

ISSN: 1110 - 0583

# JOURNAL OF THE EGYPTIAN SOCIETY OF PARASITOLOGY

Volume 30. NO. 1

April, 2000



THE EGYPTIAN SOCIETY OF PARASITOLOGY  
1. Ozoris Street, Garden City, Cairo, Egypt.

**ON THE MORPHOLOGY OF *HELIGMOSOMOIDES*  
*POLYGYRUS* (NEMATODA-  
TRICHOSTRONGYLIDAE) FROM THE FIELD  
MOUSE *APODEMUS SYLVATICUS***

**By**

**DAYHOUM A.M. AL-BASSEL<sup>1</sup>, FIRYL M. STIETIEH<sup>2</sup>  
AND ABDEL MAGEID M.K. FARRAG<sup>3</sup>**

Department of Zoology<sup>1</sup>, Faculty of Science, Cairo University (Fayoum Branch), El Fayoum; Faculty of Medicine<sup>2</sup>, King Abdul Aziz University, Jeddah, Saudi Arabia, and Department of Parasitology<sup>3</sup>, Faculty of Medicine, Ain Shams University, Cairo 11566, Egypt

**ABSTRACT**

The morphology of the trichostrongylid nematode *Heligmosomoides polygyrus* is described by light and scanning electron microscopy. In light microscope, the present material agrees with the original description given by Baylis (1926), except for the addition of more details about the structure of the genital cone and the synlophe. The scanning electron microscopy of the present nematode revealed that the oral opening of the immature worm (L<sub>5</sub>) is rounded and its cuticular surface is loosely attached to the body, while the oral opening of the mature worm is triangular, the two copulatory spicules of the male are alate and closely adhering to each other and the right lobe of the male bursa is longer than the left one. Male prebursal and bursal papillae are described. The female posterior extremity is characterized by crescent vulval and anal openings and a terminal spike.

**INTRODUCTION**

This nematode was originally described by Baylis (1926) from the intestine of the long-tailed field-mouse, or wood-mouse *Apodemus sylvaticus*

from England. Because of the confusion existing between the two nematodes *Nematospiroides dubius* Baylis (1926) and *Heligmosomoides polygyrus* (Linstow, 1878) Hall, 1916, the present work aimed to define the most important taxonomic characteristics of this trichostrongylid nematode particularly the synloph using both light and scanning electron microscopy. Based on the evolutionary pattern of the synloph, Durette-desset and Chabaud (1977) divided Trichostrongyloidea into 8 families including Heligmosomidae to which the present nematode belongs.

## MATERIAL AND METHODS

Several worms were collected from the ileum of the field mouse *Apodemus sylvaticus* from England.

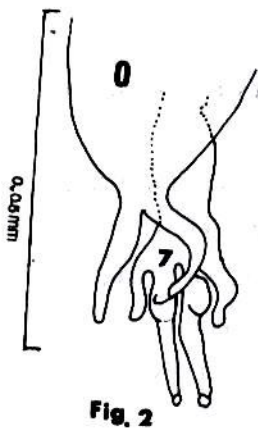
For light microscopy, nematodes were washed in saline, fixed in 10% formaldehyde, then cleared in lactophenol before detailed microscopical examination. Drawings were made to the scale using a Camera Lucida. For scanning electron microscopy, the fixed worms were dehydrated in ascending series of ethanol, then transferred through a series of intermediate fluids (3:1, 2:1 and 1:1) of 100% ethanol and amylacetate and latter to liquid CO<sub>2</sub> in Polaron critical point dryer. The dried specimens were then coated with gold/palladium and examined with JEOL (SEM) 1800EX at the Central Laboratory, Faculty of Science, Ain Shams University, Cairo.

