



ISSN 2347-2677

IJFBS 2019; 6(2): 07-11

Received: 04-01-2019

Accepted: 08-02-2019

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New species of genus *Subulura* molin, 1960 (Nematoda: subuluridae) from poultry bird *Gallus domestics* of district Khairpur, Sindh, Pakistan

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Abstract

During the current investigation on helminths parasites of Domestic Fowl (*Gallus domesticus* Linneus), fifty hosts were randomly collected from different localities of district Khairpur, Sindh, Pakistan. Alimentary canal, liver, gallbladder, lungs, kidneys and body cavity were examined under a stereo dissecting microscope for the presence of nematode parasites. Amongst these hosts examined, 300 specimens (70♂ and 230 ♀) of nematodes belonging to genus *Subulura* Molin, 1960 were recovered from intestine and gizzard of 60 hosts. Present specimens come closer to all the known species of genus *subulura* but differ in the arrangement of precloacal papillae, post cloacal papillae and caudal papillae, the shape of gubernaculum; the position of the vulval opening; and varying size of diagnostic characters other uniqueness. Hence the specimens identified as new species *S. aligulabi* sp. The name *S. aligulabi* refers the name of the father of the first author. Though, this genus is being accounted for the first time from Pakistan.

Keywords: subulura, gallus domesticus, Khairpur, Sindh, Pakistan

Introduction

Poultry gives imperative part in farming and has a huge commitment to sustenance generation by playing an essential capacity in the national economy by contributing towards nourishment security of the nation lessening interest for meat and sheep and gaining of remote trade ^[1].

Poultry products egg and meat are fundamental source of protein for man. A sum of 30% poultry protein-dependent at worldwide level ^[2]. The domestic fowl hunting around housing during the daytime, as a result they directly expose to the environment and obtain what on earth to nosh, they may be able to find in an environment often offal, seeds, fruits and insects. Which may infective stage of parasite and include many species of gastrointestinal parasite. Including Platyhelminthes, nematodes ^[3].

Nematodes represent a significant group of endoparasite which causes damage the health of domestic chicken, main genera comprise *Ascaridia*, *Ascaridia* Schrank, 1788, *Heterakis* Dujardin 1845 and *Subulur* Molin ^[4].

These genera of nematode have also fatal effect on fitness of bird these genera involve in holdup growth, drooping wings, loss of appetite, messy feathers also reduce the egg production ^[5].

Based on these points the bird desi fowl (*Gallus domesticus*) has been preferred as an experimental host for nematode parasite.

Very little work had done on nematode parasite of birds in Pakistan including Akhtar ^[6], recovered *spirurid* (Nematoda: Acuariidae) from hornbill. Akram ^[7], recovered *Physaloptera badiata* *Accipiter badius*, Akram ^[8] collected *Contraecum bubakii* (Nematoda: Anisakidae) from the Cormorant. Bilqees and Jehan ^[9] worked on edohelminthes of *gallusdomesticus*. Bilqees and Nighat ^[10] purposed *Pseudoaspedodera galli* from *Gallus gallus*. Khan *et al.*, ^[11] worked on Helminth parasites of wild duck (*Anas creca*) from Peshawar. Ahmed ^[12] recovered *Dispharynx nasuta* Rudolphi, 1819 (Nematoda: Acuariidae) from birds of Pakistan. Farooq and Aziz ^[13] recovered *Dispharynx karachiifrom Milvus migrans*; Das and Ghazi 2009 ^[14] recovered *Contra caecm* sp. (Nematoda: Filucapsulariinae) from the little cormorant; genus *Tetrameres* Creplin, 1846 and *Strongyloides avium* Cram, 1929 in *fulic aatra* Birmani *et al.*, ^[15] ^[6] Mangrio *et al.*, ^[17] recovered *Contraecum travassosi*: Gutierrez, 1943 from jungle Babbler.

Materials and method Introduction

50 domestic fowl 10 males and 40 females were collected from the different region of district Khairpur of Sindh, Pakistan. These were brought to parasitological laboratory of Department of Zoology, Shah Abdul Latif University, Khairpur, Sindh, Pakistan and examined for the presence of nematode parasites. For this purpose the internal organs of the hosts like alimentary canal, liver, gallbladder, lungs, kidneys and body cavity were checked carefully using a stereo dissecting microscope or the presence of found worms. Among the hosts, examined 33 birds were found infected with nematode parasites.

Live specimens were isolated with the help of forceps and killed in hot 70% ethanol, cleared in lactophenol and glycerol and preserved in alcohol-glycerol solution. Diagrams were made with the help of Camera Lucida. Photographs were taken with Camera DP12, measurements given micrometre (µm). The identification of specimens was made accordance to keys given by Yamaguti [18, 19] and relevant literature. Specimens deposited in the Department of Zoology, Shah Abdul Latif University Khairpur.

