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# Gastric nematodes from the Plains Goanna, *Varanus spenceri* (Reptilia: Varanidae), from central Queensland.

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## ABSTRACT

Three species of nematode, *Abbreviata hastaspicula*, *A. tumidocapitis* and *Hastospiculum* sp. were recovered from *Varanus spenceri*. The two species of *Abbreviata* occur commonly in related varanid species which inhabit the dry hot interior of Australia. Despite differences in habitat and behavioral ecology between *V. spenceri* and other large sympatric species of *Varanus*, the wide range of prey taken by large species of *Varanus* lizards precludes inferring the arthropod intermediate hosts of these nematodes. □ *Varanus spenceri*, *Abbreviata*, *Hastospiculum*, locusts, Australia.

*Varanus spenceri* is a large lizard with a total length in adults of 1.0 to 1.25 m (Cogger, 1992), and, despite its size, is probably the least known of the large Australian varanid lizards (Lemm & Bedford, 2004). It is confined to the black soil country of western Queensland and the Barkly Tablelands of the Northern Territory, where perennial Mitchell Grass (*Astrebla* spp.) is the dominant vegetation. *Varanus spenceri* is a shy species which readily takes refuge in deep cracks in the dry soil. Studies on the parasites of other large species of *Varanus* from the arid Australian inland have shown that *Abbreviata hastaspicula* is the dominant gastric nematode (Jones, 1983a, 1983b, 1988). Apart from an identification of *A. hastaspicula* from a road-killed *V. spenceri* (Woolley *et al.*, 2010), there have been no reports on the helminth parasites of this large species. I undertook this study to determine whether the nematode fauna differed significantly from that in related species (*V. gouldii*, *V. panoptes*), and to investigate whether its restricted and specialised habitat, and hence its diet, exercised a discernible influence on this fauna.

## MATERIALS AND METHODS

The gastro-intestinal tracts of 14 *Varanus spenceri* held in the Queensland Museum were dissected (QM Accession nos. J15694, J15695, J21656\*, J24535, J41654, J47127, J58096, J60593, J60712, J63898, J66732, J74893\*, J75043 and J86146\*; the three marked with an asterisk had no gastric nematode infection). Nematodes from another three specimens provided by Dave Spratt, Ian Beveridge and Pat Woolley. Nematodes recovered were cleaned and cleared in lactophenol and examined under a BA series Olympus microscope. Ecological terms used follow the definitions of Bush *et al.* (1997). All specimens (nematode accession numbers: G233510-G233526) have been returned to the Queensland Museum.

## RESULTS

Three species of nematode were recovered. Nematode infections occurred in 14 out of 17 specimens examined (88%). Adult *Abbreviata hastaspicula* occurred in 14 hosts (82%), at an

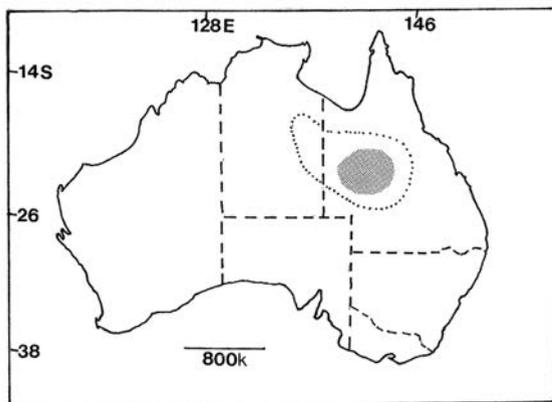


FIG. 1. Map of mainland Australia, showing distribution of *Varanus spenceri* (dotted outline), and area from which specimens studied were collected (shaded area).

intensity of between 1 and 213 (mean 56), and *A. tumidocapitis* in four (23.5%; intensity 2-5). In addition one host was infected with 15 immature *A. tumidocapitis*. One host contained one male and three incomplete female *Hastospiculum* sp. Four specimens infected with *A. hastaspicula* also contained physalopterid larvae in the stomach lumen; there were no larvae encysted in host tissues. All four infections with *A. tumidocapitis* occurred concurrently with *A. hastaspicula*, which with one exception was present at a higher prevalence than *A. tumidocapitis*.

**Host Size and Infection.** Lizard snout-vent length (SVL) ranged from 205-510 mm (mean, 360 mm). Three lizards had a snout-vent length <300 mm. There were no relationships between host size and intensity of either *A. hastaspicula* (significant regression,  $p=0.2283$ ), or *A. tumidocapitis* ( $p=0.1928$ ).

