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***Heterotestophyes jonesae* sp.n. (Trematoda: Heterophyidae) from the Bird *Sternula albifrons* (Little Tern) in Sindh, Pakistan**

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Abstract

The new species is characterized by having: different size and shape of body, width of oral sucker, position of oral sucker, position of intestinal bifurcation, number of spines in genital sac having 63-65 spines, position of ovary and testes, arrangement vitelline follicles.

Keywords: *Heterotestophyes*, Heterophyidae, *Sternula albifrons*, Jamshoro, Sindh, Pakistan

1. Introduction

The present specimens belong to the family Heterophyidae Leiper, 1909 [2] and genus *Heterotestophyes* Leonov, 1957 [3], recovered from *Sternula albifrons* (Little tern) during present study on helminth parasites of birds.

Literature reveals access to only two species of the genus *Heterotestophyes* from avian hosts. *H. sobolevi* reported from terns and gulls (*Sterna hirundo* and *Hydroprogone*) (Laridae) in Eurasia and Australasia and second one is *H. neimongolis* Qiu *et al.*, 1984. Two species are recovered during present study, *H. heckmanni* sp.n. and *H. gibsoni* sp.n. from same host i.e. *Sternula albifrons* (submitted for Publication).

2. Material and Methods

Fifteen birds *Sternula albifrons* (Little terns) were shot down from Jamshoro and brought to the parasitology laboratory, Department of Zoology, University of Sindh, Jamshoro, Pakistan. The birds were dissected and examined for collection of internal Helminth parasites. During examination of gut contents and visceral organs three mature specimens were collected from small intestine of a bird. Later these specimens were fixed in hot steaming 70% ethanol, where trematodes expand and instantly die. Later the specimens were gently placed over clean glass slide, pressed lightly with another, tied with thread and fixed in F.A.A. solution for twenty-four hours, stained with Mayer's carmalum, dehydrated in graded series of ethanol, cleared in clove oil and rinsed with xylene. Finally, the specimens were permanently mounted in Canada balsam for further study. Line Drawings were prepared with the aid of a Camera Lucida. Measurements are given in millimeters (mm) and length by width. Photomicrographs were prepared with the courtesy of Vertebrate Pest Control Institute, Southern Zone Agricultural Research Center, Karachi University Campus, Karachi.

3. Results

Heterotestophyes jonesae sp.n.

(Figs.1-4)

Host: *Sternula albifrons* (Little tern)

Location: small intestine

Locality: Jamshoro, Sindh, Pakistan

No. of hosts examined/ infected: 15/01

No. of specimens recovered: Three

Etymology: species name is designated in honour of Dr. Arlene Jones, a dedicated Parasitologist in British Museum (N.H) UK.

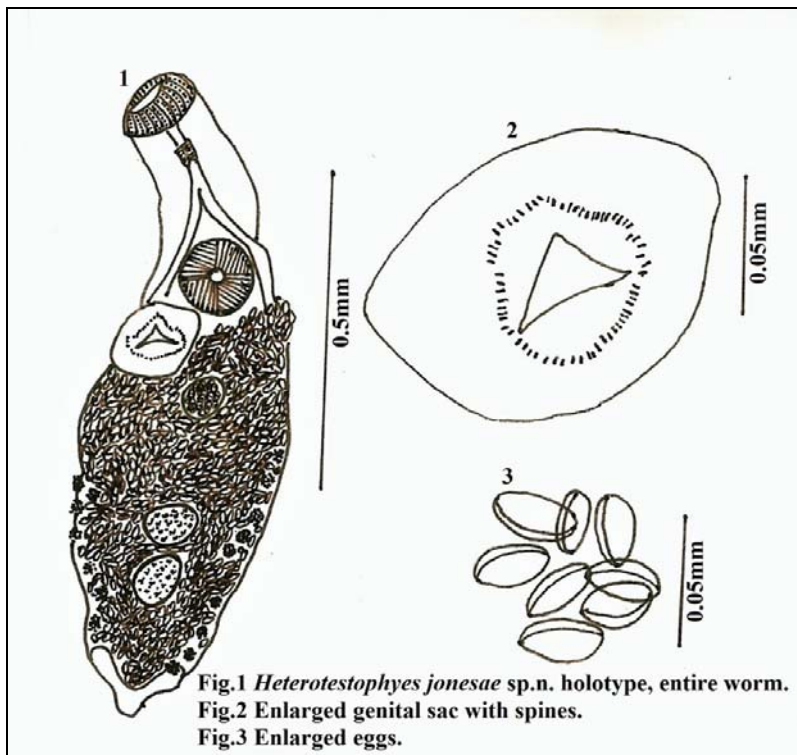


Fig.1 *Heterotestophyes jonesae* sp.n. holotype, entire worm.
 Fig.2 Enlarged genital sac with spines.
 Fig.3 Enlarged eggs.



