

# Redescription of Nematodes *Pharyngodon mamillatus* and *Thelandros* sp. from Some Reptiles of Qena, Egypt

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**Abstract:** During the present study, about 294 *Mabuya quinquetaeniata* (the common name is bean skin, *sehli* garraiya), 196 of *Ptyodactylus hasselquisti* (the common name is fan footed gecko, *bors abukaff*), 60 *Tarentola annularis* (the common name is Egyptian gecko, white spotted gecko), 30 of *Hemidactylus turicicus* (the common name is Turkish gecko, *bors manzeli*), 106 of *Chalcides ocellatus* (the common name is eyed shink, *Sehli* doffana) and 30 of *Chalcides sepsoides* (the common name is Audouin's sand; *Sehli* nana) were collected from different localities of Qena Governorate which considered as a new locality for this. Two nematode species were found and identified. The first species is *Pharyngodon mamillatus* which belonging to family Pharyngodonidae Travassos, 1919 and collected from the large intestine of *Mabuya quinquetaeniata* (38 out of 294), *Ptyodactylus hasselquisti* (112 out of 196), *Tarentola annularis* (40 out of 60), and *Hemidactylus turicicus* (120 out of 130), the rate of infections were 12.9%, 57.1%, 80%, 92.3% respectively. The second species is *Thelandros* sp. which was collected from the large intestine of *Chalcides ocellatus*, (54 out of 106), *Chalcides sepsoides* (20 out of 30), *Ptyodactylus hasselquisti* (6 out of 196) and *Hemidactylus turicicus* (4 out of 130), the rate of infections were 50.9%, 66.6%, 3.06% and 3.07%, respectively.

**Keywords:** Nematodes- *Pharyngodon mamillatus* – *Thelandros* sp. – reptiles – Qena – Governorate

## 1. Introduction

Reptiles are most abundant in the warmer regions of the world and occupy different habitats. Reptiles have been established as a significant source of diseases in humans for several decades. Adamson and Nasher (1984a) described five new species of Pharyngodontiid nematodes from *Agama yemenensis*. Elwasila (1990) described *Physalopteroides tarentolae* n. sp. from the gecko *Tarentola annularis*. Ashour *et al.*, (1992) studied the morphology of the Oxyurid nematode *Pharyngodon mamillatus* from *Chalcides ocellatus*. Ashour *et al.*, (1994) described the Oxyurid nematode *Parapharyngodon bulbosus* from the lizard *Chalcides ocellatus*. Bursey and Goldberg (1996 b) described the Pharyngodontiid parasite from *Gehyra oceanic*. Bursey and Goldberg (1996 c) described the pharyngodontiid parasite from *Hemidactylus frenatus*. Bursey and Goldberg (1998) reclassified the Pharyngodontiid parasite. Bursey and Goldberg (1999) described the Pharyngodontiid parasite and other helminthes from gecko *Diplodactylus stenodactylus*. Goldberg *et al.*, (1999 a) described two species of nematodes, *Physaloptera retusa* larvae and *Spauligodon giganticus* from side-blotched lizards, *Uta stansburiana*. Goldberg *et al.*, (1999 b) described four species of nematodes from the madrean alligator lizard. Goldberg *et al.*, (1999 c) described four species of nematodes from twenty day geckos six species of nematodes. Goldberg *et al.*, (1999d) studied the lizard *Barisia imbricate* harbored four species of nematodes. Goldberg *et al.*, (2013) described eight species of nematoda: gravid specimens of *Cosmocerca parva*, *Parapharyngodon scleratus*, *Physaloptera retusa*, *Skrjabinelazia galliardi*, *Spauligodon bonairensis* and *Spauligodon oxkutzcabiensis*, larvae of *Physaloptera* sp. and *Acuariidae* gen. sp. Haering-Hagenbeck *et al.*, (2000) redescribed some *Thelandros* and *Tachygonetria* spp. (*Pharyngodontidae: Oxyuroidea*) from plated lizard, *Gerrhosaurus validus*. Goldberg and Bursey (2001 a)

described two nematode species from gekonid lizards. Goldberg and Bursey (2001 b) described five species of nematodes from *Mabuya*. Bursey and Goldberg (2007a) described the pharyngodontiid parasite, *Parapharyngodon baueri*, from legless skink, *Typhlosaurus lineatus*. Bursey and Goldberg (2007 b) described the Pharyngodontiid parasite *Parapharyngodon grimeri* from the rock lizards *Petrosaurus repens*, and *Petrosaurus thalassinus*. Al-Bassel and El-Damarany (2002) studied the morphology of *Pharyngodon mamillatus* from *Tarentola annularis*. Bursey and Goldberg (2005) described two new species of Pharyngodontiid parasite *Parapharyngodon kenyaensis* and *Thelandros samburuensis* from the agamid lizard *Agama caudospina*. Amer and Bursey (2008) recovered more than 100 individuals of the Oxyurid nematode, *Pharyngodon mamillatus* Schneider's skink, *Novoeumeces schneideri*. Mašová *et al.*, (2008) studied morphometric and molecular characterization of the Pharyngodontiid parasite *Parapharyngodon echinatus*. Dung *et al.*, (2009) described the Pharyngodontiid parasite, *Thelandros vietnamensis*, from the agamid lizard; *Leiolepis reevesi*. Mašová *et al.*, (2009) redescribed the pharyngodontiid parasite *Parapharyngodon micipsae* from the new host *Tarentola parvicarinata*. Pereira *et al.*, (2011) described the Pharyngodon nematode, *Parapharyngodon binae* n. sp., from *Tropidurus torquatus*. Pereira *et al.*, (2012) described *Physaloptera tupinambae* n. sp. (Nematoda: Physalopteridae) from *Tupinambis merianae*.

The aim of the present study is constructed to study the parasites which infected some reptiles in Qena Governorate, determined the rate of infection and described the morphology of these parasites by both light and scanning electron microscope.

## 2. Materials and Methods

### 2.1 Collection of Helminthes

The collected hosts were dissected. The oral and body cavity were examined. The general viscera were removed and placed in physiological saline solution (0.7%). The parasites were removed and washed with saline to remove the adherent debris.

#### a) Preparation of helminthes for light microscopic examination:

The nematode parasites were fixed in hot 70 % ethyl alcohol to be sure of their relaxation. Then the collected worms were preserved in 70 % ethyl alcohol mixed with 10% glycerol to avoid sudden drying. Finally, the nematodes were mounted on a slide with few drops of lactophenol for microscopic examination and identification. The former technique was used to help for describing and counting cervical and caudal papillae.

#### b) Preparation of sample for Electron Microscopic Examination:

For scanning electron microscopy, some of freshly obtained parasites were fixed in cold 5% glutaraldehyde in 0.1 M cacodylate buffer for 24 hours. The material was washed in 0.1 M sodium cacodylate buffer (PH 7.4) three times, 15 minutes for each and then treated with osmic acid for 2 hours. Washing three times with buffer was repeated and then the material was dehydrated through aggraded ethanol series and then dried at 30°C for 30 minutes. After complete drying the material was mounted on holders with silver paint and coated with a layer of gold under vacuum. Specimens were investigated using JEOL JSM-5400 LV Scanning Electron Microscope at 15 K volt. Electron micrographs were taken with different magnifications and analyzed.

#### c) Drawing, Measurements, Photomicrography and Electron micrograph of helminthes:

Carl Zeiss drawing camera Lucida was used for drawing the specimens. Calibrated eye piece was used for measuring the specimens. For all micrographs Zeiss photo research microscope and JEOL JSM-5400 LV scanning electron microscope were used.

Identification: The collected parasites were identified by Prof. Thoraia Elassy, Prof. of Parasitology, Parasitology Department, Animal Health, Re. Inst .

