Material and methods

The worms were studied either alive or stained in SEMICHON'S carmine and mounted in canada balsam. They are rather big worms and therefore difficult to fix. Fixation in hot 5% formalin gave rather unsatisfactory results. Some of the worms were well extended but in many of them the cephalic and caudal end and the lateral edges were curved ventrad so that the dorsal surface of the worm is somewhat convex and the ventral surface concave. Fixation in concentrated acetic acid gave nice straight specimens but the body and collar spines were often corroded and swollen. After fixation the worms were kept in 5% glycerin-alcohol. Worms of different age, varying from 2 days up to 1 year old, were studied; deliberately, partly or wholly macerated worms were also examined and compared with the fresh ones. The macerated worms were obtained by killing the host and

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** The first two papers in this series are not numbered. They both are quoted in this paper.
dissecting it the next day or by leaving the worms for 1 day or longer in saline before fixing them. For the study of certain detailed structures flattened worms were also examined, but only unflattened fresh worms were used for the measurements. For an accurate study of the cephalic spines, the heads of living worms were cut off close to the collar and studied under coverslips.

**Morphology: adult of* E. malayanum*

The living worms are reddish in colour, particularly in the uterine area. In saline, they contract the body vigorously, particularly the preacetabular region, changing their shape continuously; after a couple of hours they are less active, but they remain alive for at least 12 hours.

The worms start producing eggs in experimental animals in 14 to 18 days after infection by which time they have attained a length of about 0.5 cm. They grow rapidly in size. The longest unflattened worm fixed in formalin is 8.9 mm, while fixed in acetic acid 9.4 mm. Most of the worms measure $6.8 - 8.5 \times 2.1 - 2.5$ mm when fixed in hot formalin; and $7.4 - 9.0 \times 1.9 - 3.0$ mm when fixed in acetic acid. The maximum width is usually located in the middle of the worm, but it may also be located towards the acetabulum or towards the posterior extremity, depending on the state of contraction of the body muscles. Worms which have died before fixation often show enlargement towards the posterior extremity, with the caudal margin indented in the midline, and with a constriction in the acetabular region. The worm is not so thick when alive but becomes thicker after it dies or after fixation.

The oral sucker is subterminal and 180—300 $\mu$ wide; the pharynx is 190—240 $\mu$ long. The oesophagus bifurcates in front of the genital pore into two caeca which extend to the posterior end of the body. The position of the acetabulum depends on the age of the worm. The younger and smaller the worms the more posterior it is. In fully grown adults, it is situated in the first quarter of the body and is 0.7—1.2 mm wide. It is usually somewhat broader than long but it may also be somewhat drawn out posteriorly. The collar is reniform and is united ventrally by a narrow bridge. It is distinct in immature and young specimens and less conspicuous in fully grown adults.

**Collar spines.** The number of the collar spines is of great importance for the diagnosis of the species. I have counted the collar spines of more than 100 worms. The number in intact worms is usually 43 (Fig. 1) but in about 20% of the worms it is 45. In other words, *E. malayanum* is a 43 or 45 spined species. **Leiper** (1911) found in his worms 42 spines, but **Ödner** (1913) who restudied **Leiper**'s material counted 43. **Bonne et al.** (1953) found 41 to 45 spines in specimens obtained from man. It should be emphasized that deviations from 43 or 45 occur not infrequently as a result of loss of spines or presence...