

ADDITIONAL NEMATODES FROM AUSTRALIAN BIRDS

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[Read 14 August 1941]

The nematodes recorded in this paper are mainly from water-birds. Some of the parasites were collected by Dr. J. B. Cleland, the late Dr. T. L. Bancroft (Eidsvold, Queensland) and the late Dr. MacGillivray. We are also indebted to Messrs. G. and F. Jaensch and L. Ellis for help in obtaining material from Tailem Bend, South Australia. The work was assisted by the Commonwealth Research Grant to the University of Adelaide. Types of new species are deposited in the South Australian Museum.

The following is a list of the parasites studied, recorded under their hosts:

- PITTA MACKLOTI Temm. (North Queensland)—*Thelazia pittae* n. sp.
 CHLIDONIAS LEUCOPAREIA Temm. (Tailem Bend) — *Chevreuxia australis* n. sp.;
Acuaria (s.l.) sp., larva.
 HYDROPROGNE CASPIA STRENUA Gould (Tailem Bend)—*Trichostrongylus* (s.l.)
incertus n. sp.; *Acuaria* (s.l.), sp., larva.
 PELAGODROMA MARINA Lath. (Flinders Island, Bass Strait)—*Scuratia marina*
 n. sp.
 THRESKIORNIS (CARPHIBIS) SPINICOLLIS Jameson (Eidsvold)—*Physaloptera* sp.,
 immature.
 MICROCARBO MELANOLEUCUS Vieill. (Adelaide; Tailem Bend)—*Eustrongylides*
phalacrocoracis n. sp.
 PHALACROCORAX CARBO (Linn.) (Tailem Bend; Adelaide) — *Eustrongylides*
phalacrocoracis n. sp.; *Echinuria squamata* Linst.; (Tailem Bend) *Cosmo-*
cephalus jaenschii n. sp.
 ANHINGA NOVAE-HOLLANDIAE Gld. (Burnett River)—*Eustrongylides plotinus*
 n. sp.; (Thompson River) *Acuaria* (*Dispharynx*) sp..
 PODICEPS POLIOCEPHALUS Jardine and Selby (Tailem Bend)—*Streptocara recta*
 (Linst.).
 PODICEPS RUFICOLLIS NOVAE-HOLLANDIAE Stephens (Tailem Bend)—*Streptocara*
recta (Linst.).
 CHENOPSIS ATRATA Lath. (Tailem Bend)—*Tetrameres australis* n. sp.
 ANAS SUPERCILIOSA Gmel. (New South Wales)—*Physaloptera* sp.
 BIZIURA LOBATA Shaw (Tailem Bend)—*Tetrameres biziurae* n. sp.
 AEGOTHELES CRISTATA White (Tailem Bend)—*Habronema aegotheles* n. sp.
 POMATOSTOMUS SUPERCILIOSUS Vig. and Horsf. (Elwomple,)—*Spirura* (s.l.) sp.,
 larva.

Trichostrongylus (s.l.) *incertus* n. sp.

(Fig. 1)

From the Caspian tern, *Hydroprogne caspia strenua*, from Tailem Bend. One male present, its anterior end missing; part available 2.9 mm. long, .06 mm. wide. Dorsal lobe of bursa small; right side of bursa rather larger than left, rays on that side stouter but similar in form. Ventro-ventral rays narrow, straight, reaching bursal edge, separated from latero-ventrals; latter tapering at extremities, bent ventrad, not quite reaching bursal edge; lateral rays not reaching bursal edge; ventro-lateral blunt-tipped; medio-lateral longest, tapering to narrow tip; postero-lateral shortest, narrowest, tip bent dorsad; externo-dorsal ray not arising

from dorsal, narrow, not reaching edge of bursa; dorsal reaching nearly to bursal edge, bifurcating near its tip into two short cloven branches. Spicules 12 mm. long, with alae and ridges giving them a contorted appearance, but ending in a blunt simple tip. Gubernaculum absent. Prebursal papillae present. The form of the bursal rays and the shape of the spicules suggest that the species is closest to *Trichostrongylus*, although it differs from members of that genus in the absence of a gubernaculum and in the separation of the externo-dorsal rays from the dorsal ray. In view of the condition of the material it seems unwise to attempt to assign it more definitely in the Trichostrongylidae.

