

OBSERVATIONS ON *CARCINONEMERTES* (NEMERTEA: CARCINONEMERTIDAE) ASSOCIATED WITH THE SMOOTH PEBBLE CRAB, *PHILYRA LAEVIS*.

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(with three text figures)

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The occurrence of a nemertine on the crab *Philyra laevis*, identified as a species of *Carcinonemertes* similar to *C. carcinophila imminuta* Humes, 1942, is recorded. The genus has not previously been reported from Australia. Notes are given on the larval, immature and adult stages.

Key Words: *Carcinonemertes* (Nemertea), *Philyra* (Brachyura), Tasmania

INTRODUCTION

Commensal or parasitic habits are uncommon within the phylum Nemertea. Few true relationships with a host organism have been established and these nemerteans have been found to exhibit physiological, behavioural and morphological adaptations correlating with their hosts way of life (Fleming and Gibson 1981).

The genus *Carcinonemertes* has been found to exhibit definite relationships with its crab hosts. The first actual observations of a direct nutritional and physiological dependence of the nemertean on the host was made by Wickham (1979a). He found *Carcinonemertes errans* feeding on the eggs of the Dungeness crab *Cancer magister* (Wickham 1979a).

The basic outline of the life history of *Carcinonemertes* has long been known. Juvenile worms grow to maturity and reproduce only on female crabs brooding eggs. The degree of infestation is extremely variable and can be very high. Humes (1942) recorded at least 1000 worms in the gill chambers of one crab and Pearse (1949) found an average of 83 worms per host.

Immature worms are generally found between the gill lamellae (Gibson 1972), but in some species they occur on the exoskeleton (Wickham 1979b; Roe 1979). Immature worms in the branchial chamber are encapsulated until the host becomes ovigerous. They then move to the host egg mass to mature. On attaining sexual maturity, *Carcinonemertes* deposits its eggs amongst the host's egg mass.

Once hatched, the larvae either remain amongst the host eggs and feed upon them or leave the host and, displaying positive phototactic

behaviour, swim towards the surface waters. The worms that remain on the original host return to the gill chamber when the eggs have hatched (Gibson 1972).

Within the genus *Carcinonemertes*, 5 species are currently recognised, one of which comprises two varieties. Several host species have been recorded, mostly belonging to the Brachyura (Fleming and Gibson 1981). There has been a single record of a host species within the Leucosiidae (Humes 1942) and *Carcinonemertes* has not been recorded from Australasian waters.

During a survey of parasites of the Smooth Pebble Crab, *Philyra laevis* (Bell) in southeastern Tasmania, by one of us (P.J.B.), worms ascribed to the genus *Carcinonemertes* were found to occur on crabs from several localities. Preliminary observations on these worms are presented in this paper.

MATERIAL AND METHODS

Two sexually mature worms (1♂, 1♀) found on an ovigerous *P. laevis* collected from Great Bay, Bruny Island, Tasmania on the 14th March 1982 were the only mature worms collected during the survey. Numerous immature nemertines were obtained from a sample of 57 crabs collected from Dru Point, Margate, Tasmania, over the period 15th August to 15th September 1982.

Infected and uninfected crabs used in experiments were maintained in filtered, aerated, sea water at 14-15°C. General morphological observations were made on live nemerteans slightly compressed under a coverslip supported with a little vaseline. All measurements were made on live material.

INCIDENCE

P. laevis occurs in shallow water on sands and mud flats throughout southern and south-eastern Tasmania. Specimens infected with *Carcinonemertes* were collected from Great Bay, Bruny Island, and Dru Point, Margate. Other localities at which infection was observed were Barnes Bay, Bruny Island, and Pipe Clay Lagoon.

A 100% infestation was found in the Dru Point population.

Gravid and immature worms were encountered on the host egg mass and immature worms were found on the gills of both male and female crabs. The maximum number of encapsulated worms found on the gills of a crab was 43 and the highest number of ensheathed worms found on a host egg mass was 21.

ADULT

The two sexually mature worms found were red in colour and coiled amongst the host's eggs mass. Each was enclosed in a mucous sheath attached at its anterior end to the sternum of the

