

ASCARIDOID NEMATODES OF AMPHIBIANS AND REPTILES : *RAILLIETASCARIS* N. G.

J. F. A. SPRENT

SUMMARY. Ascaridoid species occurring in lizards and previously included in *Ampliscaecum* are relegated to a new genus whose morphological features are defined. In spite of some diversity in relative length of spicules among the specimens examined, this was not correlated with host, location, or with existing species names. Accordingly, one species (*R. varani*) is recognized, other species names (*iguanae*, *monitor*, and *mackerrasae*) are regarded as synonyms.

Nématodes Ascarides d'Amphibiens et de Reptiles : *Raillietascaris* n. g.

RÉSUMÉ. Les espèces d'Ascarides parasites de lézards placées précédemment dans le genre *Ampliscaecum* sont transférées dans un nouveau genre dont les caractéristiques morphologiques sont définies. Une certaine diversité a été observée chez les spécimens examinés dans la longueur relative des spicules par rapport à la longueur du corps, mais cette diversité est indépendante de l'hôte, de l'origine géographique, et du nom attribué à l'espèce. En conséquence, une seule espèce (*R. varani*) est reconnue, les autres taxons (*iguanes*, *monitor*, et *mackerrasae*) sont considérés comme des synonymes de *varani*.

Introduction

In a previous publication (Sprent, in press *a*) several species formerly placed in the genus *Ampliscaecum* were listed. Those reported in lizards were *A. involuta* (Geddoelst, 1916), *A. varani* Baylis and Daubney, 1922 ; *A. schoutedeni*, Baylis, 1940 ; *A. alatum* Baylis, 1947 ; *A. monitor* Khera, 1954 ; *A. mackerrasae* Thomas, 1959 ; *A. iguanae* Wahid, 1961. Of these, *A. varani*, *A. schoutedeni* and *A. alatum* were placed in *Orneoascaris* by Le Van Hoa (1960) and *A. involuta* was made a synonym of *O. chrysanthemoides*. Recently the present writer (Sprent, 1983) has placed *alata* in the genus *Freitasascaris* and confirmed (Sprent, in press *a*) that *involuta* and *schoutedeni* belong in *Orneoascaris*.

Department of Parasitology, University of Queensland, Brisbane, Australia 4067.

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The present paper is concerned with the species *varani*, *monitor*, *mackerrasae* and *iguanae*, comprising those specimens whose morphological features place them in category D as listed by Sprent (in press, a).

The type material of the species, or the original description in the case of *A. monitor*, (because the type material was not available), indicate that they share the following features : (1) posterior angles of lips prolonged into distinct 'pillars', i.e. ridges extending posteriorly from their posterior corners (*Plate I, 2*); (2) shallow interlabia interconnected by a membranous collar (*Plate I, 1*); (3) cuticle in lateral region of anterior part of body raised into narrow alae (*Plate I, 3*); (4) intestinal caecum present (*Plate I, 4*); (5) more than 20 precloacal papillae (*Plate I, 6*); (6) subdorsal postcloacal papillae present on each side of tail of male in addition to subventral postcloacal papillae (*Plate II, 7*); (7) relatively small eggs.

Because the type of *Amplicaecum* (*A. colurum*) has been transferred to *Orneoascaris*, and as redefinition of the latter genus by Sprent (in press, a) precludes their inclusion in *Orneoascaris*, and as there is no other genus into which these species can be placed, it is appropriate to establish a new genus to include them. The proposed genus is defined below. Material examined was listed previously (Sprent in press a).

Raillietascaris new genus (named for Professor A. Railliet)

Small to medium-sized forms, with characters of Ascaridoidea as defined by Chabaud (1965). Lips with denticles all around margins, oral groove present, posterior angles of lips forming 'pillars'; labial pulp deeply cleft anteriorly, median lobe absent. Interlabia present, joined to isthmus of lips by collar. Cervical alae present. Excretory pore near nerve ring, excretory system with bilateral posterior filaments. Ventriculus absent. Oesophageal gland nuclei enlarged, situated in respective oesophageal sectors. Intestinal caecum present. Vulva anterior to middle of body. Two uterine branches. More than 20 precloacal papillae, postcloacal papillae comprise subventrals and subdorsals. Spicules alate. Precloacal cuticular ornamentation absent.