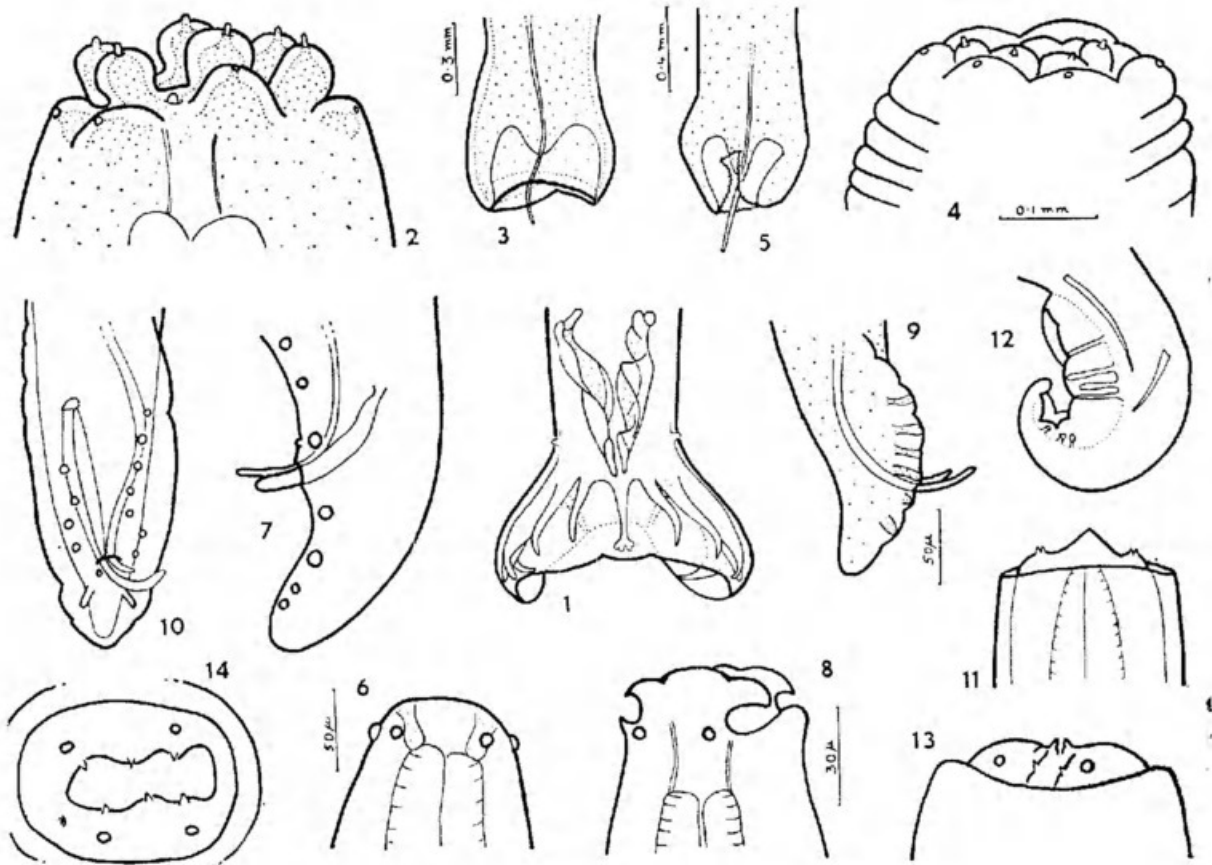


Fig. 1, *Trichostrongylus* (s.l.) *incertus*: bursa. Fig. 2-3, *Eustrongylides phalacrocoracis*: 2, head; 3, bursa. Fig. 4-5, *Eustrongylides plotinus*: 4, head; 5, bursa. Fig. 6-7, *Thelazia pittae*: 6, head; 7, male tail. Fig. 8-10, *Habronema aegothelcis*: 8, head; 9, lateral, and 10, ventral, views of male tail. Fig. 11-12, *Physaloptera* sp., from *Anas*: 11, head; 12, male tail. Fig. 13-14, *Physaloptera* sp. from ibis, sub-ventral and face views of head. Fig. 1, 9, 10, 13 and 14 to same scale; fig. 2, 4, 7 and 11; fig. 3 and 6; fig. 5 and 12.

Eustrongylides phalacrocoracis n. sp.