#### 1) *Pharyngodon mamillatus*

- Phylum : Nematoda
- Order : Ascaridida Skrjabin et Schulz, 1938
- Family : Pharyngodonidae Travasson, 1919
- Genus : *Pharyngodon* Diesing, 1861
- Species : *mamillatus* Linstow, 1897

The present nematode was collected from the large intestine of *Mabuya quinquetaeniata*, *Ptyodactylus hasselquistii*, *Tarentola annularis* and *Hemidactylus turcicus*.

**Male:** The male is shorter than the female, about 1.60-2.01 (av. = 1.8) mm. in length and about 0.12-0.17 (av. = 0.14) mm. in width. Oesophagus is cylindrical in shape, ends with

a slight constriction (Fig. 1A & plate 1A) and its length (including bulb) measures about 0.25-0.77 mm. excretory pore is situated 0.52-0.58 mm. from the anterior extremity of the body. The single lateral alae extends ventrolaterally from the cervical region to the posterior bursa forming a projection part. The cloaca is situated at the center of the projection. There are three pairs of cloacal papillae around the cloacal opening; one pair is precloaca and two pairs postcloaca (Fig. 1B & plate 1B). The tail ends in a smooth short terminal spike that measure about 0.06 – 0.09 mm. in length.

**Female:** The female is longer than the male, about 3.14-4.50 (av. = 3.20) mm in length and about 0.3-0.4 (av. = 0.3) mm in width. Mouth opening is triangular surrounded with 6 protrusible lips. The 6 lips possess 3 oral papillae. Excretory pore lies 0.70-0.92 mm from anterior extremity. Oesophagus is cylindrical in shape and measures about 0.35-0.94 mm in length (including bulb). The valval opening is transversally oval shaped and possesses double walled cuticular lips (Fig 2A & plate 2A) which are provided with cilia like structure. The vagina is a straight muscular tube measuring 0.7-0.9 mm. long. The uterus occupies most of the body and contains large number of eggs. The eggs are smooth, elongated in shape, each egg measures about 0.13-0.16 µm in length, about 0.04-0.06 µm in width and with two opercula, one on each pole of the egg (Fig 2C & plate 2C & Plate 4C). The tail extends as a terminal spike and measures 0.51-0.91 mm. long (Fig 2B & plate 2B).

#### Scanning electron microscopically study:

This study revealed that the cuticular surface of the body is regularly transversely striated. The mouth opening is laterally compressed and surrounded by three pseudolabia; one dorsal and two ventral (Plate 3A & 4A). There are four cordons in the form of ridges extending from the anterior end of the body to some distance back wordly. The valval opening is transversally oval shaped and possesses double walled (Plate 4B). The eggs are smooth elongate each with two opercula, one on each pole (Plate 4C). The posterior end of the body extends like a very smooth spine (Plate 4D).

## 3. Discussion

The morphological characters of the present nematode parasite coincide with those of the family *Pharyngodonidae*, Travasson, 1919 and the genus *Pharyngodon*, Diesing, 1861. Malan (1939) has furnished a valuable key to the species of *Pharyngodon*. Eleven species have been described since Malan's key was prepared. Calvente (1948) has proposed that the genus *Pharyngodon* divided into two subgenera, *Pharyngodon* and *Neyrapharyngodon*. *Pharyngodon mamillatus* was originally described by Linstow (1897). Chabaud and Golvan (1957) redescribed the same species from *Eumeces algerinsis*. Moravic *et al.*, (1987) redescribed the same species. In Egypt it was described by Baylis (1936) probably from *Eumeces sp.* from *Eumeces schneideri*. Ashour *et al.*, (1992) redescribed the same species from *Chalcides ocellatus*. Mazen *et al.*, (1996) reported *P. mammillatus* from *Chalcides ocellatus*, *Eumeces schneideri* and *Tarentola annularis*. Moreover, the present study described and added more details for some structures of this nematode by using scanning electron microscope. The

scanning electron microscope showed that the body is transversally striated, the mouth opening is ventral in position, laterally compressed and surrounded by three pseudolabia. Scanning electron microscope showed that four cordons are found in the form ridges on the surface of the body extending from the anterior end of the body. In the

female the mouth opening is surrounded by six protrusible lips possess 3 oral papillae. The valval opening is transversally oval shaped and possesses double walled. The eggs are smooth elongate, having the spindle shape. The present parasite has been compared with other authors as shown in table (1).

**Table 1:** Comparison between *Pharyngodon mamillatus*, (Mazen *et al.*, 1996), (Al-bassel *et al.*, 2002), and the present species (measurements in mm).

| characters       | Present species   | Mazen <i>et al.</i> ,1996   | Al-bassel <i>et al.</i> ,2002       |
|------------------|---|---|-------------------------------------|
| Host             | <i>Mabuya quinquetaeniata</i> ,<br><i>Ptyodactylus hasselquisti</i> ,<br><i>Tarentola annularis</i> ,<br><i>Hemidactylus turcicus</i> | <i>Chalcides ocellatus</i> , <i>Tarentola annularis</i> , <i>Eumeces schneideri</i> | <i>Tarentola annularis</i>          |
| Male Body Length | 1.60 – 2.01   | 2.592   | 1.75 – 2.24                         |
| Body width       | 0.12 – 0.17   | 0.180   | 0.19 – 0.25                         |
| Oesophagus       | 0.25 – 0.77   | 0.432   | 0.36 – 0.45                         |
| Excretory pore   | 0.52 – 0.58   | 0.743   | 0.52 – 0.58                         |
| spicule          | –   | 0.037 short triangular  | –                                   |
| Papillae         | 3 pairs, one precloaca & 2 postcloaca   | 3pairs, one precloaca & 2postcloaca   | 3pairs, one precloaca & 2postcloaca |

Continuuous:

|                       |   |  |   |
|-----------------------|---|--|---|
| Tail                  | 0.06 – 0.1                                    | 0.15-0.21 short terminal spike                                   | 0.13-0.20 short terminal spike                  |
| 2) Female Body length | 3.14 – 4.50                                   | 2.7 – 3.24   | 3.6 – 4   |
| Body width            | 0.3 – 0.4                                     | 0.40 – 0.46  | 0.35 – 0.45                                     |
| Oesoph-length         | 0.35 – 0.48                                   | 0.470  | 0.48 – 0.50                                     |
| Excretory pore        | –   | –  | 0.50 – 0.65                                     |
| Vulva                 | 0.8 – 1.05                                    | 0.612  | 0.45- 0.72                                      |
| Egg                   | Smooth elongate<br>137X151 – 49 X60 µm        | Smooth elongate 115X135µ<br>mX45-53 µm                           | Smooth elongate 114X136µm X46-50 µm             |
| Tail                  | 0.5 – 0.9 represent a caudal projection spike | Conical 0.544 – 0.625 of which slender caudal projection is 0.28 | 0.56 – 0.60 represent a caudal projection spike |

2) *Thelandros* sp.

- Family : Oxyuridae Cobbold, 1864.
- Subfamily : Oxyurinae Hall, 1916.
- Genus : *Thelandros* Wedi, 1861.

The present parasite was collected from the large intestine of *Chalcides ocellatus*, *Chalcides sepsoides*, *Ptyodactylus hasselquisti* and *Hemidactylus turcicus*. The body is cylindrical, tapering at both ends and striated transversally (Plate 6A). The body is 1.85-3.02 (av.= 2.39) mm. in length and is 0.17-0.25 (av.= 0.21) mm. in width. The oesophagus is cylindrical, 0.48-0.65 (av.= 0.56) mm. in length and ending by a well developed bulb which leads to the intestine (Fig. 4A & Plate 6B).

- **Male:** The testes are situated at the midbody. The tail is narrow and its length 0.03 - 0.05 mm. There are three pairs of anal papillae, the first and the second are pre and perianal. The third pair is situated on the ventral surface of the caudal process (Fig. 3B & Plate 5B).
- **Female:** The body is 2.65-3.85 (av. = 3.2) mm. in length and 0.36-0.46 (av.= 0.41) mm. in width. The esophagus (including bulb) is 0.66-0.76 (av.= 0.72) mm. in length (Fig. 4A & Plate 6B). The vulva is post-equatorial. The

egg is oval in shape and measures 78.69 - 84.27 µm. long and 51.34-68 µm wide (Fig.4C & Plate 6D).

