First Record of *Dogielius foceps* (Monogenea) on *Schizothorax richardsonii* (*Pisces, Schizothoracinae)* to India from Poonch river and its tributaries, District Poonch, Jammu & Kashmir

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Abstract

Freshwater fishes from Poonch River and its tributaries of Poonch district, Jammu and Kashmir (India) were screened for infection with ectoparasites. The study conducted on monthly basis from June 2011 to May 2012, revealed infection of *Dogielius forceps* (Monogenea) on the gills of *Schizothorax richardsonii*. *D. forceps* has been recorded for the first time in India from Schizothoracin host fish with an overall prevalence 13.56. In this paper the description, measurements, as well as figures showing the structural characteristics of *D. forceps* are given. Medicinally important plants of family Solanaceae have been successfully micropropagated through tissue culture. In most of the cases, MS medium with different concentrations of auxins and cytokinins either alone or in different combinations was used.

Keywords: Monogenea, *Dogielius forceps, Schizothorax richardsonii*, Poonch River, Jammu & Kashmir

Introduction

The state of Jammu and Kashmir is rich in aquatic and fish resources. The aquatic system of district Poonch is also known for the wealth of fish species. As far as recent published report is concerned, Dutta (2003) reported forty species of fish from Poonch. Fishes have a great importance and significance in the life of mankind, they are known for nutritionally rich source of protein, low in saturated fats and rich in essential minerals. According to Dar (2013), Swaminath in the year 1982 estimated that fish protein is of high biological value (89%) as compared to mutton (80%) and Chicken (78%). Fish industry plays an important role in the national economy as a source of income and employment. In India the demand for fish has increased many folds; the estimated demand projection for fish by 2012 was 9.99 million tons annually and by 2020 about 12.70 million tons of fish is required to mitigate the growing consumption demand (Singh, 2013). The production, quality, quantity and availability of fish supplies however, can be affected by parasites and diseases ultimately leading to affect the nutrition and national economy Chiary *et al. (*2014). So, it becomes the necessity to study such disease causing organisms effecting the fish industry and socio-economic development of nation. *Schizothorax richardsonii* is an endemic freshwater fish, constituting the major fish catch of the area. They were found infected with the monogenean *Dogielius forceps*. Monogeneans are hermaphroditic flukes, involve single host for the completion of their life cycle, commonly live as ectoparasitic on the skin, fins and gills of the fishes (Cable *et al.*, 1998 and Kearn, 1999), causing different signs and symptoms (Duijn, 1973).

Monogeneans are highly host specific, comprised of two sub groups, Monopisthocotylea and Polypisthocotylea, they differ considerably, with pathogenic implication (Al-Zubaidy, 2013). The major identifying features of monogenea are the haptoral attachment apparatus with anchors, hooks, and clamps, copulatory organ, gonads and eye spots. An intraspecific genetic or phonetic variation exists (Harris, 1988) in these characters of monogenea. In India, Bell (1891) is known for the first report on Indian monogenoidea,

subsequently various contributions were made by different workers; approximately 112 genera belonging to 28 families of monogenoidea abstracted from India (Pandey & Agrawal, 2008) included four species of *Dogielius* viz. *D. catlaius* (Jain, 1961 and Gussev, 1976); *D. indicus*, Agrawal and Singh (1984), *D. lucknowensis*, Agrawal and Sharma (1988) *D. gussevi*, Singh and Jain (1988) but there is no report of *Dogielius forceps*. In the present paper, we are reporting the occurrence and description of *D. forceps* from the gills of *Schizothorax richardsonii* in the Poonch River and its tributaries, district Poonch, Jammu and Kashmir, India.

Material and Methods

During June 2011 to May 2012, a total of 516 fishes belonging to *Schizothorax richardsonii*, were collected from Poonch river and its tributaries of Poonch district (situated between $32^{o}17' - 37^{o}05'$ north latitude and $72^{o}31'$-$80^{o}20'$ east longitude). Live fishes collected from the study sites and transported to the temporary laboratory set at Poonch. In the laboratory the fishes were pithed, their gills were cut out through the edges and examined for ectoparasites. The parasites were collected from the gills, under stereo-microscope, then placed on slide and preserved under the cover slip in glycerin. All measurements were taken according to Gussev (1985), Kritsky and Boeger (2002), by using micrometer and drawings were made by using a camera lucida. All measurements were recorded in µm. Microphotography of parasites was done by using DP_{25} digital camera. Parasites were identified microscopically according to the method followed by Gussev (1985).

Results and Discussion

***Dogielius forceps*, Bychowsky, 1986**

Schizothorax richardsonii were found harboring a monogenean species belonging to the genus *Dogielius* Bychowsky, 1936. On subsequent studies, the worms were identified as *D. forceps* which were collected from 70 specimens of the host fish recording a prevalence of 13.56, but a marked seasonal fluctuation was observed in the infestation with highest 63.63% in the July and lowest 9.09% in the month of October, but no infection was found in the months from November to January. Earlier the species has been reported by Bychowsky (1936) Koyun 2011 from *Capoeta umbla* from Murat River, Turkey.

