

LIGHT MICROSCOPY AND SCANNING ELECTRON MICROSCOPY OF *BATHMOSTOMUM SANGERI* COBBOLD, 1879, OF ELEPHANTS

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INTRODUCTION

Few reports are available on *Bathmostomum sangeri* of elephants. According to Skrjabin (1961), Yamaguti (1961), and Yorke and Maplestone (1962), there are two semilunar ventral cutting plates at the oral margin of *Bathmostomum sangeri*, thus the genus can be placed in the family Ancylostomatidae. Rep (1963) stated that the genus *Bathmostomum* lacked ventral teeth or plates at the edge of the buccal capsule, thus could not be classed among the Ancylostomidae, and be preferred to classify this genus among the Strongylidae.

To resolve this controversy, specimens of this worm were examined both by light microscopy and scanning electron microscopy.

MATERIALS AND METHODS

The worms were obtained from Mr. J. Mines, Department of Parasitology, University of Queensland, Australia, who obtained them from circus elephants, *Elephas indicus* in Brisbane. The primary origin of the elephants, and the duration of their stay in Australia could not be determined. All specimens were fixed in 70% alcohol and cleared in glycerine or in creosote. Drawings were done using a camera lucida. The scanning technique has been described previously (Setasuban, 1974).

RESULTS

Camera lucida drawings are depicted in

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Plate 1, the body measurements in mm of *B. sangeri* are shown in Table 1.

The description of *B. sangeri* is as follows: Small worms, tapering both ends and cuticle is transversely striated. Cephalic portion is bent dorsally. Mouth opening directed antero-dorsally and bounded by six circum-oral papillae (Fig. 1); two dorsal, two lateral and two ventral. Buccal capsule is well developed, funnel shaped. There is a raised and transverse fissure ridge around the oral margin (Fig. 2). The internal wall of the buccal capsule is raised into a series of circular ridge or lamellae (Plate 1, B); on both ventro-lateral margins, the ridge runs medianly aborad, and shortly splits into two ridges (Figs. 2, 3, 4). These make it look like a semilunar ventral cutting plate when seen through the light microscope. True teeth or cutting plates could not be seen. A small dorsal cone and two subventral lancets are present. Oesophagus is club-shaped. Cervical papillae and oesophago-intestinal valves are present.

Male (10 specimens) 12.15-14.25 mm in length and 0.516-0.650 mm in width and bursa is well developed. Lateral rays: postero-lateral and medio-lateral branches are close together (Plate 1, D), whereas the externo-lateral is diverted from the medio-lateral branch. Ventral rays are cleft. Dorsal ray is *Necator*-type (Plate 1, E). It divides into two at the base of the stem, then each branch redivides into two with the lateral shorter than the median. The externo-dorsal arises from the base of the branch of the dorsal ray. Spicules are stout and equal (Plate 1, H, I), 0.482-0.593 mm in length; the

