

***Myxobolus* spp. (Myxosporea: Myxobolidea)
from fishes of the Zayandeh-rud River
(Esfahan, Iran); new hosts and locality record**

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Abstract: In a parasitic survey of the native and introduced fishes in the Zayandeh-rud River, 5 *Myxobolus* spp. were found in the gills, fins and skin of examined fish specimens. They include *M. varicorhini* from fin and *M. samgoricus* from skin of *Capoeta damascina*, *M. musajevi* from gills of *Capoeta capoeta gracilis*, *Myxobolus cristatus* from *Capoeta aculeata*, and *M. saidovi* from *Alburnus* sp. Data on the location in the hosts comparing with previous records are provided. The epidemiological importance of *Myxobolus* spp. in Zayandeh-rud River is also presented. In the present paper the occurrence of five *Myxobolus* spp. all from endemic fishes from Zayandeh-rud River (A new locality) are recorded from two new hosts; *Capoeta damascina*, *Capoeta aculeata*. *M. varicorhini* and *M. saidovi* are recorded for the first time from Iranian freshwater fishes.

Keywords: *Myxobolus* spp., Zayandeh-rud River, Esfahan Province, Iran

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Introduction

The Zayandeh-rud River basin occupies an area between the volcanic belt and folded sedimentary rocks along the northeast of Zagros Mountains (central Iran). The Zayandeh-rud which is the largest stream of the entire interior basin, flows eastward from the high central part of Zagros, after passing Esfahan, terminates to the Gavkhouni depression near the center of the watershed (Saatadi, 1977).

According to Armantrout (1980) the Zayandeh-rud fish fauna is somewhat enigmatic but shows its strongest relation to the Caspian Sea fauna. Five genera and two species are shared with Namak basin, in contrast to four genera and two species, shared with the Karoon fauna. In addition, Esfahan basin appears to have been invaded by fishes from Karoon and Neyriz basins-for instance, from the Karoon River through the recently constructed tunnel and regular connections. Parasites of Zayandeh-rud fishes were first studied by Williams *et al.* (1980) who reported on the occurrence of helminthes from endemic fishes. Further fish parasite investigation mostly on monogeneans were recorded by Jalali and Molnar (1990a, b), Molnar and Jalali (1992) and Mehdipoor *et al.* (2004).

There is a large number of *Myxobolus* spp. recorded from different parts of the world. In 1991, Landsberg and Lom presented a revision of the genera *Myxobolus* and *Myxosoma* and on the basis of Lom & Noble (1984) designated all species as *Myxobolus*, and listed 444 species; Eiras *et al.* (2005) made a synopsis of species of *Myxobolus* and summarized 744 species. In Iran till now, altogether 38 different *Myxobolus* spp. have been recorded, 11 species from southwest of Iran: Mesopotamia Fauna Region (Khuzestan Province) and 27 species from Northern part of the country: Caspian Sea Faunal Region; Mazandaran, Guilan, Azarbaijan and Zanzan Provinces (Masoumian *et al.* 1994, 1996 a,b; Molnar *et al.* 1996; Baska & Masoumian 1996; Masoumian & Pazooki 1999a,b; Masoumian *et al.* 2003, 2004; Pazooki *et al.* 2004, 2005).

No data on *Myxobolus* spp. of Zayandeh-rud fishes have been reported so far. The aim of this study was to survey *Myxobolus* spp. on native or introduced fishes in Zayandeh-rud.

Material and methods

Host fishes were collected by net from three regions of Zayandeh-rud, namely head-water close to Koohrang Mountain mostly populated by *Capoeta* spp., and reservoir close to Chadegan district and the terminal parts of the river close to Esfahan city. During autumn and winter of 2004 and spring and summer of 2005 totally 50 fish specimens were examined for *Myxobolus* infection.