Fig 4: *Heterotestophyes jonesae* sp. n. holotype, entire worm photomicrograph (181x).

3.1 Description Is Based Upon Three, Stained, Permanently Mounted, Egg Bearing Mature Specimens

Small, delicate elongated worm. Fore body and hind body approximately same in size, rounded in anterior region and posterior region is pointed. Total body length is 0.90-0.96 (0.92) by 0.3-0.34 (0.32) wide. Maximum width is acquired

between the testes and ovary in hind body.

Oral sucker terminal, muscular, wider than long 0.06-0.06 (0.06) by 0.14-0.14 (0.14). Pre-pharynx 0.03-0.04 (0.033) long, hardly 0.02-0.02 (0.02) wide. Pharynx small, muscular 0.02-0.02 (0.02) by 0.02 -0.02 (0.02). Esophagus very short. Caeca long, bifurcate just below the pharynx, apart from the acetabulum and terminate near posterior extremity. Distance between caecal bifurcation and acetabulum is 0.08-0.08 (0.08). Ventral sucker spherical, highly muscular, larger than oral sucker, situated at 2nd. Quarter of the body, well apart from caecal bifurcation 0.1-0.11 (0.106) long by 0.11-0.11 (0.11) wide. Distance between oral sucker and ventral sucker 0.2-0.29 (0.25). Sucker ratio 1:0.6-1:0.54.

Testes tandem, oval to rounded, at mid of hind body and closer to posterior extremity, unequal in size. Anterior testis is 0.06-0.06 (0.06) by 0.07-0.07 (0.07). Posterior testis larger than anterior testis 0.08-0.08 (0.08) by 0.05-0.06 (0.053) in size. Cirrus pouch absent.

Gonotyl absent. Genital atrium roughly spherical, post-acetabular, distinctly separated and larger in width than ventral sucker, situated at level of half of the body, 0.1-0.11 (0.106) by 0.13-0.14 (0.133). Crown of spines is 63-65.

Genital pore opens far from acetabulum, into genital sac. Seminal vesicle not obvious due to excessive uterus.

Ovary rounded in shape, pre-testicular, lie behind the genital atrium in 3rd. quarter of the body 0.06-0.06 (0.06) by 0.05-0.05 (0.05) in size. Distance between ovary and anterior testis is 0.13-0.15 (0.14).

Uterus profuse fills the entire hind body, up to the pointed posterior extremity. Eggs oval in shape, double walled 0.03-0.03 (0.03) by 0.15-0.02 (0.15).

Vitellaria follicular, commence some distance above the anterior testis and below the ovary, at level of maximum width of the body, extend along lateral margins up to the end of hind body.

Excretory vesicles not obvious due to uterus.

4. Discussion

The present specimens belong to the family Heterophyidae (Leiper, 1909) [2] and genus *Heterotestophyes* created by Leonov, 1957 [3]. Available literature indicates only two species of the genus *Heterotestophyes neomonglis* Qiu *et al.*, 1984 n. comb and *H. sobolevi* Leonov, 1957 [3] and two species recovered during present study are *H. heckmanni* sp.n. and *H. gibsoni* sp.n. (Submitted for publication).

H. sobolevi is recovered from Terns and gulls (*Sterna hirundo* and *Hydroprogone*) in Eurasia and Australasia, while the present specimens i.e. *H. heckmanni* and *H. gibsoni* sp.n. are recovered from *Sternula albifrons* in Sindh, Pakistan.

The body size in present specimens is smaller than *H. sobolevi*; *H. heckmanni* sp.n. And *H. gibsoni* sp.n. (Table-1).