**Scanning electron microscopic study:** The body is transversely striated and this striation of cuticle is beginning just below the cephalic collar. The mouth is terminal in position and surrounded by three bilobed papillae; one is dorsal and two ventro-lateral (Plate 8A). There are four sinuous cordons in the form of ridge extending from the anterior end of the body to the extremely posterior end of the body.

- Male: The posterior end of male shows presence of 3 pairs of sessile cloacal papillae. One pair of preanal papillae is dorsal in position. Two pairs are ventro-lateral in their position (Plate 7B).
- Female: The vulval opening is a transverse opening like a slit (Plate 8B) and situated on the ventral side of the body. The anus is transverse slit-like in shape. The extremely posterior end of the body extends like a very short smooth spine ( Plate 8 C).

**Table 2:** Showing the measurements of the present species in comparison with other species of the genus *Thelandros*, all measurements are in millimeter otherwise specified.

| Characters         | <i>Thelandros</i> sp. | <i>T. aegypti</i> | <i>T. agama</i>          | <i>T. masaae</i> | <i>T. petterae</i> |
|--------------------|-----------------------|-------------------|--------------------------|------------------|--------------------|
|                    | Present species       | Amer, 2004        | Adamson and Nasher, 1984 |                  |                    |
| Male Body length   | 1.85 - 3.02           | 3.55 – 4.31       | 2.29 ( 0.72-2.51)        | 2.8 ( 2.2-3.56)  | 2.5 (2.31-2.54)    |
| Body width         | 0.17- 0.25            | 0.28 – 0.32       | 0.16                     | 0.23 (0.18-0.25) | 0.16 (0.15 -0.18)  |
| Oeso-length        | 0.48 -0.65            | 0.64 – 0.75       | 0.66                     | 0.92             | 0.87               |
| Tail length        | 0.03 - 0.05           | 0.06 – 0.07       | 0.065                    | 0.09(0.07-0.09)  | 0.077              |
| Spicule length     | -                     | 0.093 -0.12       | 0.067                    | 0.12 (0.11-0.12) | 0.050              |
| Female Body length | 2.65 -3.85            | 6.16 – 6.98       | 3.03 (2.97-3.38 )        | 5.64( 4.74-6.25) | 3.04 ( 2.95 -3.3)  |
| Body width         | 0.36 -0.46            | 0.45 – 0.59       | 0.25(0.22-0.24 )         | 0.5(0.44-0.58)   | 0.278 ( 0.23-0.31) |
| Oeso-length        | 0.66 -0.76            | 0.98 – 1.03       |                          | 1.21             | 1.18               |
| Exc.pore dist.     |                       | 1.68 – 1.83       | 1.03 ( 0.99- 1.13)       | 2.0(1.86-2.26)   | 1.34( 1.25-1.44)   |
| Vulva dist.        | 1.47-1.73             | 3.38 – 3.88       | 2.0 (1.9-2.3 )           | 0.59(0.31-0.68)  | 2.57( 2.49-2.82)   |
| Tail length        | -                     | -                 | 0.08                     | 0.08             | 0.14               |
| Egg size (µm)      | 78 -84 x 51-68        | 126-144 x 75 - 90 | 95-120 x 62-68           | 116-118 x57-63   | 122-143 x 97-112   |

#### 4. Discussion

According to Yamaguti (1961) the genus *Thelandros* is characterized by the following:

Mouth is bounded by three bilobed lips, buccal margin with 6 sessile papillae corresponding to lips. The buccal cavity is short, without chitinous lips. The esophagus is with a very short pharynx and a posterior bulb. The posterior extremity truncate of male is with a mid-dorsally tail process. The caudal alae is absent. There are three pairs of caudal papillae ; one of them is situated on the ventral surface of the caudal process. The spicule is short and sharp-pointed. The gubernaculum is absent. The tail of female is suddenly constricted behind anus to form a terminal spike. The vulva is usually a little behind middle of body. The uterine branches are parallel. These parasites are of reptiles, oviparous and the eggs are oval, not embryonated when laid.

It is obvious from the description of the present nematode that it belongs to the genus *Thelandros* (Wedl, 1861). Walton (1941) reviewed the geographical and host distribution of genus *Thelandros*. He pointed out that the majority of the known species are from North Africa. However, a few species were reported from Asian, South American hosts and one from Australia. Walton (1941) described legless lizard and the female of *Thelandros* sp. from California Red. The present parasite was reported from Qena Governrate, Upper Egypt. Amerein (1951) stated that the genus *Thelandros* consists of twenty three described species; twenty-two of them have been described from reptiles and one from an amphibian host. Adamson (1981 a) redefined *Parapharyngodon* and *Thelandros* and distinguished them on the basis of male and female caudal morphology and egg structure. He also reported that *Parapharyngodon* spp. Are found in insectivorous reptiles and amphibians, where *Thelandros* sp. are essentially parasites of herbivorous and omnivorous reptiles. Adamson and Nasher (1984 b) described the pharyngonid nematode, *Thelandros popovi* (Markov and Bogdanov, 1963) from the posterior intestine of *Agama adramitana* in Saudi Arabia. Gupta and Duggal (1989) described *Thelandros baylist* (Chatterji, 1935) from the intestine of rock lizard, *Agama hemalayana*.

The measurements of present parasite have been compared with other species of genus *Thelandros* as shown in table (2).

By comparing the present parasite with *Thelandron aegypti*, the present nematode differs from *T. aegypti* in the following:

- The oral opening of the present species has no lips but *T. aegypti* is surrounded by three lips.
- There are clear mensural variations between them.
- The number and position of caudal papillae.
- The spicule of the male.
- Two pit-like amphids are present at the lateral side of cephalic collarete of *T. aegypti* but in the present species are absent.

#### References

- [1] Adamson, M. L. and Nasher, A. K. (1984 a): Pharyngodonidae (Oxyuroidea: Nematoda) of *Agama yemenensis* in Saudi Arabia: hypothesis on the origin of pharyngodonids of herbivorous reptiles. Syst. Parasitol., 6 (4): 299-318.
- [2] Adamson, M. L. and Nasher, A. K. (1984 b): Pharyngodonidae (Oxyuroidea: Nematoda) of *Agama yemenensis* in Saudi Arabia with notes on *Parapharyngodon*. Can. J. Zool., 62 (12): 2600-2609.
- [3] Al-Bassel, D. and El-Damarany, M. (2002): On the morphology of *Pharyngodon mamillatus* (An Oxyurid nematode) from *Tarentola annularis* from Fayoum. Governorate, Egypt. Invertebrate Zoology and Parasitology., (37 D): 1-8.
- [4] Amer, O. S. O. and Bursey, C. R. (2008): On the Oxyurid Nematode, *Pharyngodon mamillatus* in the skins, *Novoeumeces schneideri* (Lacertilia: Scincidae) from Egypt. Comp. Parasitol., 75 (2): 333-338.
- [5] Ashour, A. A., Koura, E. A., El-Alfy, N. M. and Abdel-Aal, Z. (1992): On the morphology of the oxyurid nematode *Pharyngodon mamillatus* (Linstow, 1897) from *Chalcides ocellatus* from Egypt. J. Egypt. Soc. Parasitol., 22 (3): 801-807.
- [6] Ashour, A. A., Wanas, M. Q., Salama, M. M. I. and Gafaar, N. A. (1994): Scanning electron microscopy observations on *Parapharyngodon bulbosus* (Linstow,1899) (Nematoda: Pharyngodonida) from

