

Gastrointestinal nematodes of the Perentie, *Varanus giganteus* (Grey) in Western Australia, with Description of a New Species of *Abbreviata* Travassos (Nematoda: Physalopteridae)

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Abstract

Seven species of nematode, all in the family Physalopteridae, were recovered from the gastrointestinal tract of 13 specimens of *Varanus giganteus*. *Abbreviata perenticola* sp. nov. was the dominant species, and is distinguished from *A. hastaspicula*, to which it is similar, principally by the character of the right copulatory spicule. *A. antarctica*, *A. hastaspicula*, *A. kumarinae*, *A. levicauda*, *A. tumidocapitis* and *Skrjabinoptera* sp. were recovered in low numbers (one to five) from between one and three hosts.

Introduction

Physalopteran nematodes in the genus *Abbreviata* Travassos are the predominant gastric worms in the larger varanid lizards in Australia, frequently occurring at high prevalence and intensity (Jones 1983a, b). Apart from a record of *A. confusa* from Hermannsburg in central Australia (Johnston and Mawson 1947), there have been no studies on the gastrointestinal parasites of the Perentie, *Varanus giganteus*, Australia's largest varanid. This lizard has an extensive range in arid areas of the continent, where it inhabits rocky country (Storr 1980). The present paper describes a new species of *Abbreviata* and presents data on the abundance and distribution of this worm, and on the occurrence of six other nematode species, all in the family Physalopteridae, from this host in Western Australia.

Materials and Methods

Worms were examined from 12 *V. giganteus* preserved in the Western Australian Museum, and from one from the CSIRO collection in Canberra. The worms from 10 stomachs had been removed and were forwarded by Dr D. King and the intestines of these lizards, and the full gastrointestinal tract of another three lizards, were subsequently examined. All specimens

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had been fixed in formalin and were stored in 70% alcohol. They were cleaned, cleared for examination in chlorolactophenol, and stored in 70% alcohol with 10% glycerine.

Systematics

Order Spirurida

Family Physalopteridae

Abbreviata perenticola sp. nov.

Figures 1-9

Holotype

Male

WAM 115-84, from *Varanus giganteus* R 81668, collected on west face of Kennedy Range, 24°31'S, 114°58'E, Western Australia, 7.11.1982.

Allotype

Female

WAM 116-84, same data as holotype.

