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New host record *Echinostoma paraulum* (Digenea: Echinostomatidae) in house crow (*Corvus splendens* vieillot, 1817) of district Khairpur, sindh, Pakistan

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Abstract
In the present study, *Echinostoma paraulum* (Digenea: Echinostomatidae) is described from intestine of the bird house crow *Corvus splendens* of Khairpur, Sindh, Pakistan. This represents a new host record and the present specimen resemble with type of specimen *Echinostoma atrae* but is distinguished from it in having larger body size, 38 collar spines, oral sucker larger, ovary spherical, pretesticular, anterior testis smaller, uterus consists of numerous delicate transverse coils winding between ovary and acetabulum.

Keywords: Host record, trematode, *Echinostoma paraulum*, *Corvus splendens*

Introduction
Trematode fauna of birds of different feeding habits are poorly known in Pakistan and reports published are only on the morphotaxonomy of parasites of birds (Dharejo, 2006) [1, 8, 9]. House Crow are well known to live commensally with humans (Ali and Ripley, 1983) [2] and usually contruct their nests on large, well branched dense conopy tress to human settlements (Ali and Ripley, 1983; Ryall, 1990) [2]. Common House Crow is native in Indian sub–continent but it has widely adopted in various other localities of the world streaching from the Malaysia to the South Africa (Bijlsama and Meninger, 1984). The rising number of this bird population and its expansion to other areas in Tanzania and neighboring countries has created very serious concern due to its germ–infested reports, very loudy habit, acting as pest and creating problems for the children in snatching bakery foods. It has been recommended that this bird harbours and may transfer disease causing agent for the humans and other domestic animals of economic importance (Ryal and Reid, 1987). A few authors have reported that *Corvus* sp. nest on pylons in some parts of the world (Steenhof *et al*., 1993); Akter *et al*., 1994 [3]; Vyawahare, 1998 [16]; Bednorz, 2000; Allan and Davies, 2005 [5] and Agiae, 2006. On Kharg Island in the Persia Gulf, Behrouzi–Rad (2010) recorded House Crows nesting on oil and gas pipes, window ledges of building, poles, TV antennae and also tress (Ali *et al*., 2011 and Chongomwa, 2011) [4]. Variety of parasites including nematodes, cestodes, trematodes and acanthocephalan infect avian hosts. These hosts also get these pathogens through arthropod vector/ectoparasite (Roberts and Janovy, 2005). Trematodes collected from the intestine of house crow were identified as *Echinostoma paraulum* is described here.
Sindh, one of the four provinces of Pakistan is a subtropical region: hot in summer and cold in winter (Jourdain *et al*., 2007). Temperature normally rises above 46 ºC (115º F) between May and August, and the lowest average temperature of 2 ºC (36º F) occurs during December and January. The annual rainfall averages about 177 mm. The current study area (Khairpur Mirs) is the largest district of the Sindh province positioned among the central and upper Sindh province.

Materials and Methods
56 hosts were collected from Khairpur and brought to the Parasitology Laboratory of Zoology Department, Shah Abdul latif University, Pakistan. After anesthetizing birds were dissected and examined for helminth parasites. During examination of gut contents and visceral organs,

nine specimens were collected from intestine. The specimens were fixed in AFA solution, flattened under slight cover glass pressure to prevent curling, stained with Borax carmine, dehydrated in graded series of ethanol, cleared in clove oil and xylol. The specimens were finally mounted permanently in Canada balsam for detailed study Garcia and Ash (1979) [10] and Schmidt (1988). Diagrams were made with camera lucida. Measurements are given in millimeter (mm) and those of eggs in micrometer (µm).

