Original Article

Bulletin of Pure and Applied Sciences.
Vol.36 A (Zoology), No.2, 2017: P.93-101
Print version ISSN 0970 0765
Online version ISSN 2320 3188
DOI 10.5958/2320-3188.2017.00013.4

MYXOBOLUS DANRICI SP. N. (CNIDARIA MYXOSPOREA, MYXOBOLIDAE), A MYXOZOAN PARASITE OF *ESOMUS DANRICA* HAMILTON, 1882 FROM PONDS AND DITCHES OF THOUBAL, MANIPUR, INDIA

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Received on 12.10.2017
Accepted on 02.12.2017

Abstract:

A new species of the genus *Myxobolus*, *Myxobolus danrici* sp. n. is obtained from an ornamental fish *Esomus danrica* (Hamilton, 1822) commonly called flying barb from Thoubal, Manipur, India. The diagnostic characters are: spores spherical with rounded ends in frontal view, biconvex-shaped in sutural view with thick straight sutural line. Polar capsules equal, pyriform with a prominent nipple-shaped anterior ends; distinct V-shaped intercapsular appendage; polar filament makes 5 - 6 turns of coil. Sporoplasm anchor-shaped, rise up between the two polar capsules which touches the tip of the intercapsular appendage.

Keywords: Myxozoa, *Myxobolus danrici, Esomus danrica,* Thoubal, India.

INTRODUCTION

Fishes are parasitized by different groups of parasites. Myxozoans are the fish parasites having a wide geographical distribution and comprising a great number of species. Among the myzoxoans *Myxobolus* spp. are the most common species infecting both marine and fresh water fishes. (Eiras et. al., 2005). In India *Esomus danrica* (Hamilton, 1882) is widely distributed and it has been assessed as Least Concern in IUCN Red List Category & Criteria (2009) due to its wide distribution, its ability to occupy a variety of habitats, and the lack of any known major widespread threats. It is a benthopelagic species, usually found in ponds, tanks, ditches and canals. Due to its small size, it is of little interest as a food fish; however it is a popular aquarium fish for its silvery white colouration. But in Manipur, *Esomus danrica*, is one of the favourite food fish of common people and found widely distributed in the State and also rear as aquarium fish. So far only one *Myxobolus* species i.e. *Myxobolus esomi* was reported from genus *Esomus* from India but no other else. The objective of the present study is to find out any infection of *Myxobolus* spp. at any part of the body of this host fish. The study interestingly reveals the presence of a new species of *Myxobolus* species infecting the gill and intestine of *Esomus danrica*. This is described in this present communication.

MATERIAL AND METHODS

Host fishes of about 4-7 cm in length were collected from different ponds and ditches of Thoubal (Latitude 24°38'09.18" N and longitude 93°59'58.22"E), brought to the laboratory and examined for myxozoan parasites. All the internal organs, gills, fins etc. are carefully removed with the help of sterile forceps, and examined thoroughly for the presence of plasmodium (cysts). Some are teased on a clean slide, covered with coverslip and examined thoroughly for the presence of myxospores. Some slides containing myxozoans were treated with Indian Ink for detection of mucus envelop, some were treated with Lugol's Iodine solution for detection of iodinophilous vacuoles and some were treated with KOH solution for extrusion of polar filament. For permanent slide preparation, some of the smeared slides were air dried, fixed in acetone free absolute methanol, stained with Giemsa and mounted with DPX. Measurements (in micrometre) and camera lucida drawings were taken with the aid of a calibrated ocular micrometre. Photographs were taken using an Olympus CX41 Phase contrast microscope with an attached Olympus digital camera.

RESULT

Cyst: Not found.

Spores:

Trophozoites or immature spores are spherical or rounded in structure with multiple polar capsules. Mature spores are spherical with rounded posterior and anterior extremities in frontal view and biconvex- shaped in sutural view with straight and thick sutural ridge. It measures 9.60 ± 0.87 (8.13 - 11.17) µm in length, 9.55 ± 0.81 (8.13 – 10.16) µm in width and 6.36 µm thick. The shell valves are thick, outer shell valve is smooth, uniform, but the inner shell valve have little thickening or uneven at one side of the posterior part. There is no parietal fold and mucus envelope. A prominent V-shaped intercapsular ridge or appendage is present at the anterior part.