(Fig. 2-3)

Taken from the subperitoneal tissue of the stomach of *Microcarbo melanoleucus* from Tailem Bend (type locality) and Adelaide; and from *Phalacrocorax carbo* from Tailem Bend. Males up to 100 mm. long, .8 mm. wide; female ranging to 130 mm. long, 1 mm. wide. Papillae around mouth very large and prominent, those of inner circle distinctly larger than those of outer circle. Six of inner circle of same size, each bearing anteriorly a short prolongation of the pulp in form of a spine; six papillae of outer circle not of equal size, the laterals taller; each papilla with small rounded prolongation of pulp anteriorly. Between each lateral and submedian papilla of outer ring is a very small rounded projection

of hypodermis forming an accessory papilla. Buccal cavity .12-.14 mm. long; oesophagus twisted, terminating 13 mm. from head, about one-sixth to one-eighth body length.

Bursa with finely notched edge; slight ventral cleft; cuticle roughened on inside. Spicule very thin, 10.2 mm. long, 1:10 of body length.

Anus in female terminal. Vulva not observed. Eggs 65μ by 40μ , with pitted shells.

The species most closely resembles *E. africanus* Jaegerskiold, differing in the size of the papillae, the lengths of the buccal cavity and oesophagus, and in the shape of the eggs.

***Eustrongylides plotinus* n. sp.**

(Fig. 4-5)

From *Anhinga novae-hollandiae*, from the Burnett River, Queensland (coll. Dr. Bancroft). Males only present; the largest whole specimen 81 mm. long, 1 mm. wide. Head papillae resembling those of *E. phalacrocoracis* in shape and relative sizes, but all are smaller in relation to size of body, and therefore less conspicuous. Buccal cavity .08-.1 mm. long, oesophagus much twisted, occupying first sixth of body length.

Bursa with finely notched edge and very deep ventral cleft. Spicule 13 mm. long in 81 mm. specimen (1:6 of body length), but in a broken worm it reaches 15.4 mm. The species is distinguished from *E. phalacrocoracis* by the relatively smaller oral papillae, the more deeply cleft bursa, and longer spicules. The two species are, however, very close, and some of the differences may be due to the method of preservation in case of *E. plotinus*. Pending the examination of fresher material it is considered wiser to erect a new species for the specimens from *Anhinga*.

***Thelazia pittae* n. sp.**

(Fig. 6-7)

From *Pitta mackloti*, North Queensland, coll. Dr. MacGillivray. Males 14-16 mm. long, .4 mm. wide; females 18-20 mm., by .54 mm. Head with six papillae. Buccal cavity 25μ long and 30μ wide in male, 30μ long and 35μ wide in female, with walls about 10μ thick. Oesophagus .95-1 mm. long in both sexes. Nerve ring .46 mm., cervical papillae .56 mm., from head end.

Male—Tail curved ventrad, .18-.2 mm. long; single median and seven to ten pairs preanal papillae, four or five pairs postanal. Spicules .18-.2 mm. and .26 mm. long; the longer very fine, not strongly chitinised; the shorter blunt and massive.

Female—Tail .2 mm. long; vulva .75-.9 mm. from head end. Uteri containing larvae.

The species is distinguished from others of the genus by the number and position of the caudal papillae and by the relative lengths of the spicules.

***Habronema aegotheles* n. sp.**

(Fig. 8-10)

From the owllet nightjar, *Aegotheles cristata*, from Taillem Bend. Male 2.5 mm., female 4.8 mm., in length. Lateral lips trilobed, with long dorsal and ventral processes; interlabia not seen since head viewed only from lateral elevation, but probably short and simple. Vertical thickened ridges (probably two) on inside of each lip, projecting anteriorly as teeth. Buccal capsule 27μ long in male, 33μ long and 10μ wide in female. Anterior part of oesophagus .2 mm. long in female; .14 mm. in male; posterior part .81 mm. in male.

Male—Caudal alae not wide, united posterior to end of body. Spicules .18 mm. and .7 mm. in length; the shorter with rounded tip; the longer needle-like. Four pedunculated preanal papillae on same side as shorter spicule, six on

other side; one pair small sessile papillae immediately posterior to anus, and a pair large pedunculated papillae behind these. Male tail bent dorsad. Anus $70\ \mu$ in front of rounded tip of tail.

Female—Tail $\cdot 16$ mm. long, narrowing suddenly after half length. Position of vulva not seen. Body filled with thick-shelled eggs, $20\ \mu$ by $45\ \mu$, containing embryos.

The species most closely resembles *H. magnilabiatum* Maplestone in the shape of the lips. The worms are, however, shorter, the lateral lips more deeply lobed; the spicule lengths, and the ratio between them, are different, and there are more caudal papillae in the male of *H. aegotheles*.

PHYSALOPTERA sp.

