



# International Journal of Life Sciences Biotechnology and Pharma Research





Research Paper

## MONOGENEAN FAUNA OF DISTRICT SAHARANPUR, UP, PART-VIII

Vivek Kumar<sup>1\*</sup>

\*Corresponding Author: **Vivek Kumar**, ✉ [s\\_vivekkumar1979@rediffmail.com](mailto:s_vivekkumar1979@rediffmail.com)

Present communication deals with one new and one known species of monogeneans abstracted from the freshwater fish *Mystus seenghala* (Sykes). The new species of genus *Rhamnocercus* Monaco *et al.* (1954), is characterized on the basis of difference in shape of copulatory complex, and haptor armature, etc., and on the present observation, generic diagnosis of the genus is also amended. Besides this known species of genus *Chauhanellus* Bychowsky and Nagibina (1969) is briefly redescribed.

**Keywords:** Monogeneans, *Rhamnocercus*, *Chauhanellus*, *Chauhanellus indicus*, *Mystus seenghala*

### INTRODUCTION

During the course of study of freshwater monogenean fauna of district Saharanpur, I came across five specimens of *Mystus seenghala* (Sykes) infected with several specimens of *Rhamnocercus seenghali* and *Chauhanellus indicus* Rastogi *et al.* (2004). On detailed examination of specimens of genus *Rhamnocercus*, they were found new hence described as such.

While on detailed examination of *Chauhanellus indicus* Rastogi *et al.* (2004), it was found that the worms at disposal of the author exhibit several variations besides measurements. Moreover, it also exhibits new type locality and new host for this species. It is, therefore, briefly re-described.

The re-description is based on fresh materials collected by author.

### MATERIALS AND METHODS

Fishes, for the present investigation, were collected from ponds and local fish markets of district Saharanpur. They were brought to laboratory and identified. The identification of piscine hosts was made with the help of classical works of McInerney and Gerard (1958), Misra (1959), Srivastava (1980), Nelson (1984) and Day (1989). Monogeneans were collected by freezing technique of Mizelle (1936 and 1938).

Worms thus collected, were washed thoroughly, and fixed in hot 70% alcohol or 10% neutral Formaline. Study of chitinoïd hard parts

<sup>1</sup> Department of Zoology, Vardhaman college, Bijnor, UP, India.

was made in temporary Glycerin mounts. Permanent mounts were also made after staining in Aceto alum carmine, dehydrating through ascending grades of Alcohol, clearing in Xylene, and mounting in Canada balsam. Camera lucida sketches were made both from temporary and permanent preparations. Besides this, morphological studies were made using Motic Microscope and Image analyzing system. All measurements were taken with the help of stage micrometer and oculometer by method suggested by Mizelle (1936 and 1938), Gussev (1955), Malmberg (1957) and Singh (1959). The measurements were also compared with the measurement taken by Motic image analysis software 2000.

