

## ADDITIONAL NEMATODES FROM AUSTRALIAN FISH

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## SUMMARY

Parasites from 12 marine host species (including seven elasmobranchs) and 13 freshwater species (most of them from the Lower Murray River, South Australia, are referred to. Accounts are given of *Terranova galeocerdonis* (Thwaite) from *Orectolobus maculatus* and *Stegostoma tigrinum* from Queensland, and *Sphyrna lewini* from South Australia; larval *Contracaecum* spp., probably larvae of *C. spiculigerum* and *C. bancrofti*, are reported from 13 species of freshwater fish; *C. (Thynnascaris) legendrei* from *Promicrops lanceolatus* (Queensland) and *Caranx georgianus* (South Australia); *Acanthocheilus bicuspis* from *Halaelurus vincenti* (South Australia); larval *Stomachus* sp. (*marinus*) from additional hosts, *Istiompax australis*, *Trachurus declivis*, *Sphyrna lewini* and *Notogaleus australis*; *Goezia fluviatilis* in its larval or adult stage in many species of freshwater fish (Lower Murray River), the larvae often becoming encysted and destroyed in the omentum. *Proleptus urolophi* n. sp. from *Urolophus testaceus* differs from other species in its dentition and in the more anterior position of the vulva. *Capillaria orectolobi* n. sp. is described from *Orectolobus devisi*. *Eustrongylides gadopsis* (probably the larva of *E. phalacrocoracis* from Australian cormorants) is reported from a large number of freshwater fish from New South Wales, South Australia and Western Australia.

The specimens examined were collected chiefly by the senior author, but we are indebted to Professor J. B. Cleland for some from Encounter Bay; Mr. H. M. Cooper for material from *Caranx* and *Trachurus* from St. Vincent Gulf; Mr. G. G. Jaensch for assistance at Tailem Bend; Dr. A. G. Nicholls and Mr. B. Shipway, C.S.I.R.O. Fisheries Division, for Western Australian material; and Mr. J. S. Lake of Sydney for material from trout in New South Wales.

## HOST-PARASITE LIST

## MARINE FISH

- ORECTOLOBUS MACULATUS Bonmatte. *Terranova galeocerdonis* Thwaite, Caloundra, South Queensland.
- ORECTOLOBUS DEVISI Ogilby. *Capillaria orectolobi* n. sp., Port Willunga, S. Aust. This shark is not mentioned by Whitley (1940, 81), but he republished Waite's (1923, 33) figures of it under *O. ornatus halei*, the Gulf Wobbecong.
- STEGOSTOMA TIGRINUM Pennant. *Terranova galeocerdonis* Thwaite, Moreton Bay, South Queensland.
- HALAELURUS VINCENTI Zietz (*Juncrus vincenti* in Whitley, 1940). *Acanthocheilus bicuspis* Wedl, St. Vincent Gulf, S. Aust.
- SPHYRNA LEWINI Griffith. *Stomachus* sp. larva; *Terranova galeocerdonis* Thwaite, Encounter Bay, S. Aust.
- NOTOGALEUS AUSTRALIS Macleay. *Stomachus* sp. larva, Moreton Bay, South Queensland.
- UROLOPHUS TESTACEUS Mull. and Henle. *Proleptus urolophi* n. sp., Sydney district, New South Wales.
- PROMICROPS LANCEOLATUS Bloch. *Contracaecum (Thynnascaris) legendrei* Dollfus, Caloundra, South Queensland.

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- SCIAENA ANTARCTICA Castln. *Contracaecum* (*Thynnascaris*) *legendrei* Dollfus, Caloundra, South Queensland, and Kiama, New South Wales.
- ISTIOMPAX AUSTRALIS Whitley. *Stomachus* sp. larva, Mentone, Port Phillip, Victoria.
- CARANX GEORGIANUS C. and V. *Contracaecum* (*Thynnascaris*) *legendrei* Dollfus, larva, Outer Harbour, St. Vincent Gulf, South Australia.
- TRACHURUS DECLIVIS Jenyns. *Stomachus* sp. larva, Rapid Bay, South Australia.

