Rec. West. Aust. Mus. 1983, 11 (1): 1-9

Prevalence and Intensity of *Abbreviata* Travassos (Nematoda: Physalopteridae) in the Ridge-tailed Monitor *Varanus acanthurus* Boulenger in Northern Australia

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Abstract

Four species of *Abbreviata* were recovered from the stomachs of 212 *Varanus acanthurus: Abbreviata hastaspicula* (65% infection), *Abbreviata antarctica* (8% infection), *Abbreviata confusa* (5% infection), and *Abbreviata* sp. (1% infection). *A. hastaspicula* was more prevalent in Western Australia than in the Northern Territory, and occurred at all seasons of the year, with lowest prevalence and intensity of infection from March to May.

A. antarctica was more prevalent in the central parts of the host's range and during the drier season of the year. *Abbreviata confusa* was confined to the more northerly areas, north of 18°S, and was recovered throughout the year. Worm numbers appeared to be unaffected by concurrent congeneric infection. A fourth unidentified species, similar in morphology to *A. tumidocapitis,* was recovered from two host specimens from the Kimberley. Prevalence of infection and worm intensity of *A. hastaspicula* increased with increase in host size; there was a positive correlation between adult and larval numbers in both *A. hastaspicula* ($r:0.576$, $P<0.001$ and *A. antarctica* ($r:0.680$, $P<0.05$), and there was a seasonal correlation between adult and larval numbers in *A. hastapicula.*

Introduction

The Ridge-tailed Monitor, *Varanus acanthurus,* is widespread in the arid and seasonally dry areas of northern Australia, occurring principally among rocky outcrops (Cogger 1975). The biology of this species is still poorly known, and there have been no records of its helminth parasites. This paper reports the results of a study of the prevalence, intensity and geographical distribution of the gastric nematodes in *V. acanthurus.*

Material Examined

During a study of diet and foraging in *V. acanthurus,* D. King collected worms from a large number of preserved specimens in the Western Australian and Northern Territory Museums, and it is this material which forms the basis of the present paper. Worms were collected from the stomachs of 122 specimens of *V. acanthurus* stored in the Western Australian Museum; from 86 in the Northern Territory Museum; and 4 in the Queensland Museum.

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Nematodes Examined

Abbreviata hastaspicula WAM 34-81 – 123-81; NTM Y55-98, QM GL 1573-GL1575
Abbreviata antarctica WAM 124-81 – 129-81; NTM Y99-109
Abbreviata confusa WAM 130-81 – 133-81; 7-82; NTM Y110-114
Abbreviata sp. WAM 8-82; 9-82

As the stomachs had been removed from all hosts (except those from the Queensland Museum) prior to examination, any worms present in either the oesophagus or upper small intestine would not have been recorded and in larger varanid species a significant proportion of *Abbreviata* spp. may occur in these sites (Jones 1983). *Abbreviata* spp. are however predominantly gastric nematodes, and any inaccuracies resulting from their being in other locations are unlikely to invalidate these results substantially.

Methods

All hosts had been preserved in formalin and stored in70% alcohol. Worms were cleaned, cleared in chlorolactophenol and examined under an Olympus BA 211 microscope.

Ecological terms are used according to the definitions of Margolis *et al.* (1982): *prevalence* refers to the percentage of host specimens infected with a parasite species, and *intensity* refers to the number of individuals of a parasite species in each infected host.

Results

Seventy-four per cent of *V. acanthurus* stomachs examined contained nematodes in the genus *Abbreviata* Travassos, belonging to four species. Sixty-five per cent were infected with *Abbreviata hastaspicula* Jones, 1979, 8% with *Abbreviata antarctica* (von Linstow, 1899) (syn: *A. occidentalis),* 5% with *Abbreviata confusa* (Johnston and Mawson, 1942), and 1% with *Abbreviata* sp. Two per cent of lizards contained larval or immature *Abbreviata* spp. only. The prevalence and intensity of adult and larval infections are shown in Table 1. In addition, two hosts from the Prince Regent National Park were infected with one female and one immature unidentified spirurid nematode.

Table 1 Prevalence and intensity of adult and larval *Abbreviata* species in *V. acanthurus.*

Species	Prevalence (N:212)		Intensity of Infection		Single Species Infections		Concurrent Infections (2 Spp)		Associated* Larval/Immature Prevalence		Larval/immature* Intensity	
	No.	%	Mean	Range	No.	%	No.	%	No.	%	Mean	Range
A. hastaspicula	137	64.6	21.8	1-151	121	88	16	12	92	76	14.5	1-137
A. antarctica	17	8.0	15.1	1-159	9	53	8	47	6	66	5.6	1-13
A. confusa	10	4.7	14.1	1-74	4	40	6	60	2	50	0.5	0-2
Abbreviata sp.	2	1.0	2.0	1-3	0	–	2	100	–	–	–	–

* In single species infections only.