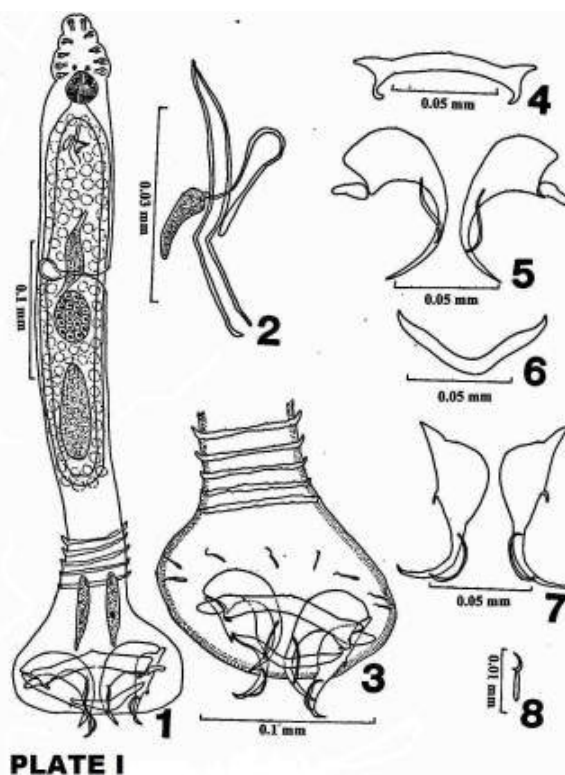
## RESULTS AND DISCUSSION

### *Rhamnocercus seenghali* n.sp.

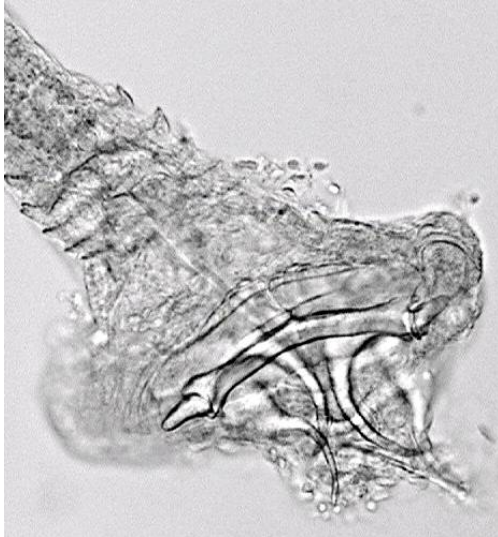
(Plate I, Figures 1-8 and Plate II, Microphotograph 1 and 2)

The body of worm is stout, elongated, measuring 0.52-0.54 mm. Maximum width was recorded in vaginal region, ranging from 0.052-0.054 mm. Prohaptor and opisthaptor are fairly set off from the body proper through a shallow constriction in the anterior and long haptoral peduncle in the posterior regions, respectively. Head is divisible in two lobes each of which is further divided into four lobes. Head is lodged with five pairs of head organs and two pairs of eyespots. Each head organ is provided with a

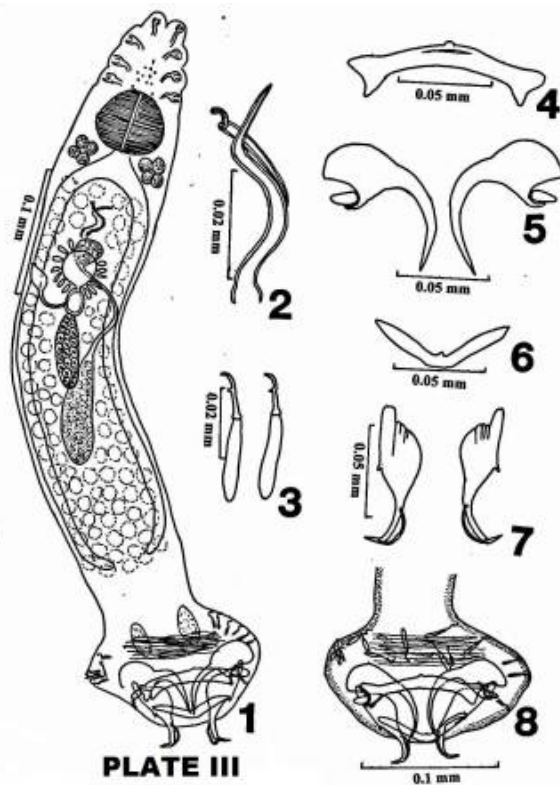
**PLATE I *Rhamnocercus seenghali* n.sp.**  
**Figure 1: Whole mount. Figure 2: Male copulatory complex.**  
**Figure 3: Haptor. Figure 4: Ventral transverse bar.**  
**Figure 5: Ventral anchors and patches. Figure 6: Dorsal transverse bar.**  
**Figure 7: Dorsal anchors. Figure 8: Marginal hooklet**



