Pakistan J. Zool., vol. 48(4), pp. 1083-1087, 2016.

Tamerlania swabiensis, New Species (Digenea: Eucotylidae Skrjabin, 1924) in House Crow, *Corvus splendens* of District Swabi, Khyber Pakhtunkhwa, Pakistan

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ABSTRACT

During the investigation of the trematodes of birds in district Swabi, Khyber Pakhtunkhwa, Pakistan, ten specimens of the genus *Tamerlania* Skrjabin, 1924, were collected from the kidneys of single host, *Corvus splendens*. The specimens were studied and identified as *Tamerlania swabiensis* new species on the basis of shape and size of the body; having pointed spines on the body; symmetrical, juxtaposed and elongated testes; transversely elongated, sub-median ovary located just above the right testis, and Vitelline bands commencing at the level of the middle of the testes.

Article Information
Received 22 July 2015
Revised 3 December 2015
Accepted 22 December 2015
Available online 1 June 2016

Authors' Contributions
S executed the experimental work and wrote the article. NJ, MSK and AK supervised the work.

Key words
Trematode, *Tamerlania swabiensis, Corvus splendens.*

INTRODUCTION

The house crow (*Corvus splendens* Vieillot, 1817) belongs to the genus *Corvus*, of the family Corvidae with 25 genera (Haring *et al*., 2007; Khan *et al*., 2013) has world-wide distribution, except South America and Antarctica (Haring *et al*., 2012). The house crow is native to Asia but have inhabited many other parts of the world, predominantly found in Australasian region and occupies a wide range of habitats all over Pakistan (Khan *et al*., 2007; Qureshi *et al*., 2010; Akram *et al*., 2013). Being omnivorous in nature (Mustafa *et al*., 2015), feeds on plants and animals like fishes, amphibian, reptiles and some invertebrate including insects, which may act as intermediate hosts of trematodes, hence exposed to different helminths infestation (Kyi and Poon, 1987; Haring *et al*., 2012; Dar *et al*., 2013).

Skrjabin (1924) established the family Eucotylidae to Digenea to accommodate the genera *Eucotyle* Cohn (1904), *Tamerlania* Skrjabin (1924) and *Tanaisia* Skrjabin (1924), but latter Nezlobinski (1926) included two other genera; *Ohridia* and *Lepidopteria* followed by the addition of the new genus *Prohystra* suggested by Korkhaus in 1930. The familiar characteristics of this family were: the presence of annular muscular thickness; sub-terminal oral sucker; caeca simple and extending up to caudal end; esophagus absent or present; Cirrus pouch absent; testes are intracaecal or extracaecal located diagonally or symmetrically, in the second third of the body; ovary anterior to testes, vitellaria commencing at the level of the testes and parasitic in urinary tract of birds (Kharoo, 2012).

Freitas (1951) suggested *Tanaisia* and *Tamerlania* as the subgenera of the genus *Tanaisia* Skrjabin (1924) and proposed two subfamilies; Eucotylinae with a single genus *Eucotyle* Cohn (1904) and Tanaisiinae with a single genus *Tanaisia* Skrjabin (1924). Yamaguti (1958) supported Freitas (1951) suggestion and He also included *Ohridia* and *Lepidopteria* as subgenera of the genus *Tanaisia* Skrjabin (1924) while Odening (1963) further added another subgenus *Paratanaisia* Freitas, 1951. Yamaguti (1971) listed *Tanaisia, Lepidopteria, Ohridia, Paratanaisia* and *Tamerlania*, all as subgenera of the genus *Tanaisia* Skrjabin (1924) and differentiated the subfamily Tanaisiinae (having seminal receptacle while lacking Cirrus sac) from the subfamily Eucotylinae (having Cirrus sac while lacking seminal receptacle).