Paratypes

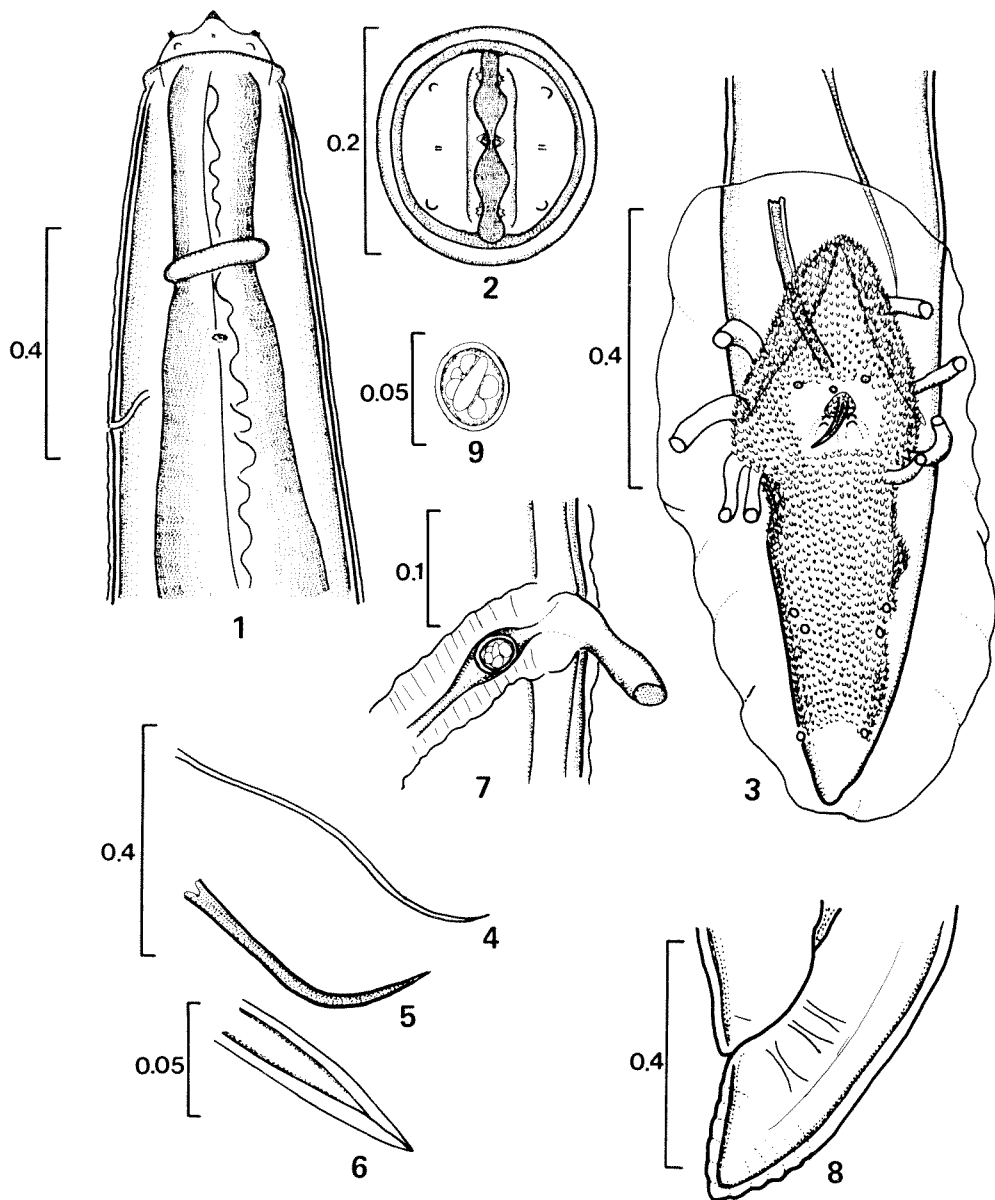
WAM 117-84, 127 adult worms and 28 immature worms, same data as holotype. In addition, adult worms collected from another 10 hosts are assigned to this species, and larval *Abbreviata* from the two remaining hosts (WAM 118-84-128-84).

Diagnosis

Large worms with characters of the genus. Denticles absent from dorsal and ventral oral opening. Male copulatory bursa closely set with tubercles extending to level of posteriormost caudal papillae. Right spicule large, broad at base, heavily sclerotised, curved ventrally at $\frac{1}{2}$ – $\frac{2}{3}$ length, terminating in a broad alate tip without terminal enlargement. Left spicule thin, 1.3-1.5 times length of right, terminating in a fine point. Eggs subspherical, thin-walled, not usually fully embryonated. The character of the right spicule distinguishes this species from *A. hastaspicula*.

Description (Table 1)

Relatively large, white cylindrical worms with fine transverse cuticular striations. Two pseudolabia, each bearing a large apical triangular externo-lateral tooth and a smaller doubled interno-lateral tooth, appearing single in some worms. Bifid submedian tooth present on eminence on dorsal and ventral border of each pseudolabium. No denticles present at dorsal and ventral margins of oral opening or on inner surface of pseudolabia. Cervical collar present. Two sessile papillae and amphid present on external surface of each pseudolabium. Muscular oeso-



Figures 1-9 (1) Anterior end, lateral view, female paratype. (2) Anterior end, *en face*, female paratype. (3) Tail, ventral view, male paratype. (4) Left copulatory spicule, lateral view, male paratype. (5) Right copulatory spicule, lateral view, male paratype. (6) Tip of right spicule, lateral view, male paratype. (7) Vulva, lateral view, female paratype. (8) Tail, lateral view, female paratype. (9) Egg from female paratype.

