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STUDIES ON THE PARASITE FAUNA OF MALAYSIA  
I. A REDESCRIPTION OF *STRONGYLUS BRAUNI*  
LINSTOW, 1897, AND THE ESTABLISHMENT OF  
A NEW GENUS, *VIVERROSTRONGYLUS*<sup>1</sup>

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We redescribed *Strongylus brauni* LINSTOW, 1897 from a large spotted civet, *Viverra megaspila* BLYTH. We also established a new genus, *Viverrostrongylus*, for *S. brauni*, because there is no genus which has the morphological characteristics of *S. brauni* among the 8 genera of Angiostrongylidae.

Key words: *Viverrostrongylus brauni* (LINSTOW, 1897) gen. et com. n., *Viverra*, Angiostrongylidae. Malaysia

INTRODUCTION

Up to this time, the lungworm (metastrongylid nematode) of the civet (genus *Viverra*) has been studied only by LINSTOW (1897), who reported *Strongylus brauni* from the large Indian civet (*V. zibetha* L.). However, the taxonomic status of *S. brauni* has been obscure because his description was insufficient for the identification.

In this paper, we redescribed *S. brauni* from a large-spotted civet, *Viverra megaspila* BLYTH, and established a new genus. We also investigated pathological lesions of the lungs parasitized by this metastrongylid nematode.

MATERIALS AND METHODS

The present metastrongylid nematodes investigated were obtained from the lungs of a female large-spotted civet, *Viverra megaspila* BLYTH, killed by a car in July, 1985, in Sungai Petani, Malaysia. The nematodes were fixed in 5% formalin solution and then cleared in lacto-phenol solution for microscopic examination. Encapsuled nodular

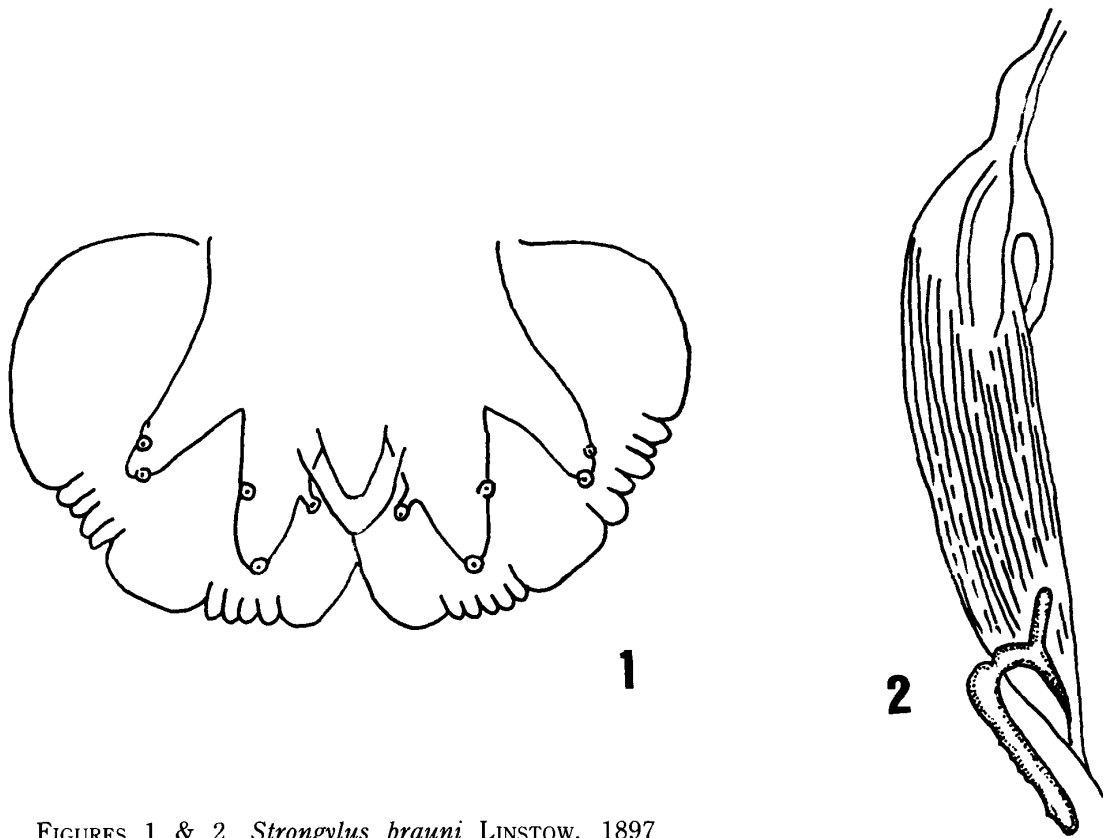
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FIGURES 1 & 2 *Strongylus brauni* LINSTOW, 1897  
 Fig. 1 Bursa, ventral view  
 Fig. 2 Spicule and gubernaculum  
 (LINSTOW, 1897)

foci of the lungs in which the nematodes were found were fixed in 10% formalin solution and embedded in paraffin, and the sections made were stained with haematoxylin-eosin for pathological investigations.

#### RESULTS

*Viverrostrongylus* n. gen.

#### Diagnosis

Metastrongyloidea, Angiostrongylidae (BÖHM & GEBAUER, 1934) ANDERSON, 1978.