Description

The body of worm is moderate in size measuring 312-332 in length and 54.76-95.84 in width just anterior to haptor. Body proper gradually decreases in width towards anterior end. The anterior end is bilobed having cephalic glands and two pairs of eye spots. The anterior pair is comparatively smaller and located closer than the poster pair. Copulatory tube measures 40.2-82.0 in length and accessory piece is 31.2-54.7 long (**Figure 1 and 2**).

The haptor is distinctly measuring 14.67-19.56 in length and 83.13-91.93 in width. The armature of haptor consists of a pair of anchors, single connective bar and seven pairs of marginal hooks. The anchors are of large size, curved and winged. They work like a forceps to form strong grip on the host's gills. They have a well developed base, solid shaft and recurved blade. The overall anchor's outer length measures 50.85-56.72, inner length 44.01-49.87 and blade 7.82-11.73. The connective bar is slightly curved strong rod with knobbed ends. It measures 36.18-62.59 in length and 4.8-8.8 in width in middle region. Seven pairs of marginal hooklets measures 15.6 – 23.4 in length.

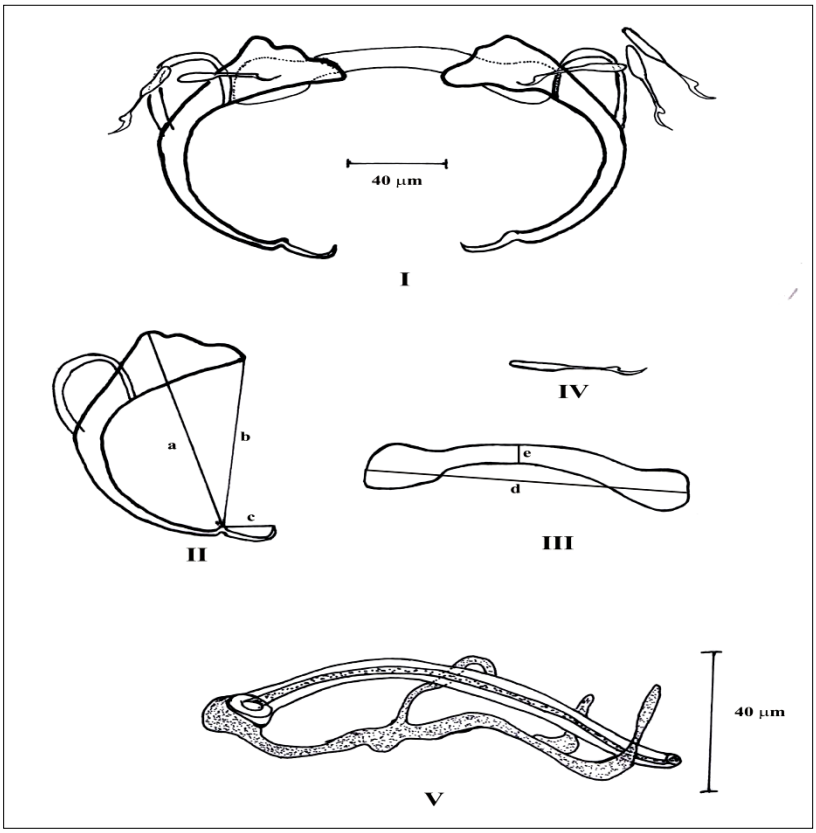

Figure 1: Sclerotized parts of *Dogielius forceps*, Bychowsky, 1936. I. Armature of haptor; II. Anchor (a) outer length, b) inner length, (c) blade; III. Bar (d) transverse length, (e) longitudinal width, IV. Marginal hook, V. Copulatory organs

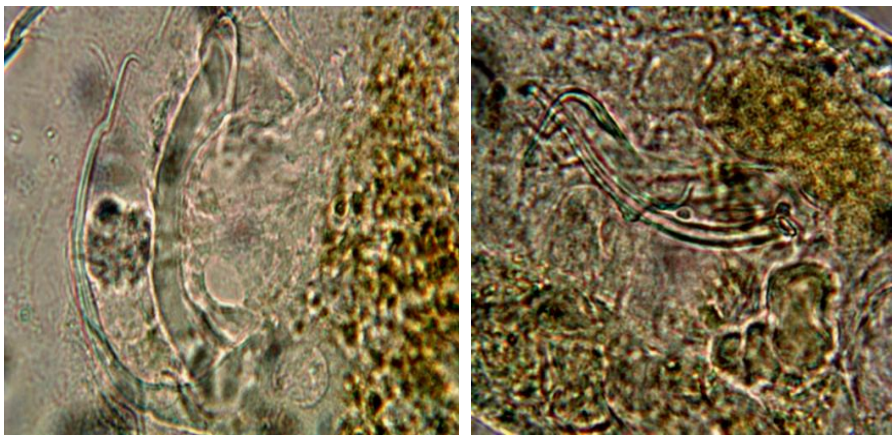

Figure 2: *Dogielius forceps* haptor and copulatory organ.