Immediately after collection, the live fish were transmeasured before being killed by the spinal cord incision; they were then examined for myxosporean parasites macroscopically and under stereo and light microscope. Spores were obtained from mature cysts. On the average 30 spores were measured using the dimensions recommended by Lom and Arthur (1989). Permanent preparations were made by placing a portion of the spores in glycerol-gelatin and mounting them under coverslip; the structure of the polar capsules and the idophilous vacuole were studied by Normarski microscope.

Results

Totally 5 *Myxobolus* spp. were recorded from the gills, fins and skin of the examined fish specimens. They include *M. varicorhini* Dzhaliyov & Danijarov, 1975; from the fins (Fig. 1), *M. samgoricus* Gogebaschivil, 1966; from the skin of *Capoeta damascina* (Fig. 2), *M. musajevi* Kandilov, 1963; from the gills of *Capoeta capoeta gracilis* (Fig. 3), *M. cristatus* Shulman 1962; from *Capoeta aculeata* (Fig. 4), and *M. saidovi* Gasimagomedov, 1970; from *Alburnus* sp. (Fig. 5). Table 1 summarizes the list of parasites, hosts, infected organs, locality, and the seasons. The measurement of the spores collected from different *Myxobolus* spp. is mentioned in Table 2.

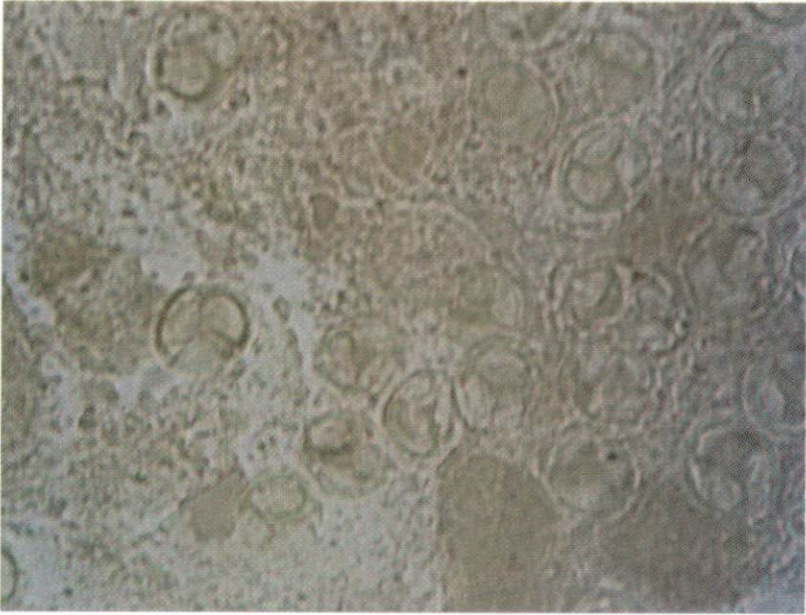


Figure 1: Spores of *M. varicorhini* from the fins of *Capoeta damascina* ($\times 1500$)



Figure 2: Spores of *M. samgoricus* from the skin of *Capoeta damascina* ($\times 1500$)



Figure 3: Spores of *M. musajevi* from the gills of *Capoeta capoeta gracilis* ($\times 1500$)