Raillietascaris varani (Baylis and Daubney 1922) new combination

Synonyms : *Amplicaecum varani* Baylis and Daubney, 1922

Orneoascaris varani (Baylis & Daubney, 1922) Le-Van-Hoa 1960

Amplicaecum iguanae Wahid, 1961

Amplicaecum monitor Khera, 1954

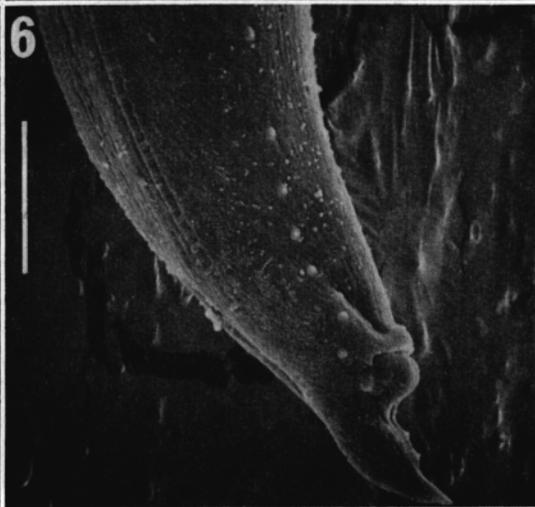
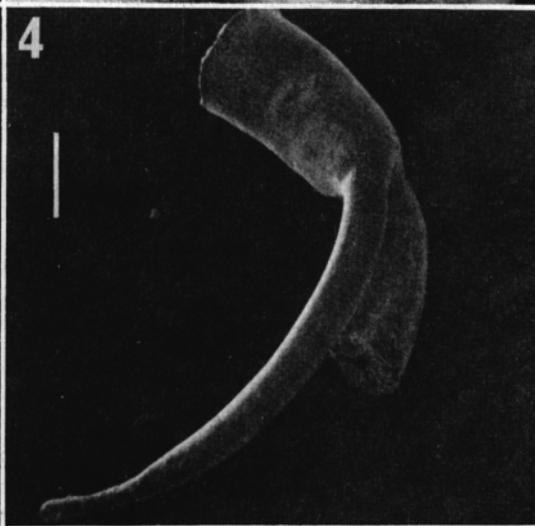
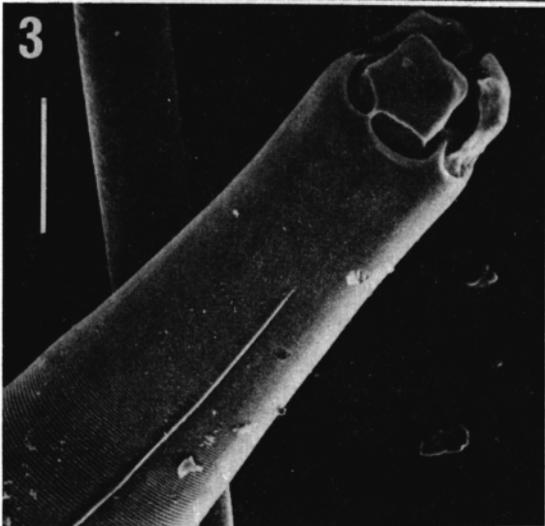
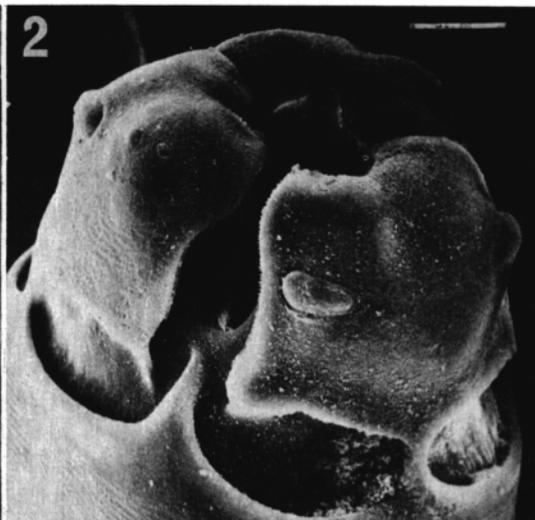
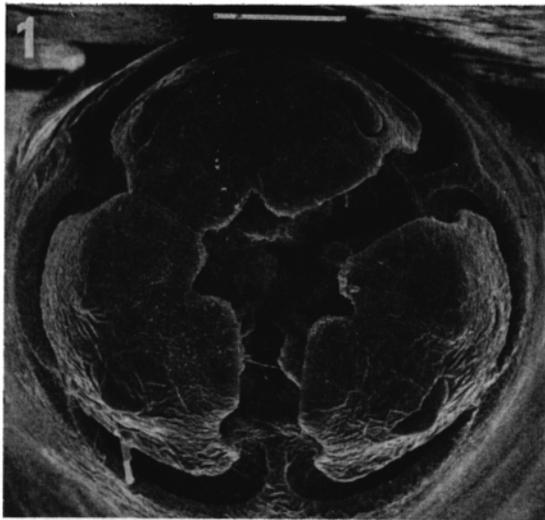
Ophidascaris varani Johnston & Mawson, 1947

Amplicaecum mackerrasae Thomas, 1959

(*Plates I and II, 1-12, fig. 1-10*).