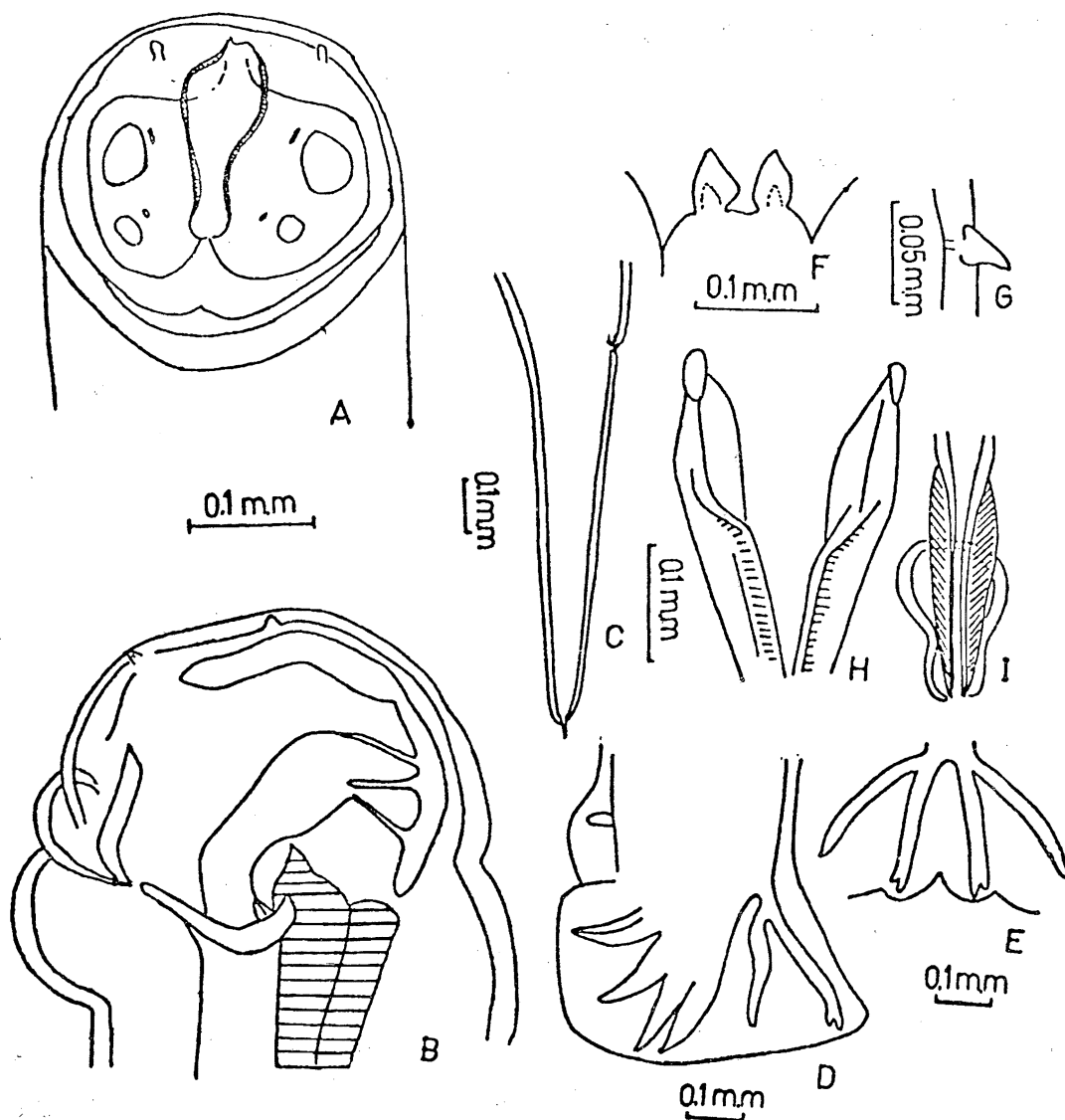


Plate 1

A = En face view of *Bathmostomum sangeri*, B = Lateral view of the anterior end, C = Female tail, D = Lateral view of bursal ray, E = Dorsal ray, F = Ano-genital papillae, G = Cervical papillae, H = Anterior end of spicules, I = Posterior end of spicules with telamon.

lateral wing of a spicule is big and broad. There is a pear-shaped telamon (Plate 1, I) situated on the ventral side of the spicule. A gubernaculum could not be seen. At the anal cone, there are two pairs of papillae on either side of the cloacal opening (Plate 1, F); the

lateral pairs are shorter and bigger than those on the median. Prebursal papillae are present.

Female (10 specimens) 14.98-17.68 mm in length and 0.369-0.576 mm in width and the

Table 1

Showing the body measurements in mm of male and female of *Bathmostomum sangeri*.

