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Echinochasmus mazharuddini n.sp. (Digenea: Echinostomatidae) from the Bank Myna *Acridotheres ginginianus* L. (Passeriformes: Sturnidae) in Sindh province, Pakistan.

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Abstract

During current studies on helminth parasites of Bank Myna *Acridotheres ginginianus* (Passeriformes: Sturnidae) in Sindh province, Pakistan, five unidentified specimens of trematodes belonging to genus *Echinochasmus* Dietz, 1909 were recovered from gizzard of the single host bird. Present species differs from its congeners by having 28 number of collar spines, ovary overlapped by ventral sucker and anterior testis, very short distance between ventral sucker and anterior testis, testes smoothly outlined, overlapped, vitellaria compact, densely arranged, commencing from pharyngeal region reaching up to posterior extremity, confluent posteriorly, and other varying characteristics. The name of new species *E. mazharuddini* is named after the late father of first author. However this is first report of the genus *Echinochasmus* Dietz, 1909 from Bank Myna *Acridotheres ginginianus*.

Keywords: Avian trematode, *Echinochasmus mazharuddini* n. sp., Bank Myna *Acridotheres ginginianus*, Sindh, Pakistan.

1. Introduction

Echinostomatidae is a large family of flukes of birds and mammals, which is morphologically characterized by the head crown armed with collar spines [30, 35]. Out of its 10 subfamilies (Jones, Bray and Gibson, 2001), Echinochasmidae is distinguished by small size and dorsally interrupted collar spines. Out of the flukes of Echinochasmidae, genus *Echinochasmus* Dietz, 1909 has vitellaria extending to posterior margin of ventral sucker [31, 35].

The genus *Echinochasmus* contains a number of species that are transmitted to human as food borne trematode infection. Transmission mainly by way of the ingestion of metacercarial cyst by humans with raw or improperly cooked freshwater fish. The genus has at least one species, *E. liliputanus* which is transmitted to humans as water borne infection. Human ingesting cercariae of this species of *Echinostome* may develop an intestinal trematodiasis referred to as Echinochasmiasis [1].

Chai and Lee (2002) studied on food-borne intestinal trematodiasis in the republic of Korea, reported *E. japonicus* from humans. Although this *Echinostome* is typically a parasite of birds in Korea and human become infected by eating a variety of freshwater fish contaminated with metacercariae of this species. *E. japonicus* was first described from experimentally infected animals by Tanabe, 1926 [32]. He commented the possibility of human infection and Ujiei (1936) [33] demonstrated human infection experimentally. Thereafter, Seo *et al.* (1985) [29] recorded 4 human cases of natural infection by this fluke first in Korea. Therefore, medical attention has been paid to this fluke. Recently Choi *et al.* (2006) [15] provided morphological observations on the cercariae of *E. japonicus* and detailed methods used to maintain the life cycle of this species from the cercariae to the adult.

In Pakistan very little work has been done on trematode parasites of birds. Reports available include [2, 5, 6, 7, 8, 9, 10, 14, 16, 17, 18, 19, 20, 21, 22, 23].

Acridotheres ginginianus is wide spread throughout Sindh, Punjab and Khair-Pakhtunkha provinces of Pakistan but is uncommon in areas away from the rivers. Waite, 1948 considered it as a rare bird in the salt range of Pakistan. They have not been seen in the Balouchistan province. Bank Mynas is omnivore bird feeds on grain, insects, fruits etc. Like Common Myna, they sometimes follow grazing animals picking up disturbed insects or even ticks on the

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animals. They feed on ripening crops such as those of sorghum, grape and pearl millet. They feed on a variety of insects, including crop pests [3].

2. Materials and method

Live fifteen Bank Myna *Acridotheres ginginianus* (Passeriformes: Sturnidae) were collected from different locations of the Khairpur city of Sindh Province, Pakistan and brought to parasitology Laboratory of Department of Zoology

and examined for endohelminths. Live five trematodes were collected from gizzard of the host, put into 0.9% saline and fixed under slight cover glass pressure in alcohol-formalin-acetic acid (AFA), stained with borax carmine, dehydrated in a graded series of ethanol solutions, then cleared in clove oil and xylol, and mounted in Canada balsam. Illustrations were made with aid of camera lucida and photographs taken with Olympus DP12 camera. All measurements are given in micrometer (μm).