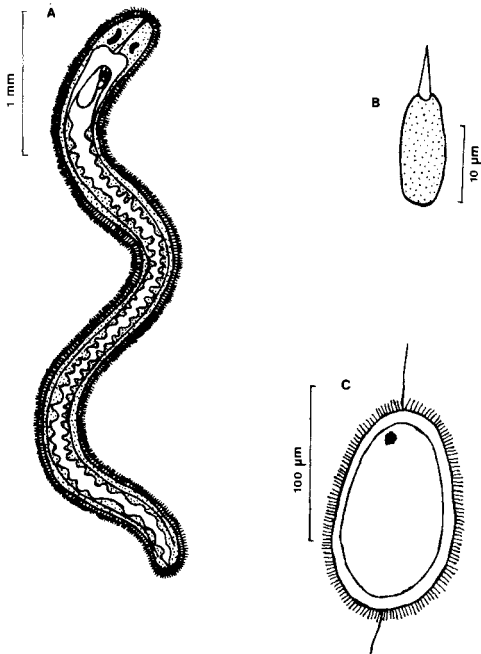


FIG. 1 — *Carcinonemertes* sp. A, adult from egg mass; B, stylet and basis; C, newly hatched larva.

host. The sheaths were slightly longer than the worms and lacked lapilli (fig. 1a,b). Within the sheath enclosing the female were numerous eggs of the nemertine, 62 µm in diameter, most of which were well developed and a few had hatched. The eggs of the host were well developed but none appeared to have hatched.

The following measurements (in microns) were made on these worms after they had been compressed: stylet + basis length, o 22, o 19; epidermis thickness, o 14.2, o 23.7.

LARVA

The newly hatched larva was ovoid and covered with long cilia (fig. 1c). It measured 130 x 52 µm. The anterior and posterior cirri were 30 and 20 µm long respectively. The thickness of the epidermis varied from 8 to 10 µm. An elongated eyespot situated anteriorly, measured 4 µm in length.

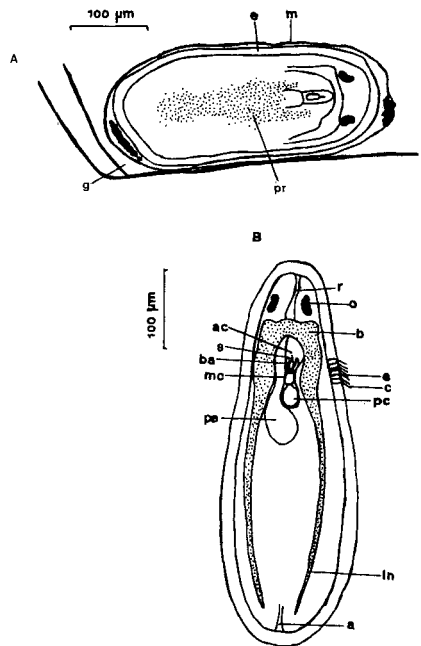


FIG. 2 — *Carcinonemertes* sp. A, encapsulated worm between gill lamellae; B, ventral view of worm removed from mucous capsule; a, anus; ac, anterior proboscis chamber; b, lobe of brain; ba, basis; c, cilia; e, epidermis; g, gill lamella; ln, lateral nerve cord; m, mucous sheath; mc, middle proboscis chamber; o, ocellus; pc, posterior proboscis chamber; pe, posterior part of oesophagus; pr, strongly pigmented region; r, rhynchodaeum.

IMMATURE WORMS

Immature worms (figs 2a,b) were found encapsulated in transparent mucous sheaths, attached to adjacent gill lamellae, in the branchial chamber of both male and female crabs. Capsules were found singly and tended to be more frequent towards the base of gill filaments. Little movement of worms was observed within the mucous capsules. However, if disturbed by the parting of adjacent gill lamellae the capsule would invariably rupture and the worm would immediately become active. Although the shape of the capsule was reasonably constant, the position of the worm within it was variable.

The number of worms present on the gills of individual crabs was highly variable (n, 57; x, 9.8; SD, 8.9; R, 0-43) but appears to show a significant increase with an increase in the carapace size of the host (fig. 3).

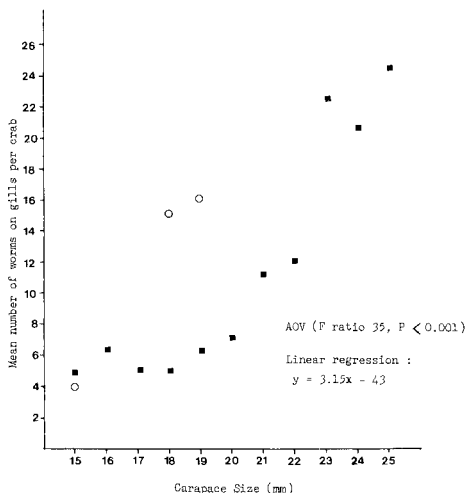


FIG. 3 — *Carcinonemertes* sp. Infection of *P. laevis* related to carapace size; solid squares - male crabs; open circles - female crabs.

