



RESEARCH ARTICLE

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### Studies on Two Species of *Myxobolus* (Myxosporea: Myxobolidae) From Aligarh Region, U.P., India.

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#### **ABSTRACT**

*Myxobolus* is a protozoan parasite found primarily in fishes belongs to family Myxobolidae. The two species, *Myxobolus oviforme* and *Myxobolus cycloid* has been described from Aligarh region. The identification of these species is primarily based upon the spore morphology.

**Keywords:** *Myxobolus oviforme*, *Myxobolus cycloid*, Fish, Aligarh.

#### **INTRODUCTION:**

*Myxobolus* (Myxosporea: Myxobolidae) is an important protozoan parasite of fishes. Many species of *Myxobolus* are highly pathogenic, often causing fatal diseases or even death to host fish. *Myxobolus* affects fish population by causing mortality, reduction in growth, weight loss, and suppression of reproductive activity. Many workers have reported the infection of *Myxobolus* in fishes, Yu and Wu (1992), Kent et al (1994), Hoffman, G.L. (1990), Das and Mukherjee (1998), Molnar (2000) and Das et al (2000).

This parasite is transmitted mostly by walled spores which are usually produced by multiple fission. These spores are of unique structure. Each spore contains (1-6) polar filaments and one to many sporoplasms. The membrane which envelops these structures may be a single layer or made up of two or more layers.

Many species of *Myxobolus* have been reported by some workers, *M. inacquus* Kent et al (1984), *M. cultus* Yokoyama et al (1995), *M. cognati* Cone et al (1996), *M. mississippiensis* Cone et al (1997) and *M. intrachondrealis* Molnar, K (2000). Present study has been conducted to describe the two species of *Myxobolus*, *M. oviforme* and *M. cycloides* in some fresh water fishes from Aligarh region. These two species have earlier been described by workers but not from this region.

#### **MATERIAL AND METHODS:**

The fresh water fishes were brought to the laboratory from different localities, such as Ganga river in Narora, Yamuna river in Mathura, Canals, Kali Dah, Kali Nadi and Shekha lake in Aligarh region, and kept in aquarium. The behavioral and gross pathomorphological changes in the spontaneous cases were recorded. The fishes were dissected to remove gills, kidney and liver. Tissue samples from these organs were taken and fixed in Bouin's solution for 24 hours, dehydrated using graded series of alcohol, embedded in paraffin wax, sectioned and examined by light microscope. Finally photomicrographs were taken out with the help of a digital camera.

#### **RESULTS AND DISCUSSION:**

##### ***Myxobolus oviforme*, Parisi 1912 (Fig. 1)**

The fresh water fishes, *Channa striatus*, *Clarias batrachus*, *Heteropneustes fossilis*, *Labeo rohita* and *Wallago attu*, are the host of this species of *Myxobolus*. Heavy infection of *Myxobolus oviforme* was observed in these fishes. The intensity of infection of this species was more than other species of *Myxobolus*; 12-21 parasites were visible in one slide.

**Table 1:** Specific site of infection of *Myxobolus oviforme* parasite in each host fishes

Host	Site of infection	Locality
<i>Channa striatus</i>	Lymphocytes & blood capillaries of kidney	Shekha lake in Aligarh region
	Liver cells	
	Blood capillaries of kidney	Ganga river in Narora
	Liver cells	
<i>Clarias batrachus</i>	Blood capillaries of kidney	Shekha lake in Aligarh region
	Lamellae of gills	
	Skin	
<i>Heteropneustes fossilis</i>	Blood capillaries of kidney	Shekha lake in Aligarh region
<i>Labeo rohita</i>	Blood capillaries of kidney	Ganga river in Narora
	Liver cells	
<i>Wallago attu</i>	Blood capillaries of kidney	Yamuna river in Mathura

**Incidence:** Heavy infection was observed, 42 fishes out of 78 fishes examined were found to be infected.

### Morphology:

#### Spore-

1. Spores are elongated and pear in shape.
2. Spore valves are relatively thin, symmetrical and smooth.
3. Spores are 3.2µm-4.0µm in length and 2.1-3.0µm in width.