Kanev *et al*. (2002) revised the family and they included the two genera; *Eucotyle* with type species *E. nephritica* (Creplin, 1846) Cohn, 1904 and *Neoeucotyle* new. g with type species *N. zakharovi* Skrjabin, 1920 in the subfamily Eucotylinae while *Tanaisia* with type species *T. fedtschenkoi* Skrjabin, 1924, *Paratanaisia* with type species *P. bragai* (Santos, 1934) Freitas, 1959 and *Tamerlania* with type species *T. zarudnyi* Skrjabin, 1924 were considered valid genera of the subfamily Tanaisiinae. The other subgenera *Lepidopteria, Ohridia* and *Prohystra* were considered the synonyms of the genus *Tanaisia*.

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0030-9923/2016/0004-1083 $ 8.00/0

Kharoo (2012) documented the review of the family Eucotylidae, suggested by Kanev *et al.* (2002) in which they differentiated the subfamily Tanaisiinae characterized by absence of annular cervical thickening; Cirrus sac absent; intercaecal testes and caeca forming cyclocoel at the posterior end, from the subfamily Eucotylinae by having annular cervical thickening; Cirrus sac present; testes extracaecal or overlapping caeca and caeca do not unite posteriorly.

The salient features of the genus *Tamerlania* indicated by Skrjabin, 1924 are; absence of anterior muscular prominence, absence of esophagus, symmetrically placed, pre-equatorial testes with total margins, pre-testicular ovary with entire margins, vitellarial field commencing at testicular region and are the kidney parasites of the birds.

The species of the genus *Tamerlania* are reported from different parts of the world in different avian hosts. In Pakistan there is no record available, hence it is the first report of the genus *Tamerlania* Skrjabin, 1924 in a Pakistani avian host. However the species of the genus *Tanaisia* including *T. karachiensis* Begum *et al*., 1997 in *Corvus splendens*; *T. fedtschenkoi* Skrjabin, 1924 in *Fulica atra*; *T. longivittellata* Shtrom in Skrjabin, 1947 in *Fulica atra* and *T. atra* Nezlobinski, 1926 in *Fulica atra* have been reported in Pakistan. Thus the present work is contribution to the already existing knowledge with a new monostomid species parasitizing house crow.

MATERIALS AND METHOD

A total of 48 house crow, *Corvus splendens* were shot down by air gun during July 2012-March 2014 from different Tehsils of District Swabi, Khyber Pakhtunkhwa and brought to the laboratory of parasitology, Hazara University, Mansehra, Pakistan. Their viscera were examined for trematodes parasites and recovered ten specimens of trematodes from the kidney of the single host. The trematodes were collected in saline, pressed slightly between two clean slides and fixed in AFA (Alcohol-Formalin-Acetic acid) solution for 24 hours followed by dehydration in graded series of 30%, 50% and 70% ethanol. The specimens were stained in Borax Carmine and again dehydrated by 70%, 80%, 90% and 100% alcohol. These were cleared in Clove oil, rinsed in xylene and permanently mounted in Canada balsam followed by photomicrography. Camera Lucida was used to make diagrams. Measurement are in millimeter (mm) (length x width), but the eggs are measured in micrometer (µm). Holotypes are deposited in the laboratory of parasitology, Department of Zoology, Hazara University, Mansehra, Pakistan.

RESULTS

Family Eucotylidae Skrjabin, 1924
Subfamily Tanaisiinae Teixeira de Freitas, 1951
Genus *Tamerlania* Skrjabin, 1924

Tamerlania swabiensis new species
(Fig.1)

Host:	Common crow, *Corvus splendens*
Location:	Kidney
Locality:	Dagai, Swabi
Number of specimen:	10 from single host
Accession number:	HUPT-1