(Fig. 11-12)

From *Anas superciliosa* (New South Wales). One male present, so preserved that only lateral views of the head and tail could be obtained. Lips each bearing two bipartite teeth in dorsal and ventral positions; in median position an outer single tooth and an inner much smaller one, either bipartite or quadripartite. Collar at base of lips, shallow. Exact position of anus and length of spicules not determined satisfactorily. At least four pairs pedunculate preanal papillae and three pairs shorter postanal papillae. Spicules at least $\cdot 3$ mm. and $\cdot 6$ mm. long, the longer very fine and poorly chitinised. It is possible that the worm is not a normal parasite of ducks. We have refrained from naming it. The presence of prominent bicuspid teeth in dorsal and ventral positions on lips has not been described for any species of *Physaloptera* from birds.

PHYSALOPTERA sp., immature

(Fig. 13-14)

From the black ibis, *Threskiornis spinicollis*, from Eidsvold, Queensland, coll. Dr. Bancroft. Immature specimens up to 15 mm. in length, $\cdot 52$ mm. wide. Head with very loose "collar" and shallow lips. Each lip with two papillae externally and three teeth internally, latter in dorsal, ventral and median positions. Oesophagus $2\cdot 24$ mm. long. Tail conical, $\cdot 56$ mm. long. The arrangement of the teeth is apparently unique among *Physaloptera* from birds.

ACUARIA (DISPHARYNX) sp.

Three poorly preserved specimens from *Anhinga novae-hollandiae*, Thompson River, Queensland. Length, 19-23 mm. Cordons about $\cdot 9\text{--}1\cdot 5$ mm. long, recurrent end reaching mouth region. Vestibule $\cdot 25$ mm. long, anterior part of oesophagus $\cdot 6$ mm. long, termination of posterior part not seen. In 19 mm. specimen, vulva $2\cdot 4$ mm. from tip of tail; latter $\cdot 12$ mm. long. Recurrent branches of cordons apparently longer than in previously described species, but in view of the condition of the material it is considered wiser not to erect a new species.

ECHINURIA SQUAMATA Linst.

(Fig. 15-19)

A young male $3\cdot 3$ mm. long, a young female $4\cdot 4$ mm. long, a female 20 mm. long, and the anterior end of another large female, from *Phalacrocorax carbo*, Tailem Bend; and a young male from same host species from the Hope Valley Reservoir, Adelaide. Lips prominent, each with two papillae and an amphid. Cervical papillae large, tricuspid, $\cdot 35$ mm. from head in male, $\cdot 4$ mm. in young female, $1\cdot 1$ mm. in adult female. Cordons prominent, wider posteriorly, not recurrent, uniting immediately anterior to cervical papillae. Cordons striated transversely, each stria consisting of a row of about eight posteriorly-directed spines; spines on dorsal or ventral respective edge of each cordon larger than others in the row and sometimes bifid. At junction of cordons, spines single and

large. Lateral alae extend from immediately posterior to cervical papillae. Vestibule with striated walls, $140\ \mu$, $150\ \mu$, and $480\ \mu$, long in male, young female, and adult female, respectively. Anterior part of oesophagus $\cdot 26$ mm. long in young female, $\cdot 25$ mm. in male; posterior part slightly wider, $2\cdot 35$ mm. long in young female. Nerve ring $\cdot 16$ mm. and $\cdot 18$ mm. from head end in young male and young female, respectively. Excretory pore $\cdot 27$ mm. from head.

Male—Caudal alae wide, $\cdot 28$ mm. long, meeting posterior to body. Cloaca $\cdot 09$ mm. from tip of tail. One median sessile preanal papilla, four pairs preanal and seven pairs postanal pedunculated papillae (fig. 18). Spicules $\cdot 45$ mm. and