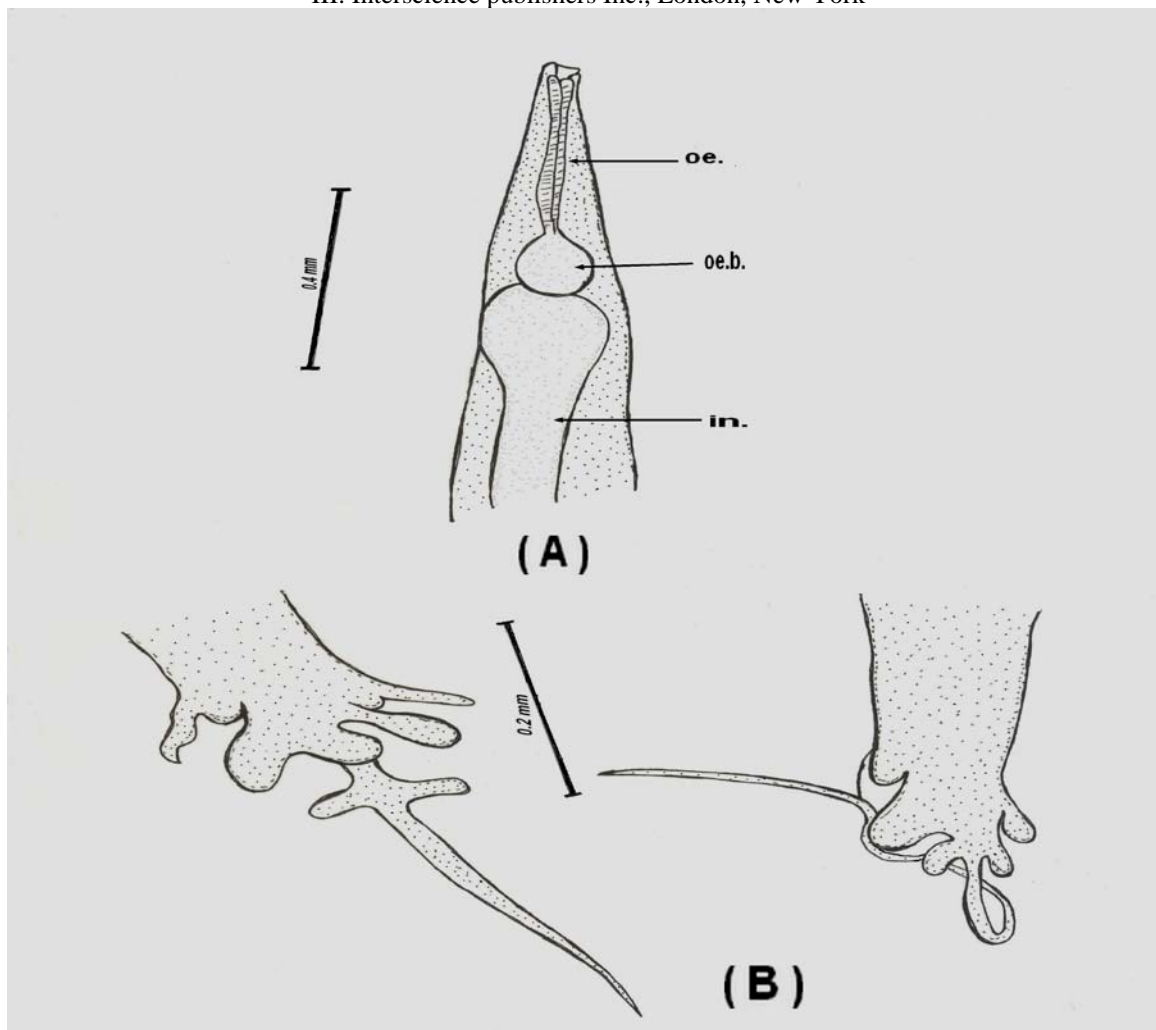
- Egyptian *Chalcides ocellatus*. J. Egy. Soc. Parasitol., (24): 585-590.
- [7] Bursey, C. R. and Goldberg, S. R. (1996 b): *Spauligodon gehyrae* n. sp. (Nematoda: Pharyngodonidae) from *Gehyra oceanica* (Sauria: Gekkonidae) from Guam, Mariana Islands, Micronesia. J. Parasitol., 82 (6): 962-964.
- [8] Bursey, C. R. and Goldberg, S. R. (1996 c): *Spauligodon hemidactylus* n. sp. (Nematoda: Pharyngodonidae) from *Hemidactylus frenatus* (Reptilia: Gekkonidae) from Oceania. J. Parasitol., 82 (2): 299-301.
- [9] Bursey, C. R. and Goldberg, S. R. (1998): Reclassification of *Skrjabinodo anolis* (Chitwood, 1934). Inglis. 1968 as *Spauligodon anolis* (Chitwood, 1934) n.comb. (Nematoda: Pharyngodon) from anolis lizards of the Caribbean. J. Parasitol., 84 (4): 819-822.
- [10] Bursey, C. R. and Goldberg, S. R. (1999): *Spauligodon ovifilus* n. sp. (Nematoda: Pharyngodonidae) and other helminthes from *Diplodactylus stenodactylus* (Reptilia: Gekkonidae) Australia. J. Parasitol., 85 (5): 898-902.
- [11] Bursey, C. R. and Goldberg, S. R. (2005): Two new species of Pharyngodonidae (Nematoda: Oxyuroidea) and other nematodes in *Agama caudospina* (Squamata: Agamidae) from Kenya, Africa., J. Parasitol., 91(3): 591-599.
- [12] Bursey, C. R. and Goldberg, S. R. (2007 a): A new species of *Parapharyngodon* (Nematoda: Parapharyngodonidae) and other helminthes in *Typhlosaurus lineatus* (Squamata: Scincidae), from Southern Africa. Onderstepoort J. Vet. Res.; 74 (2): 143-147.
- [13] Bursey, C. R. and Goldberg, S. R. (2007 b): A new species of *Parapharyngodon* (Nematoda: Parapharyngodonidae) and other helminthes in *Pterosaurius repens* and *P. thalassinus* (Squamata: Phrynosomatidae) from Baja California Del Sur, Mexico. Sou. Wes. Nat., 48 (2): 208-217.
- [14] Chabaud, A. G. and Golvan, Y. J. (1957): Miscellaneous Helminthologica Marocana XXIV. Nematodes parasites de lezards de la foret de Nefifik. Arch. Inst. Pasteur Du Maroc., (5): 447-469.
- [15] Dung, B. T., Bursey, C. R., and Goldberg, S. R. (2009): A new species of *Thalelandros* (Nematoda, Oxyuroidea, Pharyngodonidae) in *Leiolepis reevesi* (Sauria, Agamidae) from Vietnam. Acta Parasitol., 54 (2): 151-153.
- [16] Calvente, I. G. (1948): Revision del Genero pharyngodon y Descripcion de Especies Nuevas. Rev. Iberica Parasitol., (8): 367-410.
- [17] Elwasila, M. (1990): *Physalopteroides tarentolae* n.sp. (Nematoda : physalopteridae) from the gecko *Tarentola annularis* in the Sudan. Sys. Parasitol., 15 (2): 121-125.
- [18] Goldberg, S. R., Bursey, C. R. and Cheam, H. (1999 a): Composition of the helminth community of a Montane population of the side-blotched lizard, *Uta stansburiana* (Phrynosomatidae) from Los Angeles County, California. Am. Midi. Nat., 141 (1): 204-208.
- [19] Goldberg, S. R., Bursey, C. R. and Cheam, H. (1999 b): Helminths of the Madrean alligator lizard, *Elgaria kingii* (Sauria: Anguidae), from Arizona. Great Basin Nat., 59 (2): 198-200.
- [20] Goldberg, S. R., Bursey, C. R., Bauer, A. M. and Cheam, H. (1999 c): Helminths of the day geckos, *Rhoptropus afer* and *Rhoptropus barnardi* (Sauria: gekkonidae), from Namibia, Southwestern Africa. J. Helminthol. Soc. Wash., 66 (1): 78-80.
- [21] Goldberg, S. R., Bursey, C. R. and Camarillo-Rangel, J. L. (1999 d): Helminths of two lizards, *Barisia imbricata* and *Gerrhonotus ophiurus* (Sauria: Anguidae), from Mexico. J. Helmintho. Soc. Wash., (66): 205-208.
- [22] Goldberg, S. R. and Bursey, C. R. (2001 a): Research note gastrointestinal helminths of gekkonid lizards (Sauria: Gekkonidae) from the Philippine Islands and Thailand. Comp. Parasitol., 68 (1): 138-142.
- [23] Goldberg, S. R. and Bursey, C. R. (2001 b): Intestinal helminthes of four species of skinks (Mabuya) (Sauria: Scincidae) from Southern Africa. Onder. J. Vet. Res., (68): 143-147.
- [24] Goldberg, S. R. and Bursey, C. R. and Vitt, L. J. (2013): Gastrointestinal Nematodes of Four Species of *Gonatodes* (Squamata: phaerodactylidae) from Central and South America. Com. Parasitol., 80(1): 143-146.
- [25] Gupta, N. K and Duggal, C. L. (1989): On two oxyurid nematodes from rock lizard in Himachal pradesh. Res. Bull. Pan. Univ. Sci., 40 (1-2): 85-87.
- [26] Hering-Hagenbeck, S. F., Petter, A. J. and Boomre J. (2000): Redescription of some *Thelandros* and *Tachyonetria* spp. (Pharyngodonidae: Oxyuroidea) from the omnivorous plated lizard, *Gerrhaurus validus* -in South Africa. Onderste., J. Vet. Res., 0 (1): 31-51.
- [27] Linstow, O. V. O. N. (1897): Nematoden aus der Berliner Zoologiscnen.
- [28] Moravic, F., Barus, V. and Rysavy, B. (1987): Some parasitic nematodes, excluding Heterakidae and Pharyngodonidae, from amphibians and reptiles in Egypt. Fol. Parasitol., (34): 255-267.
- [29] Malan, J. R. (1939): Some helminths of South Africa lizards. Onderstepoort Journal of Veterinary Science and Animal Industry, (12): 21-74.
- [30] Mazen, N. A. M., Sayed, F. G., El-Nazer, M. and El-Damarany, M. (1996): Studies on some parasitic nematodes of reptiles in Assiut Governorate. Bull. Fac. Sci., Assuit univ., 25 (3-E): 1-10.
- [31] Mašova, Š., Baruš, V., Hodová, I., Kouber, P. and Koubková, B. (2008): Morphometric and molecular characterization of *Parapharyngodon echinatus* (Nematoda: Pharyngodonidae) from the Senegal gecko *Tarentola parvicarinata*. Acta Parasitologica, 53 (3): 274-283.
- [32] Mašova, Š., Baruš, V., Hodová, I., Kouber, P. and Koubková, B. (2009): Redescription of *Parapharyngodon micipsae* (Seurat1917) (Nematoda pharyngodonidae) from the new host *Tarentola parvicarinata* Joger1980 (Squamata : Gekkonidae) Tropical Zoo., 22:243-255.
- [33] Pereira, F. B., Sousa, B. M. and Lima, S. S. (2011): A New Species of Pharyngodonidae (Nematoda) of *Tropidurus torquatus* (Squamata: Tropiduridae) from Brazil. J. Parasitol., 97(2): 311-317.
- [34] Pereira, F. B., Alves, P. V., Rocha, B. M., Lima, S. S. and Luque, J. L. (2012): A new *Physaloptera* (Nematoda: Physalopteridae) Parasite of *Tupina mbianae* (Squamata: Teiidae) from Southeastern Brazil. J. Parasitol., 98 (6): 1227-1235.