Results and Discussion

Description of *Echinostoma paraulum* Diet, 1909

Host: House crow *Corvus splendens* Vieillot, 1817
Site of infection: Intestine
Locality: Khairpur

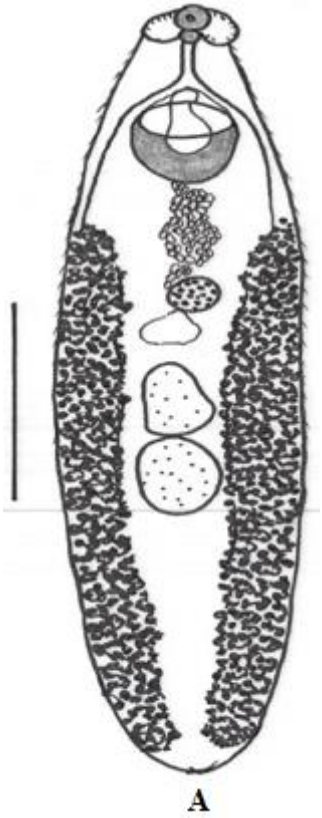

Fig 1A: Shows the Entire Worm Scale Bar 5 mm of *Echinostoma paraulum* Dietz, 1909 from Khairpur Sindh Pakistan

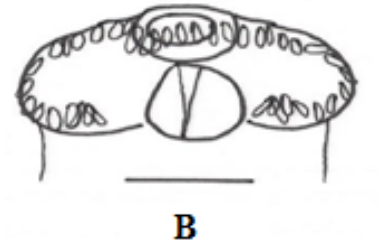

Fig 1B: Shows the Enlarged head collar. Scale Bar 1 mm of *Echinostoma paraulum* Dietz, 1909 from Khairpur Sindh Pakistan

It is elongated fluke, measuring 3.20–3.58 X 0.62–0.69 in size. Body of the worm is highly muscular, long, cylindrical, slightly tapering at both ends. Fore body very small. Headcollar well developed, reniform, measuring 0.641–0.750 X 1.602–1.725 in size, armed with 37 numbers of hooks arranged in a single row (Fig.1 B). Out of these 5 spines located on lappet, larger than marginal spines. Oral sucker smaller, terminal measuring 0.576–0.692 in size. Prepharynx is absent. Pharynx measuring 0.256–0.30in size, larger than oral sucker. Esophagus comparatively short, tubular, diverticulte in front of ventral sucker to form intestinal fork, running laterally in both sides of body in the form of ceca reaching up to posterior extremity measuring 1.025–1.026 in length. Ventral sucker large, cup–shaped, highly muscular measuring 1.923–2.260 X 1.794–1.80 in size.

Ovary measuring 0.897–0.950 X 0.833–0.920 in diameter, small, oval–shaped, median, situated in 2nd quarter of body, well a part from ventral sucker and testes. Testes unequal, irregular in shape, tandem, contiguous. Seminal receptacle continuous with ovary.

Anterior testis measuring 1.794–1.80 X 1.153–1.20 3in size, equatorial in position, smoothly outlined, with broader base and somewhat tapering narrower anterior part, comparatively smaller than posterior testis. Posterior testis post–equatorial in position, oval in shape, smoothly outlined, larger than anterior testis measuring 1.987 X 1.410–1.50in size. Uterus short, restricted in between ovary and ventral sucker, contain some eggs. Vitellria commencing from the mid–level of ventral sucker and ovary, extending backward, running laterally, reaching up to posterior extremity, not confluent. Post–testicular space measuring 6.538–6.720 in length (Fig. 1 A).

The genus *Echinostoma* Rudolphi, 1809 was erected to accommodate trematodes from birds. Type specimen is *Echinostoma revolutum* (Froelich, 1802) Looss, 1899, syn. *E. echinatum* (Zeder, 1803); *E. armatum* Molin, 1858; *E. revolutum* var. *japonicum* Kurisu, 1932; *E. miyagawai* Ishii, 1932, *E. atrae* Birmani *et al*., 2008 in various aquatic and terrestrial birds including Anatidae, Phalacrocoracidae, Scolopacidae, Ardeidae, Rallidae, Phasianidae, Corvidae, Columbidae, etc., occasionally in man - Looss, Tubangui, Sprehn, Yang, Beaver, Bashikirova, Yamaguti, etc; *E. miyagawai* and *E. echinatum* Looss (1899).

