. (Aru Islands.)


(Q) Family *CORVIDÆ*.


(M. 874, H. 45.) The crow.

**Nematoda:**—*Filaria sp.*, Bancroft, *l.c.*, p. 61. (Queensland.)

Embryos were found in the blood, the adults occurring in the peritoneal cavity. Dr. Cleland and I have seen embryofilariae (*Microfilaria*) in blood smears taken from a local bird by Mr. A. R. MacCulloch (N.S.W.).


**Nematoda:**—*Filaria sp.*, Bancroft, *l.c.*, p. 61. (Queensland.)

Embryos in the blood.

89. The following parasites have been described from Papuan hosts whose names are not known:—


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It appeared to me that it would be of some scientific as well as of economic value to bring together all the references known to me, concerning the occurrence of endo-parasites in domesticated and introduced birds in Australia. In addition to those mentioned in the following list, there are others which I have not yet identified. The fact that many of these introduced birds harbour the same tape-worms as in other parts of the world, seems to show that the larval stages have probably accommodated themselves to local intermediate hosts.


This spirochaete is the cause of fowl tick-fever or spirochaetosis (spirillosis). Its real name is perhaps *S. anserina*, Sacharoff, since Galli-Valerio\(^1\) regards both *S. gallinarum*, R. Bl. and *S. marchouxi*, Nuttall to be identical with the earlier described *S. anserina*, which produces a similar spirochaetosis in geese and ducks. Doflein,\(^2\) Nuttall,\(^3\) Liihe\(^4\) and Calkins\(^5\) regard them as different organisms, the last mentioned author placing them both under *Treponema*, and calling the fowl tick-fever organism *Treponema gallinarum*, March. and Salimbeni, 1903. Cleland recorded

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\(^3\) Nuttall, Warburton, Cooper and Robinson, "Ticks, a Monograph of the Ixodoidae," Part I, Argasidae, 1908, p. 8 etc., also p. 85 etc. In a footnote on p. 88 of this important work it is stated that *S. gallinarum*, R. Blanch. 1905, is a synonym of *S. marchouxi*, Nuttall, 1904. *S. anserina*, Sacharoff is treated as a different organism (p. 89).
the spirochaete as *Spirillum* sp.; Dodd, as spirochaetes, and myself as *S. anserina* (*S. gallinarum*). There are some other references to fowl tick-fever (*e.g.* in Agr. Gaz. N.S.Wales), but as the organism is not referred to in any way I have omitted them. The transmitter of the organism in Australia is the so-called "fowl-tick" *Argas persicus*, Oken, (syns. *A. americana*, Packard, *A. miniatus*, Koch), which is reported as being able to inflict serious injuries on human beings in certain parts of the world, *e.g.* Persia. This tick is fairly common in New South Wales, but seems to restrict its action to poultry. Blanchard regards *A. miniatus*, Koch (syn. *A. americana*) as being quite distinct from, though closely allied to, *Argas persicus*.

Trematoda:—*Prosthogonimus ovatus*, Linst. (formerly confused with *Distomum ovatum*, Rud.)

Spencer referred to the presence of small flukes in eggs from Victorian fowls. Though he does not refer to the helminth by name, yet his description evidently refers to the above named parasite. This usually infests the bursa of Fabricius of young birds, and has been occasionally found in the oviduct, and even in the eggs of mature fowls in other parts of the world.


This delicate tapeworm does not seem to have been previously recognised in Australia. The same remark applies equally to the following species.


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The last reference is to the occurrence of the parasite in Fijian fowls, and is inserted here in order that it may not be overlooked. I have recently recognised the worm in material collected from a hen in the Sydney district. This parasite (*D. echinobothrida*) frequently imbeds its scolex and part of its strombila so deeply into the mucosa and submucosa of the fowl's intestine that it produces a nodule or "tumour" somewhat comparable to those produced by the larvae of the nematode *Oesophagostomum columbianum* Curtice, in the intestinal walls of sheep, and by the larvae of *Oes. radiatum*, Rud. (syn. *Oes. inflatum*, Schn.) which infests the ox, both of these nematodes being commonly met with in these hosts in New South Wales. The condition produced in the fowl is usually called the "nodule disease," or more correctly "nodular Taenialsis."

v. *Davainea* sp., Bradshaw, l.c., p. 50. (N.S.W.)


I have now identified these as *D. tetragotta*, Molin.

vii. *Cysticercus* sp., Perrie, l.c., p. 821. (N.S.W.)

I have seen Perrie's specimen, which resembles a hydatid in appearance. I am inclined to regard it as *Echinococcus veterinorum*, Rud. (*E. polymorphus*, Dies.). Brown¹ mentions the occurrence of hydatids in fowls, but does not state whether they occur locally. He² also mentions two other tapeworms, viz. *Choanotaenia infundibulum*, Bloch, and *Davainea proglottina*, Davaine, but does not refer to any locality. The latter of these parasites should be omitted from the list of our known entozoan fauna until recognised by some worker in parasitology. The nematodes and cestodes mentioned by Bradshaw as occurring in a fowl were identified by me.

Nematoda:—Ascaris sp., Perrie, Agric. Gaz. N.S.W., III, 1892, p. 821. (N.S.W.)

This reference should be to Heterakis perspicillum.


This large ascarid is fairly common in our fowls though not so abundant as the smaller Heterakis papillosa, Bloch.

iii. Heterakis compressa, Schneider, Monogr. d. Nemat. 1866, p. 71. (South Australia.)