The oral sucker in present specimens is wider than long 0.06 by 0.14 without transverse ridge, while in *H. sobolevi* oral sucker is with transverse ridge; in *H. heckmanni* sp.n. it is larger, equal length by width 0.12 by 0.12 and in *H. gibsoni* sp.n. it is equal in length but smaller in width 0.06 by 0.09 (Table-1).

In present specimens, pre-pharynx is longer 0.03 by 0.02 than *H. heckmanni* sp.n. 0.02; in *H. gibsoni* sp.n. it is hardly 0.01 and in *H. neomonglis* pre-pharynx larger than present specimen. (Table-1).

The pharynx in present specimens is 0.02 by 0.02, while in *H. heckmanni* sp.n. it is larger; in *H. gibsoni* sp.n. and *H. neomonglis* its slightly larger, in size. (Table-1).

The esophagus in present specimens is very short, while in *H. neomonglis* is also short but in *H. heckmanni* sp.n. and *H. gibsoni* sp.n. the esophagus is larger than present specimen. (Table-1).

In present specimens the intestinal bifurcation is below the pharynx, apart from the acetabulum, distance between acetabulum and bifurcation is 0.08 mm, while in *H. neomonglis* it is also approximately same in position; in *H. heckmanni* sp.n. caeca bifurcation is above the acetabulum, 0.05 and in *H. gibsoni* sp.n. it bifurcates at some distance below the pharynx, far above from the acetabulum at distance 0.01 (Table-1).

In present specimens the ventral sucker is 0.11 by 0.14, situated in 2nd. quarter of the body, while in *H. neomonglis* it occupies, 3rd. quarter of the body and oral sucker and acetabulum are approximately equal in size, in *H. heckmanni* sp.n. it is larger and lie at 2nd. quarter of the body and in *H. gibsoni* sp.n. the acetabulum is smaller than present specimen and lie at same position of the body. (Table-1).

The distance between oral sucker and acetabulum in present specimens is 0.2, while in *H. neomonglis* oral sucker is quite apart from acetabulum; in *H. heckmanni* sp.n. and *H. gibsoni*

sp.n. it is 0.32.

Genital atrium in present specimens is 0.11 by 0.14, occupy space just behind the acetabulum, approximately at half of the body with crown of 63-65 spines, while in *H. sobolevi* circle of spines are 70-120; in *H. neomonglis* genital sac occupy space just behind acetabulum but differ in having different position of genital atrium, situated at third quarter of the body and crown of spines are 39; in *H. heckmanni* sp.n. genital atrium is larger 0.13 by 12, occupy post-acetabular space, hardly at a distance 0.01, crown of spines is 47, situated at 3rd. quarter of the body and in *H. gibsoni* sp.n. the genital atrium is smaller in size 0.07 by 0.09 and crown of spines are 57-60 (Table-1).

In present specimens testes are oval to rounded, tandem, situated in mid of hind body and closer to posterior extremity, anterior testis smaller 0.06 by 0.07 than posterior testis 0.08 by 0.06, the distance between ovary and anterior testis is 0.15, while in *H. neomonglis* the testes are oval shaped, located at the end of hind body, less distance between ovary and anterior testis; in *H. heckmanni* sp.n. it is situated in end of hind body, anterior testis is slightly larger in size, posterior testis is smaller than in the present specimen and smaller distance between anterior testis and ovary 0.08; in *H. gibsoni* sp.n. testes are juxta opposite, rounded shaped, anterior testis equal in size and posterior testis smaller than present specimen, situated towards lateral margin in end of hind body. In all rest of the species both testes are closer to each other but in *H. gibsoni* sp.n. Testes occupy some distance 0.04, the distance between ovary and testes less than present specimen 0.1mm. (Table-1).

The ovary in present specimens is rounded 0.06 by 0.06, located in middle of the body, just behind the genital atrium, while in *H. neomonglis* it is located approximately at 4th. Quarter of the body; in *H. heckmanni* sp.n. it is larger 0.07 by 0.07 occupy in 4th. Quarter of the body; in *H. gibsoni* sp.n. Ovary is equal in size 0.06 by 0.06, situated in 4th. Quarter of the body, apart from genital atrium. (Table-1).

In present specimens the vitellaria commence from below the ovary along lateral margins, extend up to end of hind body, while in *H. neomonglis* it commences from above the ovary below the genital atrium, extend up to level of anterior testis; in *H. heckmanni* sp.n. it commences from some distance above the ovary and proceed up to level of posterior testis; in *H. gibsoni* sp.n. it commences from below the genital atrium, proceed above the testes. (Table-1).