## RESULTS

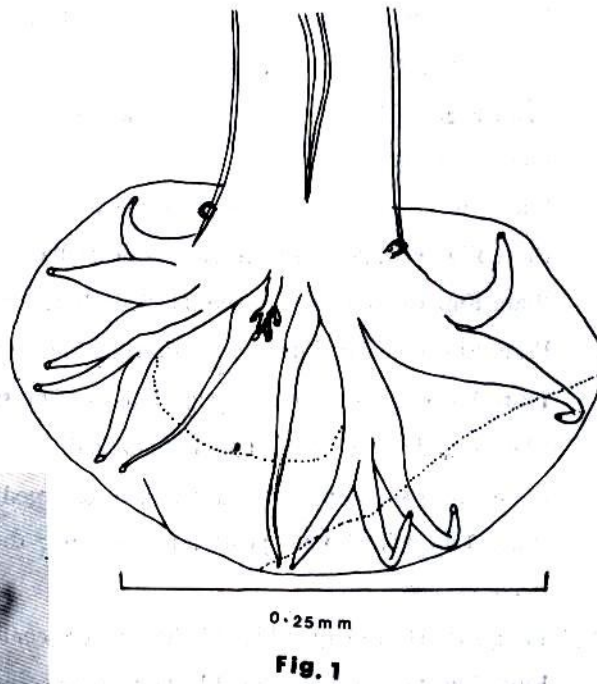
The description of the present nematode is based on 10 specimens of both sexes.

In light microscope, the details of the male bursa (Figs. 1&2) showed that it conforms in every respect to the original description given by Baylis (1926) except for the structure of the genital cone and the synloph. In the present material, the components of the genital cone are clearly illustrated (Fig. 2). This includes the (papillae 0) with two raylets, situated ventral to the cloacal opening and (papillae 7) or dorsal rays formed of 4 small raylets (2 inner long and 2 outer short ones) situated at dorsal side of the cloacal opening. A large ballon-like is found between the lateral lobes of the bursa (Fig. 1). Transverse section in adult female near the middle of the body showed that the synloph is formed of 21-26 cuticular ridges (Fig. 3).

Scanning electron microscopy of the worms revealed that the oral opening of immature worm is rounded and plugged (Fig. 4), while in mature worms, the mouth is triangular and closed by the three sectors of the oesophagus. Four cephalic papillae and two amphids (arrows) appear on the cephalic region surrounding the mouth (Figs. 5-7). Male bursa is characteristically asymmetrical with the right lobe longer than the left one (Fig.1 and Figs. 8-12). The two spicules are alate and adhere to each other and have a sharp terminal points (Figs. 1 & 5). Three pairs of bursal papillae are seen opening on the outer surfaces on both lateral sides of the bursa, and one pair of prebursal papillae situated on the lateral sides of the body just anterior to the bursa (Figs. 9 & 13). Each of the bursal papillae is situated on the top of a small cuticular elevation and possesses a central knob-like structure (Figs. 13 & 14). The female tail narrows gradually, then abruptly to form a characteristic terminal spike (Figs. 15 & 18). The vulval opening possesses a simple crescent-shaped anterior lip (Figs. 15 & 16). The anal opening is situated posterior to the vulval opening and also possesses a simple crescent-shaped anterior lip but smaller (Fig. 17).



**Fig. 3**



**Fig. 1**

## Explanation of figures

### *Heligmosomoides polygyrus*

**Fig. 1:** Camera lucida drawing of male bursa (dorsal view).

**Fig. 2:** Camera lucida drawing of genital cone showing ventral ray (papilla 0) with 2 raylets, and dorsal ray (papillae 7) with 2 outer short and 2 inner long raylets.

**Fig. 3:** Photomicrograph of synlophe.

**Fig. 4:** En-face view of immature worm (L<sub>4</sub>). Note rounded oral opening plugged.

**Fig. 5:** En-face view showing 6 cephalic papillae and 2 amphids, mouth opening partially closed. Note oesophageal anterior edge.