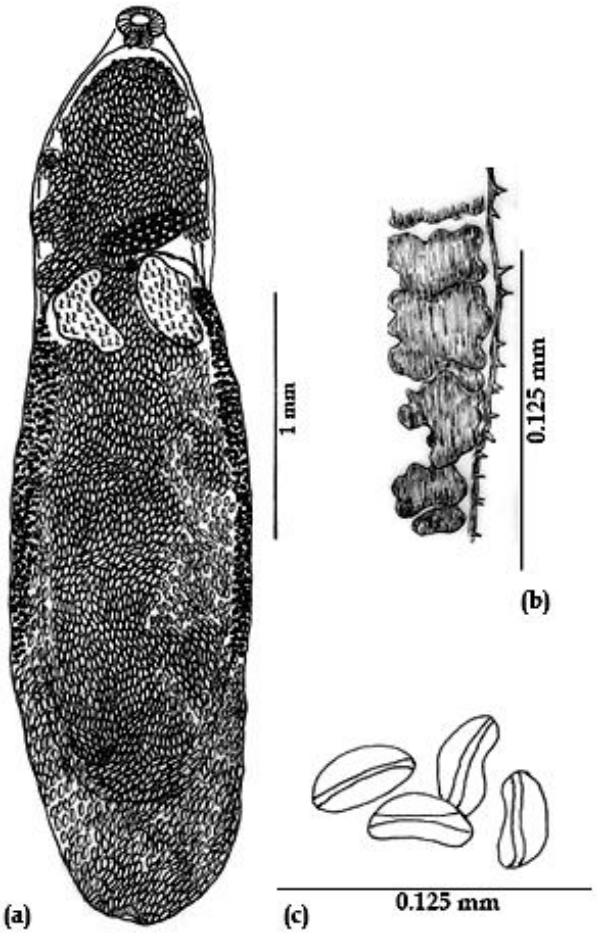

Fig. 1. *Tamerlania swabiensis* new species a, entire specimen holotype; b, tegument with spines; c, eggs.

Diagnosis

The body is elongated, tapered anteriorly, broadly rounded posteriorly and 3.41-3.75 x 0.97-1.01 in size.

Maximum width is examined in about third quarter of the body. The body is covered with small spines. Oral sucker is terminal, transversely oval and 0.13-0.16 x 0.19-0.23in size. Pre-pharynx is absent. Pharynx is muscular, bulbuls, lying immediately beneath oral sucker, partially dorsal to oral sucker and 0.07-0.09 x 0.09-0.13 in size. Esophagus is absent. Caeca are straight, run backward along the lateral sides and fuse together at the distance of 0.35-0.40 from posterior extremity, forming complete arch. Ventral sucker is not present in any specimen.

Testes are juxtaposed, nearly symmetrical, elongated vertically, inter-caecal, have smooth margins and oval to irregular in shape but not strongly finger like lobes. Right testis (below ovary) 0.31-0.35 x 0.19- 0.22 and left testis is 0.33-0.36 x 0.14-0.24 in size. Cirrus sac is absent and genital pore is not appearing due to extensive uterus. Ovary is compact with smooth margins, oval shaped, elongated transversely, sub median, situated just above the right testis and is 0.13-0.15 x 0.31-0.33 in size. Distance between ovary and oral sucker is 0.75-0.65. Vitelline bands well developed with prominent follicles, extra-caecal may overlapping caeca, commencing at the level of the middle of the testes and extending up to fourth quarter of the body; post Vitelline space is 0.8-1.03 at one side while 0.85-1.2 at the other side. Vitelline ducts arising from anterior part of vitelline bands, passing anteriorly to the small, median, post-ovarian vitelline reservoir located anterior to the testis. Uterus fills almost whole body, touching the body wall except for the space occupied by the vitelline bands. Eggs are numerous, oval, smooth, dark brown, operculated and 39.63-42.68 (41.15) x 18.29-21.34 (19.81) in size.