PLATE I.

Fig. 1 : En face view of lips (0.05); *fig. 2* : Lateral view of lips (0.025); *fig. 3* : Lateral view of anterior region (0.1); *fig. 4* : Intestinal caecum (0.25); *fig. 5* : Tail of female (0.05); *fig. 6* : Tail of male (0.05). (Scale bar values (mm) in brackets.)



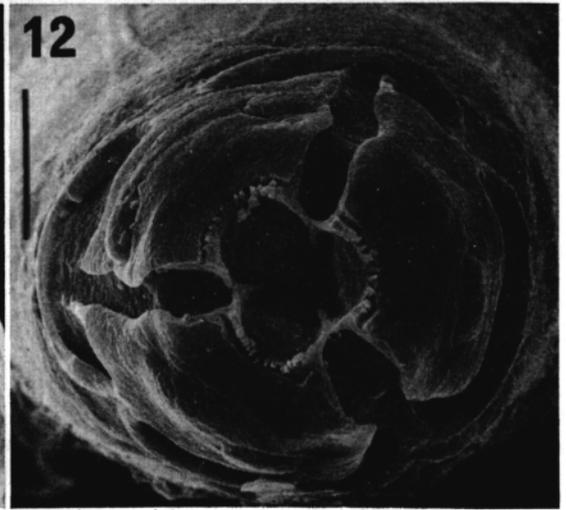
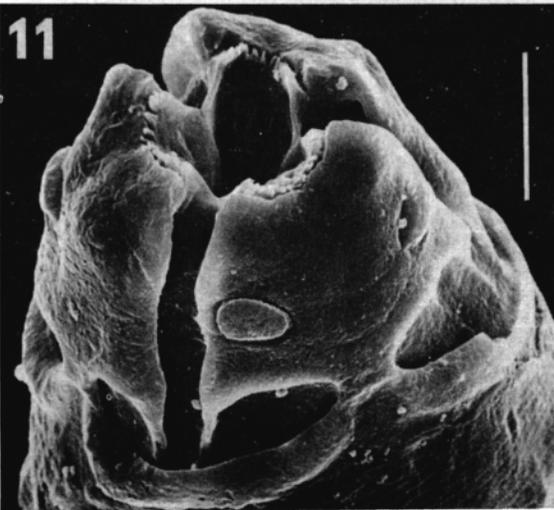
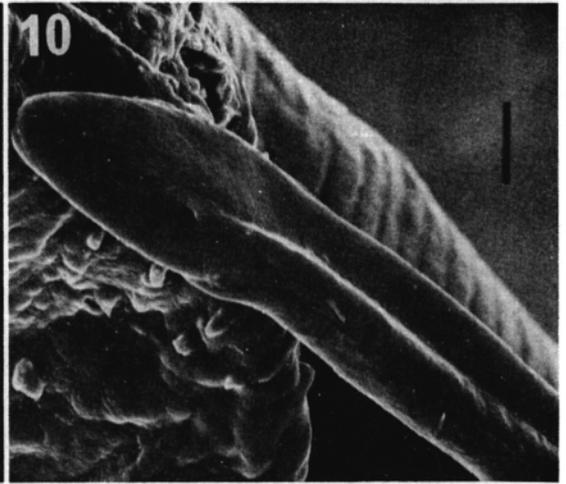
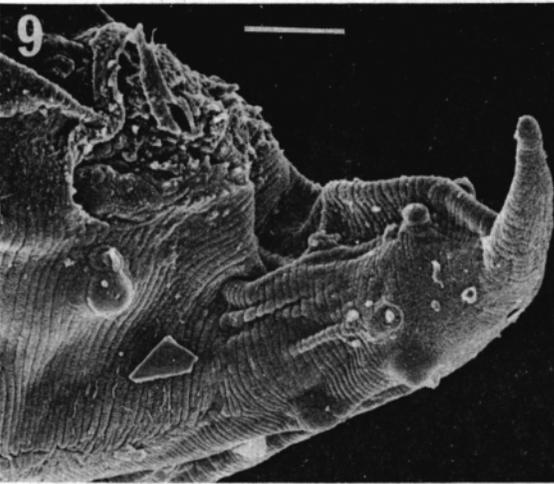
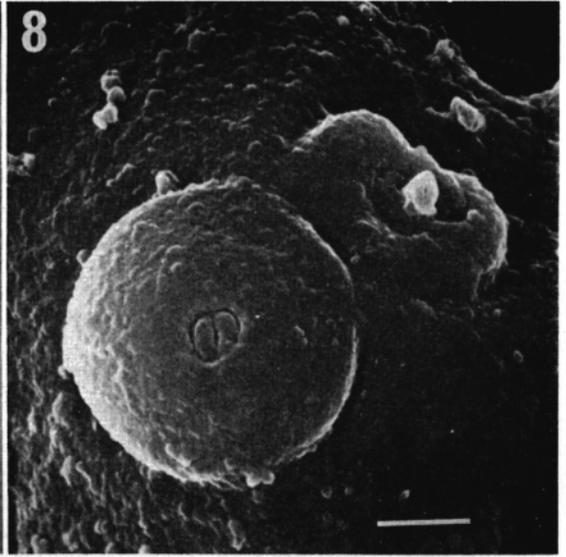
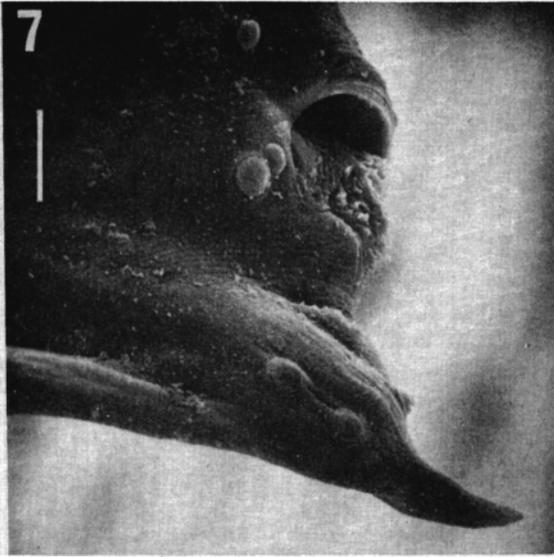
Baylis and Daubney (1922) described and named *Amplicaecum varani* from specimens collected from the intestine of *Varanus salvator* in the Zoological Gardens, Calcutta. Khera (1954) differentiated *A. monitor* (from the stomach of *Varanus monitor* in Lucknow Zoological Gardens) from *A. varani*, mainly by size relationships. Wahid (1961) differentiated *A. iguanae* (from the intestine of 'Iguana sp.' in India) from *A. varani* by size relationships and the number of caudal papillae in the male; according to records in the British Museum (Natural History) it appears very probable that the host was *Varanus* sp., not *Iguana* sp. (Gibson, personal communication). *Amplicaecum mackerrasae* was described by Thomas (1959) from specimens collected from *Varanus varius* in Southern Queensland, Australia. Earlier, Johnston & Mawson (1947) had given the name *Ophidascaris varani* to specimens collected from *V. varius* in the same locality. On later discovering an intestinal caecum in the type specimen, Thomas (1959) renamed the species *Amplicaecum mackerrasae*. But, although she described further specimens, she did not report any comparison with specimens or descriptions of *A. varani* or *A. monitor*.

