

SOME NEMATODE PARASITES OF AUSTRALIAN BIRDS.

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(Twenty-two Text-figures.)

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The parasites under review include members of the Trichurata, Strongylata, Ascaridata, and Spirurata. The material has been collected by the late Dr. T. L. Bancroft of Eidsvold, Queensland; Professor J. B. Cleland of Adelaide; Dr. D. Brummitt of Adelaide; members of the Ralph Tate Society, Adelaide; and the senior author. Four of the hosts are not native Australian birds. The study has been made possible by the Commonwealth Research Grant to the University of Adelaide. Types of new species have been deposited in the South Australian Museum.

The following is a list of parasites arranged under their hosts:

- STREPERA FULIGINOSA Gould (Coorong, S. Aust.). *Acuaria streperina*, n. sp.
 STREPERA MELANOPTERA Gould (Flinders Chase, Kangaroo I.). *Acuaria streperina*, n. sp.
 STREPERA VERSICOLOR Lath. (Mt. Kosciusko and Sydney, N.S.W.). *Porrocaecum streperae*, n. sp.
 CORACINA NOVAE-HOLLANDIAE Gm. (West Burleigh, Qd.). *Capillaria graucalina*, n. sp.
 HETEROPSAR ALBICAPILLUS Blyth. (Adelaide Zoological Gardens). *Syngamus gracilis* Chapin.
 CINCLOSOMA PUNCTATUM Lath. (Launceston, Tas.). *Porrocaecum clelandi*, n. sp.
 OREOCINCLA LUNULATA Lath. (Bunya Mts., Qd.). *Porrocaecum clelandi*, n. sp.
 ANTHUS AUSTRALIS Vieill. (Encounter Bay, S. Aust.). *Porrocaecum clelandi*, n. sp.
 MYZANTHA FLAVIGULA Gould (Renmark, S. Aust.). *Porrocaecum* sp., larvae.
 MYIAGRA RUBECULA Lath. (Stradbroke I., Qd.). *Rictularina spinosa*, n. gen., n. sp.
 PHILEMON CITREOGULARIS Gould (Burnett R., Qd.). *Oxyspirura bancrofti*, n. sp.
 POMATOSTOMUS SUPERCILIOSUS Vig. & Horsf. (Baradine, N.S.W.). *Seuratinema pomatostomi*, n. sp.
 SCYTHROPS NOVAE-HOLLANDIAE Lath. (Eidsvold, Qd.). *Subulura clelandi*, n. sp.
 PODARGUS STRIGOIDES Lath. (Perth, W. Aust.; Eidsvold, Qd.). *Subulura clelandi*, n. sp.
 HALCYON SANCTUS Vig. & Horsf. (Milson I., N.S.W.; Stradbroke I., Qd.). *Cheilonema todum halcyonis*, n. gen., n. sp.
 DACELO GIGAS Bodd. (Pilliga Scrub, N.S.W.). *Seuratinema magnum*, n. sp.
 COLUMBA LIVIA Linn. (Adelaide; Melbourne). *Capillaria columbae* (Rud.) (Adelaide; Sydney; Melbourne; Brisbane). *Ascaridia columbae* (Gm.).
 LEUCOSARCIA MELANOLEUCA Lath. (Burnett R., Qd.). *Heterakis bancrofti* Johnston.
 FRANCOLINUS CHINENSIS Osbeck. (Sydney Zoological Gardens). *Heterakis gallinae* (Gm.).
 ALECTURA LATHAMI Gray (Burnett River, Qd.). *Heterakis bancrofti* Johnston.
 GALLUS DOMESTICUS (Adelaide; Melbourne; Sydney). *Heterakis gallinae* (Gm.).
 EUPODOTIS AUSTRALIS Gray (Mt. Liebig, Central Aust.). *Cyrnea dentifera*, n. sp.
 CACATUA LEADBEATERI Vig. (Sydney Zoological Gardens). *Heterakis gallinae* (Gm.).
 DOMICELLA GARRULA FLAVOPALLIATA Salvad. (Sydney—from East Indies). *Ascaridia columbae* (Gm.).