[35]Read, C.P. and Amerein, Y. U. (1951): Some new oxyurid nematodes from Southern California. J. Parasitol., 37: 379-383.

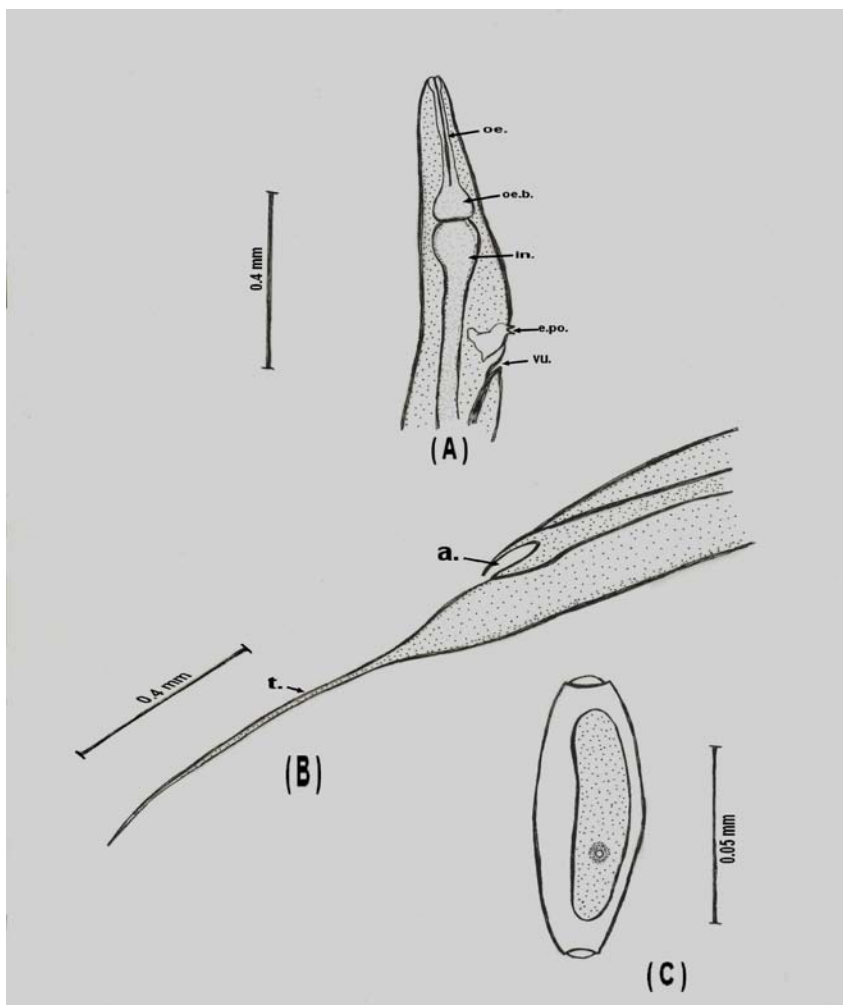
[36]Walton, A. C. (1941): Distribution of the genus *Thelandros* (Nematoda: Oxyurida ). Proc. Helminthol. Soc. Wash., 8: 15-18.

[37]Yamaguti, S. (1961): Systema helminthum: The nematodes of vertebrates. Vol.