The type material of *A. iguanae* (BMNH 1963, 361-363) and other specimens identified as *A. iguanae* (BMNH 1965, 142-151), the type material of *Ophidascaris varani* Johnston & Mawson, 1947, as well as specimens collected by the writer from *V. rudicollis*, *V. swartii* and *Physignathus cocincinus* in Thailand and *V. varius* and *V. gouldii* in Australia, were all found to resemble in most respects the type material of *A. varani* (BMNH 1923.1.22, 15-20).

There were however among the specimens examined, variations in length of oesophagus relative to body length, length of intestinal caecum relative to oesophagus, and spicule length relative to body length. Such variations could not be correlated with particular hosts or locations and the variations were manifested as a more or less continuous range, so that there were no clearcut criteria whereby more than a single species, i.e. *R. varani* could be differentiated. Thus, some of the specimens collected from *V. swartii* and *V. rudicollis* in Thailand were found to have longer spicules, i.e. 2.8-5.8 % of body length, but in other specimens from the same host in the same locality the spicules were less than 2 % of body length, i.e. about the same relative length as the spicules from the Baylis & Daubney (1922) measurements. The spicules in *A. monitor* according to Khera's (1954) measurements were 1 %. Those observed by the present writer in type specimens of *iguanae* and *mackerrasae* were 1.4-1.7 % and 1.5 % respectively. In the specimens from the Philippines the spicules were 1.7 % of body length and in specimens from Australian monitors the spicules ranged from 1.5-2.8 % of body length. In *Physignathus concincinus* from Thailand the spicules were 1.6-2.1 % of body length. A single male specimen

PLATE II.

Fig. 7 : Cloacal region of male showing paracloacal and subdorsal papillae (0.025) ; *fig. 8* : Paracloacal papillae (0.0025) ; *fig. 9* : Cloacal region showing postcloacal rugosity (0.025) ; *fig. 10* : Tip of spicule (0.01) ; *fig. 11* : Lateral view of lips of fourth stage larva showing absence of lateral interlabium (0.02) ; *fig. 12* : En face view of lips of fourth stage larva showing ventral interlabium (0.02). (Scale bar values (mm) in brackets.)



is known from Africa i.e. from *V. niloticus* in the Congo (BMNH); the spicules were 2.1 % of the body length.