Table 1 Measurements (mm) of *Abbreviata perenticola* sp. nov.
(Mean values of paratypes in parentheses)

	Male holotype	Male paratypes (N:8)	Female allotype	Female paratypes (N:11)
Length	17.26	16.0-22.0 (17.9)	31.0	26.0-31.0 (29.2)
Maximum width	0.52	0.38-0.62 (0.47)	0.56	0.60-0.76 (0.70)
Muscular oesophagus				
Length	0.39	0.26-0.40 (0.36)	0.32	0.32-0.44 (0.40)
Width	0.14	0.10-0.16 (0.12)	0.15	0.14-0.21 (0.17)
Glandular oesophagus				
Length	2.90	2.56-3.26 (2.91)	3.30	3.30-4.10 (3.62)
Width	0.28	0.19-0.27 (0.22)	0.28	0.24-0.34 (0.31)
Nerve ring*	0.34	0.32-0.38 (0.35)	0.31	0.33-0.45 (0.38)
Cervical papillae*	0.56	0.39-0.62 (0.53)	0.48	0.40-0.66 (0.53)
Excretory pore*	0.66	0.48-0.78 (0.67)	0.58	0.44-0.80 (0.64)
Left spicule (μm)	760	640-800 (740)	-	-
Right spicule (μm)	480	480-560 (520)	-	-
Tail	0.76	0.74-0.88 (0.81)	0.38	0.24-0.38 (0.31)
Vulva**	-	-	0.50	0.80-4.00 (1.72)
Eggs (μm)	-	-	36x32	36x32-40x36 (37x33)

*Distance from anterior end

**Distance posterior to oesophago-intestinal junction

phagus widest anteriorly, surrounded in posterior half by nerve ring. Glandular oesophagus wider than muscular portion, of almost uniform width. Cervical papillae small and pointed, usually just posterior to level of origin of glandular oesophagus. Excretory pore a short distance posterior to cervical papillae.

Male

Caudal alae extensive, meeting ventrally and extending beyond tip of tail, with four pairs of pedunculate pericloacal papillae. Seven sessile pericloacal papillae: three immediately anterior to cloaca, arranged transversely, and two pairs immediately postcloacal. Three pairs of short pedunculate caudal papillae, of which central pair are close to anterior pair. Bursa thick, deep anteriorly, so that edges fold in when tail is extended. Tubercles closely-set, arranged in rows which converge on the cloaca from anterior, and run in 20-25 parallel rows with little diminution in size or density from posterior to the cloaca to the level of the posteriormost caudal papillae. Tubercles absent in zone around the cloaca, demarcated by pericloacal papillae, but present within terminal cloacal canal. Phasmids not visible. Right copulatory spicule thick and well-sclerotised, shaft straight with little decrease in width for about two-thirds its length, then curving ventrally and terminating in a broadly alate tip. Left spicule thinner, sinuous,

approximately 1.3-1.5 times length of right, terminating in fine point, never observed extruding through the cloacal aperture.

Female

Tail short and stumpy. Vulva situated a variable distance posterior to oesophago-intestinal junction. Oviduct long, running posteriorly to large reservoir, thence dividing dichotomously to give four uteri, rarely extending anteriorly to level of vulva. Vulva on a slight prominence, with thin-walled tubular extension, directed posteriorly or at right angles to body wall. In some, usually larger, individuals this extension appeared to have shrivelled back to a thickened ring on the body wall. Eggs thin-walled, subspherical, rarely fully embryonated.

Distribution, Prevalence and Intensity of Infection (Figure 10; Table 2)

All hosts examined except the two smallest contained adult *Abbreviata perenticola*. The two smallest hosts contained larvae only, which cannot be distinguished from other *Abbreviata* spp., but which are assumed to be *A. perenticola*. Few adults were recovered from hosts with a snout-vent length of <300 mm; in hosts with a snout-vent length of >300 mm, adult numbers ranged from 66-926, and larval numbers from 18 to 664. The only exception was the largest host, which was in poor condition when collected (J. Wombey, pers. comm.), and which contained a single adult worm. Highest intensity of infection occurred near the coast (Exmouth and Barrow Island), where *V. giganteus* are relatively numerous (D. King, pers. comm.).

Other Nematode Species Recovered

The following species were also recovered: *A. antarctica* (von Linstow, 1899), one male 134-84 ex. R 28005; *A. hastaspicula* Jones, 1979, three males 133-84 ex. R 87388; *A. kumarinae* Jones, 1978, one male 135-84 ex. R 28005; *A. levicauda* Jones, 1983, two females 130-84 ex. R 28005, one male and four females 131-84 ex. R 84044, two females 132-84 ex. R 87388; *A. tumidocapitis* Jones, 1983, one female 129-84 ex. R 13454; *Skrjabinoptera* sp. Schulz, 1927, three + larvae 136-84 ex. R 84044. *A. hastaspicula* females cannot be differentiated from the females of *A. perenticola*.