Table 1: Comparative characteristics of various species of genus *Echinochasmus* Dietz, 1909 collected from avian hosts

Species	Present species	<i>E. prakashi</i> Gupta & Singh, 1988	<i>E. japonicus</i> Tanabe, 1926	<i>E. bagulai</i> Verma, 1935	<i>E. ruficapensis</i> Verma, 1935	<i>E. jamshorensi</i> Channa <i>et al.</i> , 2009	<i>E. mohiuddini</i> Dharejo <i>et al.</i> , 2007	<i>E. accipeteri</i> , Bhutta and Khan, 1975	<i>E. passerii</i> Dharejo <i>et al.</i> , 2010
Body size	810–886 X 395–421	0.97–1.62 X 0.30– 0.31	0.76 X 0.19	1.0–1.75 X 0.25–0.5	2.5–3.5 X 0.4–0.6	0.432 X 0.124	0.780– 1.613 X 0.215– 0.416	2.2 X 0.5	0.725 X 0.285
Fore body	277–291	0.285	0.4	0.291	0.914	0.185	0.465	0.48	0.257
Hind body	386–404	0.609	0.292	0.441	1.6	0.182	0.896	1.42	0.362
Head collar	105–117 X 145–160	0.095	0.15	0.075	0.3–0.45 X 0.5–0.65	0.056 X 0.062	0.068– 0.102 X 0.090– 0.166	0.12 X 0.24	0.088 X 0.091
Spines	28	22	24	24	24	24	24	24	26
Oral sucker	76–86 X 70–82	0.05–0.07 X 0.06– 0.07	0.10	0.05–0.07	0.15 X 0.1	0.276 X 0.021	0.032– 0.083 X 0.039– 0.083	0.08 X 0.04	0.048 X 0.047
Pre-pharynx	8–11	0.05–0.09	0.06	0.05	0.15	0.054	0.030– 0.083	0.02	0.014
Pharynx	85–91 X 65–76	0.07	0.05	0.05	0.14 X 0.14	0.051 X 0.021	0.045– 0.098 X 0.030– 0.071	0.09 X 0.08	0.054 X 0.048
Esophagus	67–83	0.08 X 0.29	0.23	0.125	0.314	0.056	0.037– 0.106	0.36	0.091
Ventral sucker	160–186 X 192–208	0.14–0.15 X 0.18– 0.19	0.08 X 0.09	0.15–0.24	0.35	0.078 X 0.072	0.106– 0.227 X 0.090– 0.189	0.3 X 0.33	0.105 X 0.097
Cirrus sac	71–82 X 45–52	0.09–0.12 X 0.06– 0.08	0.05	0.075 X 0.066	0.17	0.062 X 0.013	0.030– 0.128 X 0.041– 0.075	0.17 X 0.04	0.031 X 0.034
Ovary	73–8282 X 88–95	0.05–0.11 X 0.05– 0.08	0.028 X 0.042	0.042–0.06	0.12 X 0.26	0.018 X 0.021	0.030– 0.090 X 0.026– 0.106	0.12 X 0.1	0.057 X 0.051
Anterior testis	101–121 X 260–296	0.10–0.13 X 0.14– 0.17	0.05 X 0.08	0.06–0.151 X 0.76–0.193	0.18–0.22 X 0.19–0.35	0.029 X 0.045	0.079– 0.227 X 0.090– 0.212	0.2 X 0.29	0.068 X 0.142
Posterior testis	127–143 X 206–239	0.14–0.18 X 0.13– 0.20	0.05 X 0.08	0.084–0.168 X 0.084– 0.173	0.18–0.25 X 0.18–0.2	0.032 X 0.043	0.109– 0.280 X 0.090– 0.204	0.32 X 0.26	0.102 X 0.119
Post-testicular space	122–139	--	0.115 X 0.128	--	0.746	0.082	0.258	0.61	0.135