The two polar capsules are equal, pyriform in shape with rounded posterior ends and the anterior ends have a nipple-shaped outgrowth at the tip. Both measures 6.45 ± 0.74 (5.08-7.11) µm in length and 3.75 ± 0.46 (3.05 – 4.06) µm in breadth. The two capsules diverge posteriorly and converge anteriorly but the intercapsular ridge is wide towards the extremity, making two openings of the polar filaments. Polar capsule houses the polar filament making 5-6 coils

somewhat obliquely, when protruded looks like two long thread crossed at the tip of the spore.

The extracapsular region is occupied by anchor-shaped sporoplasm which rises up between the polar capsules and touches the tip of the intercapsular ridge. A small sporoplasmic nucleus is present. Iodinophilous vacuole is indistinct but small spherical iodinophilous vacuole is observed in some occasions. (Fig 1 & 2)

Type Host : *Esomus danrica* (Hamilton, 1882)
Type Locality : Thoubal (Latitude 24°38´09.18´´ N and longitude 93°59´58.22´´E)
Site of Infection : Gill and Intestine
Type specimen : Slide containing holotype and paratype are deposited in the parasitology lab. Department of Life Sciences, Manipur University, Canchipur. A Paratype slide is also deposited in the National Protozoans Collection, Zoological Survey of India, Kolkata.
Etymology : The species name *danrici* has been derived from the specific name of the host.

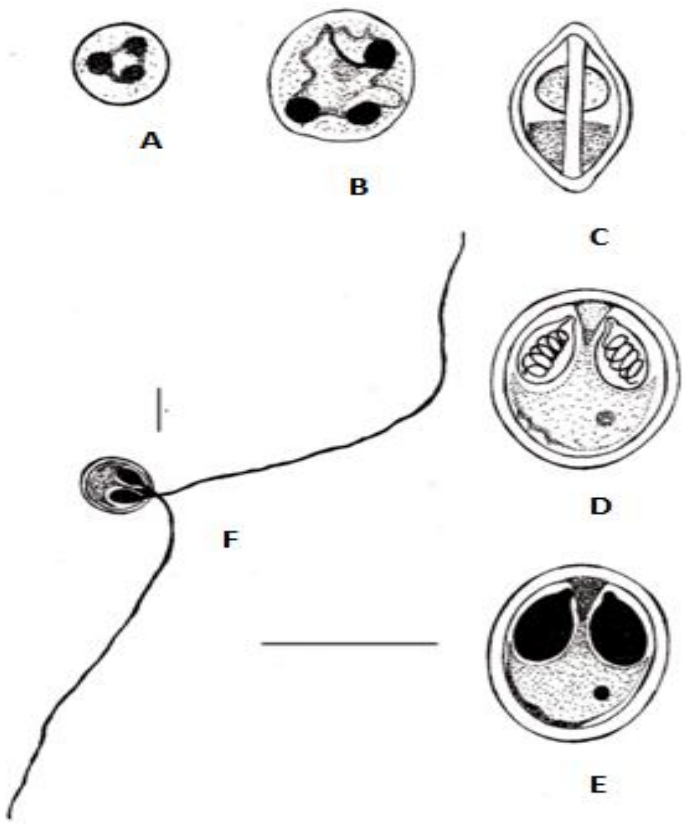


Fig. 1: Camera Lucida drawing; Bar – 9.5µm. A&B - Developing stage (pansporoblast); C – sutural view (fresh); D – mature spore (frontal view in fresh condition); E – mature spore (frontal view in Giemsa stain); F – mature spore showing extrusion of polar filament