Abbreviata hastaspicula was the most prevalent species. Infections occurred throughout the range of *V. acanthurus* (Figure 1a), in all months of the year (Figure 2a). Prevalence of infection increased with the size of the host to a snout-vent length (SVL) of approximately 120 mm, and then became constant, (Figure 3a). Prevalence of high intensity infection (>20 adult worms) also increased with host size, to an SVL of approximately 180 mm, but decreased in larger hosts (Figure 3a). Almost half the lizards (47%) infected with this species had an intensity of ten worms or less (Figure 4). Female worms (N: 207) were measured from 25 hosts; their mean length was 18.8 mm (σ4.85, range 9-32 mm). There was no relationship between worm size and intensity of infection. Seasonal abundance of larval and immature forms correlated closely with numbers of adults (Figure 5), and there was a positive correlation between increasing adult and larval numbers (r:0.576; $P < 0.001$). More than half the *A. hastaspicula*-infected lizards which contained larvae had an intensity of < six larvae. There was no significant difference ($P > 0.05$) between numbers of *A. hastaspicula* in single species infections, and in those with concurrent infections of *A. antarctica*, or *A. confusa*.

Abbreviata antarctica infection was more prevalent in the Northern Territory than in Western Australia (X^2, $P < 0.01$), (Figure 1b). Sixteen of the seventeen infections occurred during the drier months of the year, from April to October (Figure 2b). Intensity of infection with this species appeared to be unaffected by concurrent *A. hastaspicula* infection; there were no concurrent *A. confusa* infections. There was a positive correlation between increasing adult and larval numbers (r:0.680; $P < 0.05$).

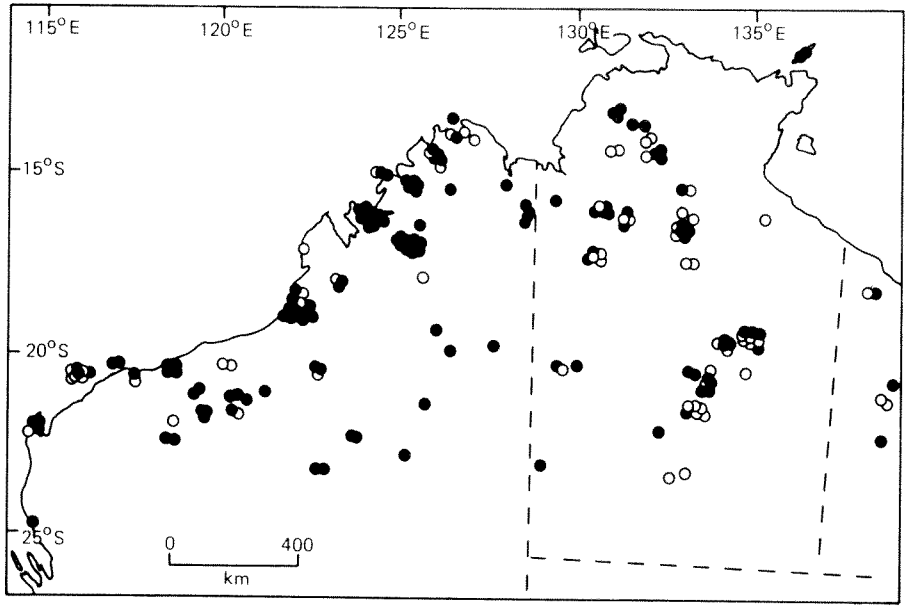

Figure 1a Geographical distribution of *A. hastaspicula* infection in *V. acanthurus* (O no infection; ● infection present).