Vitellaria	Densely arranged throughout body, commencing from posterior extremity, reaching up to pharyngeal region, confluent posteriorly	Follicular, extending from a little anterior to posterior border of ventral sucker to hind end of body, confluent in post-testicular zone	Extends over ceca and confined to posterior half of the body	Commencing from about posterior border of ventral sucker, confluent behind posterior testes	Vitellaria commence at level of hinder margin of ventral sucker and run laterally outside intestinal caeca	Small follicles, commencing from mid-level of ventral sucker to posterior end of body, confluent posteriorly	Large follicles extending backward from lower level of ventral sucker in lateral fields and almost meet behind posterior testes	Extending from level of posterior one third of ventral sucker to posterior end of body, follicles of two sides become confluent behind testes	Compact small follicles with tendency to run together and form bigger follicle groups
Eggs	73–100 X 52–86	0.04–0.06 X 0.03–0.05	0.075 X 0.060	0.067–0.075 X 0.05–0.058	0.07–0.08 X 0.039–0.052	--	56–70 X 32–44	0.043–0.063	36–43 X 20–24
Host	<i>Acridotheres ginginianus</i>	<i>Ardeola grayi</i>	<i>Anas platyrhynchos</i>	<i>Ardeola grayi</i>	<i>Podiceps ruficollis</i>	<i>Ardeola grayi</i>	<i>Ardeola grayi</i>	<i>Accipiter badius</i>	<i>Passer domesticus</i>
Location	Gizzard	Intestine	Intestine	Intestine	Intestine	Intestine	Intestine	Intestine	Gallbladder
Locality	Pakistan	India	Korea	India	India	Pakistan	Pakistan	Pakistan	Pakistan

3. Results

Body small, spinose, muscular, elongated, attenuated anteriorly, rounded posteriorly, 810–886 long by 395–421 wide; forebody 277–291 long and hindbody 386–404 long; maximum width at testicular level; head collar well developed, reniform, 105–117 long by 145–160 wide, armed with 28 spines arranged in single row, out of them 4 form corner group; oral sucker slightly protruding, 76–86 long by 70–82 wide; pre-pharynx very short, 08–11 long; pharynx almost round, 85–91 long by 65–76 wide followed by esophagus which diverticules in front of acetabulum forming an intestinal fork; esophagus, 67–83 long; ventral sucker well-developed, twice as large as oral sucker, 160–186 long by 192–208 wide;

cirrus sac cone-shaped situated anterior to ventral sucker, 71–82 long by 45–52 wide.

Ovary pear-shaped, 73–82 long by 88–95 wide situated towards left of the middle line of body, overlapped with ventral sucker and anterior testis; uterus contained three large eggs, 73–100 long by 52–86 wide.

Testes unequal, wider than long, contiguous, located in posterior half of body; anterior testis smaller and slightly wider than posterior testis, 101–121 long by 260–296 wide, while posterior testis 127–143 long by 206–239 wide; vitellaria compact, confluent posteriorly, densely arranged throughout body, commencing from posterior extremity, reaching up to pharyngeal region; post-testicular space 122–139 long.

