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New record of genus *Pseudapatemon* (Trematoda: Strigeidae) in avian host from Pakistan

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Abstract

Anew record of genus *Pseudapatemon* of family Strigeidae is described from intestine of little cormorant *Phalacrocorax niger* from Sanghar, Sindh, Pakistan. Eleven Little cormorant were captured alive, chloroformed and dissected in Parasitological laboratory and sample were examined under binocular stereomicroscope. The collected trematodes were processed in ethanol series for dehydration, stained in borax carmine and mounted in Canada balsam. Trematodes have bipartite body, divided into fore-body and hind-body, fore-body cup shaped without pseudo sucker, hind-body cylindrical larger than fore-body, ovary spherical and pre-testicular, testes massive, unequal, tandem and contiguous, vitellaria distributed in entire hind-body, eggs large, numerous and found in mid-body. On the basis of these characteristics, these are identified as *Pseudapatemon mamilliformis* (Tubangui, 1932) Dubois, 1936.only two hosts were infected with 12 specimens. This genus is being reported for first time from present locality and little cormorant is new host record.

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Introduction

Little cormorant *Phalacrocorax niger*is migratory cum resident, aquatic and piscivorous bird (Sarkar, 2002) and mostly found in fresh water inlands, lakes, and coastal areas (Roberts, 1991). It is voracious piscivorous consequently affecting commercial and recreational fishing and constantly engaged in conflict with fishermen. It harbours a lot of parasites and is potential vector of pathogens (Sarkar, 2002 and Chozyhiyattel, 2009). The freshwater lakes, water reservoir of Sanghar District are favourite areas for Little Cormorant *P. niger*. These lakes are also the best habitats for gastropods (snails), crustaceans and insects which play important role in the life cycle of the most of the helminthes. Therefore, there are reasonable chances of *P. niger* to be infected with helminths from the surrounding habitats. Little Cormorant is also the best representative of the birds to be studied for the helminthic infection from proposed locality.

Little cormorant harbor great number of helminth parasites but no detail study conducted in Pakistan except Akram (1996), Dharejo (2010) and Abro (2016a, 2016b, 2016c, 2016d, 2016e). During present study a large number of helminthes were collected and sorted into their genus. While examination of collected material a few specimens were identified as *Pseudapatemon*.

Genus *Pseudapatemon* comprises of four species including *Pseudapatemon aldousi* Mclntosh, 1940, *P. eroliae* (Fisher and Webster, 1954) Sudarikov, 1959, *P. mamilliformis* (Tubangui, 1932) Dubois, 1936 and *P. tiaratus* Mamaev, 1959. These species were collected from *Philohela minor*, *Limosa melanura*, *Gallinago gallinago*, *Capella gallinago* and *C. stenura*of Itlay, Russia, U.S.A., Philippine, Azerbaidzhan and Siberia (Yamagutti, 1971).

Present paper deals record of *Pseudapatemon mamilliformis*. Therefore, Little cormorant is new host record for genus *Pseudapatemon* (Table-1). It is also first report of this genus in Pakistan from avian host.

Materials and methods

Study area

Eleven little cormorants were collected between 2014 and 2015 from district Sanghar of Sindh Pakistan. District Sanghar is located in central part of Sindh Province at 25.8577°N and 69.4785°E. It has many water bodies which attract large number of little cormorant regularly (Rais, 2011).

Examination of Little cormorant

Birds were transported alive to parasitological laboratory of Zoology Department, University of Sindh, Jamshoro. The host was identified with help of description mentioned in works of Roberts (1991), Ali and Ripley (1978) Sarkar (2002) and Chozyhiyattel (2009). Hosts were chloroformed and dissected for removal of visceral organs. These were teased and prepared for examination on dissecting microscope. Organs were checked carefully and properly and parasites were separated for further process.

Processing of Parasites

The collected specimens were processed in ethanol series for dehydration and fixation, pressed properly, stained in borax carmine, cleared in clove oil and xylol and mounted permanently in Canada balsam. Drawings were made with aid of mirror type Camera Lucida. Photograph captured with Nikon digital camera. Measurement is taken in millimeter. Identification of specimens was made with trematodes keys by Yamagutti, (1971), Gibson *et al,* (2002) and relevant research reports.