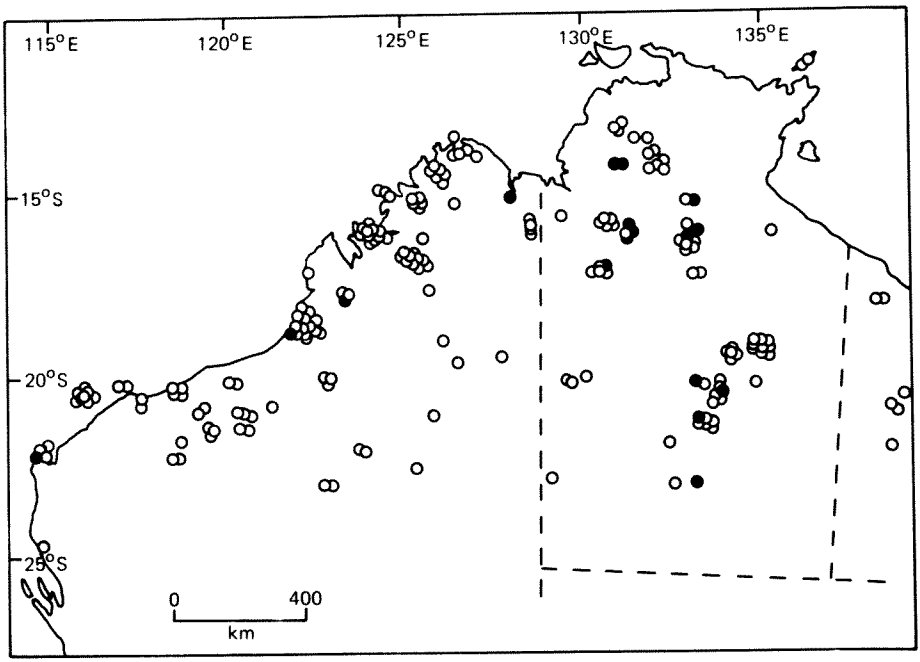

Figure 1b Geographical distribution of *A. antarctica* infection in *V. acanthurus*. (Symbols as in Figure 1a.)

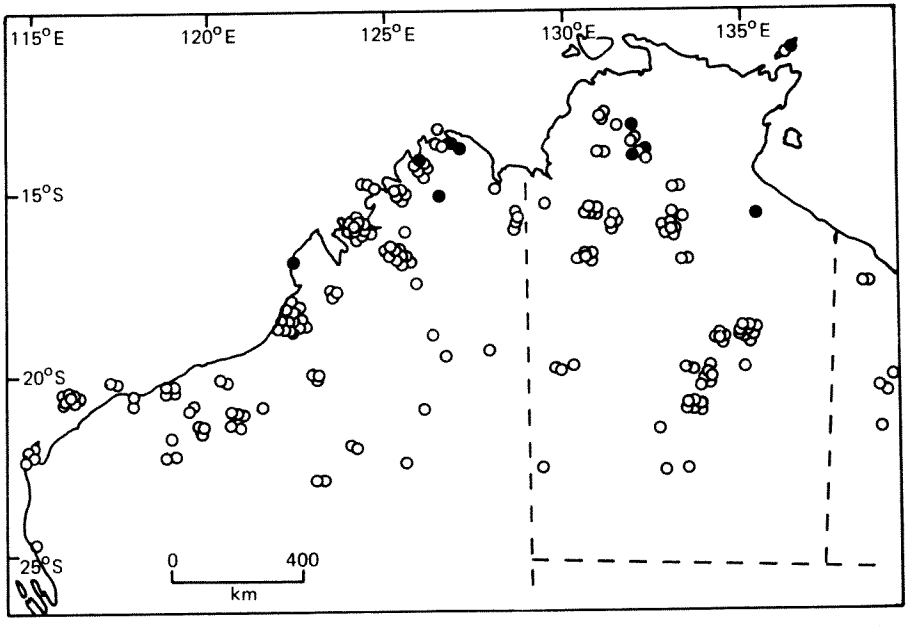

Figure 1c Geographical distribution of *A. confusa* infection in *V. acanthurus*. (Symbols as in Figure 1a.)