Hosts	<i>Elephas indicus</i>	
Locality	Brisbane	
No. exam.	M 10, F 10	
	Male	Female
Body length	12.15-14.25(13.24)	14.98-17.68(16.27)
Width E-I	.369-.576(.496)	.369-.576(.496)
Mid body	.516-.650(.591)	
Prebursa	.301-.369(.333)	
Anus (lat)		.125-.158(.144)
Buccal capsule L.	.172-.215(.182)	.172-.228(.198)
W. (D-V)	.189-.247(.214)	.198-.266(.234)
Oesophagus L.	1.25-1.425(1.31)	1.3-1.5(1.36)
W (max)	.155-.215(.179)	.189-.232(.203)
Ant. - N.R.	.475-.625(.548)	.50-.619(.562)
Ant. - Exc. pore	.625-.825(.705)	.625-.950(.777)
Ant. - Cer. pap.	.70-.875(.783)	.75-1.2 (.923)
Spicules L.	.482-.593(.532)	
Telamon L.	.120-.172(.139)	
W.	.068-.086(.082)	
Dorsal ray L.	.215-.315(.277)	
Ant. end to vulva		6.40-8.55(7.52)
Vulva to caudal end		7.55-9.55(8.75)
Anus to caudal end		.645-.80(.695)
Vagina length		.046-.069(.057)
Ratio Ant. end to vulva: Vulva to caudal end		1 : 1.16

Ant.-N.R. = Anterior end to nerve ring, Ant.-Exc. pore = Anterior end to excretory pore, Ant.-Cer. pap. = Anterior end to cervical papillae, E-I = Oesophago-intestinal junction, L = Length; W = Width, lat = lateral, D-V = Dorso-ventral, Max = Maximum.

vulva opens just a little in front of the middle of the body. Tail is gradually tapering, 0.645-0.80 mm in length.