## FRESHWATER FISH

- MCCULLOCHELLA MACQUARIENSIS C. and V. *Goesia fluviatilis* J. and M., adult and larva, Murray River, South Australia.
- PLECTROPLITES AMBIGUUS Richdson. *Goesia fluviatilis* J. and M. adult and larva, Murray River, South Australia.
- PERCALATES COLONORUM Gunther. *Contracaecum* sp. larva, Murray River, South Australia.
- THERAPON BIDYANA Mitchell. *Goesia fluviatilis* J. and M., larva, Murray River, South Australia.
- TANDANUS TANDANUS Mitchell. *Goesia fluviatilis* J. and M., larva, Murray River, South Australia.
- PSEUDAPHRITIS URVILLII C. and V. *Goesia fluviatilis* J. and M. larva; *Contracaecum* sp., larva; Murray River, South Australia. *Eustrongylides gadopsis* J. and M., larva, Coorong, South Australia. The congolli does not now enter the Murray from the sea because of the barrage near the entrance to the river.
- RETROPINNA SEMONI Weber. *Goesia fluviatilis* J. and M., larva; *Contracaecum* sp., larva; Murray River, South Australia.
- NANNOPERCA AUSTRALIS Gunther. *Goesia fluviatilis* J. and M., larva; *Contracaecum* sp., larva; Murray River, South Australia.
- NANNOPERCA (EDELIA) VITTATA Castln. *Eustrongylides gadopsis*, larva, South-western Australia.
- PHILYPNODON GRANDICEPS Krefft. *Goesia fluviatilis* J. and M. larva, Murray River, South Australia.
- CARASSIOPS KLUNZINGERI Ogilby. *Goesia fluviatilis* J. and M., larva; *Eustrongylides gadopsis* J. and M., larva; *Contracaecum* sp., larva; Murray River, South Australia.
- SALMO TRUTTA Linn. *Eustrongylides gadopsis* J. & M., larva, from various localities in New South Wales.
- SALMO GAIRDNERI. *Eustrongylides gadopsis* J. & M., larva, Blackwood River, Bridgetown, Western Australia; and from various rivers in New South Wales.

The names applied to the species of trout acclimatized in Australia and New Zealand are confusing. The brown trout has been called *Salmo trutta*, *S. eriox* and *S. fario*; the rainbow trout, *S. irideus*, *S. gairdnerii* and *S. gairdnerii gilberti* (McCulloch, Fishes of New South Wales, 1922, 18-19; 1934, 18-19; Mem. Austr. Museum, 5 (1), 1929, 45. Waite, Rec. South Austr. Museum, 2 (1), 1921, 6; The Fishes of South Australia, 1923, 234. Stead, Fishes of Australia, 1906, 33-36. Hobbs, Trout Fisheries of New Zealand, N.Z. Marine Dept., Bull. 9, 1948, 5-6. Also Snyder, The Trouts of California, 1940). Mr. J. S. Lake, Biologist to the Fisheries Branch, New South Wales, in a letter dated 3 August 1950, stated that, until 1946, the river brown and rainbow trout were known as *S. fario* and *S. irideus* respectively; and the sea run types of these two as

*S. trutta* and *S. gairdnerii* respectively; but that they are now regarded as belonging to *S. trutta* and *S. gairdnerii*, whether sea run or not; and these are the only two species which have become acclimatized in Australia. We have accordingly adopted the specific names accepted by Mr. Lake.

TERRANOVA GALEOCERDONIS (Thwaite)

Fig. 1-4

This species, originally described from *Galeocерdo tigrinum* from Ceylon, has now been recognised from two carpet sharks from Southern Queensland, *Stegostoma tigrinum* from Moreton Bay, and *Orectolobus maculatus* from Caloundra, as well as from the hammer-head shark, *Sphyrna lewini*, from Encounter Bay, South Australia.