**Plate Fig. 6:** En-face view, showing a triangular mouth completely opened, note 3 sectors of oesophagus.

**Plate Fig. 7:** En-face view, showing a triangular mouth on top of square shaped cephalic plate.

**Plate Fig. 8:** Male bursa, and 2 spicules closely adhering to each other.

**Plate Fig. 9:** Male bursa, left side. Note prebursal papillae (arrow).

**Plate Fig. 10:** Male bursa, ventral view. Note longer right bursal lobe.

**Plate Fig. 11:** Male bursal view showing bursal papillae (Nos. 4 & 8).

**Plate Fig. 12:** Male bursa showing 2 pairs of bursal papillae (Nos. 4 & 8).

**Plate Fig. 13:** Prebursal papillae (enlarged).

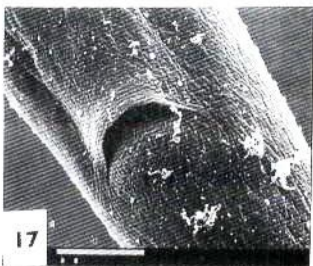
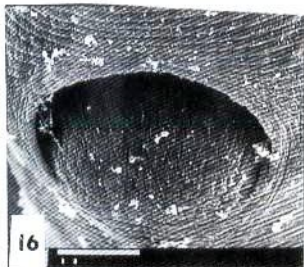
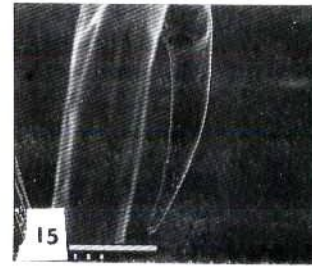
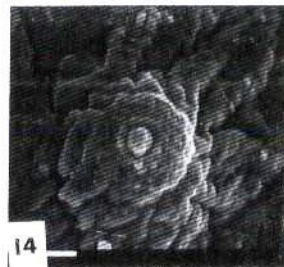
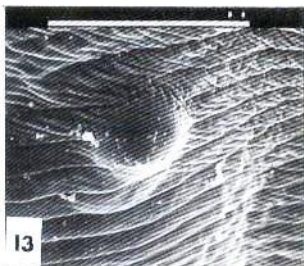
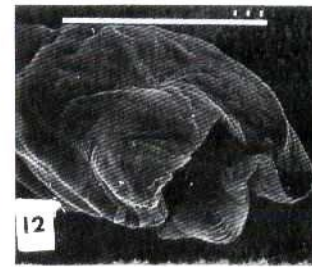
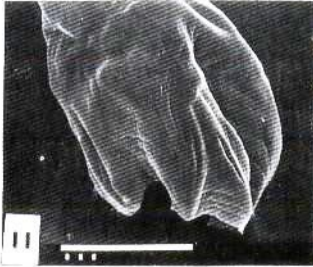
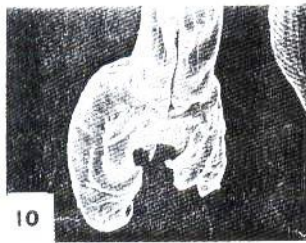
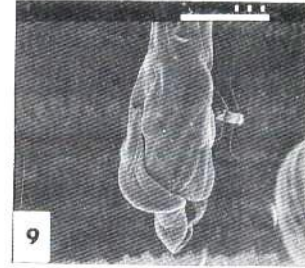
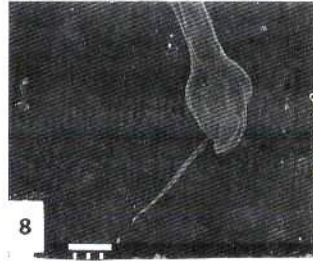
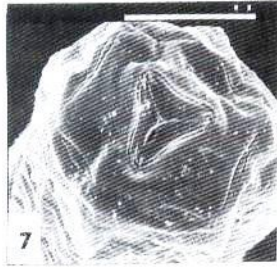
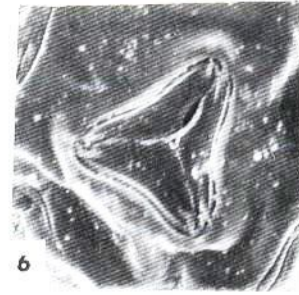
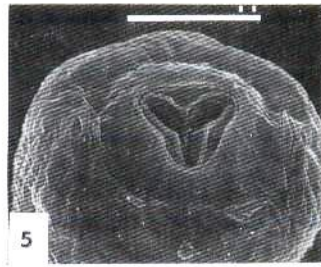
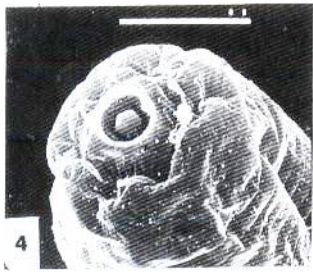
**Plate Fig. 14:** Knobbed bursal papillae (enlarged).