Discussion

Taxonomy

Abbreviata perenticola differs from other members of this genus described from Australian reptiles. It is most similar to *A. hastaspicula* Jones, 1979, from which it differs principally in the character of the copulatory spicules. The right spicule in *A. hastaspicula* is similar to that in the present species, but terminates in a pointed enlargement, anterior to which the shaft narrows to a greater extent

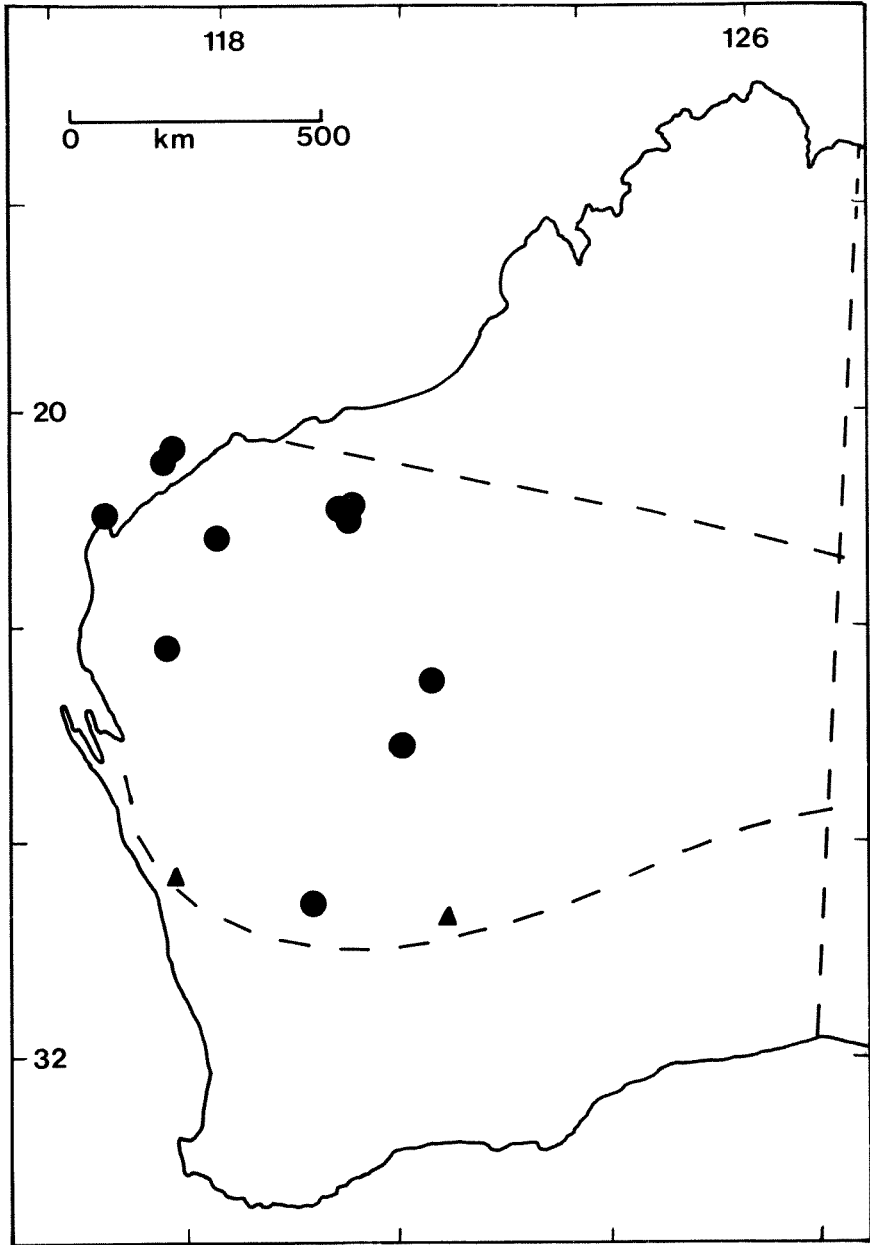


Figure 10 Distribution of *Abbreviata perenticola* sp. nov. infections in *Varanus giganteus* in Western Australia. ● adult worms; ▲ larval worms only. Interrupted line indicates limits of host's range in Western Australia (after Storr *et al.*, 1983).