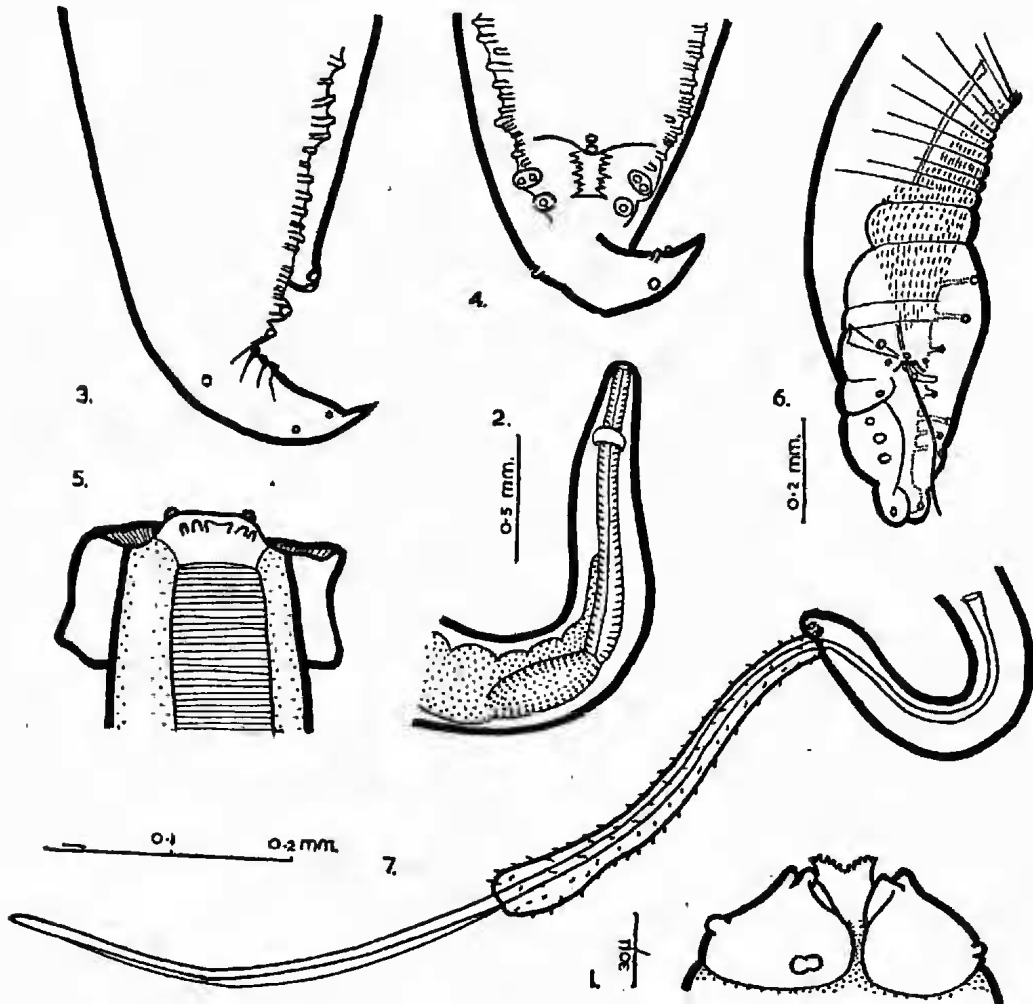


Fig. 1-7

Fig. 1-4, *Terranova galeocerdonis*—1, anterior end; 2, head; 3, lateral, and 4, ventral, views of male tail. Fig. 5-6, *Proleptus urolophi*—5, section through anterior end showing inside of pseudolabium; 6, ventral view of tail of young male. 7, *Capillaria orectolobi*, male tail. Fig. 2, 3, 4 and 6 to same scale (beside fig. 6).

