REDESCRIPTION OF GONGYLONEMA NEOPLASTICUM FIBIGER & DITLEVSEN, 1914 (SPIRURIDA: SPIRULOIDEA: GONGYLONEMATIDAE) FROM HOUSE RAT RATTUS RATTUS (RODENTIA: MURIDAE) FROM HYDERABAD, SINDH, PAKISTAN

Ramesh, Nadir Ali Birmani* and Saima Naz

Department of Zoology, University of Sindh, Jamshoro, Sindh, Pakistan.

*Corresponding author: birmani.nadir@usindh.edu.pk; birmani@gmail.com

Abstract

Nematodes belonging to the genus Gongylonema Molin, 1857 (Spirurida: Spiruroidea: Gongylonematidae) were collected from the stomach of House rat Rattus rattus Linnaeus, 1758 in Hyderabad, Sindh, Pakistan. A total of 40 nematode specimens were collected from the 24 hosts. These specimens were identified as Gongylonema neoplasticum Fibiger & Ditlevsen, 1914 on the basis of presence of various cuticular bosses in the anterior parts of the body, a gubernaculum, and unequal and dissimilar spicules. Previously this species is reported from Panjab province of Pakistan. However, this species is being described for the first time from Sindh province of Pakistan.

Keywords: Gongylonema neoplasticum, Rattus rattus, Hyderabad, Sindh, Pakistan.

INTRODUCTION

More than 3800 million people are parasitized helminth parasites around the world (Acuña et al., 2003). Many infectious diseases are spread by rats which have heavily harmed humans including plague, rat typhus, schistosomiasis, lung worm etc. (Singleton et al., 2003). The various studies suggest that the helminths disturb physiology and immunity of their hosts by damaging their tissues. They compete for nutrients with hosts, decrease blood volume and other body floods (Hsu, 1980). Genus Gongylonema Molin, 1857 is a thread like round worm belongs to family Gongylonomematidae and order Spirurid. Currently it is only valid genus from that family. It settles in the mucus of upper parts of GIT of various mammals and avian hosts of the world (Anderson, 1992). Species of Gongylonema are characterized in having various cuticular bosses in the anterior parts of the body, a gubernaculum, and spicules are unequal and dissimilar (Chabaud, 2009). Man is its accidental host for its various species. There are few studies which finds its prevalence in human from USA, France, China and New Zealand (Wilde et al., 2001). Various species of genus Gongylonema are parasitic and causing gongylonemiasis in domestic animals as well as man. The human transmission is very rare of which most of the cases are reported by G. pulchrum (Sato et al., 2005).

MATERIALS AND METHODS

Live hosts House Rat Rattus rattus Linnaeus, 1758 were trapped from Hyderabad city of Sindh, Pakistan. Twenty four hosts were collected and brought to the Parasitology laboratory of department of Zoology, University of Sindh, Jamshoro for helminthological studies. Hosts were anesthetized and killed with the help of chloroform. After killing, the hosts were placed on dissecting tray and cut longitudinally on ventral side from cloacal aperture up to the neck. Body cavity was opened carefully to remove all internal organs. The gastrointestinal tract which is divided into four parts including oesophagus, stomach, intestine and caecum. Other organs including lungs, liver, kidneys etc were also removed and placed in petri plates separately. Saline solution was added in petri dishes containing these organs. Stomach was opened with the help of fine scissor and forceps. The live nematodes belonging to the genus Gongylonema Molin, 1857 (Spirurida: Spiruroidea: Gongylonematidae) were collected from the stomach of four hosts. A total of 40 specimens of nematodes were recovered. Nematodes were killed and fixed in hot 70% ethanol and temporary mounts were made with the help of glycerol and lactophenol. Drawings were made with the help of Olympus BH2-DA Drawing Attachment. Photographs were taken with OMAX Digital Trinocular LED Microscope with 10MP Digital USB Microscope Camera. Measurements are given in millimeters (mm). Specimens are deposited in the Department of Zoology, University of Sindh, Jamshoro, Pakistan.
TAXONOMIC SUMMARY

Family: Gongylonematidae Hall, 1916
Genus: Gongylonema Molin, 1857
Species: G. neoplasticum Fibiger & Ditlevsen, 1914
No of hosts examined: 24
No of hosts found positive: 4
No of specimen recovered: 40
Site of infection: Stomach
Locality: Hyderabad, Sindh, Pakistan

RESULTS

During current study 24 House rats were dissected for the presence of helminth parasites. Out of these only four hosts were found positive with 40 nematodes Gongylonema neoplasticum with 16.66% prevalence. The mean intensity and relative density of these parasites are noted 10 and 1.66 respectively.