TRICHURATA.

CAPILLARIA GRAUCALINA, n. sp. Figs. 1-2.

From *Coracina novae-hollandiae* from West Burleigh, southern Queensland. A male and a female present; male 16.3 mm. long, 80 μ maximum width; female 27.3 mm. long, 110 μ maximum width. Ratio of lengths of oesophageal to intestinal regions about 1:2 in

female (9.4:17.9 mm.), and 7.8 in male (7.7:8.6 mm.). Male 6μ across head, 70μ across body at junction of oesophagus and intestine. Bursa formed by two lateral flaps overhanging posterior end of body. Cloaca subterminal. Spicule 1.8 mm. long, stout, cylindrical, ending in rounded tip. Female 8μ across head, 65μ across body at base of oesophagus, 50μ across body at level of anus; tail 20μ long. Vulva just posterior to oesophagus, its position marked by a protrusion of vagina and body wall. Eggs 55μ by 30μ , the given length including that of polar plugs.

CAPILLARIA COLUMBAE (Rud. 1819).

From *Columba livia*, from Adelaide and Melbourne. Many specimens, length agreeing with that given by Baylis (1929, 264).

STRONGYLATA.

SYNGAMUS GRACILIS Chapin 1925.

From the trachea of a white-capped starling, *Heteropsar albicapillus*, from the Adelaide Zoological Gardens. McLennan (1933) referred to the occurrence, identifying the parasite as *Syngamus trachea*.

ASCARIDATA.

SUBULURA CLELANDI, n. sp. Figs. 3-4.

From *Podargus strigoides* (type host) from Perth, Western Australia (type locality; coll. Dr. Cleland) and Eidsvold, Queensland (coll. Dr. Bancroft); and from *Scythrops novae-hollandiae* from the latter locality.

Males 8-9 mm. long, 0.24 mm. wide; females 12-15 mm. long, 0.42 mm. wide. Head with six small papillae. Lateral cuticular alae extending a short distance beyond the level of the end of the oesophagus. Buccal capsule strongly chitinated; 60μ long, 50μ wide (latter measurement including walls 10μ thick) in female. Oesophagus 1.2 mm. and 1.4 mm. long in male and female respectively; bulb longer than broad, 0.19 mm. by 0.17 mm. in female. Nerve ring around oesophagus at end of first quarter of length.

Male. Tail 0.28 mm. long, including narrow terminal whiplike portion 85μ long. Five pairs preanal and five pairs post-anal papillae arranged as in Fig. 4. Spicules equal, 0.91 mm. long, with two dorsally directed spurs at 80μ and 40μ respectively from its distal end. Sucker very poorly developed, its centre 0.42 mm. in front of cloaca.

Female. Tail 0.85 mm. long, ending as in male in whiplike part. Vulva just in front of midbody at 5.8 mm. from head (at 1:2.2 of body length).