In our material the males are up to 32 mm. in length; the females to 44 mm. The oesophagus is 1:12-14 of the body length, its ventriculus a quarter of the total oesophageal length, and the intestinal caecum about twice the length of the ventriculus. The ratios of these parts are not given by Thwaite, but assuming that the lower figure in each range of measurements given by him refers to the shortest worms, and the higher to the longest worms, the agreement between our specimens and *T. galeocerdonis* is close. The eggs in the Australian specimens are 32-36 $\mu$  in diameter, not 41 $\mu$  as recorded by Thwaite. The form of the postanal structure in the male appears to be that of a cuticularised plaque, the lateral edges of which are prolonged into an irregular series of spines. Of the caudal papillae, there are in our specimens two median preanal situated one behind the other in the projecting lip of the anus, and we were able to detect only two pairs, instead of three, close to the tip of the tail. In spite of these differences we consider that our specimens fall within the species *T. galeocerdonis*.

It may be noted that in some larval *Terranova* sp. studied recently by us from an unknown fish host forwarded by the Australian Museum, the proportions of the parts of the alimentary canal resemble those of this species, and it is possible that they represent its larval stage.

#### CONTRACAECUM spp. (larvae)

Glassy transparent larvae of species of *Contracaecum* s. str., have been found not uncommonly in elongate cysts in the omentum or mesentery of various freshwater fish from the Murray River, between Swan Reach and Tailem Bend. These larvae vary considerably in length due to age. They no doubt belong to *C. spiculigerum* and/or *C. bancrofti* which are common in cormorants and pelicans respectively in the swamps and along the river in the region mentioned. The tail of these larvae is devoid of spines and the oesophagus does not possess a well-defined bulb, thus indicating that it belongs to the subgenus *C.* (*Contracaecum*). The cysts when older tend to become thicker walled and brownish, but they do not usually invest closely the enclosed worms which can move readily within them. We (1947, 551) have already recorded the occurrence of these larvae in *Plectroplites ambiguus*, *McCullochella macquariensis*, *Therapon bidyana*, *Philypnodon grandiceps*, *Tandanus tandanus*, *Galaxias olidus*, *Nannoperca australis*, *Nematalosa erebi*, and *Mugilogobius gowwayi* from the Murray River in the vicinity of Tailem Bend. We now record finding them in *Retropinna semoni*, *Carassius klunzingeri*, *Pseudaphritis urvillii* and *Percalates colonorum* from the lower Murray.

#### CONTRACAECUM (THYNNASCARIS) LEGENDREI Dollfus

This apparently widespread parasite of marine fish is now recorded as occurring in its adult stage in a Queensland groper, *Promicrops lanceolatus*, from Caloundra, South Queensland, and in *Sciaena antarctica* from Caloundra and also from Kiama, New South Wales. Immature worms were found in *Caranx georgianus* from St. Vincent Gulf, South Australia. We (1945, 133) had previously recorded the presence of the larva from the latter species of fish from Tasmania.

#### ACANTHOCHEILUS BICUSPIS (Wedl 1855)

This species is recorded from the cat-shark *Halaelurus vincenti*, from St. Vincent Gulf, South Australia. It has previously been recorded by us (1945, 107) as *A. quadridentatus* (Molin) from *Mustelus antarcticus* from various parts of the Australian coast. We follow Punt (1941) in referring the worms to the specific name, *bicuspis* Wedl.

## STOMACHUS sp. (MARINUS) larvae

The following species of marine fish are added to the long list of hosts from which *Stomachus* sp. larvae are recorded:—the marlin, *Istiompax australis*, from Mentone, Victoria; *Trachurus declivis*, Rapid Bay, South Australia; the hammer-head shark, *Sphyrna lewini*, from Encounter Bay, South Australia; and the school-shark, *Notogaleus australis*, from Moreton Bay, Queensland.

Dollfus (1948) has drawn attention to the fact that the ventriculus may be either straight or sigmoid in the adult stages of *Stomachus*, for which genus he still retains the name *Anisakis*. His host list refers only to adult stages recorded from Cetaceans and Pinnipedes.