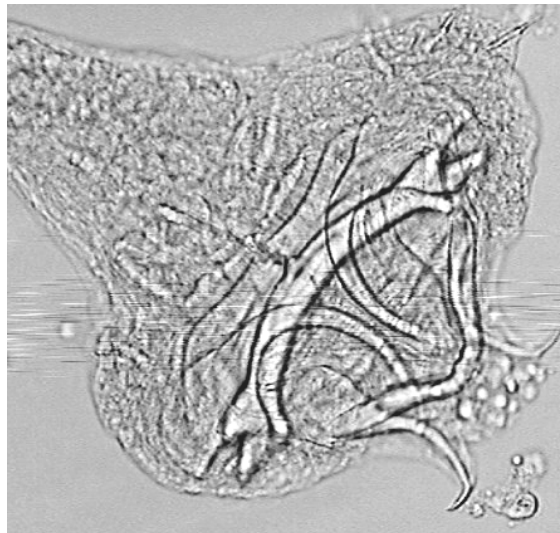
**Plate II: *Rhamnocercus seenghali* n.sp. Microphotograph 1. Haptor. Microphotograph 2. Male Copulatory Complex**



**PLATE III *Chauhanellus indicus* Rastogi et al., 2004. Figure 1: Whole mount. Figure 2: Male copulatory complex. Figure 3: Marginal hooklets. Figure 4: Ventral transverse bar. Figure 5: Ventral anchors and patch. Figure 6: Dorsal transverse bar. Figure 7: Dorsal anchors. Figure 8: Haptor.**



**Plate IV: *Chauhanellus indicus* Rastogi et al., 2004.  
Microphotograph 1. Haptor. Microphotograph 2. Male copulatory complex**



separate duct extending posteriorly. Eyespots are well developed, posterior pair of eyespot is considerably larger than anterior pair on account of presence of large number of melanistic granules. Pharynx is spherical, muscular, measuring 0.026-0.028 mm in diameter. Intestine is simple, bifurcate and crura confluent posteriorly.

Male reproductive system consists of a testis, seminal vesicle and male copulatory complex. Testis is elongated oval, inter-caecal, post-equatorial and measures 0.071-0.074 x 0.025-0.026 mm. Seminal vesicle is fusiform, located in pre-equatorial region of the body, measuring 0.045-0.048 x 0.015-0.018 mm. Male copulatory complex consists of tubular cirrus and an accessory piece. The cirrus proper is double walled chitinoid bow shaped structure, with open bubble like base and pointed anterior end, measures 0.045-0.047 mm. The accessory piece of the cirrus is made up of leaf like structure connected with long coiled rod, measures 0.013-

0.014 x 0.005-0.007 mm and rod measures 0.031-0.033 mm.

Female reproductive system consists of an ovary, vagina, receptaculum seminis and vitelline glands. Ovary is pre-equatorial, oval, measuring 0.037-0.039 x 0.024-0.026 mm. Vagina is funnel shaped, dextral, anterior to ovary, measures 0.021-0.022 mm, communicate with well developed receptaculum seminis with a narrow tube. The receptaculum seminis is oval, located anterior to ovary, measures 0.014-0.016 x 0.011-0.012 mm. Vitelline follicles are co-extensive with intestinal caeca.

Haptor is pentagonal to somewhat discoidal in shape, measuring 0.13-0.14 x 0.11-0.12 mm. Armature of haptor consists of two pairs of anchors, double transverse bar and marginal hooklets. Each dorsal anchor consists of long avian beak like inner roots, non remarkable outer roots, shaft and recurved points, measures 0.085-0.088 mm. Each dorsal anchor is with articulate finger-like protuberance on the inner

side of basal part which articulates with dorsal transverse bar. In the shaft region, each dorsal anchor is equipped with well developed sleeve sclerite. Dorsal transverse bar is 'V' shaped having pointed margins, measures 0.071-0.073 mm. Each ventral anchor is with broad base (divisible into poorly demarcated outer and inner root), strong shaft and recurved points, measuring 0.11-0.12 mm. Inner roots of each ventral anchor is provided with fist shaped patches measures 0.017-0.019 mm. Ventral transverse bar is strong, well developed, having distinctly marked articulate head by which they articulate with base of anchors, and middle protuberance, measuring 0.075-0.077 mm. Posterior margin of ventral transverse bar tilted inwardly. Marginal hooklets are four pairs, embedded in the margins of haptor. Each marginal hooklet is provided with sickle shaped blade, heel and handle, measuring 0.007-0.008 mm in length. Haptoral peduncle is provided with five pairs of daggered shaped spines, anterior pair of spine is biggest while last pair of spine is smallest. One pair of haptoral gland is observed in haptoral region.