**Plate Fig. 15:** Female posterior extremity, showing vulva, anus and terminal spike.

**Plate Fig. 16:** Enlarged Fig. 12 showing crescent-shaped vulval opening.

**Plate Fig. 17:** Enlarged Fig. 12, showing crescent-shaped anal opening.

**Plate Fig. 18:** Enlarged Fig. 12 showing characteristic terminal spike.



## DISCUSSION

Dujardin (1845) described five species of *Strongylus* from various kinds of mice. His descriptions unfortunately were not sufficiently detailed for modern systematic requirements. For example, the precise arrangement of both bursal rays and cuticular ridges, upon which the modern classification of this group largely depends, were not described and the species was not figured. So far as its description goes, one of these species *Strongylus polygyrus* from *Apodemus sylvaticus* and *Microtus (Arvicola) arvalis*, these seem to agree very closely with *Nematospiroides dubius* (Baylis, 1926). Hall (1916) established the genus *Heligmosomoides* and considered *Strongylus polygyrus* and renamed *H. polygyrus*. Baylis (1926) established the genus *Nematospiroides* and considered *Strongylus polygyrus* and *Heligmosomoides polygyrus* the same and renamed as *Nematospiroides dubius* (Baylis, 1926). Durette-Desset (1968) studied the original materials and drawings of Dujardin (1845) and redescribed *Heligmosomum polygyrum* (= *Heligmosomoides polygyrus*) and its synlophe.

In the synlophe of the present material, the number of the cuticular ridges ranges from 21 - 26, while that number as given by Durette-Desset (1968) (based on material from France) ranges from 24-34.

The importance of the present study comes from the fact that *H. polygyrus* belongs to the family Trichostrongyloidea which is considered by Durette-Desset (1985) as the best model of animal groups with respect to phylogenetic study as they are one of the richest parasitic groups in terms of the number of species and are cosmopolitan occurring in all classes of terrestrial vertebrates. The present material made it possible to establish some morphological features of this species more precisely and to extend knowledge on nematode surface topography particularly the bursa.

The present work has also showed that SEM is an important tool for studying the ultrastructural details of the small sized nematodes, which provides higher resolution with minimal damage of the surface structures such as papillae.

## REFERENCES

**Baylis, H.A. (1926):** On a Trichostrongylid nematode from wood mouse

- Apodemus sylvaticus*. Ann. Mus. Nat. Hist., **9**: 455-465.
- Dujardin, F. (1845)**: Histoire naturelle Des Helminthes. Paris, France.
- Durette-Desset, M.C. (1968)**: Les systemes d'aretes cuticulaires chez les Nematodes Heligmosomes parasites de Murides australians. Ann. de Parasitol. Hum. et Comp., **44**: 733-747.
- Durette-Desset, M.C. (1985)**: Trichostrongyloid Nematodes and their vertebrate hosts: Reconstruction of the phylogeny of a parasitic group. Advan. Parasitol., **24**: 239-306.
- Durette-Desset, M.C. and Chabaud, A.G. (1977)**: Essai de classification des Nematodes Trichostrongyloidea. Ann. de Parasitol. Hum. et Comp., **52**: 539-558.
- Hall, M.C. (1916)**: Nematode parasites of Mammals of the orders Rodentia, Lagomorpha and Hyracoidea. Proc. U.S. Nat. Mus., **1**: 1-258.
- Linstow, O. (1878)**: Neve Beobachtungen an Helminthen. Arch. F. Naturg., **7**: 218-245.