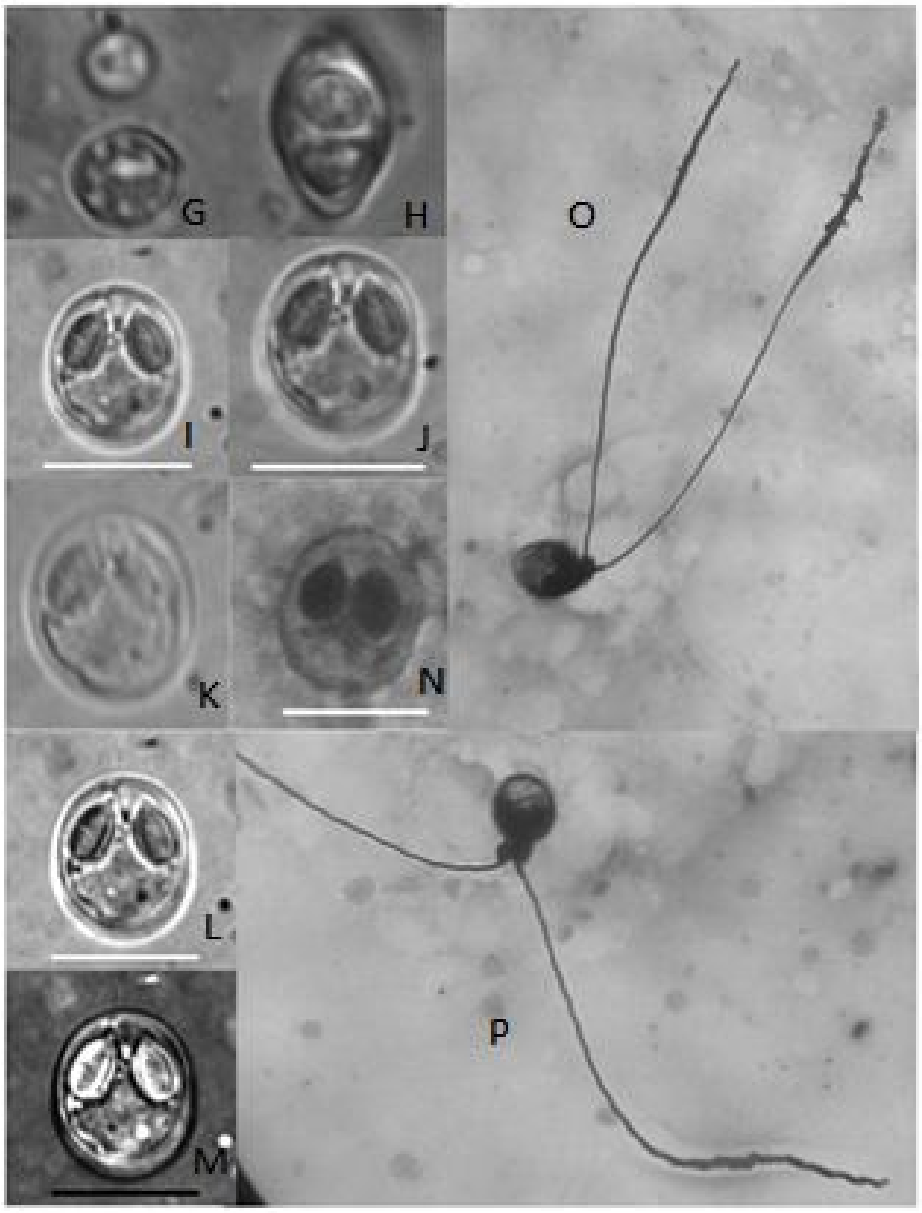


Fig. 2: Photomicrograph; Bar – 9.5µm. G - Developing stage (pansporoblast); H – sutural view (fresh); I-M – mature spore (frontal view in fresh condition); N – mature spore (frontal view in Giemsa stain); O&P – mature spore showing extrusion of polar filament

DISCUSSION

The present myxozoa with rounded spores, two polar capsules at one end confirmed the genus *Myxobolus* (Bütschli, 1882) and equal size polar capsules with intercapsular ridge belong to Tripathi's (1952) group I of the genus *Myxobolus.*