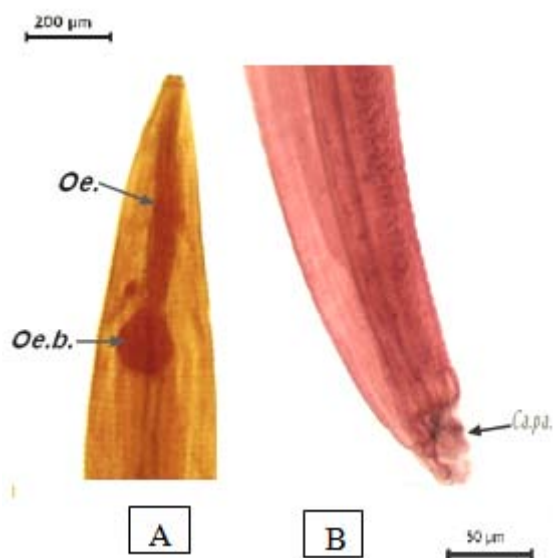
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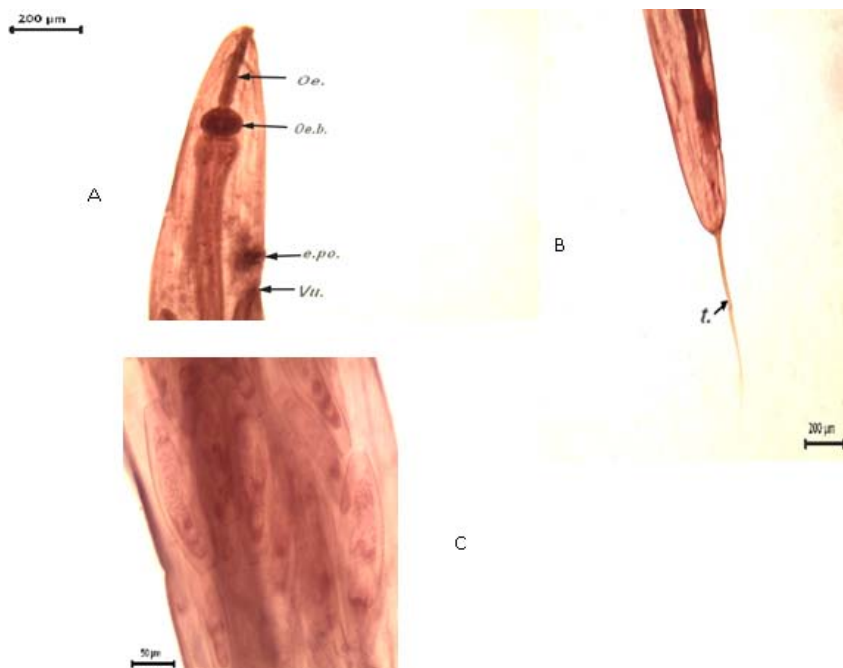
**Figure 1:** Camera Lucida drawing of male *Pharyngodon mamillatus* shows: A) Anterior region shows (oe.= oesophagus, oe.b.= oesophageal bulb, in. = intestine) and B) Posterior end.



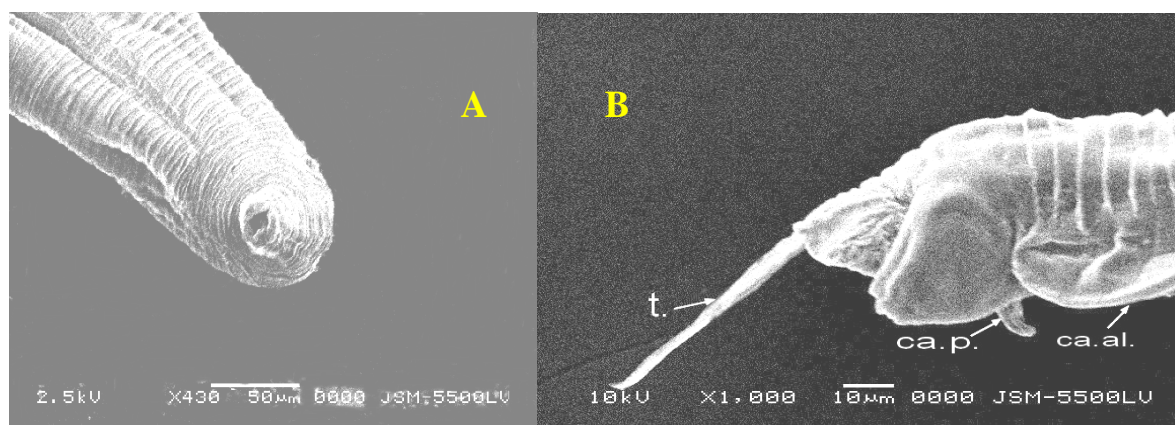
**Figure 2:** Camera Lucida drawings of female *Pharyngodon mamillatus* shows: A) Anterior region showing (oe.= oesophagus, oe.b.= oesophageal bulb, in.= intestine, e.po.= excretory pore and vu.= vulva); B) Posterior end showing (t.= tail) and C) The egg.



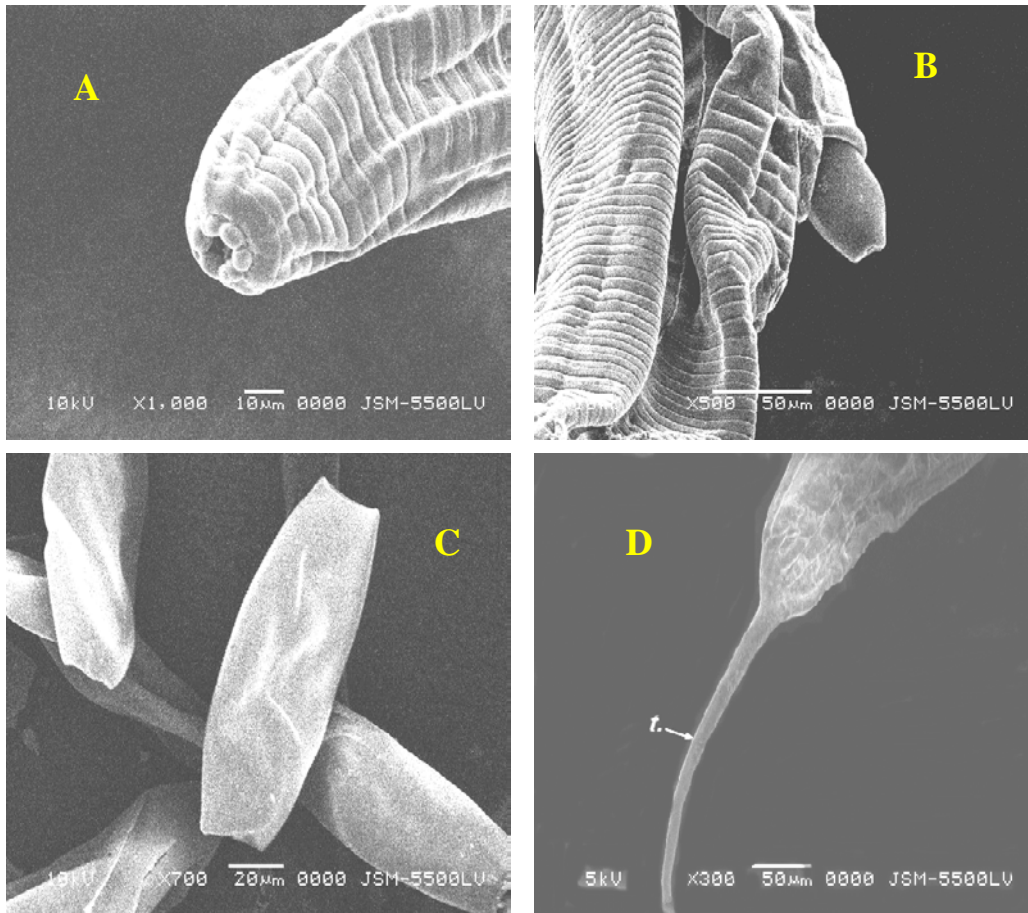
**Plate (1):** Photomicrographs of male *Pharyngodon mamillatus* shows; A) Anterior end of male showing (oe.= oesophagus and oe.b.= oesophageal bulb) and B) Posterior end of male showing ( ca.p.= caudal papillae).