Results

Eleven birds were examined, only two were infected with 12 specimens of genus *Pseudapatemon*. Specimens were recovered from intestine of little cormorant. The description is given below.

Description (Measurement is taken in range, Table No.1)

The body of the fluke bipartite, distinctly divided into fore-body and hind-body, measuring 1.20-1.62 in length and 0.35-0.52 wide at testicular level.

(Fig-1) Fore-body cup shaped, wider than long, measuring 0.25-0.50 in length and 0.27-0.51 in width, with irregular tribocystic organ and without pseudo sucker. Oral sucker 0.04-0.06 in length and 0.025-0.05 in width and ventral sucker 0.066-0.085 length and 0.075-0.09 in width. Pharynx present, short and neck absent. Hind-body larger than fore-body, elongated, cylindrical, 0.95-1.10 long and 0.35-0.52 wide at testicular level. Ovary pre-testicular oval to round, median and measuring 0.12-0.19 long and 0.13-0.21 wide. Testes massive, tandem, unequal, situated in mid and second half of hind-body. Anterior testis asymmetrical, measuring 0.20-0.30 long and 0.29-0.39 wide and in mid of hind-body. Posterior testis contiguous to anterior testis, located in second half of hind-body, almost having same shape as anterior testis and measuring 0.120-0.190 long and 0.25-0.350 wide. The anterior testis 0.45-0.55 distant from anterior extremity of hind-body. Post-testicular distance 0.14-0.18 in length and the area densely filled with vitellaria. The vitellaria dispel-rsed in entire hind-body particularly in between ovary and anterior extremity of hind-body. Vitellaria-dense laterally and cover the ceca up to posterior extremity. Eggs numerous, large, found in mid of hind-body and measuring 0.046-0.53 in length and 0.084-0.053 in width.

Taxonomic summary

Family:	Strigeidae
Subfamily:	Strigeinae
Genus:	*Pseudapatemon* Dubois, 1930
Species:	*Pseudapatemon mamilliformis* (Tubangui, 1932) Dubois, 1936 (Fig-1)
No. of specimens recovered:	12
No. of hosts found positive:	02 of *Phalacrocorax niger*
Site of infection:	Intestine
Locality:	Sanghar, Sindh, Pakistan
Record:	New host and locality record

Table 1. Comparison of various forms of genus *Pseudapatemon* with present form.

Name of organs	*P. mamiliformis* Present study	*P. mamiliformis* (Tub.,1932) Dubois, 1936	*P. elassocotylus* Dubois, 1936	*P. aldousi* Mclntosh, 1940
Body	Bipartite,1.20-1.62 X 0.35-0.52	Bipartite,1.32-2.96	Bipartite,2.19-3.05	Bipartite,1.35-1.72
Fore-body	Cup shaped0.25-0.5 X 0.27-0.51	Cup shaped 0.36-0.66 X0.58-0.64	Cup shaped 0.45-0.55 X 0.84-0.99	Cup shaped.0.35 X 0.405
Hind-body	Cylindrical 0.95-1.10 X 0.35-0.52	0.96-2.3 X 0.4-0.64	1.68-2.5 X 0.8-1.05	1.10 X 0.247
Oral sucker	Sub-terminal, 0.04-0.06 X 0.025-0.05	-------	-----	Sub-terminal, 0.7 X 0.08
Ventral Sucker	0.066-0.085 X0.075-0.090	-------	-----	0.12X 0.12
Pharynx	Small	-------	-----	0.03X 0.04
Ceca	Extended up to posterior end	Extended up to posterior end	Extended up to posterior end	Extended up to posterior end
Testes	Tandem, unequal anterior is 0.20-0.30 X 0.29-0.39,Posterior0.120-190 X 0.25-0.35	Tandem, unequal	Tandem, unequal	Tandem, unequal.Anterior testis 0.2 in diameter and posterior testis 0.2 X 0.28
Ovary	Oval to round 0.12-0.19 X 0.13-0.21	Round to oval	Oval to round	Oval to round, 0.09X 0.110
Cirrus sac	Absent	Absent	Absent	Absent
Post-testicular	0.14-0.18	-------	-----	0.264
Eggs	0.046- 0.53X 0.084-0.053	-------	-----	-----
Vitellaria	Follicular, found in hind-body	Follicular, found in hind-body	Follicular, found in hind-body	Follicular, found in hind-body
Host	*Phalacrocorax niger*	*Gallinago gallinago*	*Limusa melanura*	*Philhela minor*
Location	Intestine	Intestine	Intestine	Intestine
Locality	Sanghar Pakistan	Philpine, Azebaijan and Siberia	Russia and Italy	USA

