

# THE DEVELOPMENT OF *GNATHOSTOMA SPINIGERUM* OWEN, 1836, IN ITS FIRST INTERMEDIATE HOST, *MESOCYCLOPS LEUCKARTI* CLAUS, 1857, IN INDIA WITH REMARKS ON ITS ZOONOTIC IMPORTANCE

D. J. CHELLAPPA\* AND M. ANANTARAMAN\*\*

(Department of Parasitology, Madras Veterinary College)

**G** *NATHOSTOMA SPINIGERUM*, a spirurid in the faeces. The cat was maintained in the laboratory for four months, from 19th August 1968 until autopsy on 18th December 1968, and material for culture and infection was derived from it.

nematode of cats and dogs is known to occur as an accidental parasite of man in Japan, China, Thailand, Malaya and India. Mitter (1910) recorded the parasite from a domestic cat in Calcutta. He also cited that Lewiss found the parasite in a pariah dog in the same city. Later (1912), he recovered it from a dog and a leopard (*Felis pardus*). Chandler (1925 a) encountered the adult parasite in 13 out of 250 cats, and he observed that the incidence of the infection was seasonal. The same worker (Chandler, 1925 b) successfully infected cats by feeding them with cysts of larvae obtained from snakes in the Zoological Gardens, Calcutta. With eggs of the worm obtained from a dog at Patna, Varma (1955) studied the development of the embryo in faecal culture. Its prevalence in cats in Madras and Bombay was estimated as 1 in 50 (Alwar and Lalitha, 1958), and 1 in 40 (Rao and Kulkarni, 1964) respectively.

Reports of human infection in India are restricted to Bengal. Maplestone (1929) reported the first instance, while Maplestone and Bhaduri (1937), Maplestone and Rao (1939), and Mukerji and Bhaduri (1945) added several more.

Early studies on the life-history of the worm were made in Thailand (Prommas and Daengsvang, 1933, 1936, 1937) revealing the intermediate hosts involved. Since then, confirmatory observations have come from Japan and the Philippines. Refuerzo and Garcia (1938) described the development of the eggs in copepods, probably *Eucyclops* sp., and *Mesocyclops bicolor*, in the Philippines, and Miyazaki (1960) reported that the copepods *Mesocyclops leuckarti*, *Eucyclops serrulatus*, *Cyclops strenuus* and *C. vicinus* have been experimentally determined to be the first intermediate hosts in Japan. No literature is available on the first intermediate hosts of the worm in India, though its incidence, in Calcutta, Madras and Bombay has been well established.

In the present study, only one (stray, female) of 37 cats examined showed Gnathostome eggs

The eggs were oval, with a distinct polar cap, and a greenish tinted shell ornamented with fine granulations, and were invariably in the single- or two-celled stage in the fresh faeces. They measured  $66.7 \times 37.5 \mu$ . Eggs separated from the faecal mass by flotation or sedimentation methods were cultured in water for development (Fig. 1). Hatching occurred in 8-18 days during October-November, when the average room temperature was  $28^{\circ}\text{C}$ .