Table 1: Comparative measurements of the species of *Dogielius* Bychowsky, 1936

Parasites / Characters		*D. planus*, Bychowsky, 1958	*D. indicus* Agarwal & Singh, 1984	*D. gussevi* Singh & Jain 1988	*D. mokhayeri* Jalali & Molnar 1990	*D. persicus* Molnar & Jalali 1992	*D. forceps* (Bychowsky,1936) Koyun 2011	Present Worm and present Author
Total body length		0.25-0.30 mm	0.39-0.42 mm	710-730 µm	300400	-	340(310-420)	312-332 µm
Body Width		0.09-0.11 mm	0.06-0.08 mm	110-150 µm	80-90	-	70(60-90)	54.76-95.84 µm
Pharynx		-	0.04-0.05 mm	25-30 µm	-	-	-	-
Opisthaptor		0.08×0.09-14 mm	0.06-0.07 ×0.04-0.05 mm	70-80 ×50-60 µm	-	-	-	14.67-19.56 ×83.13-91.93
Anchor	Total length	0.055-0.065mm	0.03-0.04 mm	50-60 µm				-
	Dorsoapical (Outer)				(31-34)	40(35-51)	50(46-54)	50.85– 56.72 µm
	Ventroapical (Inner)				(42.5-44)	52(50-60)	49(46-54)	44.01-49.87 µm
	Inner root	0.010	-	-	3.54 µm	12(11.5-13)	-	-
	Outer root	0.006-0.008mm	-	-	8-9 µm	5	-	-
	Shaft	0.011-0.013mm	-	-	-	-	-	-
	Blade/ tip	-	-	-	8.5	-	11(16-18)	7.82-11.73 µm
Connecting Bar		0.045-0.047mm	-	30-40 µm	42.5 × 4.5 (middle) 9-10 (ends)	49(46-53) × 9.5(8-11 ends) 5.5 (5-6.5 middle)	65(59-77)	36.18-62.59× 4.8-8.8 µm
Marginal Hooklets		0.016-0.025mm	0.02-0.32 mm	One pair (40-50 µm) Six pairs (15-35 µm)	20.5-24	23.5 (23-25)	28(26-30)	15.6-23.4 µm
Copulatory organ	Total length	0.040-0.046 mm	-	-	-	60(43-72)		
	copulatory tube	0.035-0.042 mm	-	80-90 µm	30.5		58(56-64)	40.2-82.0 µm
	Accessory piece	0.018-0.021 mm	0.05-0.07 mm	50-60 µm	30		-	31.2-54.7 µm
	Base of tube	-	0.05-0.07 mm	-	-	-	-	6.8-9.2 ×2.9-3.6 µm
Testis		-	0.03-0.04 ×0.01-0.02mm	120-130 × 55-57 µm	-	-	-	-
Seminal vesicle		-	-	50-60 × 22-25 µm	-	-	-	-
Ovary		-	0.06-0.07 × 0.03-0.04 mm	150-160 × 50-60 µm	-	-	-	-
Vagina		-	-	30-40 × 40-50µm	-	23(17-35) disc 21(17-26)	17(15-20)	-
Host		*Schizothorax intermedius* Mclelland	*Clupisoma bacaila* (Hamilton 1822)	*Rita rita* (Hamilton 1822)	*Aspius vorax* (Heckel)	*Barbus grypus* (Heckel), B. sharpeyi (gunter) & *Carasobarbus luteus* (Heckel)	*Capoeta umbla* (Heckle 1843)	*Schizothorax richardsonii*
Locality		Vezrob River, Tadzhikistan	Gorakhpur (U.P) India	Meerut (U.P) India	River Dez Gulf basin (Iran)	River Dez & Karun (Iran)	Murat River (Turkey)	Poonch river & its tributaries Poonch (J&K) India

There is no record on report regarding *Dogielius forceps* from the fishes of India. It completely differs in micrometry and morphology from the Indian species of *Dogielius* (**Table 1)** whereas, it comes closer to *D. mokhayari*, Jalali and Molnar (1990) in its general body length but completely differs in the construction of the

copulatory complex. It also shows resemblance to the recurved anchor's blade of *D. mokhayari*, whereas, differs from *D. persicus* which lacks special blade of anchor.

The morphometric characteristics of *D. forceps* as given by Koyun (2011) fall well within the range of present specimens.

Conclusion

Schizothorax richardsonii is endemic and major fish catch of Poonch River and its tributaries. This fish host has limited number of studies on the Parasites. To the best of our knowledge regarding Indian freshwater fish parasites fauna, no record could be found regarding the *Dogielius forceps* and *Schizothorax richardsonii* is the new host record for this parasite. Since it is the first published study on *Dogielius forceps* in India, in this sense present research carries great importance.

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