Table 2 Collection sites, dates and snout-vent lengths of *V. giganteus*, and intensity of infection and accession numbers of *Abbreviata perenticola* sp. nov.

Host WAM No.		Date of collection	Snout-vent length (SVL) mm	<i>Abbreviata perenticola</i>		WAM No.
				adults	larvae	
R 13708	Mt Kenneth	16. 2.61	182	-	3	118-84
R 78177	15 km S of Menzies	13. 4.81	240	-	2	119-84
R 60128	Woodstock Stn	16. 9.63	254	5	-	120-84
R 13454	Woodstock Stn	12.11.59	280	7	1	121-84
R 48959	Barrow Island	18. 7.73	345	66	40	126-84
R 53608	Carnarvon Range	30. 3.76	350	77	81	122-84
R 28005	Barrow Island	23. 7.63	380	381	197	123-84
R 84044	16 km W of Mt Stuart	25. 4.83	405	90	154	124-84
R 52114	Woodstock Stn	17.11.59	450	95	71	125-84
R 81668	W. face of Kennedy Range	7.11.82	480	127	28	115-84
						116-84
						117-84
R 31441	Exmouth	(1965-68)	505	926	664	127-84
R 87388	40 km ESE Pindabunna Homestead	28. 4.84	675	146	18	128-84
R 1782 (CSIRO)	30 km N of Wiluna	-	740	1	-	

than is the case in *A. perenticola*. Furthermore, the left spicule in *A. hastaspicula* is more weakly sclerotised and is shorter than in *A. perenticola*, being little longer than the right; in specimens where the tip of the right spicule is just within the cloacal aperture and not visible, the only certain means of distinguishing these two species is by the length of the left spicule. The area free of tubercles around the cloaca also occurs in *A. hastaspicula* from *V. gouldii*. The appearance of the vulva and the size and thickness of the eggs do not permit differentiation from female *A. hastaspicula*, although the undeveloped nature of the eggs in the reservoir and oviduct is noteworthy. In some hosts *A. perenticola* females grow to a larger size (more than 40 mm) than has been recorded in *A. hastaspicula* (maximum length 32 mm; Jones 1983a). The similarity in morphology between these two species of *Abbreviata* is of interest in view of the close karyotypic relationship between *V. gouldii* (in which *A. hastaspicula* is prevalent) and *V. giganteus* (King and King 1975). The size and form of the copulatory spicules, tubular vulval extension and thin-shelled subspherical eggs distinguish *A. perenticola* from the other species of *Abbreviata* recovered. In addition, *A. antarctica* possesses denticles at the dorsal and ventral oral margins (Irwin-Smith 1922), *A. tumidocapitis* has the anterior end of the oesophagus enlarged, and a more anteriorly-placed vulva, and in *A. levicauda* the ventral medial surface of the male tail is free of tubercles (Jones 1983a).

Biology

V. giganteus grow to a moderate size before infection with *A. perenticola* becomes patent; on present knowledge *A. perenticola* is confined to this host, and the low intensity of infection in smaller hosts probably reflects the low density of this reptile over most of its range (R. Johnstone, pers. comm.); there is thus a lower reservoir from which infection can be acquired.

The Perentie feeds principally on vertebrate species (D. King, pers. comm.), and in this respect differs from the *V. gouldii* complex lizards, in which arthropods comprised 40.5% and 33% of the volume of the stomach contents (Pianka 1970; King and Green 1979). Arthropods are the probable intermediate hosts of *A. perenticola*, and arthropod intermediate hosts may be ingested by the vertebrate prey of the Perentie, and act as paratenic hosts for the parasite. Physalopteran larvae are commonly found encysted within the stomach wall or beneath the peritoneum of many species of snakes (Jones 1978) and smaller lizards (Jones, unpublished); these larvae cannot be identified to species, but if they include *A. perenticola*, this would certainly influence the rate of acquisition and intensity of infection in the definitive host.

Acknowledgements

I would like to thank Dr Dennis King for collecting and forwarding the worms recovered during the course of his own work, Dr Glen Storr and the staff in the

Department of Ornithology and Herpetology in the Western Australian Museum for allowing me to examine material in their care, and for their ready co-operation, and Mr John Wombey for providing me with additional information on the specimen from the CSIRO collection.

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The senior author will receive fifty free offprints of the paper. Additional offprints can be ordered at page proof stage.

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