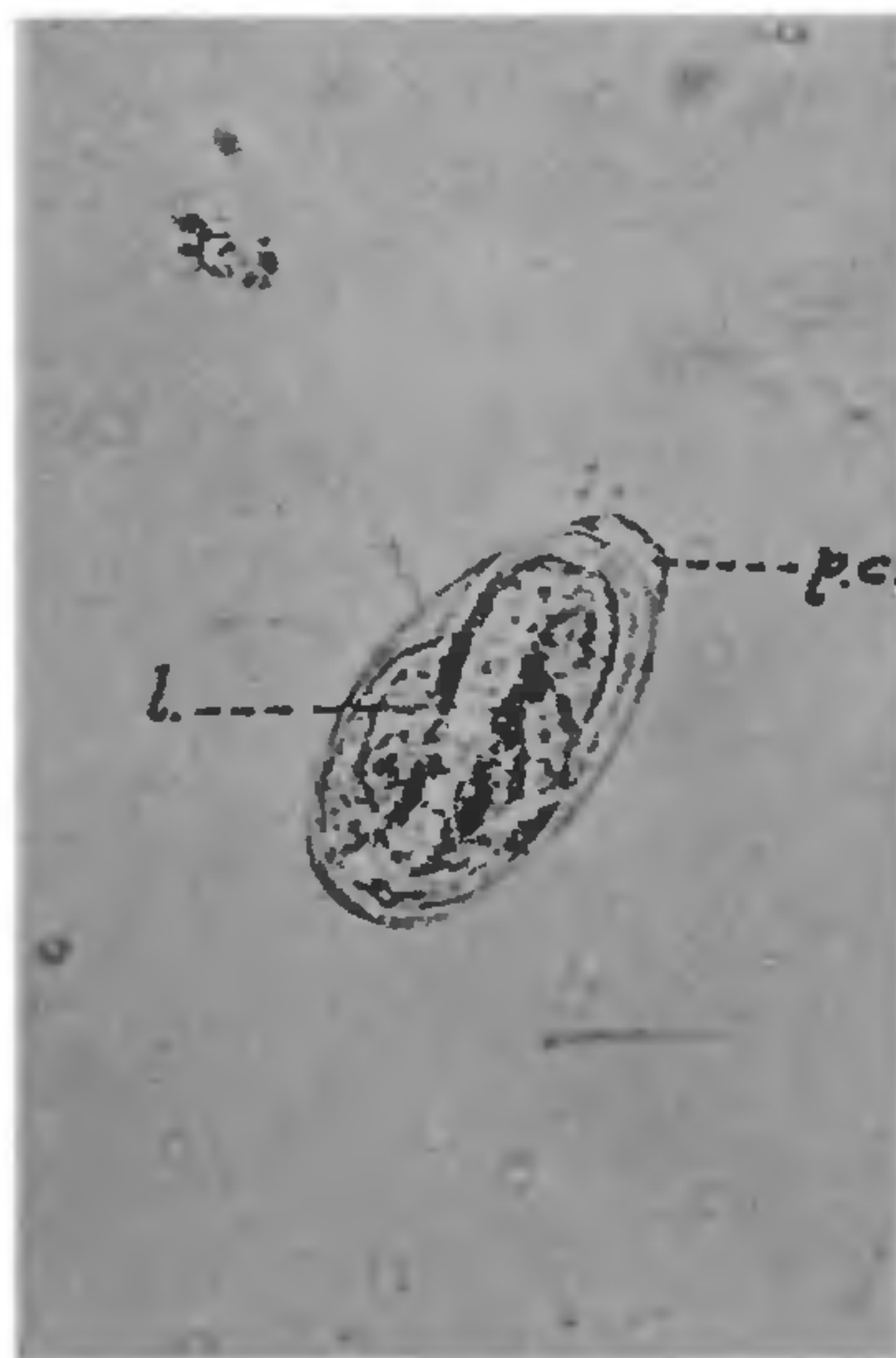


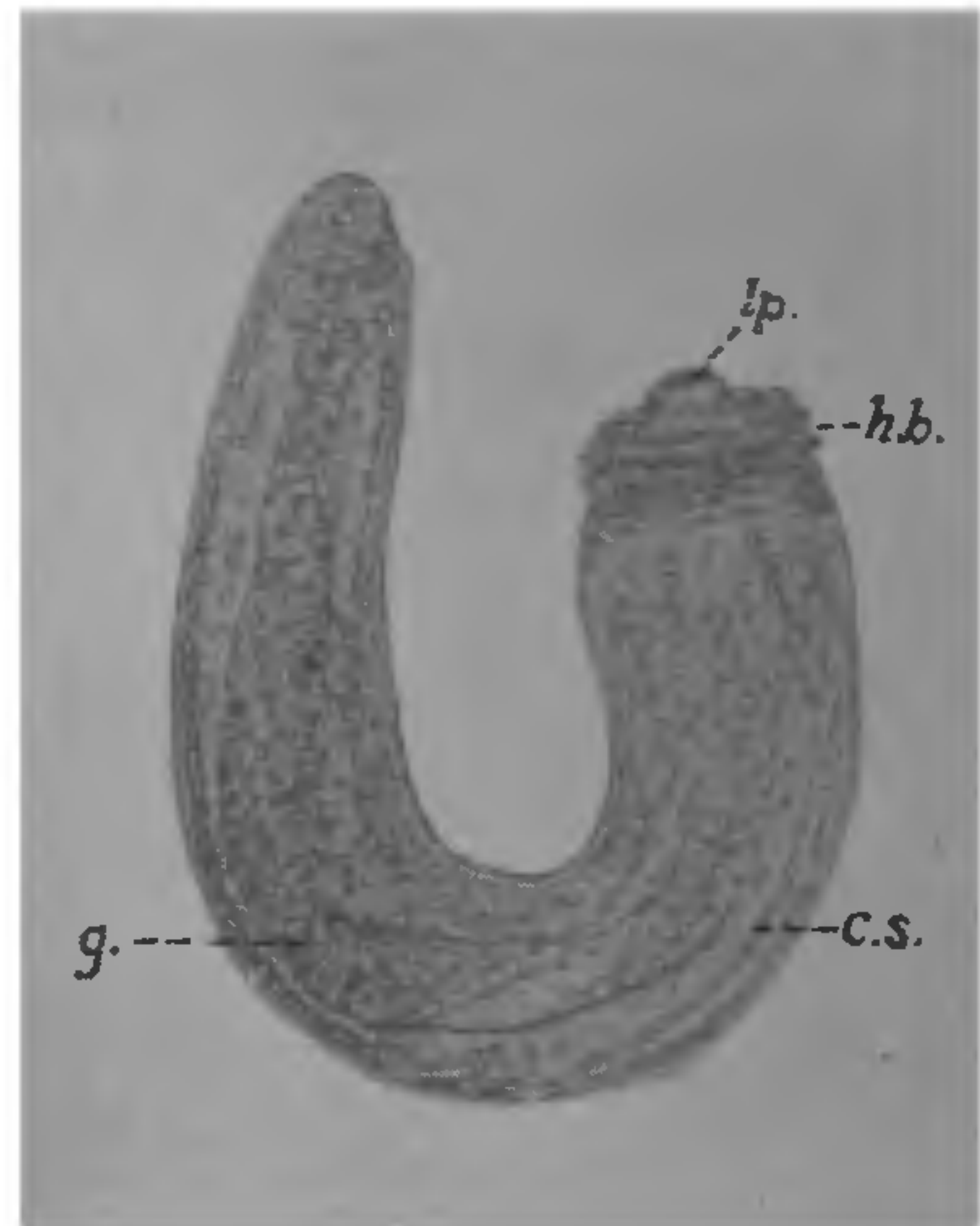
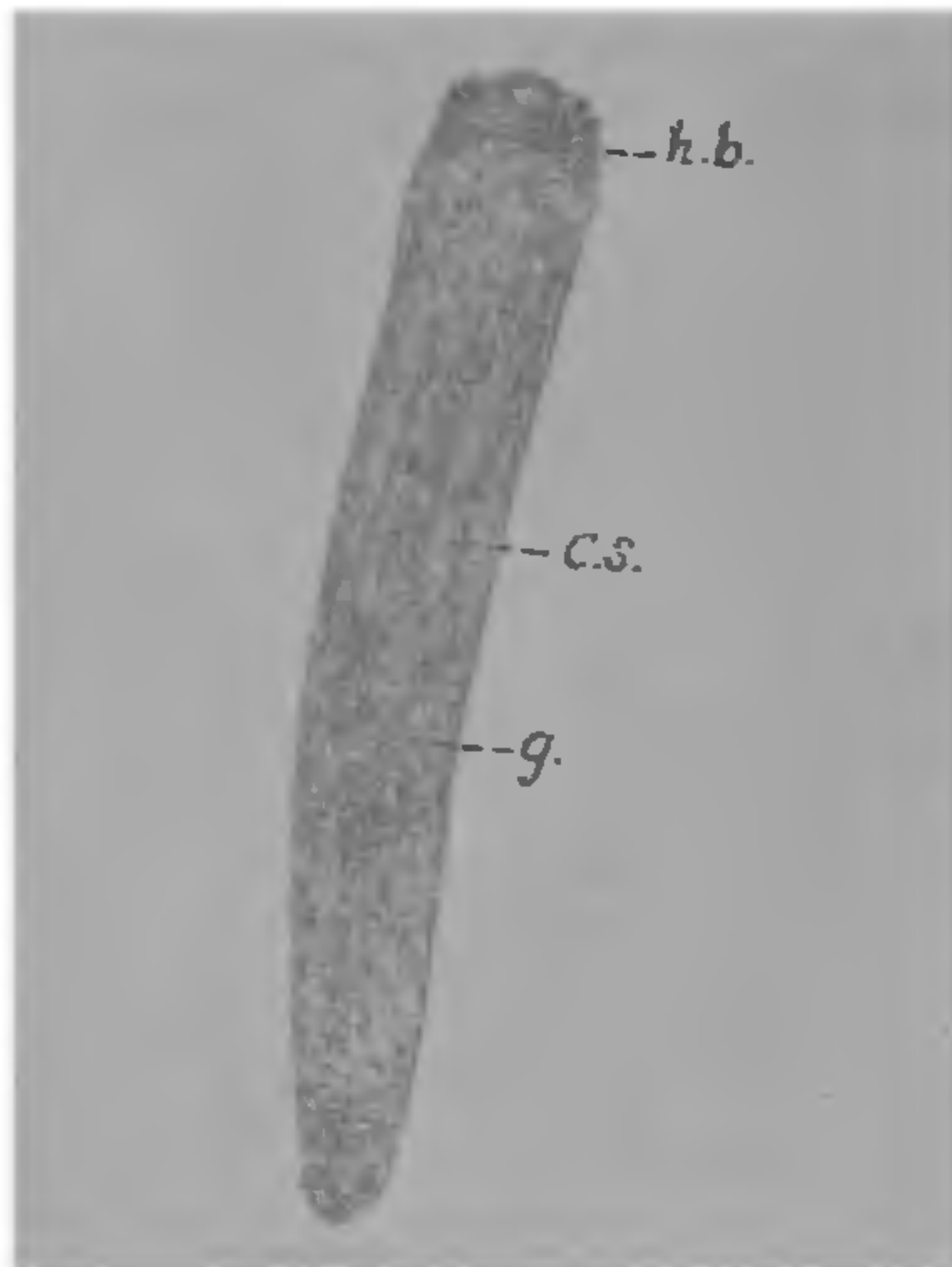
FIG. 1. Egg of *G. spinigerum* with vermiform embryo (first stage larva). *l.* = larva; *p.c.* = polar cap.