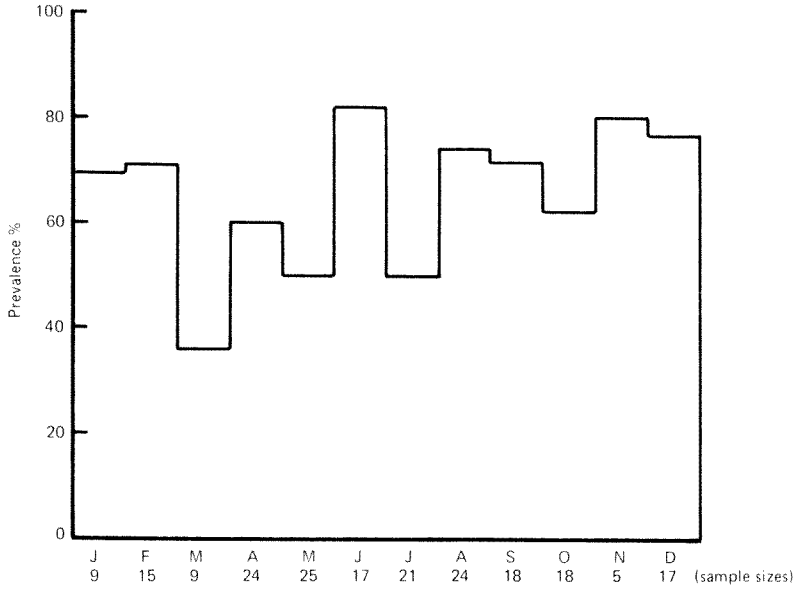

Figure 2a Seasonal prevalence of adult *A. hastaspicula* infection in *V. acanthurus*.

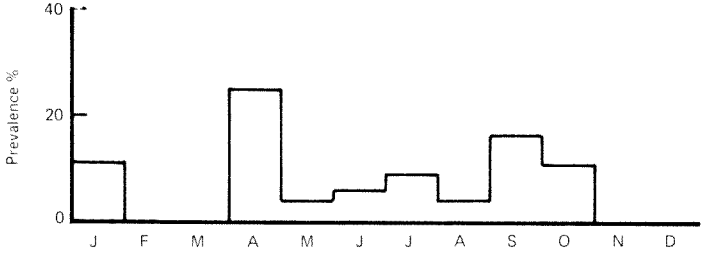

Figure 2b Seasonal prevalence of adult *A. antarctica* infection in *V. acanthurus*.

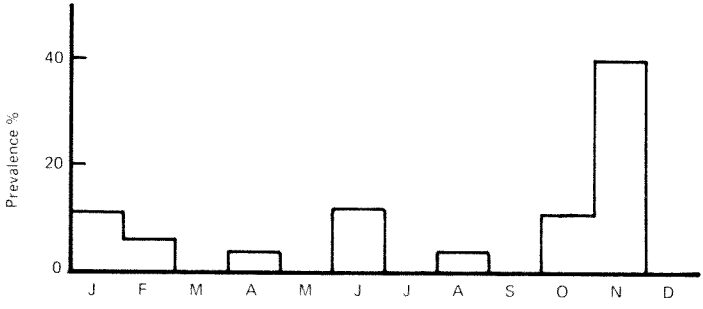

Figure 2c Seasonal prevalence of adult *A. confusa* infection in *V. acanthurus*.

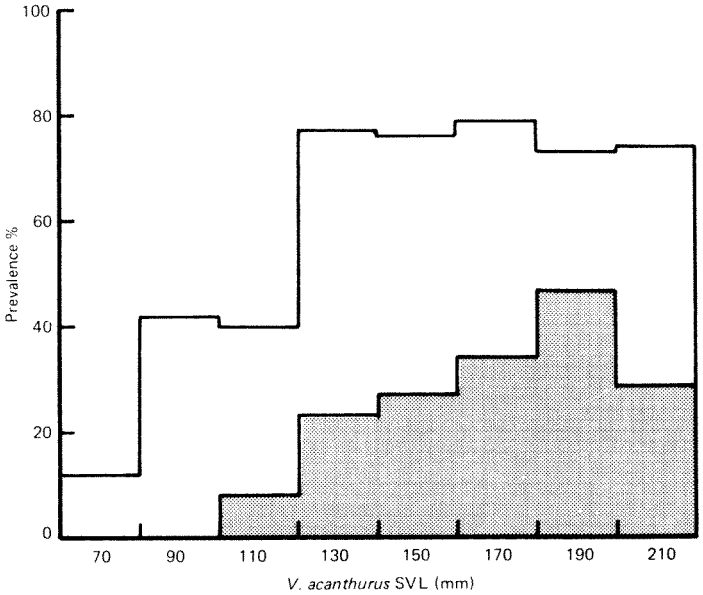

Figure 3a Prevalence of adult *A. hastaspicula* infection (open), and prevalence of infection with >20 adult *A. hastaspicula* (shaded) in relation to host size.