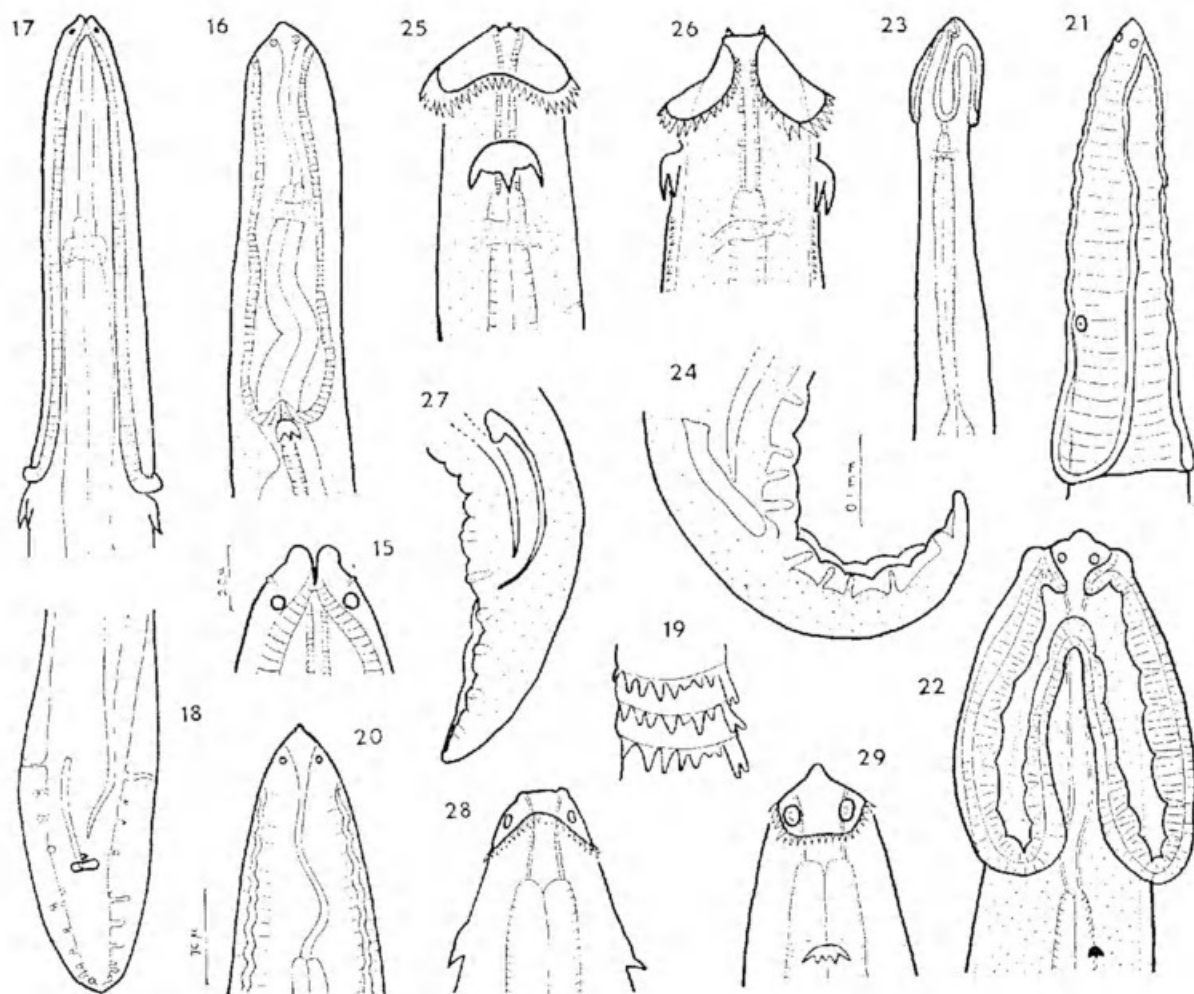


Fig. 15-19, *Echinuria squamata*: 15, male head; 16, female, and 17, male anterior ends; 18, male tail; 19, part of a cordon. Fig. 20-21, *Chevreuxia australis*, anterior end, showing, 20, vestibule; 21, cordon. Fig. 22-24, *Cosmocephalus jacnschi*: 22-23, anterior end; 24, male tail. Fig. 25-27, *Seuratia marina*: 25, lateral, and 26 dorsal, views of head; 27, male tail. Fig. 28-29, *Streptocara recta*: ventral and lateral views of head. Fig. 15 and 19 to same scale; fig. 17, 18 and 20; fig. 21, 22, 24, 25, 26 and 27; fig. 28 and 29.

$\cdot 07$ mm. in length, shorter spatulated and blunt tipped; longer tubular in proximal quarter, remainder needle-like almost to the end which is somewhat broadened.

Female—Body much wider posteriorly, tapering to head. Anus subterminal. Vulva $\cdot 18$ mm. from posterior end. Eggs thick-shelled, $33\text{--}35\ \mu$ by $24\text{--}25\ \mu$.

The present specimens agree with the limited description of the species given by Linstow (1883), whose specimens came from *Phalacrocorax carbo*, from Central Asia.

Chevreuria australis n. sp.