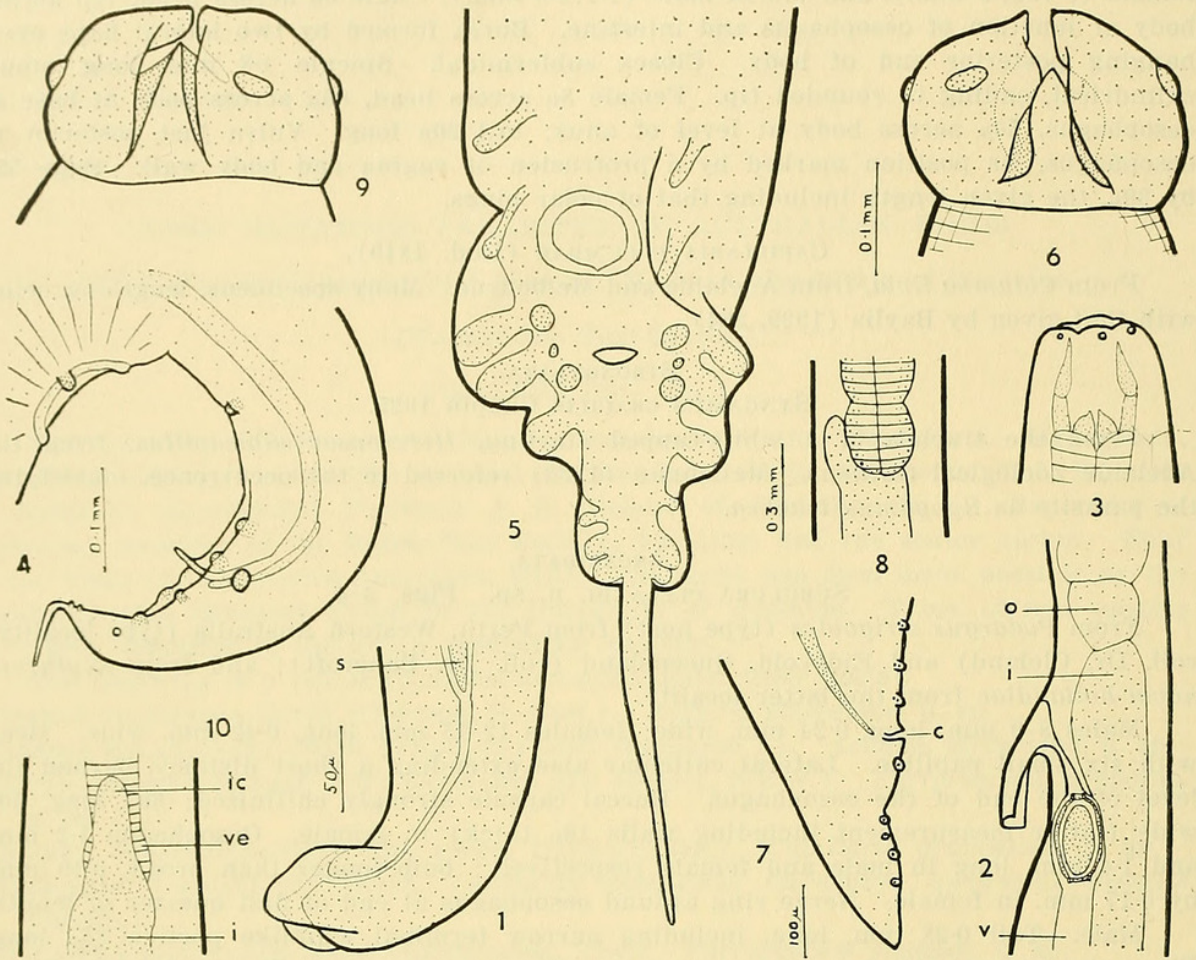
The species differs from *S. acutissima* (Molin) in its length; from *S. brumpti* Lopez Neyra in the position of the vulva, and in the length of the gubernaculum and spicules. It differs from *Subulura* sp. Jnstr. & Mawson (1941) from *Ninox strenua* in the size of the eggs, length of tail, and the shape of the oesophageal bulb. It is very close to *S. differens* (Sonsino), but differs in being larger and also in having relatively shorter spicules and smaller eggs.

HETERAKIS BANCROFTI Johnston 1912. Fig. 5.