The following measurements (in microns) were made on ten immature worms experimentally released from their mucous capsules and observed under slight coverslip pressure: length 520 (360-825); width, 157 (75-281); basis, 17 (13-20) x 5.7 (4.3-6.4); stylet, 5.1 (3.8-6.4); epidermis, 12.2 (11.4-12.9); length of eye, 27 (20-35).

Unsheathed worms were found attached to the sternum and the ventral surface of the abdomen of non-ovigerous mature female crabs. These worms were not sexually mature and appeared to be

dormant. The average length and width of these worms was 1.68mm and 0.4mm, respectively.

Five ensheathed worms, removed from a non-ovigerous host, were placed with eggs detached from an ovigerous crab in a crystal dish filled with fresh sea-water. After 6 hours, 2 worms had shed their mucous sheaths and were actively moving amongst the eggs. No feeding was observed and within 24 hours the worms had re-sheathed. These worms did not again exsheath when transferred to a fresh preparation of sea-water and host eggs.

Sexually immature worms both ensheathed and exsheathed were found in the region of the egg mass of crabs collected during August and September. Exsheathed worms were moving freely amongst the host's eggs. Ensheathed worms were attached to pleopods or the peripheral region of the ventral surface of the abdomen.

Five ensheathed worms removed from pleopods of ovigerous crabs had the following measurements (in microns): length, 3500 (1700-4600); width, 412 (348-464); basis, 16.2 (14.3-18.5) x 5.7; stylet, 4.3.

DISCUSSION

Insufficient information on the morphology of the sexually mature adult prevents a specific identification of these worms being made using Humes' (1942) key to the species of *Carcinonemertes*. However many of the currently recognised species can be eliminated from consideration. Firstly, *C. epialti* Coe, differs from *Carcinonemertes* sp. in that the juvenile worms are found on the exoskeleton of the crab host and not on the gills (Kuris 1978), the eggs are oval, measuring 7 - 7.5 by 6 - 6.5 μ m (Roe 1979) and the basis and stylet are much larger, measuring 27-30 μ m and 12-15 μ m respectively (Humes 1942).

C. errans Wickham also differs from *Carcinonemertes* sp. in that juvenile worms occur on the carapace and not on the gills (Wickham 1980).

Adult worms of *C. mitsukurii* Takakura are brown, light yellow to milky white in colour, the basis is oval, the mean basis length is 27 μ m and the mean stylet length is 8 μ m (Humes 1942). *C. coei* Humes differs from *Carcinonemertes* sp. in that the mucous sheath is several millimetres longer than the body and lapilli, light brown in colour are widely scattered over the surface. The basis is swollen posteriorly and the stylet is longer.

The only other species of *Carcinonemertes* recorded is *C. carcinophila* which has two varieties, *C. carcinophila carcinophila* (Kolliker) and *C. carcinophila imminuta* Humes. The stylet and basis are generally larger in this species than they are in *Carcinonemertes* sp. However the mean sizes of the stylet and basis in *C. c. imminuta* are comparable

with those in *Carcinonemertes* sp. *C. c. imminuta* is known from only three adult worms which were collected off the egg mass of *Persephona punctata aquilonaris* from Grant Island, Louisiana. It is the only species so far recorded from a leucosiid. From the limited information available *Carcinonemertes* sp. shows a close resemblance in morphology, size and life history to *C. c. imminuta*. Further specimens and investigations are needed before a more definite specific identification can be made.

According to Humes (1942) Van Beneden, in a study of the European *C. carcinophila*, found a nemertean 3 - 4 cm long on an endopodite of a mature non-ovigerous crab. However, Humes found no worms on the endopodites of the mature non-ovigerous crabs he examined and concluded that post-reproductive worms probably return to the gills and regress sexually and in size but remain identifiable from immature worms. The sexually immature *Carcinonemertes* sp. found attached to the sternum and ventral surface of mature non-

ovigerous *P. laevis* are easily distinguished from the immature worms found in the branchial chambers. They were never found in the branchial chamber and their presence on mature hosts throughout the non-ovigerous period suggests that after reproducing, *Carcinonemertes* sp. regresses sexually but remains attached to the ventral abdominal region and does not return to the gills.

There does not appear to be a great deal of host specificity within the genus *Carcinonemertes*. Some 20 hosts have so far been recorded for *C. carcinophila* alone. The majority of brachyurans recorded as hosts for *Carcinonemertes* belong to the Portunidae. Humes (1942) attributed this apparent specificity to the habit of these crabs to swim in large numbers near the surface of shallow water enhancing contact with the larvae of the nemertean. The leucosiid, *Philyra laevis* frequently occurs in large numbers in shallow tidal waters in sheltered bays, a habit which would likewise increase the possibility of infestation with *Carcinonemertes*.

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