Other species have variable number of collar spines are reported in birds from various parts of the world including: Armenia, Australia, Azerbaidzhan, Brazil, Bulgaria, C. Asia, China, Cuba, Czechosl., Egypt, Estonia, Europe, Far East, Farmosa, Gagarin, Georgia, Germany, Japan, Kirgizia, Kurova, London, Louisiana, Madagascar, Manitoba, N. and S. America, Queensland, Russia, Siberia, Tadzhikistan, Turkestan, Ural mountains, Uzbekistan, Venezuela (Yamaguti, 1971) [15], India (Chishti and Ahmad, 1991) and Pakistan (Bhutta and Khan, 1975) [6].

The present species (3.20 – 3.580 X 0.620 – 0.690) is larger in size than *E. parcespinosum* (0.90 – 1.0), *E. turdi* (1.0 X ¼), *E. koisarense* (1.070 – 1.30 X 0.250 – 0.330), *E. fragosum* (2.10 – 3.120 X 0.30 – 0.330), *E. neglectum* (2.50 – 4.50 X 1.0), *E. nephrocystis* (2.50 – 4.50 X 1.0), *E. chasma* (2.580 X 0.640), *E. columbae* (2.630 – 7.650 X 0.850 – 1.530), *E. echinocephalum* (2.70 – 3.30 X 0.230 – 0.270), *E. ignavum* (2.80 X 0.60), *E. aliud* (2.90 –6.30 X –), *E. dilatatum* (2.0 – 4.0 X 1.0), *E. crotophagae* (3.0 – 8.0 X 1.0 – 1.90), *E. bhattacharyai indicum* (3.120 X –), *E. americanum* (3.40 X 1.10), *E. asiaticum* (3.540 X 0.40 – 0.60), *E. hsui* (3.50 – 4.20 X 0.40 – 0.60), *E. oxycephalum* (3.0 – 4.0 X 1/3 – 1.0), *E. equinatum gigas* (3540 X 3.0 – 4.0).

While it is smaller in size than *E. revolutum* (4.0–22 X 0.88–2.5), *E. stromi* (20 X 1.175), *E. crotophagae* (3.0 – 8.0 X 1.0 – 1.90), *E. goldi* (4.0 – 7.0 X 1.360), *E. azerbaibjanicum* (4.50 – 4.80 X 0.80 – 1.2), *E. aphylactum* (4.5 – 5.0 X 0.770 – 0.778), *E. exechinatum* (4.50 – 6.0 X 4.436), *E. emollitum* (4.50 – 6.70 X 0.55–0.70), *E. ralli* (4.50 – 8.80 X 0.80 –