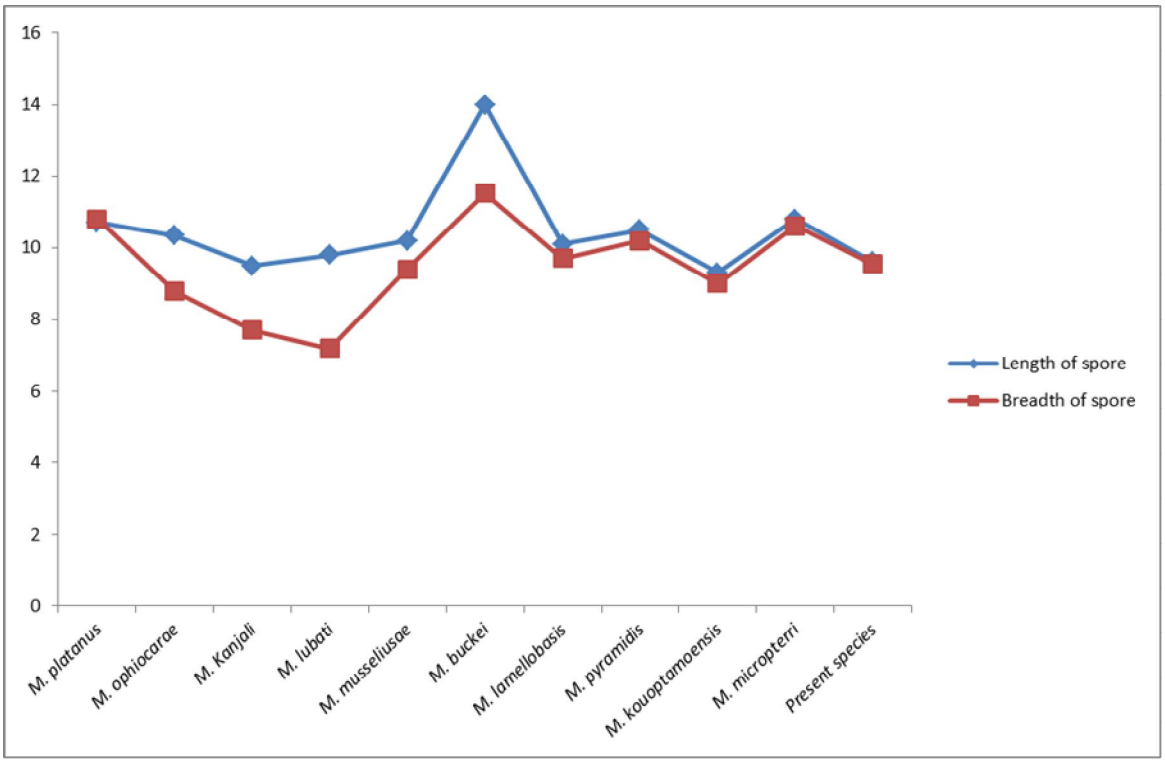
The present *Myxobolus* species with rounded spore structure and with large V-shaped intercapsular ridge resemble either morphologically or morphometrically with *M. platanus* (Eiras et. al., 2007) obtained from spleen of *Mugil platanus* from Brazil; *M. ophiocarae* (Borkhanuddin et. al., 2014) obtained from gill lamellae of *Ophiocara porocephala* from Malaysia; *M. kanjali* (Kaur & Ranjeet, 2011) obtained from scales of *Cirrhina mrigala* from India; *M. lubati* (Ali et. al., 2007) obtained from gall bladder of *Rhabdosargus haffara* from Egypt; *M. mussiliusae* (Liu et. al., 2013) obtained from gill filament of *Ciprinus carpio* from China; *M. buckei* (Longshaw et. al., 2003) obtained from spinal column of *Leuciscus cephalus* from United Kingdom; *M. lamellobiasis* (Molnar et. al., 2014) obtained from gill lamellae of *Blicca bjoerkna* from Hungary; *M. pyramides* (Zhang et. al., 2006) obtained from gill lamemmae of *Carassius auratus auratus* from China; *M. kouoptamoensis* (Nchoutpouen et. al., 2011) obtained from gills, spleen and kidney of *Labeo parvus* from Cameroon; *M. micropterii* (Walsh et. al., 2012) obtained from gill filament of *Micropterus salmoides* from USA.

However *M. platanus; M. lubati; M. mussiliusae; M. buckei* and *M. lamellobiasis* differ from the present species in having 4-8 sutural marking or parietal fold in the inner shell valve at the poster region, no nipple-shaped projection at the anterior end of the polar capsules. The later species have no sutural fold and a prominent nipple-shaped projection is present at the anterior part of the polar capsules. *M. ophiocarae* differ from the present species in having mucus envelope surrounding every spore and appeared liked a halo, with no intercapsular ridge. In *M. kanjali*, a prominent tubular structure is present that originated from anterior end of one of the polar capsule and extended backward beyond the margin of the spore and run upwards to join the posterior end of the other polar capsule, intercapsular ridge is absent whereas in the present species such structure is not present but a prominent V-shaped intercapsular ridge and some dense marking at the sporoplasm is seen in fresh condition. *M. pyramidis* differ in having pointed anterior end, pyriform shaped polar capsules with no nipple-shaped tip. *M. kouoptamoensis* differ in having subspherical spore, narrower at both ends; no intercapsular ridge and the sporoplasm were diamond-shaped which contradict with the anchor-shaped sporoplasm of the present species. *M. micropterii* differ from the present species in having smaller polar capsules, 7-8 turns of filament coil with no intercapsular ridge while the present species have 5-6 turns of filament coil and prominent intercapsular ridge (Table 1.)