The present form has peculiarity in having dagger shaped hooks at the haptoral peduncle. Singh and Agarwal (1994) reported that this character is reported in three genera, viz.

1. *Rhabdosynochus* (Mizelle and Blatz, 1941)
2. *Rhamnocercus* (Monaco *et al.*, 1954); and
3. *Pedunculospina* (Hargis, 1954).

The genus *Pedunculospina* was synonymized with the genus *Rhamnocercus* by Hargis (1955). Present form resembles closely with *Rhamnocercus* (Monaco *et al.*, 1954).

Genus *Rhamnocercus* was established by Monaco *et al.* (1954), for the worms collected

from the gills of *Umbrina roncadorensis* at California, and is characterized by species having hook-like spines longitudinally distributed on the peduncle and by accessory spines clumped on the haptor. Hargis (1955) amended the diagnosis of the genus and added some information on the internal morphology and the peduncle spines. In relation to the intestinal ceca, Hargis (1955) stated "...crura unramified, apparently confluent posteriorly..." Both, Hargis (1955) and Seamster and Monaco (1956) discussed the validity of *Rhamnocercinae* Monaco, Wood and Mizelle (1954), as a subfamily of Diplectanidae Monticelli (1903) due to the possible homology of the peduncle spines with the squamodiscs.

Luque and Iannaccone (1991) observed, for the first time, confluent ceca in *Rhamnocercinae* and following Oliver (1987), placed the species described by them into *Rhamnocercidae*. The taxonomic act of Luque and Iannaccone (1991) is not valid because these authors followed the criteria of Oliver (1987), which in his unpublished doctoral dissertation, mentioned *Rhamnocercinae* at the family status. According to the International Code of Zoology Nomenclature (Article 9), dissertation does not constitute valid publication.

Singh and Agarwal (1994) described *R. srivastavi* from a freshwater fish *Wallago attu*.

Chaves *et al.* (1999) redescribed the *Rhamnocercus stichospinus* Seamster and Monaco (1956) and amended the generic diagnosis of genus *Rhamnocercus* Monaco *et al.* (1954):

Diplectanidae. Peduncle long, slender, covered with two longitudinal rows of dorsal and ventral hook-like spines. Intestinal ceca confluent posteriorly. Testis post-germinal, copulatory organ straight or coiled, without accessory piece.

Germarium pretesticular, oviduct looping around right intestinal cecum. Vaginal aperture sinistrodorsal. Parasitic on marine sciaenid fishes.

To the best of my knowledge, following species are known under the genus *Rhamnocercus* Monaco *et al.* (1954)

1. *R. rhamnocercus* (Monaco *et al.*, 1954)
2. *R. bairdiella* (Hargis, 1955)
3. *R. oliveri* (Luque and Iannacone, 1991)
4. *R. stelliferi* (Luque and Iannacone, 1991)
5. *R. srivastavi* (Singh and Agarwal, 1994)
6. *R. stichospinus* (Seamster and Monaco, 1956; Chaves *et al.*, 1999).

The present form differs from all known forms of *Rhamnocercus* (Monaco *et al.*, 1954) in following points:

1. Number of head organs.
2. Presence of accessory piece.
3. Number of spikes on the haptoral peduncle.
4. Absence of clumps of spines on haptor.
5. Shape of dorsal and ventral anchors and transverse bars.
6. Reported from freshwater fish.