1.30), *E. govindum* (4.60 – 4.90 X 0.920), *E. mesotestius* (4.750 – 8.320 X 0.990), *E. microrchis* (5.0 X 1.0), *E. revolutum tenuicolle* (5.120 – 8.0 X 1.820), *E. siticulosum* (5.50 – 7.50 X 0.70 – 0.940), *E. exile* (5.50 – 7.50 X 0.820 – 1.0), *E. caproni* (5.650 X 1.50), *E. bhattacharyai* (5.70 X 1.050), *E. stridulae* (5.0 – 10.0 X 0.920 – 1.250), *E. longicirrus* (5.0– 7.0 X 0.90 –1.20), *E. crecci* (5.0– 8.0 X 1.0 – 1.250), *E. minimum* (5.0 X 0.90), *E. elongatum* (6.0 – 9.50 X 0.70 – 0.80), *E. pekinense* (6.290–6.730 X 1.04–1.230), *E. chloropodis* (6.40 –6.680 X 1.0–1.20), *E. sudanense* (6.50 X 1.40), *E. nudicaudatum* (6.832–7.632 X 0.948–1.280), *E. uitalicum* (6.80–7.50 X 1.350 –1.750), *E. audyi* (6.0 –14.10 X 0.80 –1.50), *E. mendax* (6.0 –9.50 X 0.40 –0.530), *E. condignum* (7.0–13.50 X 0.950 –1.30), *E. erraticum* (7.0–8.80 X 1.450), *E. attenuatum* (7.222–11.222 X 0.885–1.593), *E. rousseloti* (7.30 X 1.50), *E. chloropodis cachinnans* (7.350 – 9.0 X 0.810 –0.870), *E. chloropodis philippinense* (7.550– 10.0 X 1.050–1.220), *E. stantschinskii caudatum* (7.60–7.90 X 0.90), *E. coronale* (71.10 X 2.280), *E. uralense* (8.50 X 1.0), *E. academicum* (8.50 X 1.20), *E. necopinum* (8.50 –15.0 X 1.50 –1.720), *E. robustum* (8.80 –9.80 X 1.330 –2.180), *E. stantschinskii* (9.0–9.80 X 1.140–1.290), *E. multispinosum* (9.40 X 1.30), *E. travassosi* (9.480–9.680 X 2.120), *E. turkestanicum* (9.650–10.90 X 1.80 –2.330), *E. transfretanum* (9.0–11.0), *E. acuticauda* (9.0–12.0 X 0.90 –1.0), *E. australe* (10.20 X 1.50), *E. uncatum* (10.5 X 1.980), *E. operosum* (10.0 X 1.40), *E. grande* (11.250 X 1.50), *E. corvi* (11.40 X 1.620), *E. alepidotum* (11.50 X 1.140), *E. coecale* (11.70 X 2.072), *E. annulatum* (12.0 X 1.0), *E. gracile* (12.0 X 1.20), *E. amurzeticum* (12.120 –15.120 X 0.940 –1.10), *E. kashmirensis* (13.04 X 1.550), *E. australasianum coroma*nd*um* (13.50 X 2.50), *E. anseris* (13.20 X 2.10 –2.50), *E. australasianum* (13.0–14.0 X 1.750) and *E. armatum* (14.0 X 0.80), *E. hilliferum* (14.50–16.0 X 1.70–2.20),*E. atrea* 14.210–15.90 X 1.50–1.640, *E. uncinatum* (14.60 X 2.250), *E. sarcinum* (14.0–14.50 X 2.08–2.140), *E. bancrofti* (15.70 X 1.70), *E. paracoalitum* (17.10 X 2.30), *E. dietzi* (19.107–21.230 X 1.690–1.890), *E. rufinae* (19.820 X 1.690), *E. miyagawai* (21.0–26.0 X 2.0–3.50) and *E. echinatum* (92.0–134 X 59–76).

Present species differs from *Echinostoma atrae* Birmani *et al*., 2008 in having larger body size, head collar well developed, muscular, smaller in size, bearing 38 collar spines, oral sukkur larger, muscular, subterminal, rounded, prepharynx is hardly visible, esophagus smaller bifurcating anterior to the acetabulum, pharynx is larger, ovary spherical, pretesticular, anterior testis smaller, uterus consists of numerous delicate transverse coils winding between ovary and acetabulum.

On the basis of diagnostic characteristics like body shape, number of collar spines, distribution of vitellaria, ovary and testis, and the present specimens are identified as *Echinostoma paraulum* Dietz, 1909.

This species is being reported from the first time from Pakistan and Common House Crow.

Specimens were identified with the help of keys given by Bray *et al*., 2008; Jones *et al*., 2005; Gibson *et al*., 2001; McDonald, 1981; Yamaguti, 1959; 1961; 1963; 1971 and other related literature.

Conclusion

During present study of *Echinostoma paraulum* Dietz, 1909 species of helminths have been recorded.

During present study, a trematode namely *Echinostoma paraulum* Dietz, 1909 collected from the host Common House Crow is being reported for the first time from Pakistan and from the host Common House Crow, therefore, constituting it as new locality and new host record.

Within the broader constrains imposed by host specificity (relative to the helminths) the composition and the diversity of helminths is related to the type and diversity of animal species that compose the natural diets of birds. The present study strengthens the data base, correlating diet and diversity of helminth fauna.

Previously there is no record of such type of study in Pakistan; hence the results obtained are a new contribution to scientific knowledge.

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