#### Polar Capsule-

1. Two in number.
2. Oval shape.
3. Equal in size
4. Nuclei present in centre.
5. Size of capsules are 1.2µm-1.8µm in length and 1.0µm-1.2µm in width.
6. Located at the anterior part of the spore cavity.

Triangular **Sporoplasm** occupies the posterior half of the spore cavity. A vacuole is present in the sporoplasm.

### Taxonomic Summary:

#### Family- Myxobolidae

**Host-***Channa striatus*, *Clarias batrachus*, *Heteropneustes fossilis*, *Labeo rohita* and *Wallago attu*.

**Location (Site of infection)-** Infection is observed in lymphocytes and near blood capillaries of kidney, liver cells, lamellae of gills and skin.

**Locality:** Shekha lake in Aligarh region, the Ganga river in Narora, Yamuna river in Mathura.

### DISCUSSION:

The identification of this species is principally based on spore morphology. Identification and description of *Myxobolus oviforme* in various fishes was reported by many workers, Parisi (1912), Auerbach (1912), Kudo (1920), Jameson (1929, 1931) Shulman and Shulman-Albova (1953), Shulman (1962, 1966), Barisheva and Bauer (1957), Walliker (1968), Kennedy (1974), and Molnar (2000) reported presence of *Myxobolus oviformes* in liver, kidney and gills of *Apogon rex mullorum*, *Coris julis*, *Cymatogaster aggregatus*, *Damalichthys argyrosomus*, *Godus callaris*, *G. morhua*, *Hypsurus caryi*, *Onchorhynchus gorbusha* *O. keta*, *O. nerka*, *O. tsahawytscha*, *Salmo gairdneri*, *S. irideus*, *S. salar*, *S. trutta* and *Alburnus alburnus* [L.]. They had mentioned the length of spores 9µm-11µm and the width of spores 6.5µm-8.0µm. I observed the species in skin and gills too in addition to kidney and liver but size is smaller than that of previously described. In the present findings the length of spore is 3.2µm-4.0µm and the width is 2.1 µm-3.0µm.

They reported the length of polar capsules  $3.0\mu\text{m}$ - $4.5\mu\text{m}$  but nobody reported the width of polar capsule, while in the present study, the length of polar capsule is  $1.2\mu\text{m}$ - $1.8\mu\text{m}$  and  $1.0\mu\text{m}$  - $1.2\mu\text{m}$  in width. Two polar capsules are equal in size. A vacuole is present in sporoplasm in both investigations. Parisi (1912) and other workers reported elongated oval spores with rounded extremities in gills, slightly pointed in liver and longitudinal shape in kidney.

In present case, the spore is elongated in the kidney of *Channa striatus*, *Labeo rohita* and *Heteropneustes fossilis*, slightly pointed and longitudinal in liver, kidney and gills of *Clarias batrachus* and *Wallago attu* while only slightly pointed in skin of *Clarias batrachus* as already described. Moreover, the present material is obtained from the different host and different localities. Hence, on the basis of the above similarities, the present specimens of *Myxobolus* are identified as *Myxobolus oviforme* (Parisi, 1912).

Table 2 shows measurement of spores and polar capsules in all fishes, while Table 3 shows comparison of size of spore and polar capsule between my findings and previous findings.