**Host Diet.** Ten of 14 stomachs contained food residues. Four contained scanty plant material (grass stems and one ball of plant fibers), six contained orthopteran remains; spur-throated locusts, *Austracris* sp, and *Lagoonia* or *Yrrhapta* spp. were identified in one host each, and one contained a large centipede and a caterpillar. One contained immature bird feathers, and the lizards *Tympanocryptis* sp. and *Ctenotus* sp. and

scanty vertebrate bones were identified from one host stomach.

**Locality** (Fig. 1). All 17 *V. spenceri* were recovered from central-western Queensland, where Mitchell grass (*Astrelba* spp.) is the dominant vegetation.

## DISCUSSION

*Abbreviata hastaspicula* and *A. tumidocapitis* have been reported from ten other species of tropical and arid-zone *Varanus* lizards, and appear to be confined to this host genus (Jones, unpub.). They are most frequent in *V. gouldii*, *V. acanthurus* and *V. panoptes* (Jones, 1983a, 1983b, 1988, 1995). The gastric nematode fauna of *V. spenceri* is thus similar to that of other large, closely-related *Varanus* spp. which inhabit the same climatic region, and in which these nematode species occur at comparable prevalence and intensity; five of six *V. gouldii* and one *V. panoptes* examined from Mitchell grassland areas of central Queensland, sympatric with *V. spenceri*, were infected with 9-248 adult *A. hastaspicula*; that with the highest infection was also infected with a single *A. tumidocapitis* (Jones, unpublished). Valentic & Turner (1997), in examining a road-killed *V. spenceri*, recorded a number of small live transparent nematodes (20-25 mm in length) located inside the oesophagus, on the *Ctenotus joanae* (Scincidae) prey items, and in the intestines; these were not identified, but may have been *A. hastaspicula*.

*Varanus spenceri* is a burrowing species confined to relatively treeless *Astrelba* spp. grasslands in central Queensland and the adjacent Northern Territory, where it feeds on other smaller reptiles, small mammals such as *Rattus villosissimus*, and invertebrates (Pengilley 1981; Jackson & Lemm 2009). Orthoptera, including plague locust species, are frequently reported in the diet of *V. spenceri* (Valentic & Turner 1997; Woolley *et al.* 2010). They occurred in 6/14 lizards dissected in the present study, often as the sole prey species.

*Astrelba* spp. grasslands (Mitchell Grass) cover about 450 000 km<sup>2</sup> of inland tropical and subtropical Australia, primarily in western and central Queensland (Orr 1975). These grassy plains are the primary habitat of the Australian

plague locust (*Chortoicetes terminifera*) (Anon. 2009a), from where most plagues originate (Wright *et al.* 1988). Nine of ten lizards whose date of collection was recorded (1971 to 1998), were collected in seasons of localised or major outbreaks (Anon. 2009b). There was no discernible relationship between locust plague years and intensity of *A. hastaspicula*. Neither the time to reach maturity nor the longevity of *Abbreviata* spp. nematodes are known, and in view of the wide range of prey taken by *V. spenceri*, the relevance of the periodic preponderance of migratory locusts in the diet of these lizards cannot be determined. Orthoptera can be intermediate hosts for *Abbreviata kazachstanica* (Kabilov, 1980), and the cockroach *Blatella germanica* for *Abbreviata caucasica* (Poinar & Quentin 1972), but no life cycles of physalopterid nematodes in Australia have yet been elucidated. In the Great Victoria Desert only 7% of *V. gouldii* contained identifiable orthopterans in the stomach (Jones 1995), and in that study epidemiological evidence suggested that termites may have a role as intermediate hosts for arid-zone species of larger species of *Varanus* lizards. However, the black soil country which *V. spenceri* inhabits is almost devoid of termites (Watson & Gay 1991). Larger *Varanus* lizards are opportunistic feeders and take a wide range of largely vertebrate prey (Pianka 1994), many smaller reptiles acting as paratenic hosts for physalopterid nematodes (Jones 1995). Therefore, despite marked differences between the behavioral biology of *V. spenceri* and other species of large sympatric species of *Varanus*, a relatively wide range of arthropod species may be implicated as intermediate hosts for these nematodes.

The third nematode species, recovered from a road-killed lizard, comprised one complete male and three incomplete female *Hastospiculum* sp., but they were in poor condition and could not be confidently identified to species. *Hastospiculum gouldi* has been recorded from several species of *Varanus* in Australia (Yorke & Maplestone 1926; Baylis 1930; Jones 1988) and *H. drysdaliae* from the elapid snake *Drysdalia coronata* (Jones 1980). This is the first report of *Hastospiculum* sp. from *V. spenceri*.

These observations illustrate that despite the discrete and specialised habitat of *V. spenceri* and the preponderance of species of plague locusts in the diet, many other prey species may be taken, and thus nothing can be firmly inferred as to the intermediate hosts of these nematodes.

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