DESCRIPTION

**Males:** Body whitish in color; elongated 12.5 long; maximum width at the base of left spicule, 0.125; cuticle bosses present at anterior surface of the body, poorly developed and oval or rounded in shape; mouth opening at lateral view; pharynx small and thin, 0.05 long; esophagus 4.26 long, separated into two regions, small muscular region 0.51 long and large glandular region 3.75 long; nerve ring located at posterior part of muscular esophagus, 0.052 long; spicules dissimilar in shape and unequal in length, right spicule thick and test tube shaped 0.50 long, left spicule thin long, needle shaped 0.611 long; gubernaculums bowl shaped in which right spicule attached; caudal papillae different in shape, 6 pairs in number, each precloacal and post cloacal 3 paired; lateral alae present from base of pharynx to tip of tail, expanded small at though out the body but much expended at tail region.

**Females:** Total length 66.64; cuticular bosses abundant extending at anterior end; maximum width at the level of the muscular esophagus 0.13; nerve ring 0.20; excretory pore 0.34; pharynx 0.04; muscular esophagus 0.44; glandular esophagus 3.52; tail conical 0.17; vulva situated at posterior end; eggs 0.035-0.028.

![Image](https://example.com/image1.jpg)  
**Fig. 1:** Gongylonema neoplasticum Fibiger & Ditlevsen, 1914. **A & C.** anterior portion of male; **B & D.** posterior portion of male. **Scale Bar.** 0.1mm.
REDESCRIPTION OF *Gongylonema neoplasticum* Fibiger & Ditlevsen, 1914

**Fig. 2:** *Gongylonema neoplasticum* Fibiger & Ditlevsen, 1914. A & C. anterior portion of female; B & D. posterior portion of female. **Scale Bar.** 0.1mm.

**REMARKS**

Genus *Gongylonema* Molin, 1857 is a thread like round worm belongs to family Gongylonematidae and order Spirurid. Currently it is only valid genus from that family. Species of genus *Gongylonema* are characterized in having various cuticular bosses in the anterior parts of the body, a gubernaculum, and spicules are unequal and dissimilar (Chabaud, 2009). Comparing the species on morphological characters, based on data obtained in the original descriptions, a great deal of overlap was observed. Thus, for interspecific identification of *Gongylonema* of rodents, it is also necessary to rely on structures such as shape of the caudal alae, presence or absence of lateral alae and number of pairs of caudal papillae.

*G. musculi* and *G. ursi* were described by Rudolphi (1819) in the beginning. After that more than 50 species are recorded from the mammals and aves from all over the world except Antarctica. Thirteen species of this genus were recorded from rodent hosts. Some of its species are poorly characterized, need of more specimen to understand their character in better fashion. *G. neoplasticum* is mostly found in rodents of various regions of the world. Although variation is found in total body lengths. Present values are lower than original description, these values are ranged with mentioned by Yokogawa (1925) and Kruidenier and Peebles (1958) for *G. neoplasticum* (Table 1). The Table 1 shows variations in size of *G. neoplasticum* species from different hosts and geographical regions. Males show a constant number of 6 pairs of cloacal papillae (3 pre-cloacal and 3 post-cloacal), which is unmatched with the 8 pairs in the original description of the species cited by Fibiger and Ditlevsen (1914) and 9 pairs of papillae from Eastern Brazilian Amazon and are matched with the range of the values reported by Kruidenier and Peebles (1958) which were 6-9 pairs of papillae. From China the voucher HWML 37483 has 10 pairs of caudal papillae and a left spicule about to 7.6% length of the total body, which differs from the present specimens, including the specimens of previous descriptions of this species.