**Table 2:** Measurement of *Myxobolus oviforme* parasites in fresh water fishes

Range	Host				
	<i>Channa striatus</i>	<i>Clarias batrachus</i>	<i>Heteropneustes fossilis</i>	<i>Labeo rohita</i>	<i>Wallago attu</i>
Length of spore	$3.4\mu\text{m}$ - $4.0\mu\text{m}$	$3.2\mu\text{m}$ - $4.0\mu\text{m}$	$3.2\mu\text{m}$ - $3.8\mu\text{m}$	$3.2\mu\text{m}$ - $3.7\mu\text{m}$	$3.3\mu\text{m}$ - $3.9\mu\text{m}$
Width of spore	$2.5\mu\text{m}$ - $3.0\mu\text{m}$	$2.3\mu\text{m}$ - $3.0\mu\text{m}$	$2.1\mu\text{m}$ - $2.8\mu\text{m}$	$2.2\mu\text{m}$ - $2.9\mu\text{m}$	$2.4\mu\text{m}$ - $3.0\mu\text{m}$
Length of polar capsule	$1.4\mu\text{m}$ - $1.8\mu\text{m}$	$1.3\mu\text{m}$ - $1.7\mu\text{m}$	$1.2\mu\text{m}$ - $1.6\mu\text{m}$	$1.2\mu\text{m}$ - $1.7\mu\text{m}$	$1.3\mu\text{m}$ - $1.8\mu\text{m}$
Width of polar capsule	$1.1\mu\text{m}$ - $1.2\mu\text{m}$	$1.0\mu\text{m}$ - $1.2\mu\text{m}$	$1.0\mu\text{m}$ - $1.1\mu\text{m}$	$1.1\mu\text{m}$ - $1.2\mu\text{m}$	$1.0\mu\text{m}$ - $1.2\mu\text{m}$

**Table 3:** Measurement of *Myxobolus oviforme* parasites in fresh water fishes

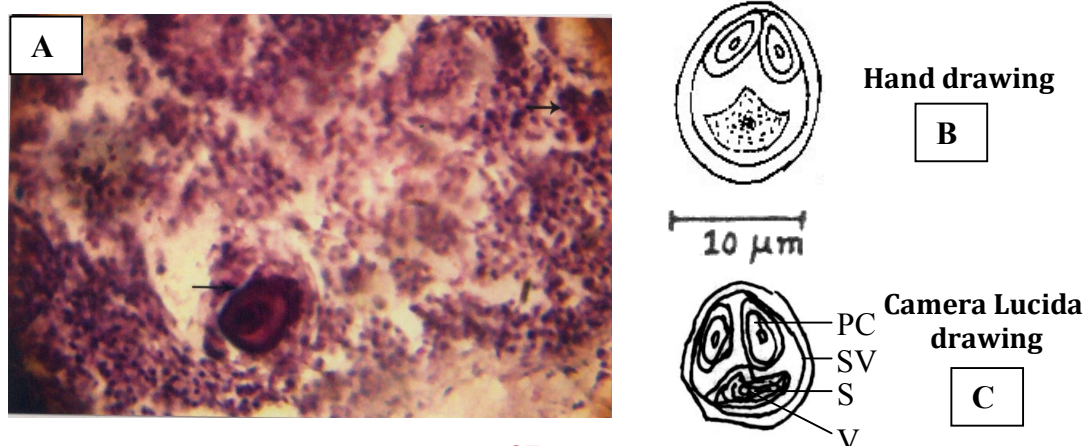
#### A. New Findings-

	Length of Spore	Width of Spore	Length of Polar Capsule	Width of Polar Capsule
Range	$3.2\mu\text{m}$ - $4.0\mu\text{m}$	$2.1\mu\text{m}$ - $3.0\mu\text{m}$	$1.2\mu\text{m}$ - $1.8\mu\text{m}$	$1.0\mu\text{m}$ - $1.2\mu\text{m}$

#### B. Previous Findings-

	Length of Spore	Width of Spore	Length of Polar Capsule	Width of Polar Capsule
Range	$9\mu\text{m}$ - $11\mu\text{m}$	$6.5\mu\text{m}$ - $8.0\mu\text{m}$	$3.0\mu\text{m}$ - $4.5\mu\text{m}$	Not measured

**Fig. 1:** Photomicrograph of kidney of *Channa striatus* showing *Myxobolus oviforme* (X1000) (A: Kidney, B & C: Hand and Camera Lucida drawings of *Myxobolus oviforme*)



Spore valve	=	SV
Polar capsule	=	PC
Sporoplasm	=	S
Vacuole	=	V

***Myxobolus cycloid*, Gurley 1893 (Fig. 2)**

The fresh water fishes *Channa striatus*, *Clarias batrachus* and *Heteropneustes fossilis* are the host of *Myxobolus cycloid*. A heavy infection of *Myxobolus* was observed, 6-12 parasites were obtained in a slide.