Results

Family Subuluridae Yorke & Maplestone 1926.

Genus *Subulura* Molin, 1960.

Subulura aligulabi n. sp.

Site of infection: Intestine and Gizzard

Number of worms: 300 (70 (23.3%) ♂ and 230 (76.6%) ♀)

Material examined: 50

Number of effected birds. 33 (66%)

Description

General

Anterior body cylindrical and bent posteriorly wider at the middle region; vestibule large, hexagonal lacking lips; pharynx with three piercing teeth; nerve ring absent; esophagus long club-shaped followed by almost spherical smooth bulb without denticles; excretory opening at the posterior end of the body; spicules unequal with pointed tip; cloacal sucker round muscular. Females larger than males; vulva near the posterior tip of the body, vulval lips rounded; eggs almost round containing larvae; 10 caudal papillae present arranged as three pairs preloacal, three pairs are cloacal and four last pairs are postcloacal in position.

Measurement

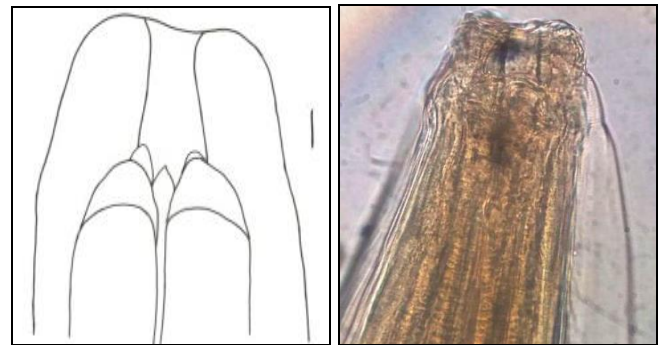
Male

The body of worm measuring 7090-13200X290-320. Buccal capsule hexagonal, measuring 10-60X10-16 in size. Esophagus long, measuring 589-871X41-87. Oesophageal bulb round measuring 153-200X69-98. Gubernaculum regular measuring 82 in size; spicules unequal in size, right spicule measuring 1120-1641 in length and left spicules 1025-1179 in length, both the spicules overlapped at the middle. Preloacal sucker around with radial muscles, measuring 194-205 in diameter; 10 pairs of caudal papillae present; out of the three pairs are cloacal, three pairs are preloacal and four last pairs are postdedloacal in position; tail measuring 378-380 in length.

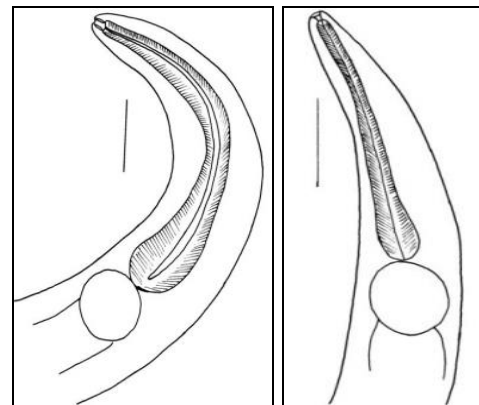
Female

The body of nematode is 11540-20000X309-545 long. Buccal capsule measuring 26-178X17-20. The oesophagus is 866-

1172X25-68. Oesophageal blub is 140-267X131-310. Valvular opening at distance 8363-10900 from the anterior body, 4181-6727 from posterior of the body; tail measuring 327-448; eggs round measuring 59-69X59-90.

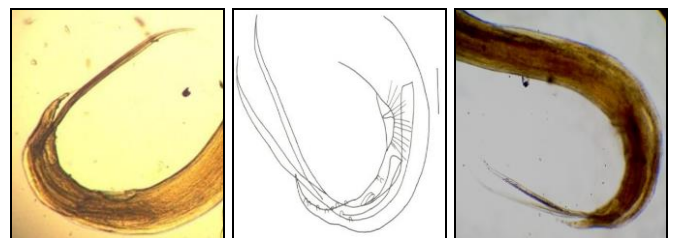


A



B

C



D

Fig 1: A. Cephalic end; B. Anterior end of female; C. anterior end of male; D. posterior end of male viewing spicules, caudal papillae and gubernaculum

Scale bars: A. 50µm; B & C. 200µm; D. 50µm



E

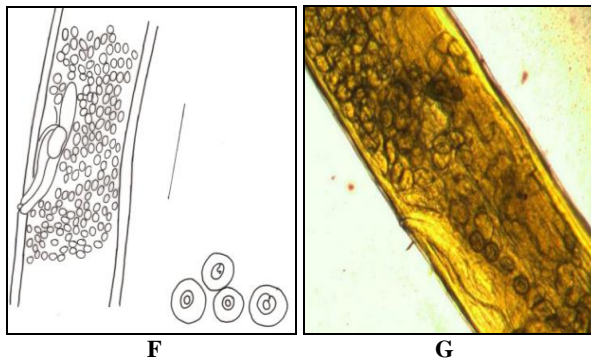


Fig 2: E. posterior end of the female; F. vulval opening of the female; G. eggs

Scale bars: E. 50µm; F. 500µm; G. 200µm.