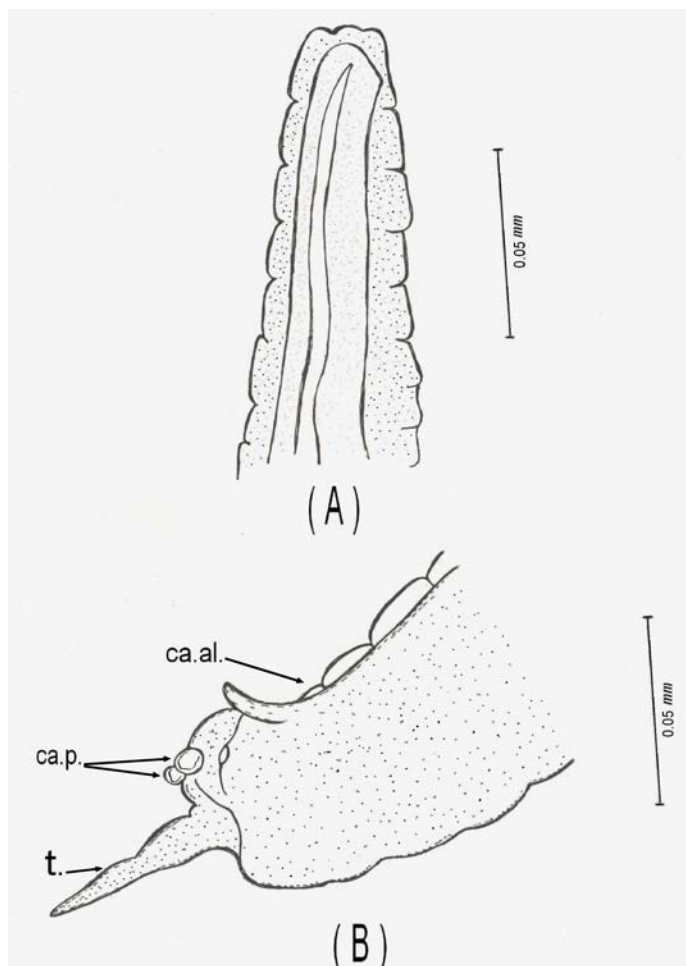
**Plate 2:** Photomicrographs of female *Pharyngodon mamillatus* containing; A) The oesophagus, Oesophageal bulb, excretory pore and vulva stained by acetocarmine showing (oe.= oesophagus, oe.b.= oesophageal bulb, e.po.= excretory pore and vu.= vulva); B) The posterior extremity stained by acetocarmine showing (t. = tail) and C) The eggs.



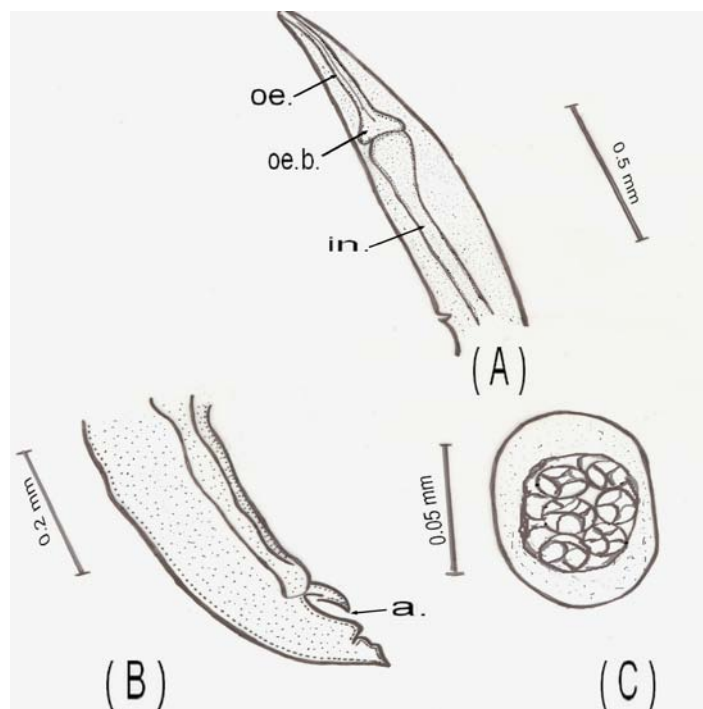
**Plate 3:** Scanning electron microscope of male of *Pharyngodon mamillatus* illustrating; A) Anterior end and B) Posterior end (ca.al.= caudal alae, ca.p.= caudal Papillae and t. = tail).



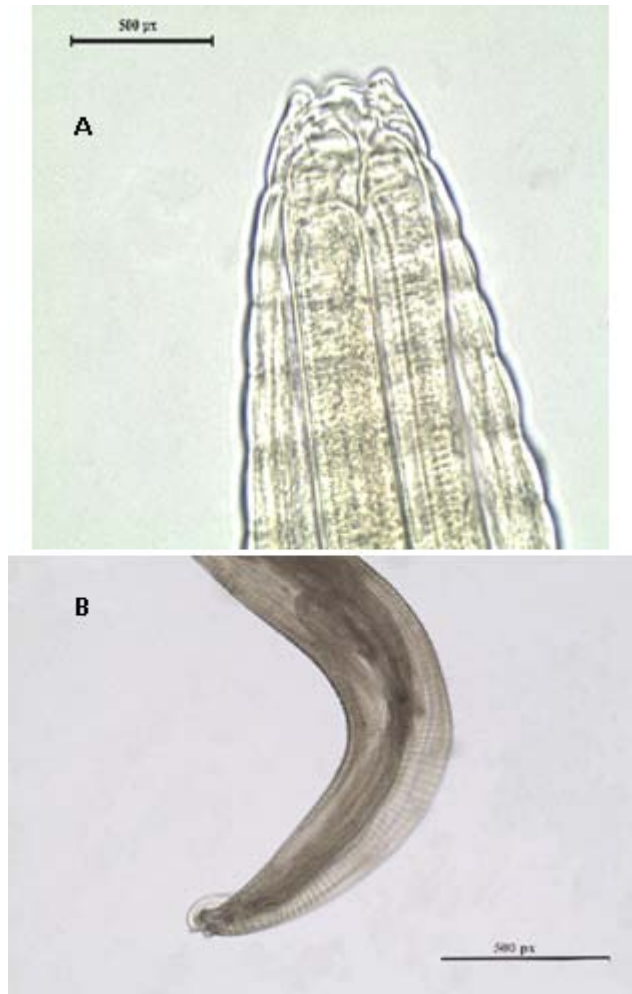
**Plate 4:** Scanning electron microscope of female of *Pharyngodon mamillatus* illustrating; A) Anterior end showing lips; B) Vulva region; C) Egg and D) Posterior end of female showing tail filament.



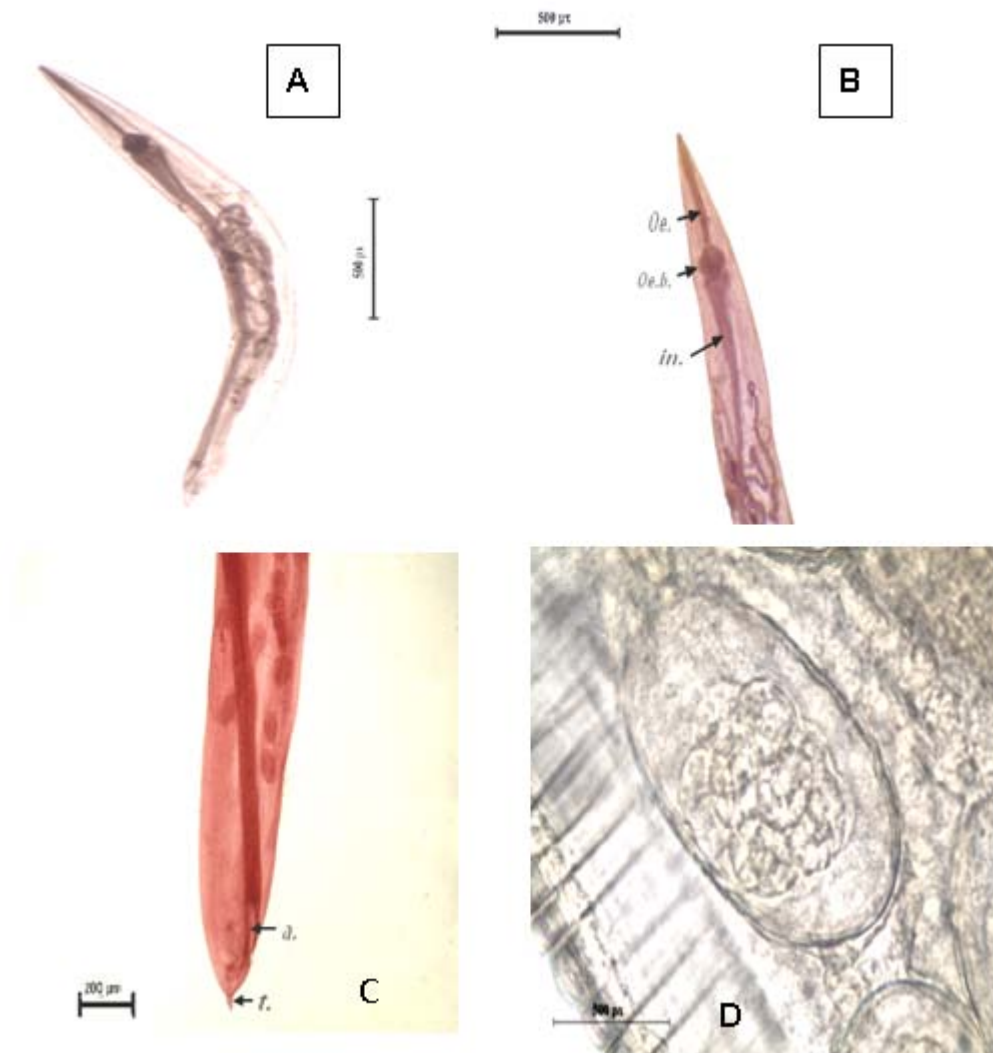
**Figure 3:** Camera lucida drawings of male *Thelandros sp.* illustrating; A) Anterior end and B) Posterior end (ca.al.= caudal alae, ca.p.= caudal papillae and t.= tail).