The present form comes closer to *R. srivastavi* (Singh and Agarwal, 1994) in following points:

1. Number of spikes on the haptor peduncle.
2. Absence of clumps of spines on the haptor.
3. Shape of dorsal anchors.

However, the present form differs from *R.*

*srivastavi* (Singh and Agarwal, 1994) in following points:

1. Number of head organs (7-8 pairs as compared to 5 pairs in present form).
2. Presence of receptaculum seminis in present form.
3. Shape of cirrus proper and accessory piece.
4. Shape of dorsal transverse bar, ventral transverse bar and ventral anchors.

On the basis of above differences the present form is described as a new species, viz., *R. seenghali* n.sp. on the name of fish is collected.

In light of the present observations, generic diagnosis of the genus *Rhamnocercus* (Monaco *et al.*, 1954) requires amendment.

### Amended Generic Diagnosis

Diplectanidae. Peduncle long, slender, covered with two longitudinal rows of dorsal and ventral hook-like spines. Intestinal ceca confluent posteriorly. Testis post-ovarian, copulatory organ straight or coiled, with or without accessory piece. Ovary pre-testicular, oviduct may or may not present if present looping around right intestinal cecum. Vaginal aperture sinistrodorsal or dextral. Clumps of spines on the haptor may or may not present. Seminal vesicle present or absent. Parasitic on marine or freshwater fishes.

Type Species: *Rhamnocercus rhamnocercus* (Monaco *et al.*, 1954)

Type Host : *Umbrina rancador*

Type Locality : California

Additional Species: *R. bairdiella* (Hargis, 1955), *R. oliveri* (Luque and Iannacone, 1991), *R. stelliferi* (Luque and Iannacone, 1991), *R.*

*srivastavi* (Singh and Agarwal, 1994), *R. stichospinus* (Seamster and Monaco, 1956; Chaves *et al.*, 1999) and *R. seenghali* n.sp.

Additional Host: *Bairdiella chrysur*, *Micropogon undulatus*, *Menticirrus littoralis*, *Wallago attu*, *Menticirrus americanus* and *Mystus seenghala*.

Additional Locality: Florida, Gulf of Mexico, Texas, Peru, Meerut (India), Coastal Zone of the State of Rio de Janeiro (Brazil) and Saharanpur (India).

***Chauhanellus indicus* Rastogi *et al.* (2004)**

(Plate-III, Fig. 1-8 and Plate-IV, Microphotograph 1 and 2)

The body of worm is stout, elongated, measuring 0.57-0.59 mm. Maximum width was recorded in testicular region, ranging from 0.094-0.098 mm. Prohaptor and opisthaptor are fairly set off from the body proper through a shallow constriction in the anterior and deep constriction posterior regions, respectively. Head is divisible in two lobes each of which is further divided into four lobes. Head is lodged with four pairs of head organs. Each head organ is provided with a separate duct extending posteriorly. Eyespots are degenerated and scattered melanistic granules are present in adults. Pharynx is pear shaped, muscular, measuring 0.055-0.057 x 0.051-0.053 mm. At the postero-lateral sides of the pharynx, four pairs of darkly stained pharyngeal glands are present. Intestine is simple, bifurcate and crura end blindly.

Male reproductive system consists of a testis, vas deferens, seminal vesicle and male copulatory complex. Testis is elongated oval, inter-caecal, post-equatorial and measures 0.085-0.088 x

0.025-0.026 mm. From the anterior border of testis a fine duct, vas deferens, arises extend anteriorly, loops with left intestinal limb and dilates to form seminal vesicle. Seminal vesicle is balloon shaped, located in pre-equatorial region of the body, anterior to vagina, measuring 0.022-0.023 x 0.020-0.022 mm. Male copulatory complex consists of tubular cirrus and an accessory piece. The cirrus proper is double walled chitinous 'S' shaped structure, with open like base and pointed anterior end, measures 0.045-0.046 mm. The accessory piece of the cirrus is made up semicircular piece, having originated a tube, measures 0.006-0.007 mm and tube measures 0.020-0.021 mm.