Uterus is profuse in the present specimens and occupy space up to ovary, while in *H. neomonglis* it is less uterine coils up to below the genital sac.

Table 1: Comparative body features measurements of species of the genus *Heterotestophyes* Leonov, 1957 recovered in sindh, Pakistan and elsewhere (body measurements of *Heterotestophyes neomonglis* and *sobolevi* are not mentioned in literature).

Species	<i>Heterotestophyes Sobolevi</i> Leonov, 1957	<i>Heterotestophyes neomonglis</i> Qiu <i>et al.</i> , 1984	<i>Heterotestophyes heckmanni</i> sp.n. (recovered during present study and submitted for publication)	<i>Heterotestophyes gibsoni</i> sp.n. (recovered during present study and submitted for publication)	<i>Heterotestophyes jonesae</i> . (present specimen)
Hosts	<i>Sterna hirundo</i> and <i>Hydroprogone</i>	-----	<i>Sternula albifrons</i>	<i>Sternula albifrons</i>	<i>Sternula albifrons</i>
Location	Eurassia and Australasia	-----	Jamshoro, sindh, Pakistan.	Jamshoro, sindh, Pakistan.	Jamshoro, sindh, Pakistan.
Locality		Intestine	Intestine	Intestine	Intestine

Body size	1.3-2.0		1.21 by 0.29	1.00 by 0.32	0.96 by 0.34
Oral sucker	With transverse ridge	With transverse ridge	Without transverse ridge 0.12- by 0.12	Without transverse ridge 0.06 by 0.09	Without transverse ridge 0.06 by 0.14
Pre-pharynx	-----	Long	Very short, hardly 0.02	very short hardly 0.01	0.03 by 0.02
Pharynx	-----	Short	0.1 by 0.03	0.03 by 0.03	0.02 by 0.02
Esophagus	-----	Very short	Long 0.13	0.1 long	Very short
Intestinal bifurcation	-----	Bifurcates just below the pharynx, apart from acetabulum	Bifurcates above the acetabulum at distance above the acetabulum 0.05	Bifurcates at some distance below the pharynx, far from above the acetabulum at distance 0.1	Bifurcate just below the pharynx, apart from the acetabulum at 0.08
Ventral sucker	-----	Situated in third quarter of the body	0.16 by 0.15 situated just above half of the body	0.07 by 0.07 occupy 2nd. quarter of the body	0.11 by 0.11
Genital atrium size/ location	-----	Occupy in third quarter of the body	0.12 by 0.13 occupy slightly below half of the body	0.07 by 0.09 occupy at middle of the body	0.11 by 0.14 occupy at level of the half body
Genital sac spines	70-120	39	47	57-60	63-65
Genital pore				Inside the genital sac, above the spines	Opens far from acetabulum, into genital sac
Seminal vesicle	Bipartite	Bipartite	Oval 0.08- by 0.05	Not obvious	Not obvious
Ovary	-----		0.07 by 0.07 distance b/w ovary & anterior testis 0.08	0.06 by 0.06 distance b/w ovary & testes 0.1	0.06 by 0.05 distance b/w ovary & testes 0.15
Testes	-----	Testes tandem	Anterior testis: 0.07 by 0.05 Posterior testis: 0.071 by 0.05, tandem	Anterior testis: 0.06 by 0.06 Posterior testis: 0.05 by 0.05, juxta-opposite	Anterior testis: 0.06 by 0.07 Posterior testis: 0.08 by 0.06, tandem
Vitelline follicles	-----	Commence from below genital sac, extend up to base of anterior testis	commence form slightly above the ovary, arranged in lateral fields up to the base of posterior testis.	Commence from below genital sac, extend up to above the testes.	Vitellaria follicular, commence some distance above the anterior testis and below the ovary, at level of maximum width of the body
Eggs	24-32 by 14-20 um	-----	0.024-0.035 by 0.015-0.015.	0.02-0.03 by 0.02-0.15	0.03-0.03 by 0.015-0.02

5. Conclusion

Present form appears un-matched from species reported worldwide and those reported in Pakistan, it is therefore proposed as *Heterotestophyes jonesae* sp.n. in Jamshoro, Sindh, Pakistan.

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