Some specimens were examined from the type host, *Alectura lathamii*, from Eidsvold, Burnett R. The species is also now recorded from *Leucosarcia melanoleuca* from the same district (coll. Dr. Bancroft). Specimens from *A. lathamii* were longer than those recorded by Johnston and more papillae were seen on the male tail. The general description of the new material agrees with the earlier account. Its measurements are as follows: Female: 8-9 mm. long; oesophagus 0.85 mm. long; nerve ring 0.25 mm. from head; tail 0.9 mm. long; vulva just behind midbody; eggs $65-70\mu$ by 40μ . Male: 5-7 mm. long; width 0.34 mm.; spicule length 1.23 mm.; distance from posterior border of sucker to cloaca 0.05 mm., and from cloaca to tip of tail 0.36 mm.; length of narrow part of tail posterior to alae 0.21 mm.; sucker 65μ across and 53μ long; caudal alae widest just anterior to sucker; eight pairs pedunculated papillae supported by alae, and three pairs sessile papillae adanally, arranged as in Fig. 5.

HETERAKIS GALLINAE (Gmelin 1790).

This common parasite was obtained from *Francolinus chinensis* and *Cacatua leadbeateri* from the Sydney Zoological Gardens; and the domestic fowl from Adelaide, Melbourne and Sydney.



Figs. 1-2.—*Capillaria graucalina*, n. sp. 1, male tail; 2, vulvar region of female. Figs. 3-4.—*Subulura clelandi*, n. sp. 3, head; 4, male tail. Fig. 5.—*Heterakis bancrofti* Johnston, male tail. Figs. 6-8.—*Porrocaecum clelandi*, n. sp. 6, head; 7, male tail; 8, junction of intestine and oesophagus. Figs. 9-10.—*Porrocaecum streperae*, n. sp. 9, head; 10, posterior end of oesophagus. Figs. 1, 2, 3 and 5 drawn to same scale, beside 1; figs. 6, 9 and 10, beside 6. c, cloaca; i, intestine; ic, intestinal caecum; o, oesophagus; s, spicule; v, vagina; ve, ventriculus.

PORROCAECUM CLELANDI, n. sp. Figs. 6-7.

Material consists of male 30 mm. long, 0.72 mm. wide, from a thrush, *Oreocincla lunulata* (type host) (Bunya Mts., Queensland); a female 50 mm. long, 0.73 mm. wide, from another thrush, *Cinclosoma punctatum*, from Launceston, Tasmania; and a male 40 mm. long, 0.73 mm. wide, from a ground lark, *Anthus australis*, from Encounter Bay, S. Aust.; all material collected by Dr. Cleland. Head 0.27 mm. broad, distinctly wider than succeeding body; dentigerous ridge on each lip long, continuing on lateral flanges almost to base of lip; interlabia about two-thirds length of lips, to which they are joined internally near their tips; two papillae on dorsal lip, one on each ventral lip. Oesophagus 2.96 mm. long; intestinal caecum (seen only in specimen from *Anthus australis*) very short, 0.2 mm. long; ventriculus 0.3 mm. long. Nerve ring in type specimen 0.7 mm. from head.

Male. Tail tapering to blunt point; spicules almost equal, 0.54 mm. long; thirteen pairs preanal papillae, five pairs post-anal, arranged as in Fig. 7.

Female. Tail elongate, tapering, 0.64 mm. long; vulva at end of anterior third of body length; eggs not present. Our species differs from *P. ensicaudatum* (Zeder) and *P. cheni* Hsü (in both of which the intestinal caecum is rudimentary) in the number of post-anal caudal papillae in the male; and from the latter species in the position of the vulva. The lengths of oesophagus and spicules in *P. ensicaudatum* are not available.

PORROCAECUM STREPERAE, n. sp. Figs. 8-9.

From intestine of *Strepera versicolor* (type host) from Mt. Kosciusko and from Sydney, N.S.W. Each collection contained one female only. Length 35-40 mm., width 0.88 mm. Head rather narrower than succeeding body. Each lip with narrow cuticular flange on either side and without dentigerous ridge. Interlabia pointed, nearly as long as lips, joined to latter internally near their tips. Oesophagus 2.2 mm. long, ending in spherical bulb (ventriculus) separated from rest by constriction. Intestinal caecum 0.1 mm. long; vulva just in front of midbody. Ripe eggs not present.