Female reproductive system consists of an ovary, vagina, receptaculum seminis, ootype complex and vitelline glands. Ovary is equatorial, elongated oval, slightly imposed on testis, measuring 0.067-0.069 x 0.021-0.022 mm. Vagina is sinistral, muscular, having narrow opening, anterior to ovary, measures 0.021-0.022 x 0.011-0.012 mm, communicate with well developed receptaculum seminis with a narrow tube. The receptaculum seminis is oval, located anterior to ovary, measures 0.018-0.019 x 0.012-0.013 mm. Receptaculum seminis communicates with spherical ootype complex, measuring 0.031-0.032 mm in diameter. Vitelline follicles are co-extensive with intestinal caeca.

Haptor is pentagonal to somewhat hexagonal in shape, measuring 0.092-0.095 x 0.15-0.16 mm. Armature of haptor consists of two pairs of anchors, double transverse bar and marginal hooklets. Each dorsal anchor consists of long inner roots, hardly protruding outer roots, shaft and recurved points, measures 0.085-0.091 mm. Each dorsal anchor is with articulate finger-like



protuberance on the inner side of basal part which articulates with dorsal transverse bar. In the shaft region, each dorsal anchor is equipped with well developed sleeve sclerite. Dorsal transverse bar is 'V' shaped having protuberance in middle, measures 0.071-0.075 mm. Each ventral anchor is with broad base (divisible into poorly demarcated outer and inner root), strong shaft and recurved points, measuring 0.11-0.12 mm.

Inner roots of each ventral anchor is provided with fist shaped patches measures 0.015-0.016 mm. Ventral transverse bar is strong, well developed, having distinctly marked articulate head by which they articulate with base of anchors, and middle protuberance, measuring 0.095-0.098 mm. Marginal hooklets are seven pairs, embedded in the margins of haptor. Each marginal hooklet is provided with sickle shaped blade, heel, handle

**Table 1: Showing difference in measurement between various body parts of *Chauhanellus indicus* Rastogi et al. (2004) and present worm (all measurements are in mm)**

	<i>Chauhanellus indicus</i> Rastogi et al. (2004)	Present Worm
Host	<i>Mystus tengara</i> and <i>Wallago attu</i>	<i>Mystus seenghala</i>
Locality	Meerut	Sharanpur
Body length	1.020-1.350	0.57-0.59
Body width	0.060-0.070	0.094-0.098
Pharynx	0.030-0.058 x 0.035-0.062	0.055-0.057 x 0.051-0.053
Testis	0.225-0.275 x 0.065-0.073	0.085-0.088 x 0.025-0.026
Seminal vesicle	0.036-0.042 x 0.010-0.015	0.018-0.019 x 0.012-0.013
Cirrus	0.075-0.088	0.045-0.046
A. P. of cirrus (First)	0.070-0.076	0.006-0.007
Second	0.041-0.045	-
Vagina	0.023-0.027 x 0.010-0.014	0.021-0.022 x 0.011-0.012
Ovary	0.120-0.0132 x 0.049-0.055	0.067-0.069 x 0.021-0.022
Receptaculum seminis	0.022-0.026	0.018-0.019 x 0.012-0.013
Ootype complex	-	0.031-0.032
Haptor length	0.166-0.22	0.092-0.095
Haptor width	0.175-0.225	0.15-0.16
Dorsal anchor length	0.093-0.11	0.075-0.079
Ventral anchor length	0.063-0.068	0.11-0.12
Dorsal transverse bar	0.078-0.081	0.071-0.075
Ventral transverse bar	0.0125-0.0127	0.095-0.098
Marginal hooklets	0.010-0.032	0.037-0.038

and papillae, measuring 0.037-0.038 mm in length. Scleroized folds and reservoirs are present just below the haptor peduncle.

Present form at the disposal of author differs in some features from *Chauhanellus indicus* described by Rastogi *et al.* (2004).