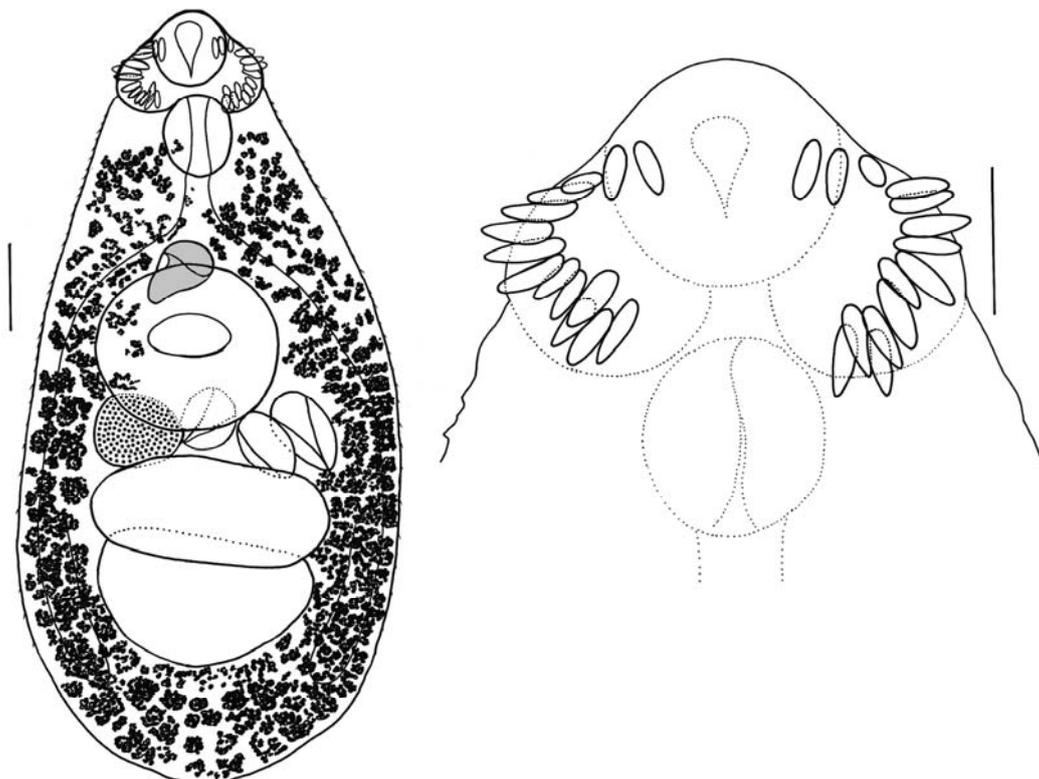


Fig 1: *Echinochasmus mazharuddini* n.sp. (a) Entire worm; (b) Head collar. Scale bar: (a) 100 μ m; (b) 50 μ m.



Fig 2: *Echinochasmus mazharuddini* n.sp.

3.1 Taxonomic summary

Type Host: Bank Myna, *Acridotheres ginginianus* (Passeriformes: Sturnidae)
Type locality: Khairpur District, Sindh, Pakistan.
Site of infection: Gizzard
Number of specimen: Five from a single host, 15 examined.

4. Discussion

The Genus *Echinochasmus* Dietz, 1909 was proposed to accommodate trematodes collected from avian hosts. Type species is *E. coaxatus* Dietz, 1909 collected from *Colymbus cristatus*, *C. griseigena*, *C. nigricollis*, *C. caspicus*, *Ciconia ciconia* and *Anas platyrhynchos* of Europe, Central Asia and Siberia^[36].

Species of genus *Echinochasmus* Dietz, 1909 reported from Pakistan include *E. passerii* Dharejo *et al.* 2010, *E. jamshorensi* Channa *et al.* 2009^[14], *E. mohiuddini* Dharejo *et al.* 2007^[17], *E. accipeteri* Bhutta and Khan, 1975^[4], *E. amphibolus* Kotlan, 1922 and *E. bagulai* Verma, 1935^[34].

E. passerii Dharejo *et al.* 2010 collected from *Passer domesticus* of Sindh, Pakistan differs from present species in having smaller, elongated body with constriction at acetabulum level; head collar smaller having 26 collar spines arranged in single uninterrupted row, 2-3 corner spines on each side; oral sucker smaller; pre-pharynx longer; pharynx smaller and elongated; esophagus longer; ventral sucker

smaller; testes smaller, irregular, close together, not overlapped, posterior testes lobed; smaller size of cirrus sac; ovary oval, smaller; vitellaria commencing from level of cirrus sac, reaching up to posterior extremity not confluent posteriorly; larger post-testicular space and smaller size of eggs.

E. jamshorensi Channa *et al.* 2009^[14] collected from intestine of Pond Heron, *Ardeola grayii* of Sindh, Pakistan differs in having smaller elongated, narrow, transparent body; head collar triangular, smaller, bearing 24 collar spines arranged in a single row, 4 corner spines on each side; smaller oral sucker, pre-pharynx and esophagus; pharynx elongated, smaller; ventral sucker smaller, sub-globular; testes tandem, anterior one sub-quadrate, posterior testes triangular, smaller; cirrus sac and ovary smaller; vitellaria consist of numerous small follicles commencing from mid-level of ventral sucker extending backward laterally outside intestinal caeca reaching up to posterior end of body confluent posteriorly; and smaller post testicular space.

E. mohiuddini Dharejo *et al.* 2007^[17] collected from Paddy bird, *Ardeola grayii* of Sindh, Pakistan differs in having smaller, less wider body; head collar smaller bearing 24 collar spines, 3 corner spines on each side, presence of collar spines on oral sucker region; pre-pharynx long; pharynx elongated to oval; smaller esophagus and ventral sucker; testes subequal, larger, median, tandem, irregular; larger space between ventral sucker and anterior testes; ovary smaller, oval, away from

ventral sucker and anterior testes; vitellaria arranged in scattered follicular groups commencing from level of acetabulum reaching up to posterior extremity; larger post testicular space and larger size of eggs.