The first stage larva is slender, with one end rounded and the other pointed, sheathed, and measures  $242-267 \times 12-13.3 \mu$ . It shows active lashing movements though progressing slowly. Such larvae, if not swallowed by Cyclops, died in 48-72 hours. Individuals of cyclops were obtained from freshwater ponds in Red

Present address :—

\* Veterinary Dispensary, Pennadam, S. Arcot.

\*\* 6, Nageswara Iyer Road, Madras-34.



FIGS. 2a-2b. Second stage larvæ of *G. spinigerum* released from *M. leuckarti* showing head-bulb with transverse rows of spines, lips, gut and cervical sacs. c.s.—cervical sac; g—gut; h.b.—head-bulb; lp.—lip.

Hills and Moore Market area, bred in glass jars and utilized for infection experiments. They were screened under the microscope for any natural infection, prior to the experiments, and only infection-free individuals were left in square wells, four to six with 40 to 60 larvæ. It needs to be stressed that no natural infection was ever encountered among those collected.

Ingestion of larvæ by the copepods could not be observed under the microscope, but actively wriggling, exsheathed larvæ up to 15 in each, could be discovered in the body-cavity of the cyclops as early as 20 hours. Differentiation of a head-bulb, with the characteristic armature of 4 transverse rows of spines, and an increase in the thickness of the body were observed. Fully developed second-stage larvæ, not more than 8 in each showing 4 cervical sacs, gut, and well developed head-bulb with four rows of spines and distinct lips (Figs. 2a, b and 3) were seen in 8 to 10 days. They measured  $354 \times 50 \mu$ , and the spines numbered 36, 38, 40 and 42 in the first, second, third and fourth rows respectively, those of the second and third rows being larger and of the fourth row smaller than those of the first row. The cuticle was also clothed with spines which gradually diminished in size towards the posterior end.