Among the female of *G. neoplasticum* collected in this study, length of total body is (66.64 mm), the opening of vulva to the caudal end and egg size (0.035-0.028 mm) are markedly lower and mostly resemble with the values of the original description of *G. neoplasticum* by Fibiger and Ditlevsen (1914). However, they remain within the minimum values presented by Kruidenier and Peebles (1958) and Eira et al. (2006) (Table 1). The present *G. neoplasticum* although small, are very similar to the findings of Kruidenier and Peebles (1958) may be related due to the same host *R. rattus* and *R. norvegicus* from different geographical locality. The present study is the first report of *G. neoplasticum* from Hyderabad, Sindh, Pakistan. Thus, more than offering only a new geographic record, here detailed morphological and morphometric analyses of taxonomic characters from male and female specimens of *G. neoplasticum* parasitizing *R. rattus* is being reported.
Table 1. Comparative morphometry of *Gongylonema neoplasticum* reported from various countries.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>G. neoplasticum</th>
<th>G. neoplasticum</th>
<th>G. neoplasticum</th>
<th>G. neoplasticum</th>
<th>G. neoplasticum</th>
<th>G. neoplasticum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference</td>
<td>Present Study</td>
<td>Cordeiro et al., 2018</td>
<td>Cordeiro et al., 2018</td>
<td>Kruidenier and Peebles, 1958</td>
<td>Cordeiro et al., 2018</td>
<td>Eira et al., 2006</td>
</tr>
<tr>
<td>Total body length of male</td>
<td>12.5</td>
<td>9.2–12.5 (10.4)</td>
<td>—</td>
<td>7.4–20 (13.7)</td>
<td>9.58</td>
<td>15–20 (17.5)</td>
</tr>
<tr>
<td>Buccal capsule</td>
<td>—</td>
<td>0.03–0.04</td>
<td>0.05</td>
<td>—</td>
<td>0.02–0.03</td>
<td>—</td>
</tr>
<tr>
<td>Right spicule</td>
<td>0.089</td>
<td>0.07–0.08 (0.08)</td>
<td>0.08</td>
<td>0.07–0.12 (0.09)</td>
<td>0.10</td>
<td>0.09</td>
</tr>
<tr>
<td>Left spicule</td>
<td>0.611</td>
<td>0.39–0.52 (0.47)</td>
<td>0.26</td>
<td>0.52–0.74 (0.63)</td>
<td>0.73</td>
<td>0.52</td>
</tr>
<tr>
<td>Gubernaculum</td>
<td>0.069</td>
<td>0.02–0.04 (0.03)</td>
<td>0.05</td>
<td>0.06–0.07 (0.06)</td>
<td>0.06</td>
<td>—</td>
</tr>
<tr>
<td>Lateral ala</td>
<td>Continuous</td>
<td>Continuous</td>
<td>—</td>
<td>Continuous</td>
<td>—</td>
<td>Continuous</td>
</tr>
<tr>
<td>Caudal wing</td>
<td>—</td>
<td>Asymmetrical</td>
<td>Asymmetrical</td>
<td>Asymmetrical</td>
<td>Asymmetrical</td>
<td>—</td>
</tr>
<tr>
<td>Papillae Pairs</td>
<td>6</td>
<td>9</td>
<td>6–9</td>
<td>10</td>
<td>8</td>
<td>8–9</td>
</tr>
<tr>
<td>Pre-cloacal</td>
<td>3</td>
<td>4</td>
<td>3–4</td>
<td>4</td>
<td>4</td>
<td>5–6</td>
</tr>
<tr>
<td>Post-cloacal</td>
<td>3</td>
<td>5</td>
<td>3–5</td>
<td>6</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Total body length of female</td>
<td>66.64</td>
<td>44.5–48 (45.94)</td>
<td>—</td>
<td>35–80 (57.5)</td>
<td>—</td>
<td>60–80 (70)</td>
</tr>
<tr>
<td>Buccal capsule of female</td>
<td>—</td>
<td>0.04</td>
<td>—</td>
<td>0.05–0.08</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Vulva at posterior end</td>
<td>2.64–4.61 (3.92)</td>
<td>—</td>
<td>2.5–8 (5.25)</td>
<td>—</td>
<td>7–8.75 (7.87)</td>
<td>5.2–9.6 (7.58)</td>
</tr>
<tr>
<td>Eggs</td>
<td>0.35–0.028</td>
<td>0.04–0.02</td>
<td>0.05–0.03</td>
<td>0.05–0.03</td>
<td>—</td>
<td>0.06–0.04</td>
</tr>
<tr>
<td>Host</td>
<td><em>Rattus rattus</em></td>
<td><em>Rattus rattus, R. norvegicus</em></td>
<td><em>Mus musculus</em></td>
<td><em>Rattus rattus, R. norvegicus</em></td>
<td><em>Rattus rattus</em></td>
<td><em>Mus decumanus, Oryctolagus cuniculus</em></td>
</tr>
</tbody>
</table>
ACKNOWLEDGEMENTS

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LITERATURE CITED


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