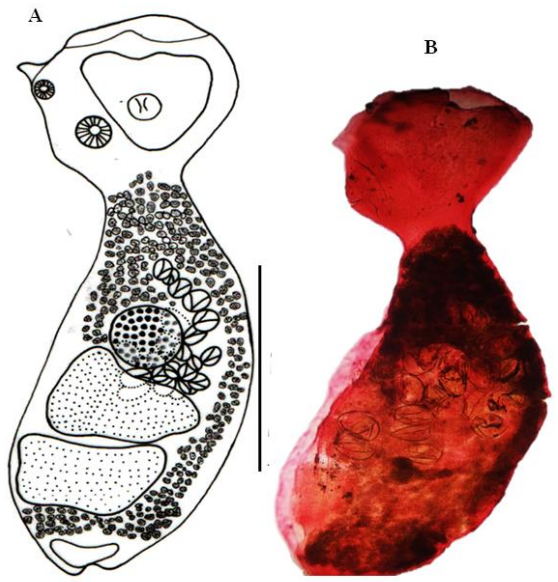

Fig. 1. *Pseudapatemon mamilliformis*. A. entire worm drawing, B. Photograph. *Scale bar*: A: 0.5mm

Discussion

Genus *Pseudapatemon* Dubois, 1936 was created to accommodate the strigeides which lack pseudosucker and have stopper like structure of the holdfast. Once, it was given status of subfamily Pseudapatemonae and such ranking was supported by Zazornova and Sysoev, 1933 but uniqueness of holdfast did not prove long lasting feature. Therefore, it was demoted to generic level. Currently, *Pseudapatemon* have cup shaped fore-body, without pseudo sucker and neck, hind-body is cylindrical with copulatory bursa and without genital cone, vitellaria usually confined in hind-body and mostly parasitic in grallatores (Gibson *et al*, 2002) *Pseudapatemon* has *P. elassocotylus* (Dubois, 1934), Dubois, 1936 as type species and other species are; *P. aldousi, P. mamiliformis, P. tiaratus* and *P. eroliae.*

P. elassocotylus (Dubois, 1934), Dubois, 1936, measuring about 2.19-3.05 long, reported from *Limosamelanura* of Italy and Russia. *P. aldousi* Mc Intosh, 1940, parasitic in small intestine of *Philohela minor* from USA. While, *P. mamiliformis* (Tubangui, 1932) Dubois, 1934, syn. *Cotylurus*, reported in *Gallinago gallinago* from Western Siberia and Phillipine and also in *Capella gallinago* from Azerbaidzan.

P. tiaratus Mamaev, 1959 diagnosed in *Capella sternur* and *P. eroliae* reported from *Limnodromus griseus, Capella minutilla* and *Capella puilla.* (Yamagutti, 1971, Gibson *et al.,* 2002).

Present specimen differs from *P. elassocotylus* in size of body, shape, arrangement of testes and ovary. *P. elassocotylus* is larger (2.19-3.05) than present species. (Table 1.) Ovary in *P. elassocotylus* is situated in first quarter of hind-body and not perfectly median in position. Ovary in present specimen is present in second quarter of hind-body and median in position. Whereas, position of testes is same in both species but differ in shape.

P. aldousi differs from present species in having small fore body (0.35 X 0.405), large hind-body (1.10 X 0.27) and large post-testicular area, large oral sucker and distinct pharynx (table 1). It resembles present species in size of body, shape and size of testes and ovary and location of uterus.

P. mamiliformis resembles Present specimen in having bipartite body, average size of body, size and shape of fore-body and hind-body, shape and position of testes and ovary, uterus and distribution of vitellaria. However, it slightly varies in size of organs from already reported one. (Table-1)

Therefore, on the basis of body shape and size, shape and size of fore-body and hind body, position ofuterus, ovary, testes the present species identified as *Pseudapatemon mamilliformis* (Tubangui, 1932) Dubois, 1936. However, genus *Pseudapatemon* is being reported for the first time from Pakistan and Little cormorant, *Phalacrocorax niger* is a new host record for this genus.

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