E. accipeteri Bhutta and Khan, 1975^[4] collected from *Accipiter badius* of Punjab, Pakistan differs in having larger and more elongated body; larger size of head collar bearing 24 collar spines, 3 corner spines on each side; oral sucker sub-terminal not protrudible; pre-pharynx, pharynx and esophagus larger; ventral sucker larger; cirrus sac oval, anterodorsal to ventral sucker; testes larger, contiguous, smooth, irregular, posterior testes more elongated; ovary larger, spherical to oval; vitellaria follicular commencing from level of ventral sucker reaching up to posterior end of body, larger post testicular space and smaller eggs.

E. amphibolus Kotlan, 1922 collected by Bhutt and Khan (1975) from *Gallinula chloropus* of Punjab, Pakistan differs in having larger, elongated and cylindrical body; larger head collar armed with 24 collar spines, 3 corner spines on each side; pre-pharynx longer; pharynx elongated and highly muscular; longer esophagus; oral sucker spherical; ventral sucker larger; cirrus sac longer lying on anterodorsal surface of ventral sucker; testes smooth, median, tandem, unequal, smaller; ovary submedian, oval, lies between ventral sucker and anterior testes; vitellaria follicular commencing from posterior border of ventral sucker to a little in front of posterior end of body; larger post testicular space and larger eggs.

E. bagulai Verma, 1935^[34] in Common Pond Heron, *Ardeola grayii* of Punjab, Pakistan and India differs in having larger and more elongated body tapering at both ends; head collar larger bearing 24 collar spines, 4 corner spines on each side; oral sucker smaller; pre-pharynx longer; pharynx and esophagus smaller; ventral sucker larger; cirrus sac thin walled, pear shaped with narrow posterior end, pre-acetabular in position, partly overlapping acetabulum; testes tandem, contiguous, transversely elongated, smaller, anterior testes quadrangular, posterior testes subtriangular; ovary smaller, rounded; vitellaria commencing from posterior border of acetabulum, confluent behind posterior testes; larger post-testicular space and smaller eggs.

E. prakashi Gupta and Singh, 1988^[24] collected from Paddy bird, *Ardeola grayi* of Kanpur, India differs from present species in having larger, more elongated body; smaller size of head collar bearing 22 collar spines, 3 corner spines on each side; oral sucker smaller, terminal, sub-spherical; larger size of pre-pharynx; pharynx smaller and globular; esophagus larger, tubular; ventral sucker smaller, sub-spherical; testes tandem, smaller, entire or lobed, contiguous, post equatorial; cirrus sac larger, elongated, curved, overlapping anterior margin of ventral sucker; ovary smaller, spherical to sub-spherical; vitellaria follicular extending from a little anterior of posterior border of ventral sucker to hind end of body, confluent in post testicular area; larger post testicular space and smaller eggs.

E. antigonus Gupta, 1953 collected from small intestine of Sarus crane *Antigone antigone* of Uttar Pradesh, India differs in having narrow, larger, elongated body, posterior end slightly tapering; head collar larger, bearing 24 collar spines; pre-pharynx, pharynx, esophagus and ventral sucker larger; testes larger, longitudinally; ovary larger, subglobular, slightly dextral; vitellaria commencing from short distance behind acetabulum tend to come closer in post-testicular region not confluent and larger eggs.

E. megavitellus Lal, 1939 collected from intestine of *Ardeola grayi* of Lucknow, India resembles with present species in having same size of pharynx, ventral sucker, ovary and eggs

while differs in having larger, elongated, oval body with broad posterior end; head collar smaller, bearing 24 collar spines; oral sucker smaller; pre-pharynx longer; testes larger, almost contiguous; cirrus sac very thin walled, larger, transversely pre-acetabular; ovary ovoid, slightly dextral; vitellaria consist of large compact follicles commencing from post acetabular region confluent behind posterior testes.

E. narayani Mudaliar, 1938^[31] collected from intestine of Kite, *Milvus migrans govinda* of Madras, India differs from present species in having larger lanceolate body, broad posteriorly; head collar bearing 24 collar spines, 3 corner spines on each side; oral sucker; pharynx and ventral sucker smaller; longer esophagus; testes post equatorial, tandem, contiguous, larger, anterior tests rectangular with slightly indented margin, posterior testes more or less triangular with very few notches at its margin; ovary larger; vitellaria lateral in position commencing from level of acetabulum to posterior extremity, confluent behind posterior testes; larger post-testicular space and smaller eggs.