In relation to the length of the ejaculatory duct, the spicules of specimens from the Philippines, Africa, and India were one-third or less the length of the ejaculatory duct. Those from Australia were more than a third and up to three-quarters, whereas those from Thailand fell into two groups, 29-37 % and 70-96 % respectively. These observations may suggest that speciation is emerging, but as no other differences could be detected whereby these specimens could be differentiated, they are all regarded as the single species described below.

Description

With characters of *Raillietascaris* as defined above. Small to medium-sized. Lips with notch in three free borders (*Plate I, 1*), denticles all round margin; oral groove and postlabial grooves present. Interlabia shallow, within membranous flange, connected by cuticular collar behind lips, incorporating narrow isthmus to each lip (*Plate I, 2*); posterior angles of lips extended as 'pillars' to postlabial region (*fig. 1*). Labial pulp deeply cleft anteriorly, symmetrical in dorsal lip (*fig. 2*), asymmetrical in sub-ventral lip, with slightly longer lobe extending to amphid (*fig. 3*); anterior prolongations wide and flat with short posterior extension (*fig. 2*); median lobe of pulp absent. Cuticle in cervical region forming narrow alae (*Plate I, 3*) extending from a point about halfway between subventral lips and the nerve ring to about halfway along length of body. Cuticular bars in lateral fields present also in caudal region. Cuticular striations prominent along whole length of body. Excretory pore behind nerve ring; two posterior filaments of excretory system meeting to form flat commissure; nucleus in left posterior filament at junction with commissure (*fig. 4*); bilateral anterior filaments present; cervical papillae at same level as excretory pore. Oesophagus 7.3-13.2 % of body length, posterior end slightly swollen, containing 3 nuclei of oesophageal glands (*fig. 5*). Nuclei of oesophageal glands about equal in size, relatively very large, nucleus of dorsal gland confined to dorsal sector, subventral gland nuclei in lateral part of subventral sectors (*fig. 6*). Dorsal gland opening behind dorsal lip, subventral glands near gland nuclei. Intestinal caecum on left side, slender, of variable length, 17-60 % of length of oesophagus (*Plate I, 4*). Female with vulva in anterior half of body except in small specimens, vulva between slightly inflated lips, located at a point 56-35 % of body length from anterior end (the smaller the female, the further posterior is the vulva). Tail conical, tapering to mucronate tip (*Plate I, 5*). Phasmids about one-third distance from tip of tail to anus. Rectal glands prominent (*fig. 8*). Eggs oval, relatively small, $0.049 - 0.092 \times 0.038 - 0.070$ mm, with slightly thickened poles. Surface of egg with about 64 pits around circumference. Vagina relatively short (*fig. 7*), extending posteriorly; in female 75 mm long, vagina was 1.3 mm, undivided uterus four to six times length of vagina, dividing into two uterine branches. Male tail tapering, slightly probular (*Plate I, 6*), without ornamentation on ventral surface anterior to cloaca. On each side of tail, 25-35 precloacal papillae, one double paraocloacal papilla with inner