Rastogi *et al.* (2004) reported nine pairs of head organs and two pairs of eyespots, but in present specimens, four pairs of head organs and degenerated eyespots are present. Rastogi *et al.* (2004) reported oval pharynx but it is pear shaped in present specimens. Rastogi *et al.* (2004) reported more or less similar female reproductive system except the shape of receptaculum seminis and vagina and absence of ootype complex. In present specimens receptaculum seminis is oval shaped and large than reported by Rastogi *et al.* (2004)). Vagina is with narrow opening in present specimens but vagina with oval opening was reported by Rastogi *et al.* (2004). They also fail to observe ootype complex. Rastogi *et al.* (2004) reported more or less similar type of male reproductive system except the shape of male copulatory complex and course of vas deferens. Male copulatory complex is altogether different in shape of cirrus proper and accessory piece. Course of vas deferens is sinistral in present specimens but dextral course of vas deferens was reported by Rastogi *et al.* (2004). It is difficult for me to comment upon this variation, however, this could be due to presence of parasite in different host and geographical niche. Rastogi *et al.* (2004) also reported more or less similar anchors but a marked difference is noted in the region of base. Specimens at the disposal of Rastogi *et al.* (2004) with two patches at inner root of ventral anchors but one patch is observed in present specimens. In dorsal anchors roots

are demarcated but in present specimens roots of dorsal anchors are not demarcated. Dorsal transverse bar differs in margins and with middle protuberance in the specimens at the disposal of Rastogi *et al.* (2004).

Besides these, differences were also noted in measurements of various parts of the body and appended in the Table 1.

## CONCLUSION

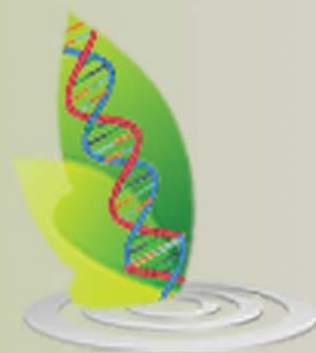
In the present investigation fish fauna of district Saharanpur were explored. It is a new type locality for monogeneans. Very few researchers abstracted monogeneans from this region. During the study few specimens of *Mystus seenghala* (Sykes) infected with several specimens of genus *Rhamnocercus* Monaco *et al.* (1954) and *Chauhanellus* Bychowsky and Nagibina (1969). On detailed examination it was found that the specimens of genus *Rhamnocercus* Monaco *et al.* (1954), are new from the previously described species. They were characterized as *Rhamnocercus seenghali n.sp.*, on basis of number of head organs, presence of accessory piece, number of spikes on the haptor peduncle, absence of clumps of spines on haptor, shape of dorsal and ventral anchors and transverse bars. Specimens of genus *Chauhanellus* Bychowsky and Nagibina (1969) were close to *Chauhanellus indicus* Rastogi *et al.* (2004). Specimens at the disposal of author exhibit several variation like number of head organ, male copulatory complex, vaginal opening, body measurement etc., therefore, it is re-described.