Discussion

Genus *Subulura* was established by Molin in 1860 with type species *S. Brumpti* in domestic fowl. Other species of genus added reported from various avian hosts from the different region of the world. Including *S. anulata* Molin, 1860 (Travassos in 1913) *Anthene noctua* from Europe; Molin during 1860 reported *S. acutissima* in *Strix*, *Cuculus* sp and *S. papillosa* from common house crow; Gendere, 1909 reported *S. similis* recovered from *Ptilopsis leucotis* Linstow reported *S. recurvata* from Gray francolin; *S. rima* from *Otis haubara*; *S. bolivari* (Lopez-Neyra, 1922); *S. different* Sonsino, 1890 from dasi fowl; *S. albai* Agerwal, 1965 from barn owl of India; *S. Alfenensis* Pinto, 1968 from *Anthenecuni cularia* of Brazil; *S. galloperdicis* Baylis and Daubney, 1922 from Red super fowl *Galloperdix spadicea*; *S. forcipata* Vicente *et al.*, 1995 in Cuckoo in South America and Kinsella *et al.*, 2001 from *Athene cuncularia*; *S. mackoi* Barus *et al.*, 2013 from Eurasian owl there is no record found from Pakistan.

S. skrjabini Semenov, 1926 syn. *S. coturnicis* Yamaguti [20] collected from intestine of the *C. coturnix* varying in smaller body; vestibule smaller; oesophagus larger by 860-960; gubernaculum triangular in contrast irregular compact shaped; arrangement of caudal papillae 2 pairs paraocloacal, 3 pairs preocloacal and 6 post cloacal; female larger body size; valvular opening at anterior; eggs smaller in diameter. *S. samilis* Gender [21], collected from the intestine of the *Ptilopsis leucotis* differs from present species in having larger body size; 11 pairs of caudal papillae; spicules equal in size; female having smaller body size; varying in valvular aperture position. *S. suctoria* Molin [22], collected from the *P. falcinellus* from Asia varying from present specimens in

having larger body; buccal capsule bigger; esophagus bigger; nerve ring present; blub larger; gubernaculum bigger; varying in the composition of caudal papillae, preocloacal three, cloacal two and six-post cloacal; varying in position of valvular opening in female body.

S. acutissima Freitas *et al.*, [23] collected from the intestine of the *Gaucidium braslianum* from Brasil male specimens varying in the larger body; spicules larger; tail smaller 0.26-0.31; caudal papillae 10 in number; female smaller in body size; valvular opening at the anterior; eggs smaller in size. *S. longispicula* Wang, [24] collected from the intestine of *Ninox scutulata* from China male specimens differs in larger; specula by 2.88- 3.36; tail smaller; female smaller body size; valvular aperture at the middle of the body; eggs smaller.

S. glaucidii López-Neyra, [25] collected from the intestine of *Glaucidium passerinum* varying in the smaller body; spicules smaller; varying in the arrangement of caudal papillae; tail smaller 0.150- 0.220; the female has a smaller body, eggs; valvular aperture at the middle. *S. lutzi* Barreto [26], collected from the intestine *Strix* sp from Brasil varying in male larger; spicules smaller; varying in caudal papillae arrangement; tail smaller 0.169; female larger; valvular opening at anterior of the body, eggs slightly smaller. *S. reclinata* from *Crotophagaani* Linnaeus from Brasil differs in male specimens smaller, spicules smaller; tail smaller 73 µm in length; female larger; vulva at anterior; eggs smaller.

S. burmpati Pinto, Menezes and Gomes [27], collected from the intestine of *Phasianus colchicus* of Brazil varying in smaller in the body; buccal capsule, esophagus, blub, gubernaculum larger; nerve ring present; varying in the arrangement of the cloacal, preocloacal and postcloacal papillae. Female buccal capsule, esophagus and blub are smaller in size; vulva 3264-3774 from anterior extremity; eggs larger in diameter. *S. dentigera* Ortelepp [28], collected from the gastrointestinal tract of Guinea fowl varying in the smaller body; nerve ring present; esophagus larger; caudal papillae arranged as three preocloacal, two pairs at anal sap; and five pairs at post cloacal; gubernaculum Y-shaped. The female body, esophagus smaller; nerve ring present; eggs larger.