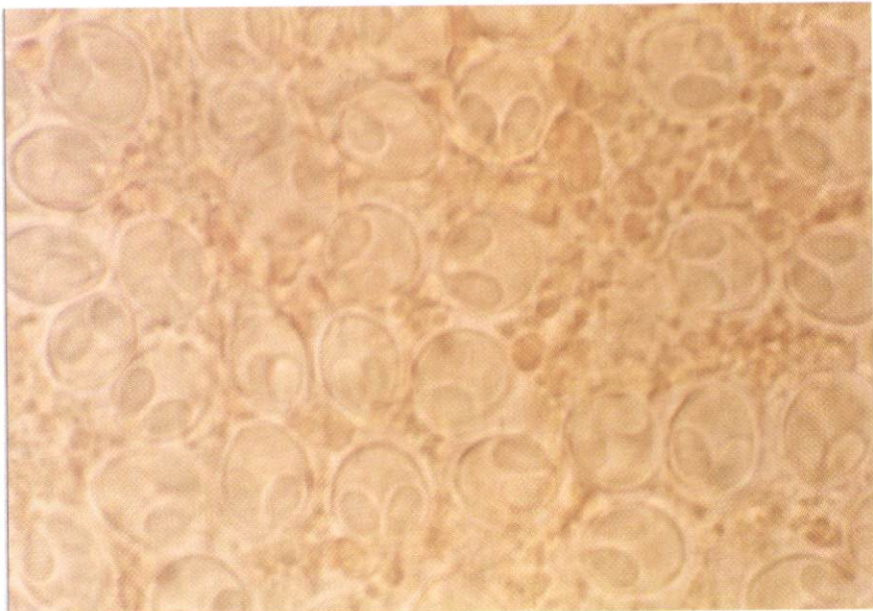
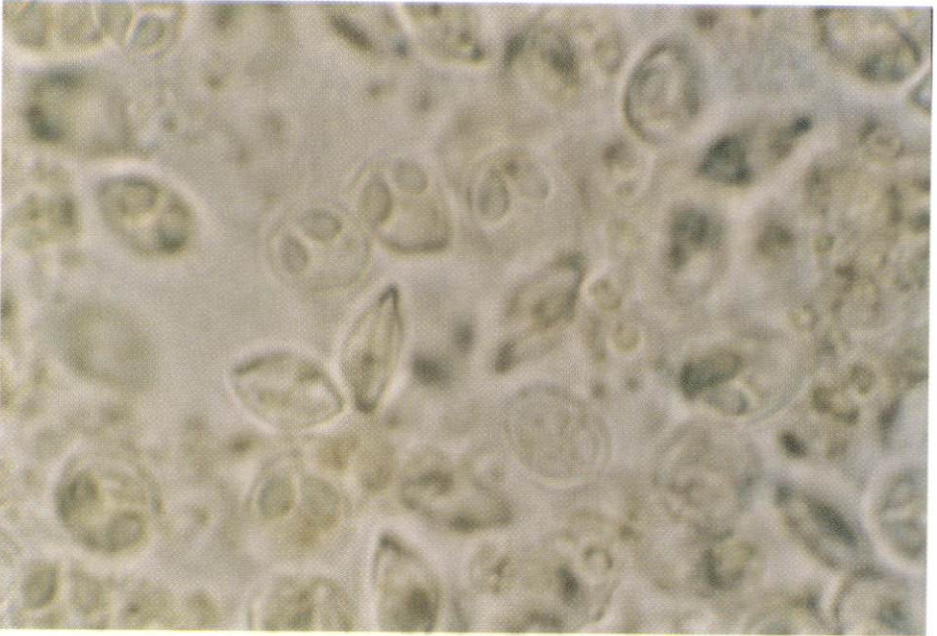


Figure 4: Spores of *M. cristatus* from *Capoeat aculeate* ($\times 1500$)



**Figure 5: Spores of *M. saidovi*, from the gills of *Alburnus* sp.
(×1500)**

Table 1: *Myxobolus* spp. found in the infected endemic fishes in the Zayandeh-rud River and other parts of Iran

No	<i>Myxobolus</i> spp.	Host (s)	Infected organ	locality	Region	Season	Reference (s)
1	<i>M. samgoricus</i> Gogebaschivili, 1966	<i>Capoeta amaschna</i> , <i>Capoeta capoeta</i>	Skin Fin	Zayandeh-rud R. Tadjan	Esfahan Mazandaran	Autumn	Present work Masoumian & Pazooki, 1999a
2	<i>M. varicorhini</i> Dzhaliyov & Danjjarov, 1975	<i>C. damaschna</i>	Fins	Zayandeh-rud R.	Esfahan	Autumn	Present work
3	<i>M. musjjevi</i> Kandilov, 1963	<i>C. c. gracilis</i> <i>C. c. gracilis</i>	Gills Fins	Zayandeh-rud R. Tadjan R. Saja-Rud, Ghezal-Ozon R. Karooon R. Zangbar R.	Esfahan Caspian Caspian Caspian Karooon Caspian	Autumn Summer Summer Spring Summer	Present work Masoumian & Pazooki 1999a Pazooki <i>et al.</i> , 2005 Molnar & Baska, 1993 Pazooki <i>et al.</i> (in press)
4	<i>M. cristatus</i> Shulman, 1962	<i>C. c. gracilis</i> <i>C. aculeata</i>	Gills Gills & Fins	Zangbar R. Zayandeh-rud R.	Caspian Esfahan	Summer Spring	Pazooki <i>et al.</i> , 2005 Present work
5	<i>M. saidovi</i> Gasimagnomedov, 1970	<i>Alburnus maculatus</i>	Gills	Zayandeh-rud R.	Esfahan	Spring	Present work