Table 1: Comparative statement of closely related *Myxobolus* sp. with the present species

Species ↓ Characters →	Length of the spore	Breadth of the spore	Length of Polar capsule	Breadth of polar capsule	No. of filament turns	Site of infection	Host fish	Reference
M. platanus	10.7 10-11	10.8 10-11	7.7 7-8	3.8 3.5-4	5 - 6	Spleen	*Mugil platanus*	Eiras et. al., 2007
M. ophiocarae	10.34±0.47 9.29-11.35	8.79±0.37 7.98-9.53	4.72±0.42 3.93-5.45	2.85±0.27 2.23-3.29	5 - 6	Gill lamellae	*Ophiocara porocephala*	Borkhanuddin et. al., 2014
M. kanjali	9.5±0.28 9.3-9.7	7.7±0.42 7.4-8.0	4.8±0.56 4.4-5.2	1.8±0.28 1.6-2.0	6 - 7	Scales	*Cirrhinus mrigala*	Kaur and Singh, 2011
M. lubati	9.8±0.8 9.0-11.0	7.2±1.1 7.0-9.0	4.2±0.5 4.0-5.0	1.6±0.2 1.5-2	3	Gill and Gall bladder	*Rhabdosargus haffara*	Ali et. al., 2007
M. musseliusae	10.2±0.5 10.0-12.8	9.4±0.4 8.8-10.0	4.9±0.4 4.0-5.9	3.4±0.3 3.0-3.9	5 - 6	Gill filaments	*Cyprinus carpio*	Liu et. al., 2013
M. buckei	14.0±0.7 12.6-15.4	11.5±0.6 10.2-12.4	7.5±0.5 6.0-8.6	4.2±0.3 3.3-4.6	11 - 12	Spinal column	*Leuciscus cephalus*	Longshaw et. al., 2003
M. lamellobasis	10.1±0.5 9.1-10.8	9.7±0.58 8.6-10.5	4.7±0.26 4.4-5.0	3.3±0.54 2.7-4.8	6	Gill lamellae	*Blicca bjoerkna*	Molnar et. al., 2014
M. pyramidis	10.5±1.1 9.6-12.0	10.2±0.9 9.0-11.5	5.5±0.7 4.5-6.3	3.5±0.2 3.0-4.1	5 - 6	Gill lamellae	*Carassius auratus auratus*	Zhang et. al., 2006
M. kouoptamoensis	9.3 8-10	9.0 8-10	4.7 4-5.5	3.5 3-4	5 - 6	Gills, Spleen and Kidney	*Labeo parvus*	Nchoutpouen et. al., 2011
M. micropterii	10.8±0.09 9.1-12.2	10.6±0.08 9.0-11.7	4.0 – 5.0	2.0 – 3.0	7 - 8	Gill filaments	*Micropterus salmoides*	Walsh et. al., 2012
Present species	9.60±0.87 8.13-11.17	9.55±0.81 8.13-10.16	6.45±0.74 5.08-7.11	3.75±0.46 3.05-4.06	5 – 6	Gill filaments and intestine	*Esomus danrica*	Present specimen

Figure 3: A graph showing the difference in the mophometry



So far more than 856 species of *Myxobolus* were reported from different parts of the world (744 nominal species by Eiras et al, 2005 and 112 nominal species again added in 2014) out of which 131 were from India (Kaur et al, 2012). Among these *Myxobolus* species, no species were described form the host *Esomus danrica* (Flying barb). The present species is described for the first time from the above mentioned Host but second species from the genus *Esomus* (the first is *Myxobolus esomi* Kalavati and Narasimhamurti, 1984a emend. Landsberg and Lom, 1991). The present species, when compared with all related species of *Myxobolus,* is found to have some unique characters like prominent V-shaped intercapsular ridge; anchor-shaped sporoplasm which rise up between the two polar capsules and that joined the tip of the intercapsular ridge; polar capsules with nipple-shaped tip at the anterior ends. These characters identify the present species as a new species to science and hence named *Myxobolus danrici* sp.n.

Morphometrical Data in µm of 20 fresh and stained spores are given below:

Characters	Range	Mean	Std. D.	S.E.	C.V.
Length of the spore:	8.13-11.17	9.60	0.87	0.19	19.6
Breadth of the spore:	8.13-10.16	9.55	0.81	0.18	18.1
Length of polar capsule	5.08-7.11	6.45	0.74	0.16	16.5
Breadth of polar capsule	3.05-4.06	3.75	0.46	0.10	10.4

Acknowledgements:

The Authors acknowledge the laboratory facilities provided by the Department of Life Sciences and Centre of Advanced Study in Life Sciences, Manipur University.

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