## GOEZIA FLUVIATILIS Johnston and Mawson

In our original account (1940, 342) we recorded finding the adult stage of this short plump spiny worm in the digestive tract of *Plectroplites ambiguus*, *McCullochella macquariensis* and *Percalates colonorum* from Taillem Bend; and immature stages in *Nannoperca australis* and *Tandanus tandanus* from Taillem Bend, as well as in *Mogurnda adspersa* from the upper Burnett River, Queensland. Later (1947, 552) we reported it from *Plectroplites ambiguus* from the Thompson River, Central Queensland; and larval stages from *Percalates colonorum*, *McCullochella macquariensis* and *Tandanus tandanus* from Taillem Bend, South Australia.

Larvae have since been found encysted in the omentum and mesentery of the following additional species of fish in the lower Murray region (South Australia):—*Retropinna semoni*; *Carassiops klunzingeri*; *Philypnodon grandiceps*; *Pseudaphritis urvillii*; *Therapon bidyana*; and *Plectroplites ambiguus*. It is of interest to note that both larval and adult stages may occur in the same species of percoid fish, e.g., *McCullochella*, *Percalates* and *Plectroplites*.

The youngest stages seen were found apparently free in the body muscles—perhaps indicating a wandering stage before settling down in their usual habitat in cysts in the omentum. These very small larvae were found in *Carassiops* and *Retropinna*. Another of similar size was found amongst muscle fibres of the teased body of *Philypnodon grandiceps*, but fragments of thin connective tissue were adhering to it, hence it is possible that these tiny worms from the three hosts mentioned may have come from the mesentery or omentum and were in process of becoming encysted. The specimens from *Carassiops* and *Retropinna* were bent dorsally into an open U, while one from *Philypnodon* formed two spirals. The worms from these three hosts measured .87-.97 mm. long, with a maximum breadth of .077-.09 mm. The body was widest in the anterior two-thirds, very gradually narrowing towards the anal region, when the tapering became more pronounced. The very short tail was bluntly rounded. The distance between the anus and the tip of the tail was .055 mm. The lips were well developed, as was the spination on the anterior two-thirds of the body, but the series of spines became very low in the succeeding region, and then practically disappeared, but spines could be seen quite definitely on the ventral surface of the tail. The oesophagus measured 0.158 mm. long (= 1:5.5 of body length), its diverticulum (which is relatively extremely long and about three times the oesophageal length) 0.44 mm., and the short intestinal caecum .03 mm.

The larvae previously described by us were an encysted larva 1.35 mm. long and another 2.8 mm. in length from the omentum of *Nannoperca australis* (Taillem Bend) and *Mogurnda adspersa* (Burnett River, Queensland) respectively.

A degenerating larva from *Tandanus* was coiled within a round, rather flat cyst with its head lying across the rest of the body, the cyst being .31 mm. in diameter, and closely investing the worm. In another from the same host the cyst was more dense, .36 mm. in diameter, and the worm more degenerated.

In the Murray cod, *McCullochella*, we have met with many degenerating cysts on various occasions and usually the enclosed worm is no longer recognisable. The *Goczia* worm or its remnant was seen to be more or less straight, curved, partly coiled or irregular; and the inner part of the cyst was very dense when degeneration was more or less complete. Two small round cysts measured .33 mm. and .44 mm. in diameter, the outer zone consisting of rather clear fibrous tissue, the denser region enclosing the worm being .19 by .16 and .24 by .26 mm. respectively. Much smaller cysts were also present but the identification of the causative worm was not possible. In one case the cyst measured .66 by .17 mm. and the contained worm .46 by .11 mm.; in another cyst .77 by .27 mm., the degenerating worm measured .44 by .28 mm. In other cases the cyst was much longer and was irregular but the parasite could not be recognised and may have belonged to a quite different species.