Table 2: Measurement of the spores collected from *Myxobolus* spp. (μm)

Parasites	Length	Width	Thickness	Length (Polar capsule)	Width
<i>M. samgoricus</i>	8.5(8.5-10.5)	7.5(7.3-9)	4.7(4.7-5.1)	3.2	2.5
<i>M. varicorhini</i>	11.5(11.8-14.5)	1.2(1.6-11.5)	4.2(4.5-4.8)	5.9(4.3)	2.5(2)
<i>M. musajevi</i>	10.5(1.2-13.5)	9.5(9-10.8)	3.8(3.2-4.5)	5.5	3.5
<i>M. cristatus</i>	10(10.5-11)	8(8.2-9.2)	6(6.2-6.8)	5	3
<i>M. saidovi</i>	10(9.8-10.2)	9(8-9.50)	6(5-6)	4	3

Discussion

Five species of *Myxobolus* have been recorded for the first time from the Zayandeh-rud River Basin, central part of Iran. All infected hosts belong to three species of genus *Capoeta* except one belonging to genus *Alburnus* (Table 1). The dimensions of the spores (Table 2) in some cases are less than other references (Shulman, 1990,1984), probably due to the differences in preparation and fixation methods.

According to the results, two more *Myxobolus* spp. are recorded from the Iranian freshwater fishes, namely *M. varicorhini* from fins and *M. saidovi* from *Alburnus* sp. In addition, three new hosts are presented for four *Myxobolus* species as well, namely *Capoeta aculeata* for *M. cristatus* and *Capoeta damascina* for *M. varicorhini* and *M. samgoricus*.

M. musajevi has already been recorded from the gills of *Capoeta capoeta* from rivers Tadjan (Mazandaran), Saja-Rud, Ghezel-Ozon (Zanjan) and Zangbar (West Azarbaijan) in summer and Karoun (Khouzestan) in spring (Molnar & Baska 1993; Masoumian & Pazooki 1999a; Pazooki *et al.*, 2005), but in the present study from the same fish species in autumn. The *M. cristatus* has been also already recorded from the gills of *C. c. gracilis* from Zangbar (West Azarbaijan) in summer, but in the present study from another host in summer. The differences in the finding of the present study and others are, most probably, due to the prevailing temperature during the sampling season at different sampling sites. Knowing the fact that water temperature at different sampling sites (rivers) even during the same season is not similar, makes the differences logically expected.

M. saidovi was described from *Alburnus alburnus* from Agrakhanski Gulf (former Soviet Union), in northern part of the Caspian Sea Faunal Regions (Shulman, 1984,1990). In the present study, however, *M. saidovi* is recorded from *Alburnus* sp.

M. varicorhini described from *Capoeta capoeta* and also recorded from *Barbus ciscaucasicus*, in Canirnigan River (former Soviet Union), *M. samgoricus* described from *Capoeta capoeta* and also recorded from *Leuciscus cephalus orientalis* (Shulman 1984,1990; Eiras *et al.*, 2005). In the present study, these two species are recorded from a new host, *Capoeta damascina*.

All parasites were collected from wild and native fishes in Zayandeh-rud, which could affect the cultured fishes under certain condition. The present study revealed some new host and localities that are important from both commercial, zoological and host-parasites relationship point of views.

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