The species differs from *P. clelandi*, described above, in the absence of dentigerous ridges on the lips, and in the presence of a definite intestinal caecum, and in the size of the head relative to the body width. It differs from *P. wui* Hsü in the length of the intestinal caecum and in the absence of dentigerous ridges on the lips.

PORROCAECUM SP. Larvae.

Two specimens from *Myzantha flavigula* from Renmark, S. Aust. (coll. Dr. Cleland). Lips undeveloped, intestinal caecum present; length 8-10 mm. The adult stage possibly occurs in a hawk.

ASCARIDIA COLUMBAE (Gmelin 1790).

From *Columba livia* in Adelaide, Sydney, Melbourne and Brisbane; and from *Domicella garrula* var. *flavopalliata* (Syn. *Lorius flavopalliatatus*), Sydney Zoological Gardens.

SPIRURATA.

CHEILONEMATODUM HALCYONIS, n. gen., n. sp. Figs. 11-12.

Material consists of a male worm from *Halcyon sanctus* from Stradbroke Island, Queensland; and a male and female from the same host species from Milson Island, Hawkesbury River, N.S.W.

The specimens from Milson Island were obscured by a black pigment with which they had come in contact and which had penetrated the body cavity and mouth. The worms were very fragile so that only a sublateral view of the lips could be obtained.

Male 16-18.5 mm. long, 0.65-0.7 mm. wide; female 20 mm. long, 0.68 mm. wide. Anterior end with two lips, each with median projection. Lips free on external surface but joined to interlabia internally. Interlabia present, their form not determined in lateral view. Each lip with two large papillae. Mouth leading to chitinated buccal capsule 40 μ long and 12 μ wide. Oesophagus narrow, straight, 3.1 mm. long in male, 3.5 mm. in female; anterior part rather narrower, 0.82 mm. long in male, 0.9 mm. in female. Nerve ring 0.23 mm., and excretory pore 0.35 mm. from head end.

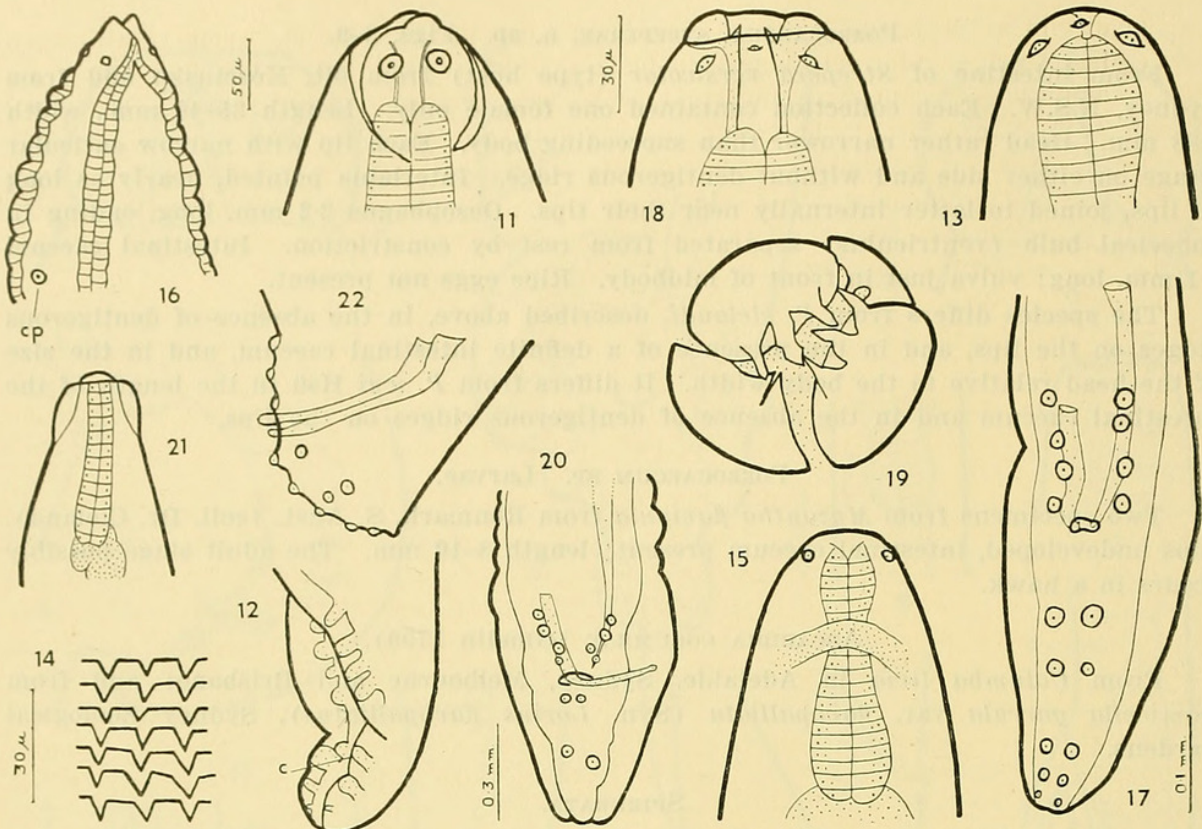
Male. Posterior end coiled; cloaca 90 μ from rounded tip; caudal alae wide; four pairs preanal and three pairs post-anal papillae in alae, and a pair sessile papillae adanally; spicules unequal; longer narrow tubular, 0.12-0.15 mm. in length; shorter spatulate, 0.07-0.08 mm.