White nematode. Bursa: Dorsal lobe separated; ventral rays fused showing a short branch; lateral rays fused with a short branch; externo-dorsal ray short; dorsal ray thick with two branches bifurcated. Spicules short, broad, lancet-shaped and complex. Gubernaculum unpaired and like the Greek letter "η (eta)". Vulva and anus near caudal end. Parasites of lung of civets of the genus *Viverra*.

Type species: *Viverrostrongylus brauni* (LINSTOW, 1897) gen. et comb. n.

Host: Large Indian civet, *Viverra zibetha* L. (Type host) and large-spotted

civet, *V. megapila* BLYTH

Habitat: Lung

Locality: Malaysia (LINSTOW'S material was obtained from a zoo at Königsberg)

Description (All measurements are in mm.)

White and fragile nematode. Cephalic extremity smooth without a characteristic structure (figs. 3 & 4). Mouth opening (about 0.011 in diameter) with three lips and a pair of amphids. Cervical papillae present (fig. 5). Male (8 specimens): Body length 13.99–18.16, width at mid-body 0.226–0.277. Excretory pore at 0.458–0.506 and nerve ring at 0.095–0.229 from the head end. Esophagus length 0.286–0.318. Bursa symmetric, dorsal lobe separated (figs. 6, 7 & 11). Bursal rays developed well, lateral rays slightly longer than ventrals; ventral rays fused and thick, a short branch at distal one third; lateral rays fused and thick, with a short branch at mid way; externo-dorsal ray short; dorsal ray thick with two branches, each branch bifurcated with a nodule in the crocheted portion (fig. 6). Spicules (figs. 8 & 12), 0.191–0.251 long and 0.032–0.048 wide, composed of two parts, a large lancet-shaped and a small pedunculated feather-shaped, each part with many rays. Gubernaculum 0.060–0.076 long, shaped like the Greek letter "η (eta)". Female: Only fragmental specimens of the caudal extremity were obtained, because female body was conglomerated and encapsuled, several females in each nodule, and the caudal end protruded from the capsule. Vulva and anus near caudal end (fig. 10). Ovoviviparous, uterine eggs oval, 0.197–0.210 × 0.116–0.156 in size. Larva in egg coiled two times, 0.254–0.286 long and 0.014–0.016 wide, tail end without characteristic structures.

Pathological observations

Male nematodes were found freely distributed in the terminal bronchioles and alveoli, but females were tightly conglomerated and existing in capsules showing a white nodular focus of about 4.0 in diameter. We obtained 12 nodules (fig. 13). In addition to the female nematodes, the nodule also contained fluid with eggs and blood cells. The nodule was surrounded by a fibrous layer accompanied by macrophages and eosinophil leucocytes. The pulmonary parenchyme was pressed around the nodule (figs. 14 & 15).

Specimens are deposited in the Department of Parasitology, Faculty of Veterinary Medicine, Hokkaido University, Japan.



FIGURES 3-10 *Viverrostrongylus brauni* (LINSTOW, 1897) gen. et comb. n. (scale in mm)

- Fig. 3 Anterior extremity of male, apical view: D, dorsal; V, ventral; L, left-lateral; R, right-lateral  
 Fig. 4 Anterior extremity of male, ventral view  
 Fig. 5 Anterior extremity of male, ventral view  
 Fig. 6 Posterior extremity of male, ventral view  
 Fig. 7 Posterior extremity of male, right-lateral view  
 Fig. 8 Left spicule  
 Fig. 9 Gubernaculum  
 Fig. 10 Posterior extremity of immature female, right-lateral view

## DISCUSSION

The present nematode belongs to the family Angiostrongylidae (BÖHM & GEBAUER, 1934 subfam.) ANDERSON, 1978, because of the following key characteristics: 1) cephalic extremity smooth, 2) gubernaculum unpaired, 3) bursa typical form and 4) vulva and anus near caudal end. And judging from 1) the arrangement of bursal rays, 2) the morphological characteristics of spicules and gubernaculum, 3) measurements, 4) nodule formation in the lungs and 5) the host (genus *Viverra*), the present species was considered to be identical to *Strongylus brauni* LINSTOW, 1897. The description of LINSTOW (1897) was inadequate for identification (figs. 1 & 2). DOUGHERTY (1946) and KONTRIMABICHUK & DELIAMURE (1979) proposed that *S. brauni* was rearranged and proposed as the genus *Aelurostrongylus* CAMERON, 1927 as a matter of convenience. The genus *Aelurostrongylus*, however, did not accord with *S. brauni*, because in *Aelurostrongylus* 1) bursal rays were developed and regular in arrangement, 2) spicules and gubernaculum was simple in form, 3) there was absence of nodular lesions and 4) this nematode parasitized mustelids and felids (GERICHTER, 1949; ANDERSON, 1962, 1978). Therefore, we considered that *S. brauni* does not belong to the genus *Aelurostrongylus*.

Among 8 genera of Angiostrongylidae, there are no genera to which *S. brauni* belongs. Therefore, we established a new genus, *Viverrostrongylus*, for LINSTOW's *Strongylus brauni*.

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## EXPLANATION OF PLATE

PLATE I *Viverrostrongylus brauni* (LINSTOW, 1897) gen et comb. n.  
(scale in mm)

Fig. 11 Posterior extremity of male, ventral view

Fig. 12 Spicule and gubernaculum

Fig. 13 Nodules of lung

Fig. 14 Cross-section of nodule, H.-E. stain

Fig. 15 Larvae