E. famelicus (Odhner, 1911) Prudhoe, 1944 collected from smaller adjutant Stork, *Leptoptilos javanicus* of Colombo, Srilanka differs in having collar spines, 3 corner spines on each side; oral sucker and ventral sucker larger; smaller esophagus; pharynx and testes larger, elongated; cirrus sac pear shaped, poorly developed, overlapping anterior margin of acetabulum; ovary larger, transversely elongate; vitellaria extending from a little behind acetabulum to posterior extremity commencing behind posterior testes and larger post-testicular space. *E. ruficapensis* Verma, 1935^[34] from intestine of the Indian little Grebe, *Podiceps ruficollis capensis* resembles with present species in having same size of eggs but differs in having larger, elongated, narrow body; head collar triangular, broad, bearing 24 collar spines, 3 corner spines on each side; oral sucker almost round, spherical, larger; pre-pharynx longer; pharynx oval, larger; esophagus long; ventral sucker sub-globular, larger; testes median, larger, anterior testes subquadrate, posterior testes ovoid or sub-triangular; cirrus sac longer; ovary oval, larger; vitellaria composed of numerous follicles commencing from posterior level of ventral sucker run laterally outside intestinal caeca reaching up to posterior end of body and larger post testicular space.

E. dietzevi Issaitschikoff, 1927 reported by Kostadenova, Cipev and Genov (1988) from small intestine of *Podiceps cristatus*, *P. nigricollis* of Northern Bulgaria differs from present species in having larger fusiform body; head collar bearing 20 collar spines in one row with a dorsal interval, 3 corner spines on each side; oral sucker smaller, slightly protruding; pre-pharynx larger; pharynx smaller, elongated; esophagus and ventral sucker smaller; testes smooth, smaller, transversely elongated; cirrus sac larger, oval; ovary oval, smaller; vitellaria composed of large follicles commencing from posterior end of ventral sucker, reaching up to posterior end of body, filling up entire body space post testicularly with exception of a narrow strip in middle; larger post testicular space and smaller eggs.

E. mordex (Loos, 1899) Witenberg, 1932 reported by Kostadenova, Cipev and Genov (1988) from *Podiceps cristatus* of Northern Bulgaria differs in having larger body, maximum width at ventral sucker; head collar bearing 22 collar spines situated in one dorsally interrupted row, 2 corner spines on each side; oral sucker smaller, terminal; pre-pharynx longer; ventral sucker smaller; cirrus sac oval extending dorsally from esophageal bifurcation to 2/3 of length of ventral sucker; testes oval, smooth, smaller; ovary oval in shape, smaller; vitellaria commencing from level of posterior margin of ventral sucker, fusing post-testicularly; larger post testicular

space and smaller eggs.

E. zubeckhaname Nasir and Diaz, 1968 reported by Lamothe-Argumedo and Aguirre-Macedo (2001) from aquatic birds of Mexico differs in having more elongated larger body curved posteriorly; head collar bearing 20 collar spines, 3 corner spines on each side; oral sucker rounded, larger, muscular; pre-pharynx longer; pharynx spherical or elongated; esophagus smaller; ventral sucker rounded, smaller, overlapped with cirrus sac; testes larger irregular, median; cirrus sac larger; ovary oval, larger; vitellaria arranged in scattered follicular groups commencing from level of cirrus sac, reaching up to posterior extremity; larger post testicular space and larger eggs.

E. japonicus Tanabe, 1926^[32] from small intestine of *Anas platyrhynchos* var. *domestica* of Korea differs in having smaller body, maximum width at level of testes, posterior end bluntly pointed; head collar prominent bearing 24 collar spines dorsally interrupted, 3 corner spines on each side; oral sucker larger; pre-pharynx longer; pharynx round, smaller; esophagus longer; ventral sucker smaller; testes oval, smaller; cirrus sac smaller, ellipsoidal; ovary smaller; vitellaria extends over ceca, confined to posterior half of body; larger post testicular space and larger eggs.

E. militaris Leonov, 1958 collected from intestine of *Ardeacinerea* differs in having larger body, slightly curved anteriorly; head collar slightly larger, bearing 24 collar spines; oral sucker terminal, globular, smaller; pre-pharynx and esophagus longer; pharynx oval, larger; ventral sucker, testes larger and cirrus sac larger; ovary oval, larger; vitellaria consists of small follicles commencing from rear edge of ventral sucker reaching up to posterior end of body and smaller eggs.

The name of new species refers to Mazhar uddin Ujjan the late father of first author. However this is first report of the genus *Echinochasmus* Dietz, 1909 from Bank Myna, *Acridotheres ginginianus*.

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