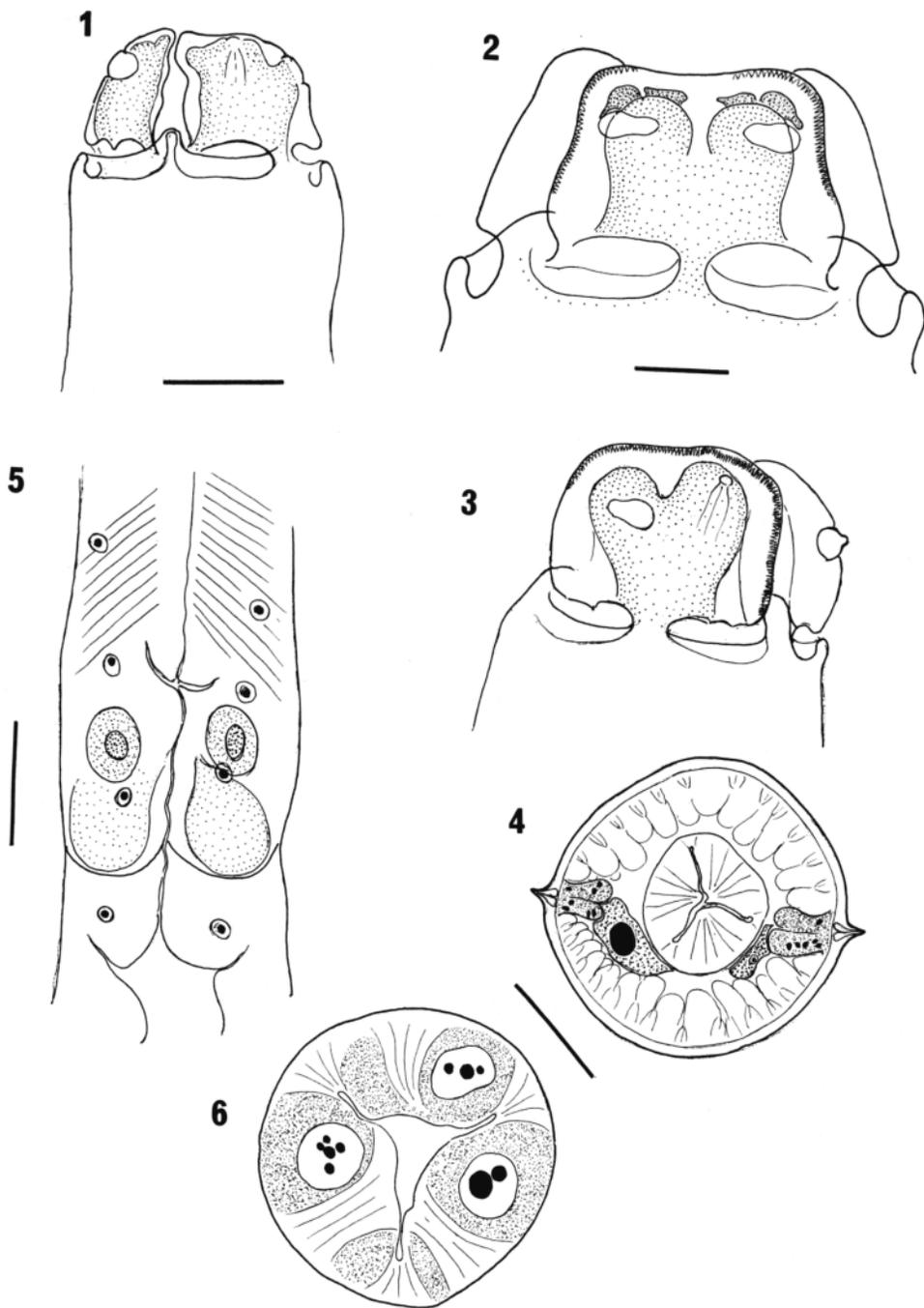


FIG. 1 à 6.

Fig. 1 : Lateral view of lips showing membranous collar and pillars (0.1) ; *fig. 2* : Dorsal lip (0.05) ; *fig. 3* : Subventral lip (0.05) ; *fig. 4* : Cross section just behind excretory commissure showing excretory nucleus (0.1) ; *fig. 5* : Posterior end of oesophagus showing nuclei of subventral oesophageal glands (0.1) ; *fig. 6* : Cross section through nuclei of oesophageal glands (0.1). (Scale bar values (mm) in brackets.)