DISCUSSION

The absence of esophagus and annular muscular thickening; symmetrically placed testes with entire margins; pre-testicular, compact ovary and vitellarial field commencing at testicular region indicated that the species under study agree with the characters reported for the genus *Tamerlania* Skrjabin, 1924. The features which are considered most important for the identification of species with in the genus *Tamerlania* are; the general body shape and size, the presence or absence of esophagus, straight or undulating caeca, size and shape (lobed or smooth margins) of gonads, extension of vitellaria and sometime the distribution of uterine coils. The specimens reported are larger in size (3.41-3.75 x 1.01-0.97) than *T. melospizae* Penner, 1939 syn. of *T. zarudnyi* Skrjabin, 1924 (3.7 x 0.55); *T. zarudnyi vietanmensis* Odening, 1963 (3.1-3.2 x 0.69-0.727); *T. parva* Freitas, 1951 (3.62 x 0.77); *T. freitasiana* Odening, 1963 (0.91-3.1 x 0.528-0.583); *T. incerta* Freitas, 1951 (2.28-3.22 x 0.62-0.77); *T. meruli* Nezlobinski (1926) Freitas, 1951 syn. of *T. zarudnyi* (2.5 x 0.45); *T. exigua* Freitas, 1951 (2.95 x 0.43); *T. oviaspera* Freitas, 1951 (2.51-3.01 x 0.49-0.75); *T. similis* Freitas, 1951 (1.57-1.94 x 0.54-0.6); *T. taiwanensis* (1.37-1.815 x 0.37-0.42); *T. inopina* Freitas, 1951 (1.178-1.93 x 0.48-0.58) While smaller in size than *T. corvi* (4.0-5.1 x 0.9-1.2); *T. zarudnyi* (3.1-4.8 x 0.67-0.88) and *T. precaria* (3.72-3.85 x 0.5-0.64). The specimens are also different from *T. valida* Freitas, 1951 (3.11-3.45 x 0.89-0.94); *T. indica* Singh, 1962 (3.756 x 0.641); *T. minax* Freitas, 1951 (2.18-3.68 x 0.54-0.87) and *T. japonica* Yamaguti, 1935 syn. of *T. zarudnyi* (2.5-4.0 x 0.4-0.6) particularly in width while from *T. magnicolica* (1.09-3.82 x 0.28-0.83) and *T. gallica* Dollfus, 1946 syn. of *T. zarudnyi* (2.0-5.0 x 0.76-0.87) in length.

The eggs of the present specimens (39.63-42.68 (41.15) x 18.29-21.34 (19.81)) are larger in size than the eggs of *T. melospizea* (30 x 21); *T. exigua* (34-38 x 14-15); *T. meruli* (30 x 15).

While these are smaller than *T. minax* (44-52 x 21-27), *T. japonica* (42-51 x 24-26), *T. zarudnyi* (32–50 x 25–32), *T. corvi* (42-48 x 22-26), *T. indica* (46-46 x 28.6-33) and *T. panuri* (34.5-42.8 x 20.7-27.6). These are also different from the eggs of *T. valida* (31-34 x 13-17); *T. precaria* (35-42 x 13-16); *T. similis* (34-36 x 17-18); *T. freitasiana* (29-35 x 19-25) and *T. gallica* (40-41 x 22.5-24) particularly in width while different from the eggs of *T. inopina* (34-49 x 15-17); *T. parva* (31-38 x 17-19) and *T. oviaspera* (34-35 x 16-19) in length.

T. zarudnyi Skrjabin, 1924 collected from the kidneys of European tree sparrow, *Passer montanus* in Turkestan for the first time but later recovered from many other avian hosts including *Fringilla*; *Dendrocopus*; *Corvus*; *Oriolus*; *Muscicapa*; *Pica*; *Turdus* etc in different parts of the world including Asia. The present species resembles *T. zarudnyi* in position of gonads and extension of vitellaria but differences are found in general body shape and size, shape and size of gonads, size of oral sucker, size of eggs and the uterus of the present species touching the wall of the body, occupy almost all body of the worm except vitellarian fields and anterior to cecal bifurcation. Moreover there is a constriction in the cutical of the worm at the middle level of the testes in each specimen of the present species which is not present in *T. zarudnyi*.