S. makoi Barus *et al.*, [29], collected from the intestine of *Otus scope* of Czech Republic varying as of present specimens by smaller body; esophagus bigger; vestibule larger; smaller blub; cloacal sucker larger; left specula smaller and right specula larger; gubernaculum slightly larger; diverge in sequences of caudal papillae three cloacal, two preocloacal and five post cloacal. Female larger; valvular position by 643 µm by the posterior end; eggs smaller.

Table 1: Morphometric comparisons (mm) of new species with various reported male species of genus *Subulura* Molin, 1960.

Present species	<i>Subulura Brumpti</i> (Lopez-Neyra, 1922; Cram, 1926)			
	<i>Subulura mackoi</i> (Barus <i>et al.</i> , 2011)	<i>Subulura suctoria</i> (Molin, 1860)		
Male	Measurement			
Body size	7090-13200 X 290-320	7.174-9.758	10.77	7.98-13.68
Buccal capsule	10-60 X 10-16	0.032-0.043 X 0.029-0.036	21-26 X 43-54	0.32-0.04 X 0.03-0.04
Esophagus	589-871 X 41-87.	0.700-1.022	1083-1198	0.92-1.22
Esophageal blub	153-200 X 69-98	0.168-0.196 X 0.154-0.210	114-172	
Nerve ring	Absent	0.101-0.280 240-300	240-300	0.24-0.30
Gubernaculum	0.082	0.108-0.440	90-120	0.12-0.18
Preocloacal sucker	0.194-0.205	--	197-201	0.49-0.75
Spicules	Unequal	Equal		Equal
Right	1.120-1.641	0.812-1.90	807-855	0.94-1.38
Left	1.025-1.179	0.108-1.90	539-582	0.94-1.38

Caudal papillae	10 Pair	10 Pair	10 pair	11 pair
Precloacal	3 pair	3 Pair	3 pair	3 pair
Paracloacal	4 pair	2 Pair	2 pair	2 pair
Post cloacal	4 pair	5 Pair	5 pair	6 pair
Tail	378-380	-	259-260	-
Host	<i>Gallus domesticus</i>	<i>Phasiensis colchicus</i>	Owl <i>Otus scop</i>	<i>Plegadis falcinellus</i>
Location	Khairpur, Sind Pakistan	Brazil	Czech Republic	U.S.S.R- Azerbaijan

Table 2: Morphometric comparisons (mm) of new species with various reported female species of genus *Subulura* Molin, 1960.

Present species	<i>Subulura burmpti</i> (Lopez-Neyra, 1922) Cram, 1926		<i>Subulura mackoi</i> (Barus <i>et al.</i> , 2011)	<i>Subulura suctorina</i> Molin, 1860
	Measurement			
Female				
Body size	11540-20000 X 309-545	7.140-13.872	16.90 X 0.46	11.02-19.00 X 0.32-0.51
Buccal capsule	26-178 X 17-20	10.043-0.058 X 0.036-0.040	31 X 51	0.036-0.049 X 0.041-0.057
Esophagus	866-1172 X 25-68	0.952-1.078	1234-1787	1.19-1.442
Esophagealblub	140-267 X 131-310	0.120-0.210 X 0.168-0.238	178-202	0.21-0.26
Nerve ring	Un seen	0.191-0.0288	191-288	0.22-0.34
Valvular region	8363-10900 from anterior end of body. 4181-6727 from posterior end of body	3.264-3.774 from anterior end of body	643	4.75-8.64
Eggs	59-69 X 59-90.	0.057-0.092 X 0.0468-0.0576	46-52 X 39-48	0.061-0.070X 0.045-0.062
Tail	327-448		832	
Host	<i>Gallus domesticus</i>	<i>Phasiensis colchicus</i>	<i>Otus scop</i>	<i>Plegadis faclcinellus</i>
Location	Khairpur, Sindh, Pakistan	Brazil	Chez Republic	U.S.S.R-Azerbaijan

Conclusion

Above discussion indicates present specimens have varying characters like arrangement of precloacal papillae, post cloacal papillae and caudal papillae, shape of gubernaculum; pointed spicules; shape of and thickness of cloacal sucker, absence of nerve ring, absence of denticles in esophagus, position of valvel pening; and varying size of diagnostic features and other uniqueness. Hence the specimens identified as new species *S. aligulabi* n. sp. The name of new species *S. aligulabi* refers the late father's name of the first author. Ali Gulab Lund. However, this genus is being reported for the first time from Pakistan.

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