## REFERENCES

1. Chaves N N, Luque J L and Cezar AD (1999), "Redescription of *Rhamnocercus*

- stichospinus* Seamster and Monaco, 1956 (Monogenea: Diplectanidae), Parasitic on *Menticirrhus americanus* (Osteichthyes: Sciaenidae) from the Coastal Zone of the State of Rio de Janeiro, Brazil. *Mem Inst Oswaldo Cruz, Rio de Janeiro*, Vol. 94, No. 5, pp. 615-618
2. Day F (1989), *The fauna of British India including Ceylon and Burma Fishes*, Vol. I & II, Today & Tomorrow's Printers and Publishers, New Delhi.
  3. Gussev A V (1955), "Monogenetic trematodes of fishes of Amur River system", *Trudy Zool. Inst. A. N. USSR*, Vol. 19, pp. 171-398.
  4. Hargis Jr. W J (1954), "Monogenetic trematodes of gulf of Mexico fishes Part VII", The super family Diclidophoroidea Price, 1936. *J. Parasitol.*, Vol. 4, pp. 38-46.
  5. Hargis Jr. W J (1955), "Monogenetic Trematodes of Gulf of Mexico Fishes", Part III. The Superfamily Gyrodactyloidea (Continued). *Quart J Florida Acad Sci.*, Vol. 18, pp. 33-47.
  6. Luque J L and Iannacone J (1991), "Rhamnocercidae (Mono-genea: Dactylogyroidea) in Sciaenid fishes from Peru, with description of *Rhamnocercoides menticirrhii* n. gen, n. sp. and two new species of *Rhamnocercus*", *Rev Biol Trop.*, Vol. 39, pp. 193-201.
  7. Malmberg G (1957), "On the occurrence of *Gyrodactylus* on Swedish fishes", *Skec. Sod. Sevr. fish for Arsskr*, pp. 19-76.
  8. McInerney D and Gerard G (1958), *All about tropical fish* George G. Harrap & Co. Ltd. London, Toronto, Wellington, Sydney, pp. 480.
  9. Misra K S (1959), "Fishes of Eastern Uttar Pradesh", *Rec. Indian Mus.*, Vol. 57, pp. 1-320.
  10. Mizelle J D (1936), "New species of trematodes from gills of Illinois fishes", *Amer. Midl. Nat.*, Vol. 17, pp. 785-806.
  11. Mizelle J D (1938), "Comparative studies on trematodes (Gyrodactyloidea) from gills of North American freshwater fishes", *Illinois Biol. Mongr.*, Vol. 17, pp. 1-81.
  12. Mizelle J D and Blatz V (1941), "Studies on monogenetic trematodes VI. Two new dactylogyrid genera from Florida fishes", *Amer. Midl. Nat.*, Vol. 28, pp. 15-29.
  13. Monaco L H, Wood R A and Mizelle J D (1954), "Studies on monogenetic trematodes XVI. Rhamnocercinae, a new subfamily of Dactylogyridae", *Amer. Midl. Nat.*, Vol. 52, pp. 129-132.
  14. Monticelli F S (1903), "*Per una nuova classificazione degli* "heterocotylea", *Monit. Zool. ital.*, Vol. 14, pp. 334-336.
  15. Nelson J S (1984), *Fishes of the World*, 2<sup>nd</sup> Edition, John Wiley and Sons, New York.
  16. Oliver G (1987), "*Les Diplectanidae* Bychowsky, 1957 (Monogenea, Monopisthocotylea, Dactylogyridea)", *Systématique. Biologie. Ontogénie. Ecologie. Essai de phylogénèse*, Ph.D. Thesis, Université des Sciences et Techniques du Languedoc, 340 (as cited by Luque, J.L. and Iannacone, J. 1991).
  17. Rastogi P, Kumar K and Singh H S (2004),

- “Review of the genus *Chauhanellus* (Young, 1967) Bychowsky and Nagibina, 1959 with a report on a new species from freshwater fishes of Meerut, (U.P.) India”, *Uttar Pradesh J. Zool.*, Vol. 24, pp. 121-128.
18. Seamster A and Monaco L H (1956), “A new species of Rhamnocercinae”, *Am Midl Nat.*, Vol. 55, pp. 180-183.
19. Singh H S and Agarwal S (1994), “On three new monogeneans from Meerut”, *Dr. C B Srivastava Comm.*, Vol., 207-217.
20. Singh S N (1959), “On the direct application of the camera lucida in measuring worms”, *Jour. Inst. Sci. &Tech. (Lond.) Proc.*, pp. 23-24.
21. Srivastava G J (1968), *Fishes of Eastern Uttar Pradesh*, Vishwavidyala Prakashan, Varanashi.



**International Journal of Life Sciences Biotechnology and Pharma Research**

**Hyderabad, INDIA. Ph: +91-09441351700, 09059645577**

**E-mail: editorijlbpr@gmail.com or editor@ijlbpr.com**

**Website: www.ijlbpr.com**