(Fig. 20-21)

One female 12.3 mm. long, obtained from a marsh tern, *Chlidonias leucopareia*, from Tailem Bend. Two large lips each with anterior projection and two large papillae. Cuticular "collar" extending backwards from level of cervical papillae, .34 mm. from head, for .18 mm. Each of the dorsal and ventral cordons joining laterally on free border of this collar. Cuticle over cordons not striated, but somewhat twisted; inter-cordon area markedly striate. Vestibule .17 mm. long, 5 μ wide except near mouth where it widens. Anterior part of oesophagus .61 mm. long, posterior part obscured by uteri. Tail .36 mm. long, tapering to blunt point. Vulva 6.3 mm. from head end, i.e., just posterior to middle of body. Eggs thick-shelled, 18-19 μ by 30-31 μ .

The species is closely related to *C. revoluta* (Rud.) from *Himantopus*, the distinguishing features of the new species being the unstriated cordons, striated inter-cordon areas, and the rather longer and less conspicuous "collar," or cuticular flap, which characterises the genus. These differences are, however, small.

Cosmocephalus jaenschi n. sp.

(Fig. 22-24)

From *Phalacrocorax carbo*, Tailem Bend. Two males present, about 10.5 mm. long. Lips shallow, each with prominent anterior projection and two large papillae. Rounded cuticular expansion dorsally and ventrally between cordons. Cordons voluminous, scalloped on inner edge, forming immediately after origin on lips a postero-lateral narrow loop about 30 μ long, then continuing back to a point .39 mm. from head; front of recurrent loop .9 mm. from head. Cervical papillae tricuspid, .46 mm. from head end. Vestibule .39 mm. long, 20 μ wide. Anterior part of oesophagus .9 mm., posterior 3.7 mm., in length; nerve ring .45 mm. and excretory pore .53 mm. from head end. Spicules .61 mm. and .15 mm. in length. Caudal alae present, supporting four pairs preanal and five pairs postanal pedunculated papillae, the final pair being stouter than the others. Tail .29 mm. long.

The species resembles *C. capellae* Yamaguti very closely in general features but differs in the lengths of the spicules and in the number of postanal papillae. It differs from *C. aduncus* (Creplin) in the length of the cordons; from *C. asturis* Y. and M. in the shape of the cordons, length of the vestibule and the position of the excretory pore; and from *C. obvelata* (Creplin) in the length of the vestibule relative to the cordons and cervical papillae and in the number of postanal papillae and the relative lengths of the spicules.

Seuratia marina n. sp.

(Fig. 25-27)

From the stormy petrel, *Pelagodroma marina*, from Flinders Island, Bass Strait, coll. Dr. Cleland. Spinous collar and large tricuspid papillae as in *S. shipleyi*; collar with about 34 teeth on each side. Upper border of cervical papillae 130 μ from head in female, 90 μ in male. Hooks on body in four sub-lateral rows, small. Mouth surrounded by six shallow lips, two laterals each with a prominent papilla. Vestibule in female 180 μ long, transversely striated; walls about 5 μ thick, lumen 9 μ wide; in male, 140 μ long. Anterior part of oesophagus .62 mm. long in female, posterior part at least 1.6 mm., its posterior end obscured by other organs. Nerve ring .23 mm., and excretory pore .31 mm., from head end in female.

Male—5.5-6 mm. long; tail with narrow alae supporting two pairs preanal and four pairs postanal papillae. No other caudal papillae observed. Spicules

1.4 mm. and 2.4 mm. in length, longer tapering to a point, shorter more massive with large head and blunt tip.

Female—7.4-8 mm. long, .42 mm. wide. Anus about .1 mm. from rounded posterior end; vulva .4 mm. in front of anus; eggs about $18\ \mu$ by $40\ \mu$.

The species differs from *S. shipleyi* as described and figured by Stossich and by Seurat, in the relative positions of the posterior end of the vestibule and the cervical papillae; in the number of preanal papillae in male; in the position of vulva; and in the absence of a terminal multicuspidate papilla in male.

STREPTOCARA RECTA Linstow

(Fig. 28-29)

This species was taken from *Podiceps poliocephalus* and *P. ruficollis novae-hollandiae*, Tailem Bend. Figures are given of the anterior end of a female to show the vestibule.

ACUARIA (s.l.) sp., larvae

(Fig. 30)

(a) From a marsh tern, *Chlidonias leucoparcia*, from Tailem Bend. Anterior end conical, apparently protected by two cuticular "plates" posterior borders of which are shaped to uncover four submedian papillae. Long vestibule present; oesophagus divided into anterior and posterior parts; nerve ring just posterior to vestibule. Tail tapering, its tip wrinkled and ending bluntly. This larva occurred in the same host as *Chevreuxia australis* described above.