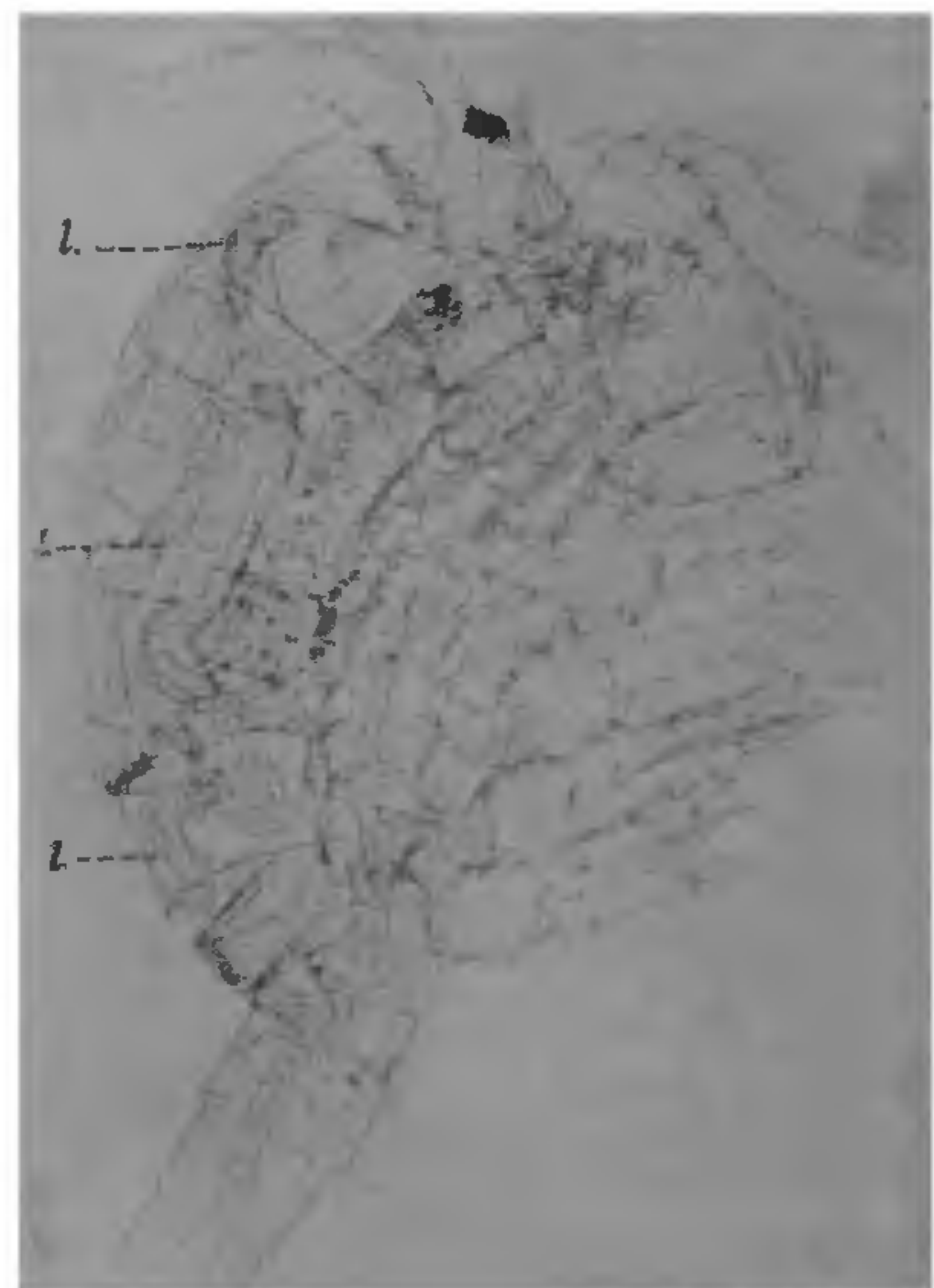


FIG. 3. Second stage larvæ of *G. spinigerum* in the body cavity of *Mesocyclops leuckarti*. l.—larva.

The cyclops which were successfully infected in the present studies were identified as *Mesocyclops leuckarti* Claus, 1857 on the basis of the 1st antenna possessing 17 segments and the presence of a hyaline membrane in its terminal segment. For further development, freshwater fishes obtained from the Madras Fisheries Department and other sources were employed. Six specimens of *Rasbora daniconius* and two of *Tilapia mossambica* were reared in an aquarium, fed with 2 or 3 infected cyclops containing second stage larvæ. Dissection of one *R. daniconius* which died on the 8th day, and all the others in the sixth week after feeding revealed no evidence of infection with *G. spinigerum*. The second intermediate host (fish) of the parasite in this part of the country still remains to be identified.