Similar degenerating *Goczia* cysts were seen in *Plectroplites*, *Therapon bidyana* and *Pseudaphritis urvillii*. The last-named fish, the congoli, is anadromous and is not now found in the Murray River since the barrage at its entrance has been completed, the fish now being found in the neighbouring Coorong.

#### *Proleptus urolophi* n. sp.

Fig. 5-6

From a stingray, *Urolophus testaceus*, from Port Jackson, New South Wales. Numerous specimens are present. Males up to 9.6 mm. in length; females to 17.5 mm. Cuticular collar more or less pronounced according to age and state of contraction of the worm. Pseudolabia each with two external papillae and five internal teeth of which the median is truncated and the two outer pairs conical. The anterior part of the oesophagus is narrower than the posterior; and is .33-.4 mm. long in the male, .4-.5 mm. long in the female, and is surrounded just posterior to the mid-length by the nerve ring. The excretory pore is a transverse cuticularised slit at about the junction of the two parts of the oesophagus. The posterior oesophagus is 1.1-1.3 mm. long in the male, 1.4-1.7 mm. in the female.

*Female*—Tail an elongate cone, usually dorsally directed. Vulva shortly behind oesophageal region, 2.6-3.4 mm. from head. Eggs 20 by 40 $\mu$ , with thick shells.

*Male*—Alae more in the form of bulbous expansions of the cuticle than membranous wings, and not meeting anteriorly or posteriorly. Ventral surface of the precloacal region with longitudinal circular ridges. Three pairs of pedunculate preanal papillae, three median papillae on the anterior lip of the cloaca, four pairs of pedunculate postanal papillae, and almost at the tip of the tail a pair with markedly expanded peduncles. Fig. 6 is of a young male; in older specimens the posterior end is coiled into two or three tight spirals. The shorter spicule is .18-2 mm. long, its tip sometimes protected by a membranous "sheath"; the longer spicule is acicular, about .95 to 1.2 mm. long.

The species appears on general characters of the head and male tail to fall into the genus *Proleptus*. However, the position of the vulva is more forward and the dentition is different from that present in any other species of the genus of which we have seen a description. We have been unable to obtain an account of *P. anabantis* Pearse 1933.

A useful review of the various species attributed to the genus was given by Baylis in 1933. In his description of *P. australis* he states that the host was a "tiger shark" (probably *Galeocerdo tigrinus*) from North Queensland.

***Capillaria orectolobi* n. sp.**

Fig. 7

One whole male and a part of another male worm belonging to the genus *Capillaria* were taken from a carpet shark, *Orectolobus devisi*, from Port Willunga, South Australia. The length of the whole male is 15.3. The cells of the oesophagus are indistinguishable. The oesophageal region, 7.3 mm. long, occupies about half the body length. The alate spicule is 10.1 mm. in length, and its sheath is spinose. The bursa is very small, with one papilla at each side. Bacillary hands appear to be absent from the cuticle.

**EUSTRONGYLIDES GADOPSIS J. and M.**

Additional hosts for the larval stage:—a carp gudgeon, *Carassiops klunzingeri*, from Tailern Bend; congolli, *Pseudaphritis urvillii*, Coorong, South Australia (J. Kimber); western pigmy perch, *Nannoperca (Edelia) vittata*, South-western Australia (B. Shipway); brown trout, *Salmo trutta*, New South Wales rivers; rainbow trout, *S. gairdneri*, Blackwood River, Bridgetown, Western Australia (Dr. A. G. Nicholls); also from the New England area, Macdonald River, Major's Creek (Central Western New South Wales), Sodwalls Creek, Little or Retreat River, Monaro district (especially the headwaters of the Lachlan River), all of these localities being in New South Wales (J. S. Lake). Other Australian fish hosts for the larva have already been recorded by us (1940, 350; 1944, 64; 1047, 548).

The presence of the adult stage, described by us as *E. phalacrocoracis*, in cormorants in New South Wales and Western Australia may be inferred.

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