(b) From a Caspian tern, *Hydroprogne caspia strenua*, from Tailem Bend. Appearance identical with (a).

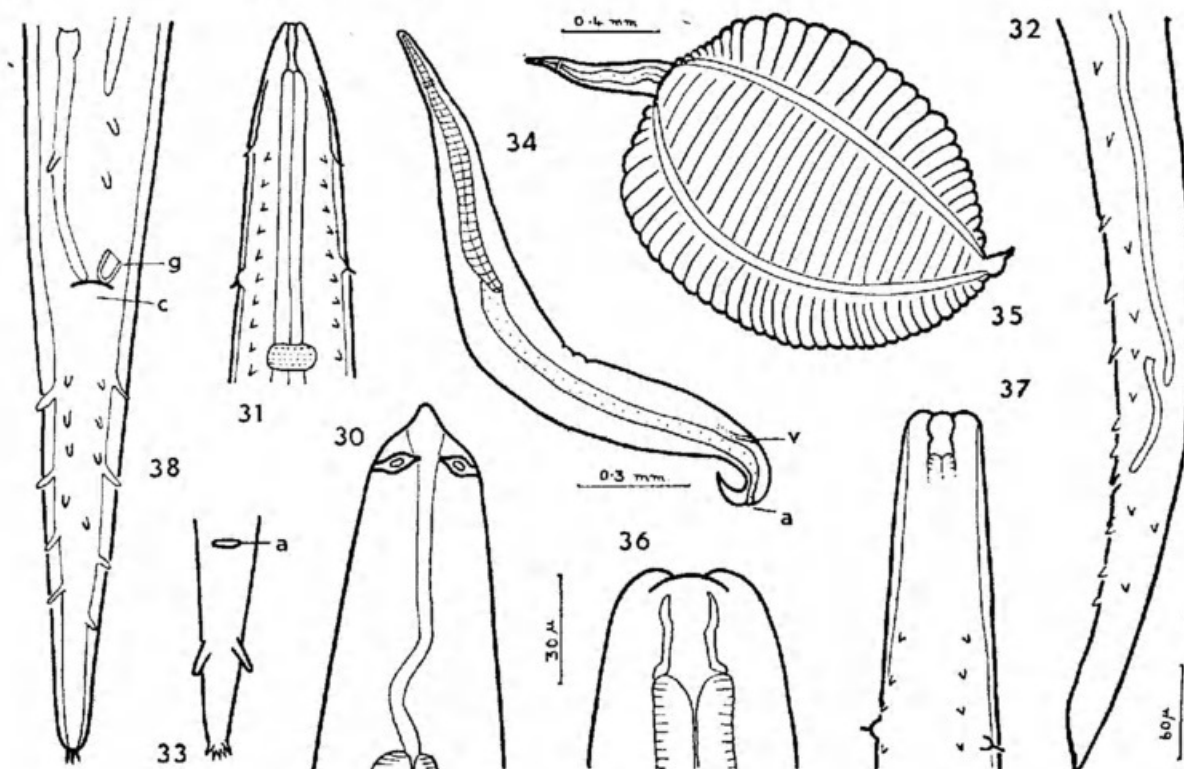


Fig. 30, *Acuaria* (s.l.) larva: from *Retropinna*, anterior end. Fig. 31-35, *Tetrameres biziurac*: 31, anterior end of male; 32, male tail; 33, tail of larva; 34, young female; 35, adult female. Fig. 36-38, *Tetrameres australis*, male: 36, head; 37, anterior end; 38, tail. Fig. 31, 32, 33, 37 and 38 to same scale; fig. 30 and 36. a, anus; c, cloaca; g, gubernaculum; v, vulva.

The larvae found in terns had probably been ingested with small fish.

(c) From a fresh water fish, *Retropinna semoni*, Murray Bridge, South Australia (fig. 30). Appearance identical with (a) and (b).

Although cordons were not seen on any of these larvae, it is possible that the worms are young stages of one of the species of Acuariinae found in birds of the Tailem Bend region. The measurements in mm. of our specimens are given below.