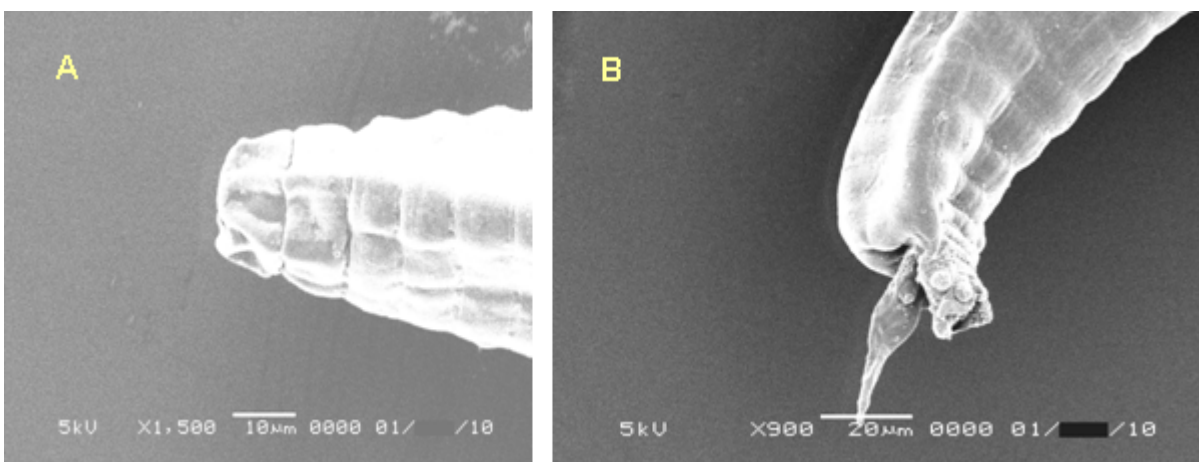
**Figure 4:** Camera lucida drawings of female *Thelandros sp.* illustrating; A) Anterior end (oe.= oesophagus, oe.b.= oesophageal bulb and in.= intestine); B) Posterior end: (a.= anus) and C) The egg.



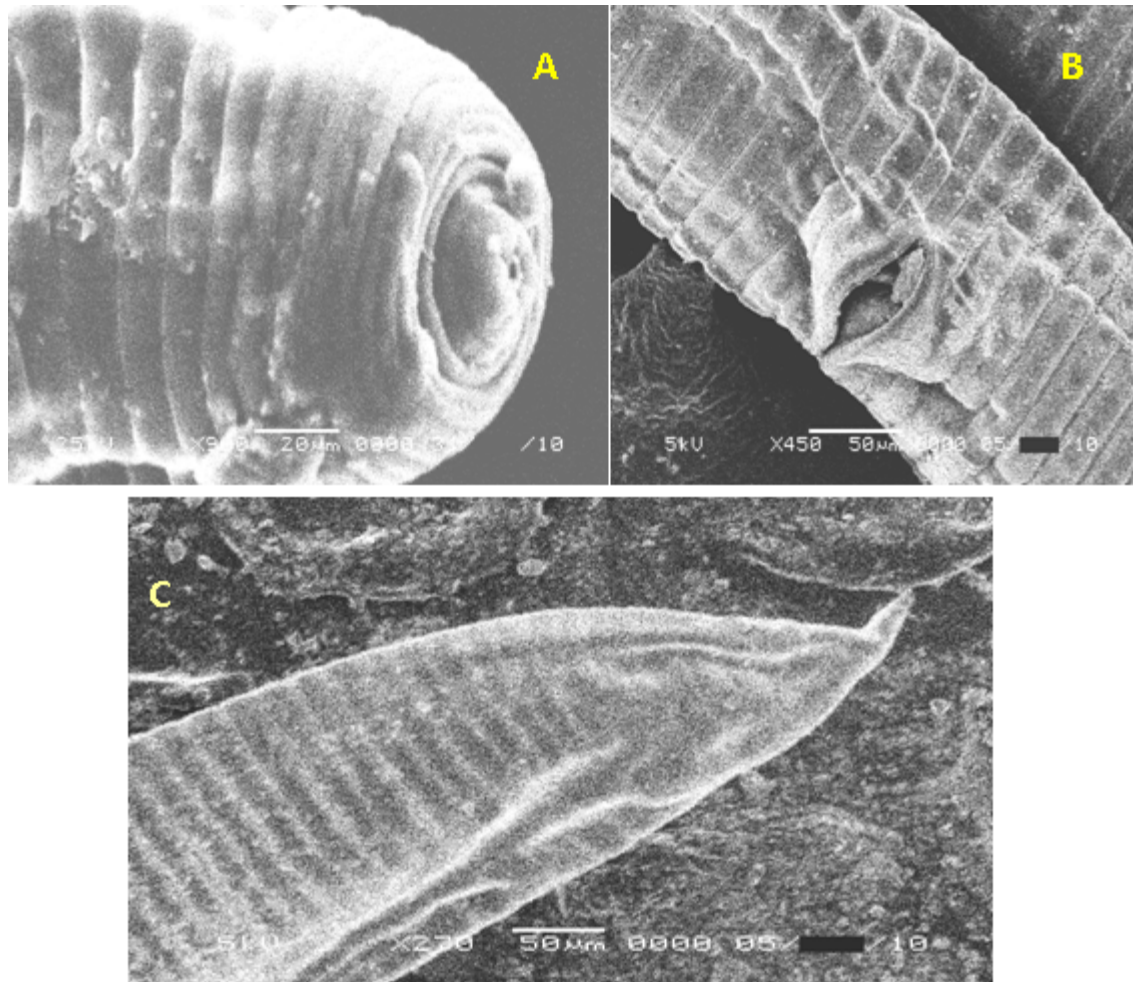
**Plate 5:** Photomicrographs of male of *Thelandros* sp. illustrating; A) Anterior and B) Posterior ends



**Plate 6:** Photomicrographs of female of *Thelandros* sp. illustrating; A) The entire worm, B) Anterior end (oe.= oesophagus, oe.b.= oesophageal bulb and in.= intestine), C) Posterior end (a. = anus and t. = tail) and D) The egg.



**Plate 7:** Scanning electron microscope of male *Thelandros* sp. illustrating A) The anterior end and B) Posterior end.



**Plate 8:** Scanning electron microscope of female of *Thelandros sp.* illustrating A) The anterior end; B) Vulva opening and C) Posterior end.