T. melospizae syn. of *T. zarudnyi* Skrjabin, 1924 collected from *Melospiza lincolni lincolni* in North America, Minnesota differs in general body shape and larger body size and having sub-terminal oral sucker, esophagus, and vitellarian bands commencing at anterior level of the testes.

T. incerta reported from *Myospiza humeralis*

humeralis in Brazil differs in body shape, smaller body size, sub-terminal oral sucker, gonads oval or nearly round, vitellarial bands commencing pre-testicular at one side while post-testicular at the other side and the uterus inter-cecal at the anterior body portion while extra-cecal at the posterior body part but not touching the body wall of the worm. Similarly in *T. incerta*, the constriction in the cutical at the middle level of the testes is absent.

T. inopina collected from *Passer domesticus* in Brazil by Freitas, 1951 differs in general body shape, being smaller in size, have larger sub-terminal oral sucker and presence of esophagus, lobed ovary and testes, pre-testicular extension of vitellaria and smaller size of eggs. *T. inopina* collected from Japanese quail, *Coturnix japonica* in Brazil by Pinto *et al*., 2005 differs in general body shape and size, presence of esophagus, shape of ovary and testes, body tegument, extension of vitellaria and uterus.

T. similis collected from *Cyanocorax chrysops* as new species in Brazil by Freitas, 1951 differs in having smaller body size, smaller, sub-terminal oral sucker, presence of esophagus, lobed ovary and round to rectangular shape testes overlapping intestinal ceaca, vitellarial bands commencing at testicular region or may pre-testicular and have smaller size of eggs.

T. oviaspera collected by Freitas, 1951 from *Ramphocelus carbo connectens*, *Ramphocelus carbo carbo*, *Thraupis sayaca sayaca* and *Icterus cayennensis pyrrhopterus* in Brazil differs in general body shape, presence of esophagus, lobed ovary and testes, overlapping ceaca and vitelline bands commencing at pre-testicular level.

T. exigua discovered from *Troglodytes m, musculus* and documented by Freitas, 1951 differs being smaller in size body and have esophagus, lobed gonads, overlapping ceaca and pre-testicular vitelline bands.

The present species resembles with *T. precaria* Freitas, 1951 collected from *Speotyto cunicularia* only in the vertical elongation of testes but differs in having sub-terminal oral sucker, esophagus and pre-testicular extension of vitellaria.

T. minax Freitas, 1951 collected from *Passer domesticus*, *Cyanocorax cyanomelas* and *C. chrysops* in Brazil resembles in the absence of esophagus and vertically elongated testes but differs in having sub-terminal, larger oral sucker, multi-lobed ovary, extra-ceacal testes and vitelline bands commencing above the testicular region.

T. magnicolica Freitas, 1951 collected from *Guira guira, paroaria capitata* in Brazil differs in having larger, sub-terminal oral sucker, 0.04-0.1 mm long esophagus, intestinal ceaca undulating, ovary multi-lobed, testes overlapping intestinal ceaca and vitelline fields commencing at the middle of the ovary and testes.

T. valida Freitas, 1951 collected from *Himantopus himantopus* in Brazil differs in the presence of esophagus, multi-lobed gonads overlapping ceaca and elongated vitellarial bands commencing at the level of the middle of the ovary and testes.

T. parva Freitas, 1951 discovered from *Uroleuca cristatella* in Brazil resembles only in the vertically elongated shape of testes and expansion of uterus touching the wall of the body of the fluke but differs in having larger sub-terminal oral sucker, long esophagus, multi-lobed ovary overlapping ceaca and vitellaria commencing at the level of the ovary.

On the basis of above mentioned differences in the diagnostic features of the present species and previously described species of the genus *Tamerlania*, it is indicated that the species is new to science for which the name *Tamerlania swabiensis* is proposed.

Etymology

The species name refers to the locality of the host.

Conflict of interest statement

Authors have declared no conflict of interest.

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