Female. Position of anus not clearly seen, but most probably near tip of rounded tail; vulva at midbody; uteri opposed; eggs thick shelled, 26-28 μ by 45-48 μ .

The genus is probably nearest to the Habronematinae as defined by Chitwood and Wehr (1934). Since the shape of the interlabia is unknown, it is difficult to classify it definitely. It differs from the Hedrurinae in the structure of the male tail (caudal alae present, spicules unequal), but agrees in having only the four submedian papillae on the head. In the latter feature as well as in the shape of the lateral lips it differs from any known genus of *Habronematinae*. We suggest a new genus, *Cheilonematodum*, diagnosed as follows: *Habronematinae*?: Anterior and posterior ends rounded, anterior with two lateral lips each with a median projection; interlabia present; vestibule followed by long narrow oesophagus with two distinct parts.

Male: With wide caudal alae supporting pre- and post-anal papillae; spicules unequal; gubernaculum absent.

Female. With vulva at mid-body; opisthodelphous; eggs thick-shelled. Parasites of birds. Type species, *C. halcyonis*, n. sp.



Figs. 11-12.—*Cheilonematodum halcyonis*, n. gen., n. sp. 11, head; 12, male tail. Figs. 13-14.—*Rictularina spinosa*, n. gen., n. sp. 13, head; 14, part of cuticle of midbody. Fig. 15.—*Seuratinema magnum*, n. gen., n. sp., anterior end. Figs. 16-17.—*Acuarina streperina*, n. sp. 16, head; 17, male tail. Fig. 18.—*Oxyspirura bancrofti*, n. sp., head. Figs. 19-20.—*Cyrnea dentifera*, n. sp. 19, head, face view; 20, male tail. Figs. 21-22.—*Seuratinema pomatostomi*, n. gen., n. sp. 21, head; 22, male tail. Figs. 11, 13 and 16 to same scale, beside 11; figs. 12, 17 and 22, beside 17; figs. 15, 20 and 21, beside 20. c, cloaca; cp, cervical papilla.

RICTULARINA SPINOSA, n. gen., n. sp. Figs. 13-14.