Host		Marsh tern	<i>Retropinna</i>	Caspian tern
Length	- - -	2.65	2.3-2.8	3
Breadth	- - -	.072	.096	.104
Vestibule	- - -	.15	.11	.12
Oesophagus (anterior part)	- - -	.25	.23	.3
Oesophagus (posterior part)	- - -	1.5	—	1.26
Head to cervical papillae	- - -	.19	.15	—
Head to excretory pore	- - -	.22	.18	—
Tail	- - -	.12	.11	.12

SPIRURA (s.l.) sp., larva

From *Pomatostomus superciliosus*, Elwomple (near Tailem Bend). Length 5.68 mm., breadth .24 mm.; anterior end rounded, without lips or papillae. Buccal capsule 80 μ long. Tail .48 mm. long, ending in rounded knob.

Tetrameres biziurae n. sp.

(Fig. 31-35)

From the musk duck, *Biziura lobata*, from Tailem Bend. Material comprises males, females, and fourth stage larvae.

Male—4.2-4.4 mm. long; lateral alae present; in each a long spine bifid posteriorly, its termination .08 mm. from head, a structure apparently similar to that described by Seurat (1918) for *T. fissispina* and suggested by him to be a specific character. Four longitudinal rows of spines beginning at level of tips of the bifid spines, and extending throughout body length. Cervical papillae at slightly different levels, .15 and .16 mm. from head end. Four distinct lips. Buccal capsule 30 μ long, about 4 μ wide. Oesophagus 1 mm. long; nerve ring .2 mm. from head. Tail .15 mm. long, narrowing suddenly near tip. Four ventral and three lateral papillae on each side of tail. Spicules .25-.26 and .07 mm. in length.

Female—Lips not distinguished; buccal capsule more subglobular than cylindrical. Young female: body very little swollen; dimensions as follows: 2 mm. long, .2 mm. wide; oesophagus .8 mm. long; tail .15 mm. long, vulva .22 mm. from posterior end. Two long ventral spines 60 μ from tip of tail, and two terminal spines. Adult female with following dimensions: body longer than wide; narrow projecting anterior part .6 mm. long, posterior part .15 mm. Swollen part 1.5 mm. long, 1.2 mm. wide. Buccal capsule 20 μ long, 10 μ wide at centre, narrower at top and bottom. Swollen part almost entirely filled by saccular intestine containing dark granular material. Vulva at posterior end of swollen part; anus .5 mm. from tip of tail. Eggs not visible.

Larvae—About 2.4 mm. long; no spines on body except group of five at end of tail and two prominent subventral spines 60 μ from tip of tail. Buccal capsule 18 μ long; oesophagus .73 mm. long; nerve ring at .15 mm., and cervical papillae at .09 mm., from head end.

The species is apparently very close to *T. fissispina* (Diesing), differing in the length of the bifid spines as described by Seurat, the length of the buccal

capsule, the position of the most anterior body spines, the length of spicules (shorter than observed for *T. fissispina* by any author), and the size of the female worm. *T. fissispina* has been recorded by Canavan (1931) from the Australian pied goose, *Anseranas semipalmata*, from the Zoological Gardens, Philadelphia, U.S.A.

***Tetrameres australis* n. sp.**

(Fig. 36-38)

From Black Swan, *Chenopsis atrata*, from Tailm Bend. Male worms collected, 7.8-9 mm. long. Lateral alae from .02 mm. behind head to .15 mm. Two rows sublateral spines on each side of body; spines closer together and larger anteriorly, becoming very thin and sparser posteriorly. Spine-like cervical papillae 170 μ behind head; body spines beginning 140 μ from head end. Long bifid spines in lateral alae (observed by Seurat in *T. fissispina*) present in this species, though not so well marked. Head bearing six lips; mouth leading into chitinized buccal cavity 28 μ long, 10 μ wide. Several (3-5 pairs) small teeth on inner side of lateral lips; dorsal and ventral lips with large papillae, others with smaller. Oesophagus 1.7 mm. long. Longer spicule needle-like, proximal end about 30 μ posterior to oesophagus, i.e., length about 5.8-6.3 mm. Shorter spicule wider, .8 mm. long, with blunt tip. Gubernaculum present, 20 μ by 15 μ . Tail .3 mm. long. Body spines anterior to cloaca small and blunt, those posterior modified into papillae and lying in lateral or subventral lines. Tip of tail bearing several (probably five or six) small spines, as described for fourth stage larva of *T. fissispina* and *T. biziurac*. In the relative lengths of the spicule and body, this species comes closest to *T. tetrica* Travassos 1917. It is, however, much shorter than that species, and differs also in the number of caudal papillae in the male.

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