**Table 4:** Specific site of infection of *Myxobolus cycloid* parasite in host fishes

Host	Site of infection	Locality
<i>Channa striatus</i>	Near glomerulus	Shekha lake in Aligarh region
	Lymphocyte cells and interspace capillaries in kidney	
<i>Clarias batrachus</i>	Near glomerulus	Shekha lake in Aligarh region
	Interspace capillaries in kidney	
<i>Heteropneustes fossilis</i>	Near glomerulus	Shekha lake in Aligarh region
	Near lymphocytes cells in kidney	

**Incidence:** A heavy infection of *Myxobolus cycloid* is observed, 4 fishes out of 20 fishes examined were found to be infected.

**Morphology:**

**Spore-**

1. Ellipsoidal in shape.
2. Spore valves are relatively thin, symmetrical and smooth.
3. Spores are 2.5µm-3.0µm in length and 1.5µm-2.3 µm in width.
4. A round iodophilous vacuole is present in sporoplasm.

**Polar Capsule-**

1. Two in number.
2. Pyriform in shape.
3. Equal in size.
4. Size of capsules are 1.2µm-1.7µm in length and 0.6µm – 1.0µm in width.
5. Polar capsules are located at the anterior part of the spore cavity.
6. Polar capsule valves are symmetrical.

A **sporoplasm** occupies the posterior half of the spore cavity.

**Taxonomic Summary:**

**Family-** Myxobolidae

**Host-** *Channa striatus*, *Clarias batrachus* and *Heteropneustes fossilis*.

**Location (Site of infection)-** Near glomerulus, lymphocyte cells and interspaces of blood capillaries in kidney.

**Locality-** Shekha Lake in Aligarh region.

**DISCUSSION:**

The identification of this species is principally based on spore morphology .Of the various species of *Myxobolus* reported so far, the present species conforms to *Myxobolus cycloids* from Roach (*Rutilus rutilus*), Gurley (1893).

Gurley (1893) had mentioned the length 4.0µm -4.5µm and width 3.0µm of the spores but he had not given the measurement of the polar capsule. While in present study, the size of spores is 2.5µm-3.0µm in length and 1.5µm-2.3µm in width. The size of polar capsules is

1.2 $\mu$ m-1.7 $\mu$ m in length and 0.6 $\mu$ m-1.0 $\mu$ m in width. Gurley reported the species from pseudobranchia of Roach (Marine fish), while in present case the species has been reported from kidney of fresh water fishes. There are no marked differences between morphology of the two species. The polar capsules are equal in size. Iodinophilous vacuole is present in both investigations. Polar capsules are located at the anterior part of the spore cavity in both cases. However, the size of spore and polar capsules shows some differences, the present specimens of *Myxobolus* are identified as *Myxobolus cycloid* (Gurley 1893) on the basis of morphology.

Table 5 shows measurement of spores and polar capsules in all fishes, while Table 6 shows comparison of size of spore and polar capsule between my findings and previous findings.