From the leaden fly-catcher, *Myiagra rubecula*, from Stradbroke Island, Queensland. A female and a very young worm present. Body stout, 8.5 mm. long, 0.4 mm. maximum breadth. Head rounded, with four large submedian and two small more anteriorly situated lateral papillae. Mouth leading to funnel-shaped vestibule 20 μ long; oesophagus 0.6 mm. long, swollen anteriorly and posteriorly. Nerve ring 0.2 mm. from head; excretory pore just behind that level. Cuticle strongly annulated, anterior border of each annulation overlapped by the one preceding it; each annulation with about eighty-two short, triangular, posteriorly directed hooks on its posterior border, arranged in longitudinal rows converging anteriorly and posteriorly. Vulva behind middle of body, 3.6 mm. from posterior end; tail short, conical, pointed, 0.3 mm. long. Ripe eggs not present.

The presence of hooks indicates a member of the Rictulariinae but their arrangement does not agree with that in any previously described genus. A new genus, *Rictularina*, is therefore proposed, with the following diagnosis: Rictulariinae: Head rounded, lips absent; six cephalic papillae. Cuticle strongly annulated, each ring with numerous hooks arranged in longitudinal rows, continuous over whole of body. Oesophagus short, muscular, swollen anteriorly and posteriorly. Male unknown. Female with short conical tail; vulva behind middle of body. Parasites of birds. Type species, *R. spinosa*, n. sp.

ACUARIA (CHEILOSPIRURA) STREPERINA, n. sp. Figs. 16-17.

From *Strepera fuliginosa* (Coorong, S. Aust.; coll. Dr. D. Brummitt) and *S. melanoptera* (Kangaroo Island, obtained by the Ralph Tate Society). One female 9.5 mm. long, 0.26 mm. wide, from former host; two females 13-15 mm. long, 0.32 mm. wide, and one male 8 mm. long, 0.31 mm. wide, from *S. melanoptera*, which is the type host.

Head typical of genus; cordons prominent, continuing beyond oesophageal region before disappearing, relatively longer in female. Cervical papillae round, 0.19 mm. from head; vestibule 0.18 mm. long in female, 0.12 mm. in male; oesophagus 0.7 mm. long in male and 0.8 mm. in female.

Male. Caudal alae slightly unequal, being a little longer on same side as shorter spicule (i.e., extending about 0.55 mm. from posterior end of body); spicules unequal, 0.1 mm. and 0.26 mm. long, similar in shape, massive, tapering; four pairs preanal and five pairs post-anal papillae arranged in two longitudinal rows.

Female. Body narrowing suddenly just in front of anus; tail short, rounded, 0.23 mm. long; vulva at midbody; eggs thick-shelled, 35–37 μ by 23 μ in uterus, one in vagina 27 μ by 40 μ .

The species is very like *A. corvicola* Instn. & Mawson, but differs in the relative lengths of the oesophagus and cordons, and in the size of the eggs.

OXYSPIRURA BANCROFTI, n. sp. Fig. 18.

From *Philemon citreogularis*, from Eidsvold, Queensland (coll. Dr. Bancroft). Two specimens and several broken pieces present, all apparently immature. Complete worms 10.4 mm. and 12.8 mm. long, 0.23 mm. wide. Head with two lateral papillae 10 μ from anterior end, and four submedian papillae 15 μ from end. Buccal capsule 39 μ long, 12 μ wide, its strongly chitinized walls 2–3 μ thick, continuous anteriorly with a chitinized ring around mouth and bearing near its anterior end six sharply pointed teeth projecting into mouth. Oesophagus 3.6 mm. long, anterior 0.3 mm. narrower than the rest. Nerve ring 0.2 mm. from head. Tail tapering to a point, anus 0.15 mm. from tip. Vulva not observed.

In 1912 *O. acanthochaerae* was described by the senior author from another honey-eater, *Acanthochaera ruficularis*, from some poorly preserved material obtained originally by Krefft. It is difficult to compare the present specimens with that species, since the descriptions are incomplete, and on the only points at which they overlap, the worms differ (body length, positions of anus and nerve-ring, body width). The variation is not great, but pending the examination of more material from both hosts, we consider it wiser to assign the parasites from *Philemon* to a new species, *O. bancrofti*.