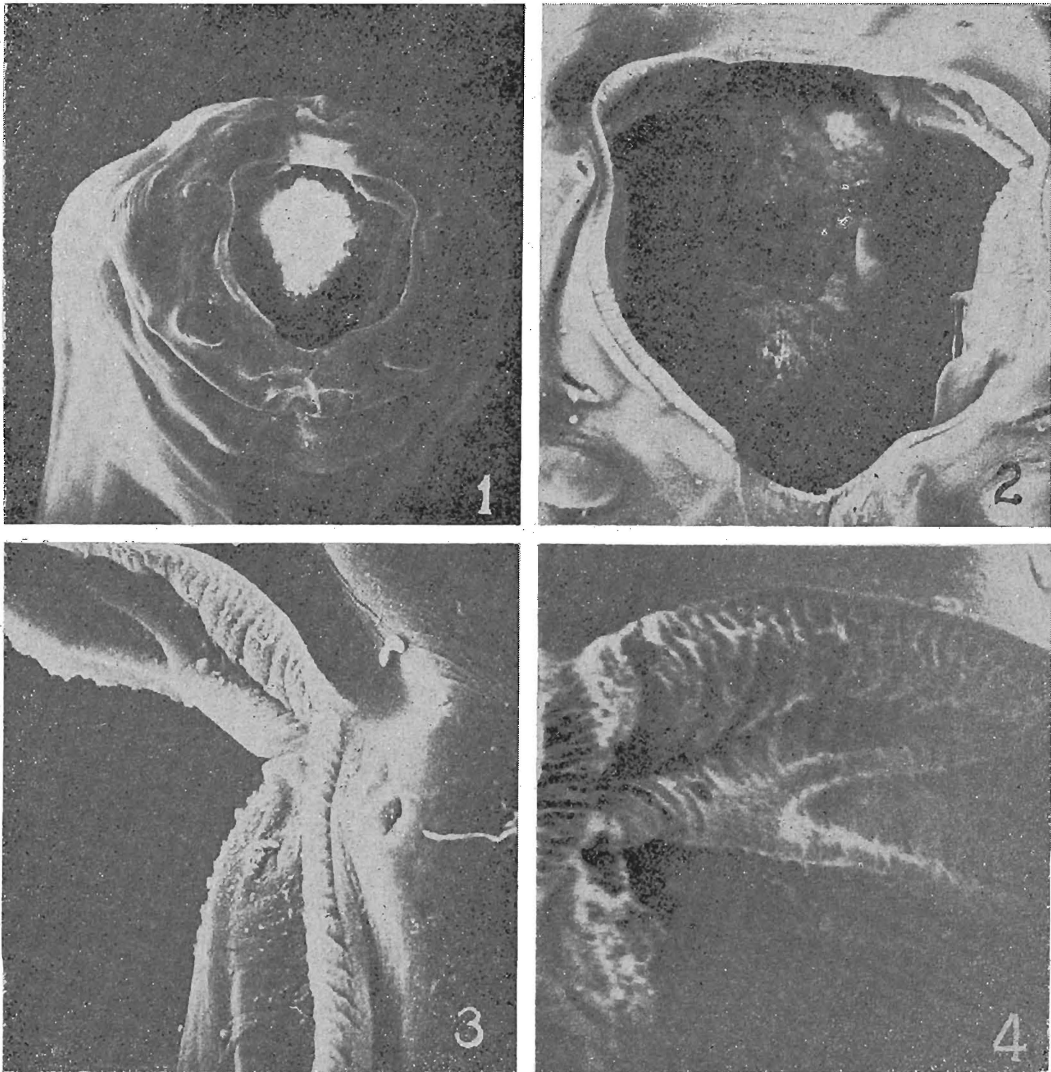
DISCUSSION

Foster (1954) reported a heavy infection of *B. sangeri* in Sarawak elephants. *B. sangeri* was placed in the Ancylostomatidae by Cobbold (1879), but Rep (1963) preferred to place it in the Strongylidae since it appeared to lack teeth or cutting plates.

In the present work, it was easy to discern the basis for the controversy; under light

microscopy there was indeed an appearance of cutting plates and thickened ridges in the buccal capsule. But, examination by scanning electron microscopy made it clear that the so-called cutting plates were in fact merely thickened folds in the inner wall of the capsule. A decision about the structure of the ridges is less easy to make from the scanning pictures. Rep (1963) did not mention these at all. In the present work, around the oral margin of the buccal capsule the ridges resembled the denticular ridges seen in similar enlargements of *Ascaris* (Figs. 2, 3, 4). A

ELECTRON MICROSCOPY OF *Bathmostomum sangeri*



Figs. 1-4—Scanning electron microscopy of *Bathmostomum sangeri*.

Fig. 1—Showing the *en face* view and six circumoral papillae. X 330.

Fig. 2—Showing a raised and transverse fissure ridge around the oral margin. X 770.

Figs. 3&4—Showing a circular ridge or lamella at the ventro-lateral margin of the buccal capsule. X 1650 and 3050, respectively.

decision about the nature of the ridges in *Bathmostomum* must be postponed.

Thus, this study supports the finding of Rep (1963) that *B. sangeri* should not be placed in the Ancylostomatidae. It is probably a strongylid.

SUMMARY

Bathmostomum sangeri is an intestinal parasite of the elephant. Males measured 12.15-14.25 mm in length; females measured 14.98-17.68 mm in length. Buccal capsule is

well-developed and funnel-shaped. There is a raised and transverse fissure ridge around the oral margin. The internal wall of the buccal capsule is raised into a series of circular ridges or lamellae. Teeth or cutting plates could not be seen. Spicules are stout, wing-like structures. The telamon is pear-shaped, but a gubernaculum is not present. There are two pairs of papillae on the either side of the cloacal opening. The female tail is gradually tapering.

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REFERENCES

- COBBOLD, T.S., (1879). *Parasites: A Treatise on the Entozoa of Man and Animals, Including Some Account of the Ectozoa.* London.
- FOSTER, A.O., (1954). Helminthiasis in elephants. *Vet. Rec.*, 66 : 196.
- REP, B.H., (1963). On the polyxenias of the Ancylostomidae and the validity of the characters used for their differentiation. *Trop. Geogr. Med.*, 15 : 173.
- SETASUBAN, P., (1974). Scanning electron microscopy of hookworms. I. Morphological differences between infective stages of *Ancylostoma caninum* (Ercolani, 1859) and *Ancylostoma tubaeforme* (Zeder, 1800). *Southeast Asian J. Trop. Med. Pub. Hlth.*, 5 : 519.
- SKRJABIN, K.I., (1961). *Strongylata. Key to Parasitic Nematodes.* Vol. 3. Translated from Russian. Published by the Israel Program for Scientific Translations.
- YAMAGUTI, S., (1961). *Systema Helminthum.* Vol. 3. *The Nematodes of Vertebrates. Parts 1 and 2.* Interscience Publishers, Inc., New York.
- YORKE, W. and MAPLESTONE, P.A., (1962). *The Nematode Parasites of Vertebrates.* Hafner Publishing Company, New York.