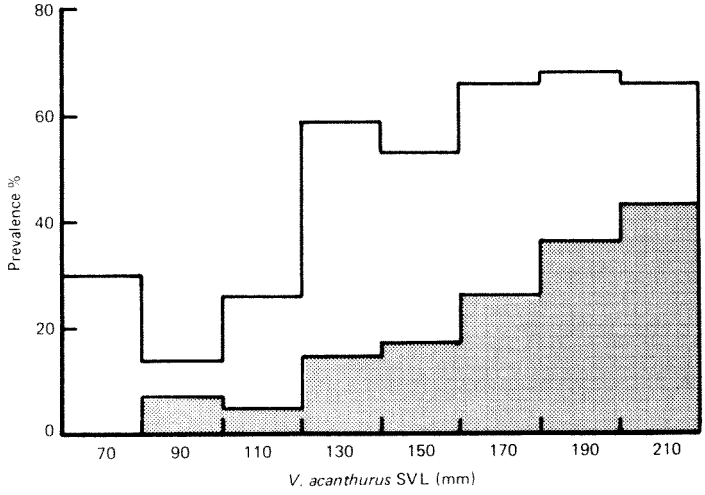

Figure 3b Prevalence of larval *Abbreviata* spp. infection (open) and prevalence of infection with >10 *Abbreviata* spp. larvae (shaded) in relation to host size.

Abbreviata confusa was only recorded from the northern part of the range of *V. acanthurus*, north of 18°S, where the mean annual precipitation is >50 cm (Figure 1c). There was no clear seasonality in occurrence of infection (Figure 2c), although more data

are needed to confirm this. Intensity of infection was unaffected by concurrent *A. hastaspicula* infection.

Fifty per cent of *V. acanthurus* contained *Abbreviata* spp. larvae in their stomachs. Prevalence of larval infection increased with host size to an SVL of approx. 170 mm, and then became constant. Prevalence of moderate intensity larval infections (>10 worms) increased throughout the size range of the host (Figure 3b).

Two hosts from the Prince Regent National Park in the Kimberley were infected with one male, and with two females and an immature, of a form very similar to *A. tumidocapitis* Jones, 1983. The females had a tubular vulva similar to that in *A. hastaspicula*, but in both specimens the eggs were infertile and distorted and could not be examined. Both infections were concurrent with *A. hastaspicula*.

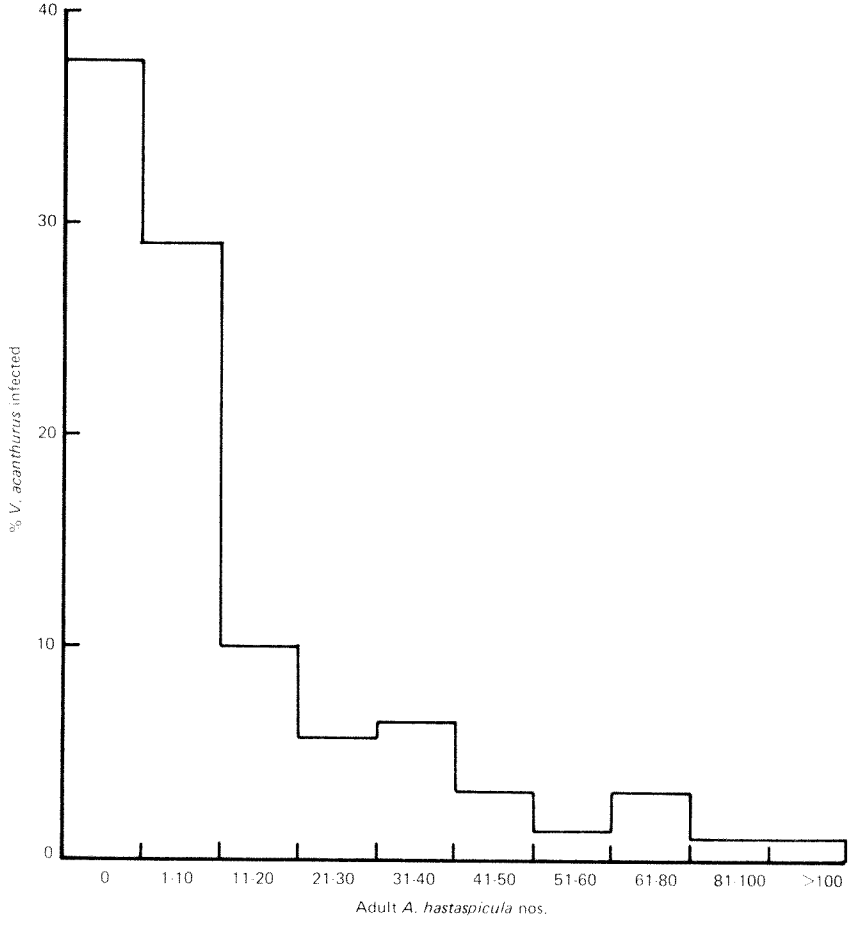

Figure 4 Prevalence and intensity of *A. hastaspicula* infection in *V. acanthurus*.