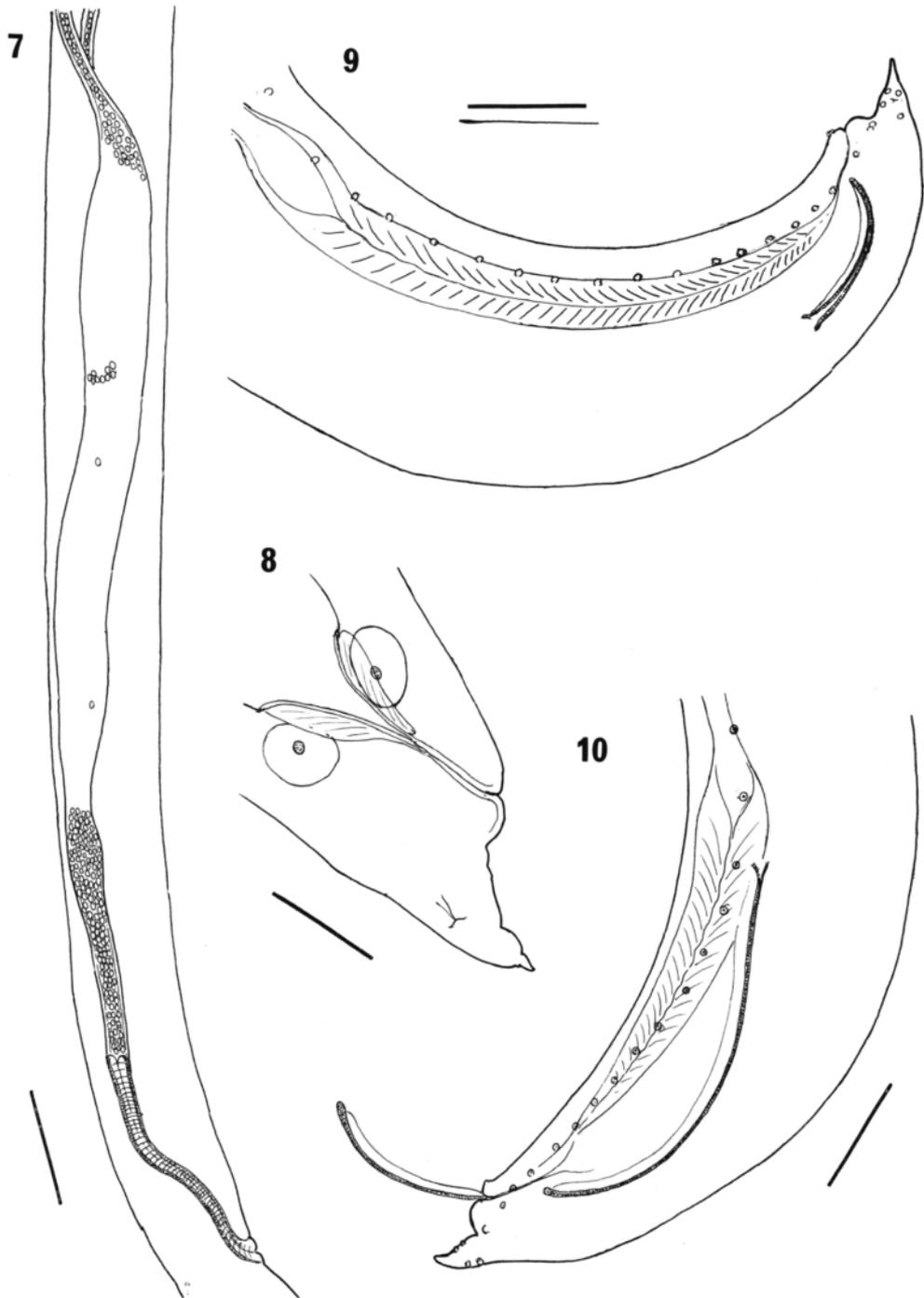


FIG. 7 à 10.

Fig. 7 : Vagina and undivided uterus (1.0) ; *fig. 8* : Tail of female showing phasmids (0.1) ; *fig. 9* : Tail region of male showing short spicule (0.25) ; *fig. 10* : Tail region of male showing long spicule and one protruding spicule (0.25).

member of pair smaller, (*Plate II*, 7, 8), two subventral and two subdorsal postcloacal papillae. Patch of cuticular bosses present behind cloaca (*Plate II*, 9). Spicules with alae gradually widening posteriorly, slender, with slightly swollen tip (*Plate II*, 10), of variable length (1.3-5.8 % of body length), usually 1/4-1/3rd of ejaculatory duct (*fig. 9*), but in some specimens from Thailand, spicules almost equal to ejaculatory duct (*fig. 10*). Phasmids at level of posterior postcloacal papillae (*fig. 9*). Median papilla present near anterior edge of cloaca. Measurements are shown in *Tables I and II*.

Type material : BMNH 1923.1.22 15-20

Other material : BMNH 1963, 361-363, (*iguanae*); 1965, 142-151, (*iguanae*); DPUQ 1823, 2014; USNPC 60658

TABLE I. — Measurements (mm) of male specimens of *R. varani*.

	AUSTRALIA	THAILAND	INDIA	PHILIPPINES	AFRICA
No. of specimens	21	29	2	1	1
Length	14-62	12-42	23-27	32	17
Width (maximum)	0.48-0.79	0.19-0.56	0.47-0.55	1.1	0.49
Width (at 0/1 junction)	0.26-0.62	0.18-0.64	0.35-0.45	0.83	0.46
Subventral lip (length)	0.10-0.15	0.68-0.11	0.11-0.13	0.16	0.10
Nerve ring	0.40-0.81	0.38-0.68	0.55-0.65	0.95	—
Excretory pore	0.48-0.94	0.36-0.77	0.66-0.73	1.2	0.71
Oesophagus (length)	1.9-5.2	1.4-3.9	2.6-3.5	5.5	3.0
Caecum	0.88-2.4	0.46-1.8	0.73-1.0	2.3	0.88
Tail	0.11-0.27	0.11-0.22	0.17-0.20	0.23	0.11
Spicules	0.24-1.1	0.29-1.5	0.39	0.57	0.37
Ejaculatory duct	0.73-2.4	1.0-1.8	1.3-1.4	2.1	1.1

TABLE II. — Measurements (mm) of female specimens of *R. varani*.