This parasite was described from material collected from South Australian fowls. Both Railliet¹ and Neumann² give a summary of Schneider’s account. Leiper⁶ also refers to it in describing an allied worm Heterakis numidae, Leiper, taken from the guinea fowl, Numida ptilorhyncha, Licht., in the Soudan. I have taken specimens from a hen in Sydney, which I regard as belonging to this species, as they fully agree with the scanty account given by Schneider.


As mentioned before, this small nematode is very common in local fowls, especially in the caecum. I have also taken it from the caecum of a turkey (vide infra) (N.S.W.)

v. Heterakis sp. (N.S.W.)

Mr. Thos. Steel of Sydney kindly forwarded me a chicken harbouring abundance of nematodes which I have not yet been able to identify specifically.


This reference should be to *Heterakis papillosa*.


This tiny worm was formerly known as Manson’s eye worm, *Filaria mansoni*. Ransom\(^1\) in 1904, showed that it belonged to the genus *Oxyspirura*.


The “gape-worm” of poultry appears to be rare in Australia. It lives in the trachea, firmly attached to the mucosa. Since the male remains permanently attached to the female, the parasite has often been termed the “forked worm.” Mr. E. A. Le Souef, Curator of the Zoological Gardens, Perth, West Australia, informed me that this parasite occurs in fowls and turkeys in that State.

vii. *Dispharagus nasutus*, Rud. (Sydney.)

This filariid was collected by me from the stomach of a fowl sent by Mr. T. Steel. It has not been previously recorded from Australia.


This acarid has been recorded from the subcutaneous tissue of poultry. The original description is extremely scanty, the name *A. depilis* being practically a nomen

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nudum, but judging from the few points of structure and
the habitat mentioned, I think that this parasite is identical
with Cytodites nudus, Viz.

Wales, xxxv, 1910 (N.S.W.).

This tiny parasite was found in considerable numbers
infesting the mesentery of a local hen. Most members of the
Acarida (Acarina) lead a free or ectoparasite existence,
while a few penetrate into the skin, e.g. Demodex, Sarcoptes,
Psoroptes, etc. Sarcoptes (Cnemidocoptes) mutans, Robin,
the itch mite which produces the disease known as "scaly
leg" of poultry, and which occurs in this State,¹ comes
under this group. Very few actually pass deeply into the
tissues. Examples of the latter group are Cytodites,
Falciger (in certain stages) and others, some of which
inhabit the trachea and other passages.

91. Meleagris gallopavo, Linn. The turkey.

Linn. Soc. N.S. Wales, xxxiv, 1909, p. 412. (N.S.W.)

This round worm lives in the caecum of the turkey and
fowl.


Mr. E. A. Le Souef of the Zoological Gardens, Perth,
informed me of the occurrence of the "gape-worm" in
Western Australian turkeys and fowls.

Bradshaw² regards the disease known locally as "black-
head," as the same as that known under this name in the
United States, and produced by a protozoan, Amoeba
(Entamoeba) meleagridis, Th. Smith. Films taken from
the inflamed areas in the intestine and liver and examined
by Dr. F. Tidswell, Dr. Cleland, and myself show the
presence of very numerous organisms which are probably

¹ Bradshaw, loc. p. 78; also Agric. Gaz. N.S. Wales, xvii, 1906, p. 125;
A. meleagridis, but the identification is not yet completed. The form of the parasite showed considerably resemblance to a Coccidian, Doflein remarking the same thing in regard to Theobald Smith’s figures of it. A more detailed account will be published shortly by the Director in the annual report of the Bureau of Microbiology.

92. Anas boschas, Linn. The duck.


The specimens were very small and immature. The scolex was unarmed.

93. Anser cinereus, Meyer dom. The goose.


94. Columbia livia, Bonn., dom. The pigeon.

Nematoda:—Ascaris sp., Krefft, l.c., p. 212. (New South Wales or Queensland).

This reference should be to Heterakis maculosa.


The hypopial stage of this mite was found deeply buried in the subcutaneous tissues.

95. Passer domesticus, Linn. The sparrow.


This sporozoan infests the red corpuscles of the blood. It was first recorded by me as Plasmodium praecox, Gr.

and Fel.? The differences between *P. praecox* and our forms were thought by us to be of sufficient importance to justify the separation of the latter as a different species *P. passeris*.


96. *Sturnus vulgaris*, Linn. The starling.

This bird is now very common in the settled districts of New South Wales.

Cestoda:—*Hymenolepis farciminosa*, Goeze.

Some specimens forwarded to me by Mr. S. J. Johnston of the Biology Department, Sydney University, as well as others collected by Dr. Cleland at Berry, belong to the above species. (Sydney, Berry, N.S. Wales.)


This bird has become well established in South and South-eastern Australia.

Cestoda:—*Hymenolepis serpentulus*, Schrank.

This parasite was identified from material collected by Dr. Cleland, near Adelaide (South Australia).


This is not an Australian bird, since it lives only in New Caledonia. Mr. H. E. Finckh, of Mosman, Sydney, recently forwarded me a dead specimen of this rare bird, and from its intestine I have obtained numerous very small cestodes about 4 mm. long, with well developed suckers and an armed rostellum and alternating genitalia. These have been provisionally determined as *Amoebotaenia sp.*, though the genital organs alternate somewhat irregularly.

Addendum:—The record of *Holostomum sp.* from the gull and jackass mentioned by David (Jour. Proc. Roy. Soc. N.S.W., xxxiv, 1900, p. xx.) evidently refers to *Holostomum hillii* from *Larus novaehollandiae* and *Hemistomum triangulare* from *Dacelo gigas*, respectively, (*vide supra*).
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