CYRNEA DENTIFERA, n. sp. Figs. 19–20.

From the bustard, *Eupodotis australis*, Mt. Liebig, Central Australia. Several specimens, bodies rather wrinkled and darkened. Males about 10 mm. long, females up to 16 mm. Head with four lips, the two laterals being wider; three teeth on each lateral, two each on dorsal and ventral lips. Cephalic papillae obscure, probably two on each dorsal and ventral lip and one on each lateral. Oesophagus 4.32 mm. long (in male); anterior region 0.48 mm. long, narrower than remainder. Nerve ring 0.36 mm. from head.

Male. Ventral surface of alae and tail raised into longitudinal ridges extending anteriorly for about 1.9 mm. in front of cloaca. Alae 0.8 mm. long, widest at anterior ends, narrowing to joint at posterior end of body. Spicules unequal; longer 2.7 mm. in length, narrow, with rounded tip; shorter about 0.5 mm., ending in rounded knob. Gubernaculum about 0.1 mm. long. Papillae symmetrically arranged, four pairs precloacal, a pair immediately postcloacal, and a pair half-way between cloaca and tip of tail. Tail 0.4 mm. long.

Female. Tail 0.22 mm. long, rounded. Vulva not observed. Uteri full of eggs, latter largest near middle of body, so vulva is presumably in that region. Eggs thick-shelled, 26 μ by 40 μ .

The species is nearest to *C. excisa* (Molin), from which it differs in the relative lengths of the spicules and in the size of the eggs. Teeth are not described as occurring on the dorsal and ventral lips of that species.

SEURATINEMA POMATOSTOMI, n. sp. Figs. 21–22.

From *Pomatostomus superciliosus*, from Baradine, N.S.W. (coll. Dr. Cleland). Male 8 mm. long, 0.72 mm. wide; female 22 mm. long, 1 mm. wide. Head rounded, mouth dorsoventrally elongate; no cephalic papillae. Cervical cuticle inflated in region

commencing (in male) 0.03 mm. from head end and extending to a point 0.2 mm. from head, forming a collarette around base of lips. Oesophagus cylindrical, clubshaped, short, 0.5 mm. long in male, 0.82 mm. in female. Nerve ring at level of base of cervical inflation.

Male. Spicules equal, 0.2 mm. long; tail 0.12 mm. long, conical; three pairs preanal and eight pairs post-anal papillae arranged as in Fig. 12.

Female. Tail long, tapering, rounded at tip; position of vulva not determined, but eggs most numerous near middle of body; uteri not extending into anterior quarter of body.

The species is referred to *Seuratinema* Jnstr. & Mawson (1941) in view of characters of the head and male tail; it differs from the only other species described for the genus in its smaller size and in the greater number of caudal papillae in the male.

SEURATINEMA MAGNUM, n. sp. Fig. 15.

From *Dacelo gigas*, from the Pilliga Scrub, north-western New South Wales (coll. Dr. Cleland). Only a very large female obtained. Body shrivelled, greatly twisted by preservation; when pulled as straight as possible length 40 mm., but probably nearer 50 mm., width 3.5 mm. Body tapering suddenly at head end, more gradually to tail. Head with two low lips, each with two submedian papillae. Oesophagus 0.8 mm. long, muscular, with constriction 0.3 mm. from its anterior end; nerve ring around constriction. Tail end shrivelled, rectum and anus not visible. Greatest development of uteri and ripest eggs found in middle of body; vulva not seen but presumably lies in that region. Uterine tubes not approaching oesophageal region. Eggs subglobular, thick-shelled, about 50 μ diameter.

The species resembles *Seuratinema* in the characters of the head, but differs in the shape of the oesophagus and in the absence of inflated cervical cuticle. In view of the condition of the material the species is assigned provisionally to that genus.

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