**Table 5:** Measurement of *Myxobolus cycloid* parasites in all fresh water fishes are as follows

Range	Host		
	<i>Channa striatus</i>	<i>Clarias batrachus</i>	<i>Heteropneustes fossilis</i>
Length of spore	2.7 $\mu$ m-3.0 $\mu$ m	2.5 $\mu$ m-2.9 $\mu$ m	2.6 $\mu$ m-2.8 $\mu$ m
Width of spore	1.6 $\mu$ m-2.3 $\mu$ m	1.5 $\mu$ m-2.0 $\mu$ m	1.6 $\mu$ m-2.2 $\mu$ m
Length of polar capsule	1.3 $\mu$ m-1.7 $\mu$ m	1.2 $\mu$ m-1.6 $\mu$ m	1.2 $\mu$ m-1.7 $\mu$ m
Width of polar capsule	0.7 $\mu$ m-1.0 $\mu$ m	0.6 $\mu$ m-1.0 $\mu$ m	0.7 $\mu$ m-1.0 $\mu$ m

**Table 6:** Measurement of *Myxobolus cycloid* parasites in fresh water fish are as follows

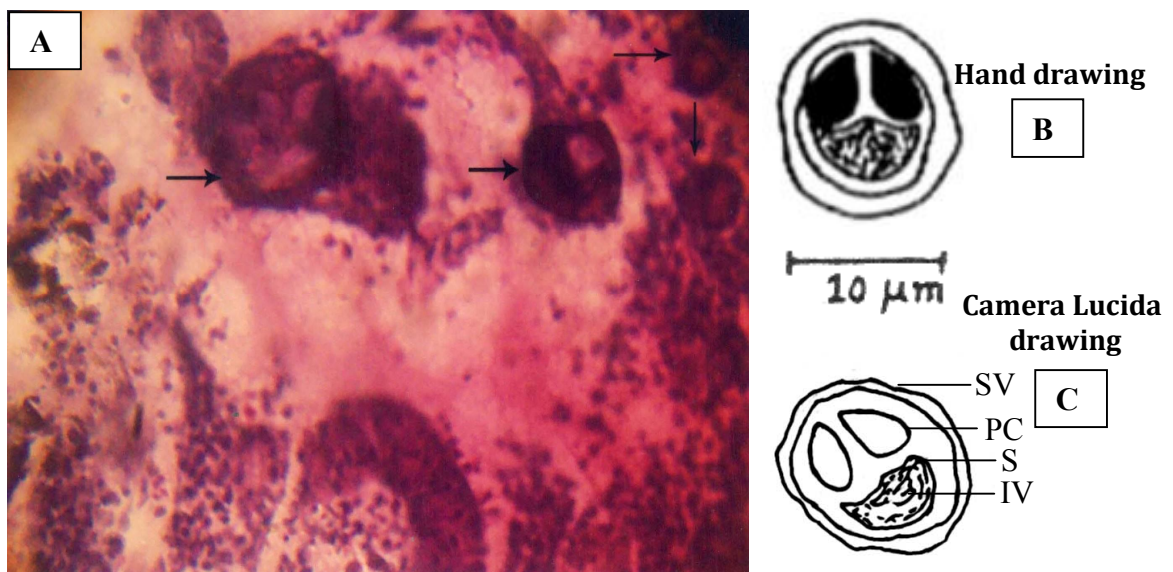
**New Findings:**

	Length of Spore	Width of Spore	Length of Polar Capsule	Width of Polar Capsule
Range	2.5 $\mu$ m -3.0 $\mu$ m	1.5 $\mu$ m -2.3 $\mu$ m	1.2 $\mu$ m-1.7 $\mu$ m	0.6 $\mu$ m -1.0 $\mu$ m

**Previous Findings:**

	Length of Spore	Width of Spore	Length of Polar Capsule	Width of Polar Capsule
Range	4.0 $\mu$ m-4.5 $\mu$ m	3.0 $\mu$ m	Not reported	Not reported

**Fig. 2:** Photomicrograph of kidney of *Channa striatus* showing *Myxobolus cycloid* (X1000) (A: Kidney, B & C: Hand and Camera Lucida drawings of *Myxobolus cycloid*)





Spore valve	=	SV
Polar capsule	=	PC
Sporoplasm	=	S
Iodinophilous Vacuole	=	IV

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