The syndrome 'Creeping eruption' or 'Cutaneous Larva Migrans' attributed to the wandering larva of *G. spinigerum* in the tissues of man has been unknown in Madras and neighbouring states. The consumption of raw or ill-cooked fish is relatively scarce in these areas and should partly explain this fact. However, the epidemiology of the infection as a zoonosis

cannot be fully understood till the fish intermediate host is determined and its role as a food fish investigated thoroughly.

Grateful acknowledgement is made of the facilities given by the Dean, Madras Veterinary College, for the work which formed part of a thesis for the M.V.Sc. Degree of the University of Madras, submitted by the first author.

1. Alwar, V. S. and Lalitha, C. M., *Indian vet. J.*, 1958, **35**, 292.
2. Chandler, A. C., *Indian J. med. Res.*, 1925 a, **13**, 213.
3. — *Parasitology*, 1925 b, **17**, 237.
4. Maplestone, P. A., *Indian med. Gaz.*, 1929, **64**, 610.
5. — and Bhaduri, N. V., *Ibid.*, 1937, **72**, 713.
6. — Rao, S. S., *Ibid.*, 1939, **74**, 479.
7. Mitter, S. N., *J. trop. Vet. Sci.*, 1910, **15**, 284.
8. —, *Vet. J.*, 1912, **68**, 687.
9. Miyazaki, I., *Exp. Parasit.*, 1960, **9**, 338.
10. Mokerji, A. K. and Bhaduri, N. V., *Indian med. Gaz.*, 1945, **80**, 126.
11. Prommas, C. and Daengsvang, S., *J. Parasitol.*, 1933, **19**, 287.
12. — and —, *Ibid.*, 1936, **22**, 180.
13. — and —, *Ibid.*, 1937, **23**, 115.
14. Rao, S. R. and Kulkarni, V. G. P., *Bombay vet. Coll. Magazine*, 1964, **11**, 1.
15. Refuerzo, P. G. and Carcia, E. Y., *Phil. J. Anim. Ind.*, 1938, **5**, 351.
16. Varma, A. K., *Curr. Sci.*, 1955, **24**, 57.

## ON *BACOPA FLORIBUNDA* (R. Br.) WETTST.—A LITTLE KNOWN FLOWERING PLANT IN THE INDIAN FLORA

T. RAJAGOPAL AND N. RAMAYYA

Department of Botany, Osmania University, Hyderabad-7 (A.P.), India

**B**ACOPA FLORIBUNDA (R. Br.) Wettst. (Scrophulariaceæ), which is otherwise known from Africa, Java and Australia, has been so far recorded only from S. Kanara, Nellore, Chingleput in India.<sup>2,3</sup> Cooke<sup>1</sup> doubted its occurrence in the erstwhile Bombay State, whereas Santapau<sup>4</sup> records it from the same State without citing a locality. Besides these few reports, the present authors are not aware of its record from any other place in India. The plant has been recently collected by us from Hyderabad, which is obviously significant. Since the species has so far been neither fully described nor illustrated in the Indian floras, it was felt to fill this gap. The present paper also includes a detailed account of the various types of trichomes occurring on the different parts of the species and also the epidermal features of its

leaf, due to their growing taxonomic importance.

- Bacopa floribunda* (R. Br.) Wettst. in *Eng. Prn. Pfam*, 4 (3 b): 77, 1895; Pennell, *Proc. Acad. Nat. Sci. Philad.*, 98: 92, 1943; Santapau, *J. Bombay Nat. Hist. Soc.*, 49: 43, 1950.
- Herpestis floribunda* R.Br. *Prodr.*, 442, 1810; Hook.f., *F.B.I.*, 4: 273, 1884.
- Monniera floribunda* Cooke, *Fl. Pres. Bombay*, 2: 286, 1904; Gamble, *Fl. Pres. Madras*, 2: 953, 1921.

Erect herb, growing upto 10 cm (25 cm) high (Fig. 1). Stems obtusely four-angled, often branched, with glandular hairs which in herbarium specimens appear like bright dots. Leaves sessile, 1-3 × 0.2-0.5 cm, opposite, linear or linear-lanceolate, acute, tapering at