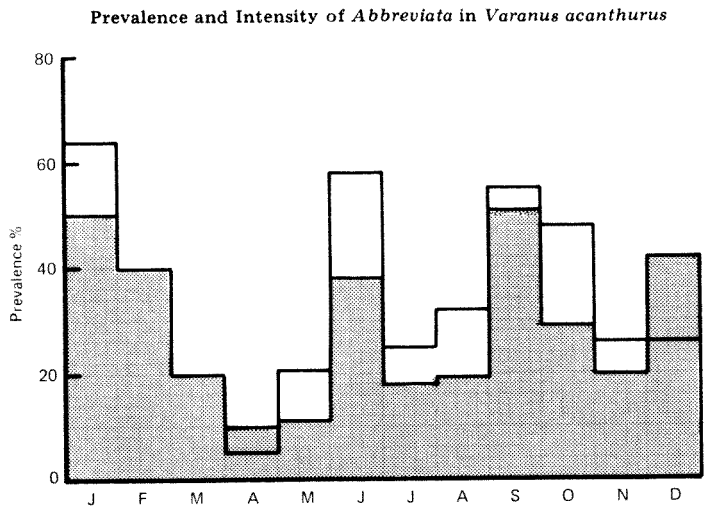

Figure 5 Seasonal prevalence of >20 adult *A. hastaspicula* (open) and >10 larval *Abbreviata* (shaded); single species infections only.

Discussion

This investigation demonstrates that *Abbreviata* spp. are the predominant gastric nematodes in *V. acanthurus* throughout the geographical range of the host. The three described species recorded in this monitor occur in other reptile species in Western Australia (Jones 1978, 1983) although their full geographical distribution and host specificity are not yet known.

Physalopterid nematodes require an arthropod intermediate host for the completion of their life cycles, but the invertebrate species involved, and other details of their life cycles, have not yet been studied in these species of *Abbreviata*. The geographical distribution of the species recorded in *V. acanthurus*, and the seasonality in occurrence of *A. antarctica*, probably reflect differences in their respective intermediate hosts, but may result from the differential survival of their eggs in the external environment. The diet of *V. acanthurus* specimens examined in this study consisted almost entirely of small lizards and invertebrates, two-thirds of the total food items comprising grasshoppers (44%), beetles (17%) and cockroaches (6%) (King, in press); there was no seasonality in occurrence of these insect groups. It is probably among the cockroaches and scavenging beetles that a search should be made for the intermediate hosts of these worms. The positive correlation between numbers of adult and larval *A. hastaspicula* is difficult to explain on the available data. The close similarity between adult and larval numbers throughout the year indicates that there is no seasonal maturation in this species.

Future studies are needed on the identity and distribution of intermediate hosts, on the longevity of the worms, and on possible immune mechanisms in the reptilian hosts in order to elucidate more of the biology of these species of *Abbreviata*.

Acknowledgements

I am grateful to Dr Dennis King for collecting and forwarding the worms recovered during the course of his own work, and to Ms J. Covacevich for allowing me to examine reptilian hosts from the Queensland Museum. Dr G.M. Storr and G. Gow also agreed that the worms from the lizards in their collections could be used for this study. Financial support was received from the ARGS.

References

Cogger, H.G. (1975). *Reptiles and Amphibians of Australia.* 1-584. (A.H. & A.W. Reed, Sydney.)

Jones, H.I. (1978). *Abbreviata* (Nematoda: Physalopteroidea) from Western Australia snakes. *Aust. J. Zool.* **26:** 789-807.

Jones, H.I. (1983). *Abbreviata* (Nematoda: Physalopteroidea) in lizards of the *Varanus gouldii* complex (Varanidae) in Western Australia. *Aust. J. Zool.* **31:** 285-298.

King, D. (In press.) The diet and foraging strategy of *Varanus acanthurus. Copeia.*

Margolis, L., Esch, G.W., Holmes, J.C., Kuris A.M., and Schad, G.A. (1982). The use of ecological terms in parasitology (Report of an *ad hoc* Committee of the American Society of Parasitologists), *J. Parasitol.* **68:** 131-133.

Received 14 July 1982 Accepted 28 March 1983 Published 14 November 1983