	AUSTRALIA	THAILAND	INDIA	PHILIPPINES
No. of specimens	8	16	2	1
Length	16-75	21-68	31-48	43
Width (maximum)	0.54-0.85	0.42-1.0	0.65	0.72
Width (at 0/1 junction)	0.35-0.85	0.33-0.60	0.47-0.52	0.59
Subventral lip (length)	0.13-0.47	0.09-0.12	0.12-0.15	0.14
Nerve ring	0.42-0.85	0.57-0.82	0.69-0.79	0.72
Excretory pore	0.74-0.91	0.64-0.98	0.76-0.94	0.88
Oesophagus (length)	2.0-6.2	2.7-5.8	3.4-3.5	4.2
Caecum	0.95-2.9	0.76-1.7	0.67-0.68	1.9
Vulva (from anterior end)	8.2-30.8	7.3-30.0	11.2-17.7	16.9
Tail	0.10-0.45	0.16-0.30	0.20-0.26	0.23

Type host : *Varanus salvator*

Other hosts : *V. monitor*, *V. swartii* (new host record), *V. rudicollis* (new host record), *V. nuchalis* (new host record), *V. varius*, *V. gouldii* (new host record), *V. niloticus* (new host record), *Physignathus cocincinus* (new host record).

Type locality : India

Other localities : Thailand, Australia, Philippine Islands (in U.S. National Zoological Park), Africa (Congo)

Location in host : Stomach and intestine

A fourth-stage larva was found in *V. rudicollis* in Thailand measuring 8.5 mm in length. The spicule primordium and developing testis were visible, the oesophagus measured 1.2 mm and the caecum 0.445 mm. The lips were more shallow than in the adult stage and the papillae relatively larger. Similar fourth stage larvae were found in *Varanus* spp. in Australia. They measured 9.1-13.2 mm in length. The lateral interlabia were absent (*Plate II, 11*), the lateral interlabial region resembling that described (Sprent, in press *c*) in *Seuratascaris numidica*; the ventral interlabium was present (*Plate II, 12*). The denticles were relatively larger than in the adult and restricted to the middle part of the anterior margin of the lip. The vulva in fourth stage larvae was slightly behind the middle of the body. The smallest observed adult male specimen was 11.5 mm, the smallest female was 15.7 mm. The smallest female containing eggs was 26 mm. The fourth moult was observed at a length of 15 mm.

The life history pattern of this species is not known, but it seems likely that an intermediate host is involved. Larval stages with rounded anterior end, measuring 3.1-6.1 mm in length, with lateral alae extending along most of the body and with a slender intestinal caecum about half the length of the oesophagus have been observed by the present writer encapsulated on the outside of the stomach of carpet pythons (*Morelia spilotes*) in Queensland. A characteristic feature of these larvae is that the anterior quarter of the intestinal wall is devoid of granules giving a translucent appearance to this part of the intestine. The prominent nuclei of the subventral glands, the lateral alae and the form of the caecum indicated that these larvae are probably third stage larvae of *R. varani*. Larvae with identical structure (3.7-4.9 mm in length) were found encapsulated on the outside wall of the intestine of several bandicoots (*Perameles nasuta*) and a spotted tiger cat (*Dasyurops maculatus*). Larvae expressed from eggs had an average length of 0.5 mm. It seems likely that embryonated eggs are ingested by a coprophagous intermediate host and that the larvae encapsulated in snakes and mammals result from their feeding on this intermediate host.

Discussion

Raillietascaris varani manifests affinity with *Orneoascaris* spp. in relation to lip structure, especially similar features being the 'pillars' at the posterior angles, the deeply divided pulp, and the membranous interlabial flanges bearing interlabia.

The lips of the fourth stage resemble *Seuratascaris numidicum*. On the other hand, in relation to the features of the male tail, *R. varani* more closely resembles *Ophidascaris* spp. with subdorsal postcloacal papillae, more numerous precloacal papillae, and alate spicules. Features which are characteristic of *R. varani* are the cervical alae, the large nuclei of the subventral oesophageal glands located in the lateral part of the subventral sectors (as in *Angusticaecum holopterum*) and the relatively small eggs and spicules.

The distribution of *R. varani*, like that of *Orneoascaris* and *Seuratascaris* spp., is indicative of recent origin in the Old World Tropics. There are indications of emergent speciation as reflected in the wide range of spicule length. *R. varani* appears to have dispersed throughout India, along the Malay Archipelago, to Australia. While this species is associated mainly with varanid lizards, it is evidently able to develop to maturity in agamids also. It is surprising that *R. varani* can develop in *Physignathus cocincinus* in Thailand, yet it has not been reported in *P. leseurii* or other agamid lizards in Australia, where agamids are often found closely associated with varanids. It is of interest to note that in spite of the widespread occurrence of the Nile monitor (*Varanus niloticus*) in Africa, *R. varani* has not previously been reported in Africa. *V. niloticus* has been found more often to be infected with *Hexametra applanata* and *Orneoascaris schoutedeni*.

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