

Occurrence of *Gyrodactylus* spp (Monogenea: Gyrodactylidae) From Iranian Freshwater Fishes

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Abstracts: Thirty three *Gyrodactylus* spp. have been found on the gills and body surface of both wild and farmed freshwater fishes in Iran. Among them, nine species have been identified up to the species level, which are new locality records. The identification of the others, mainly belong to endemic wild freshwater fishes, need further studies. Among the known species, *Gyrodactylus derjavini* (Mikhailov, 1975) has been found on the gills, caudal and anal fins of the Caspian salmon (*Salmo trutta caspius*) and rainbow trout (*Oncorhynchus mykiss*). These species are very harmful to salmonid fingerling production industry of Iran. In warm water cultured fishes, *G. sprostona*, with widest host range, infects common carp (*Cyprinus carpio*), Silver carp (*Hypophthalmichthys molitrix*) and big head carp (*Aristichthys nobilis*) in almost all fish farms of Iran. Other species, which will be discussed here from their economic importance and host specificity points of view, are *G. cyprini*, *G. elegans*, *G. fossilis*, *G. kobayashii*, *G. prostaе*, *G. shulmani* and *G. stankovici*. Furthermore the pathogenicity of *Gyrodactylus* spp are discussed and new technology (DNA sequence) for precise identification of parasites is also recommended.

Keywords : *Gyrodactylus* spp., Freshwater fishes, Iran

Introduction

During the past 50 years mans attempts have been made to elucidate monogenean parasites fauna of freshwater fishes of Iran. During this period tens of previously described and undescribed species belonging to different genera have been recovered and reported (Jalali & Molnar, 1990a,b; Molnar & Jalali, 1992; Gussev *et al.*, 1993b,c; Jalali *et al.*, 1995 and Jalali *et al.*, 2000). Most of the identified species belonged to the *Dactylogyrus* spp, *Dogielius* spp, *Ancyrocephalus* spp and *Ancylodiscoides* spp. Except *Gyrodactylus elegans*, which has been recorded from common carp of Sefidrud river (Mokhayer, 1981), and *Gyrodactylus derjavini* from Salmonids (Shamsi & Jalali, 1997), there is no report of *Gyrodactylus* spp from freshwater fishes of Iran, so far. These parasites have elongate body, small opisthaptor with sixteen marginal hooks and one pair of anchor connected by one dorsal bar and one ventral bar. Eyes are absent in gyrodactylus species (Fig. 1) (Kabata, 1985). Their viviparous reproduction and monoxenous life cycle can lead to rapid population growth, particularly when hosts are kept in relatively high densities in pond culture. The resulting disease condition, Gyrodactylosis, has been reported to cause losses among cultured fry in ponds in Iran (Jalali, 1995). In the present paper, nine known and twenty-four unknown species of *Gyrodactylus* spp from gills, fins and body surface, of freshwater fishes are identified to species and genus level respectively. The later needs further studies for precise description.

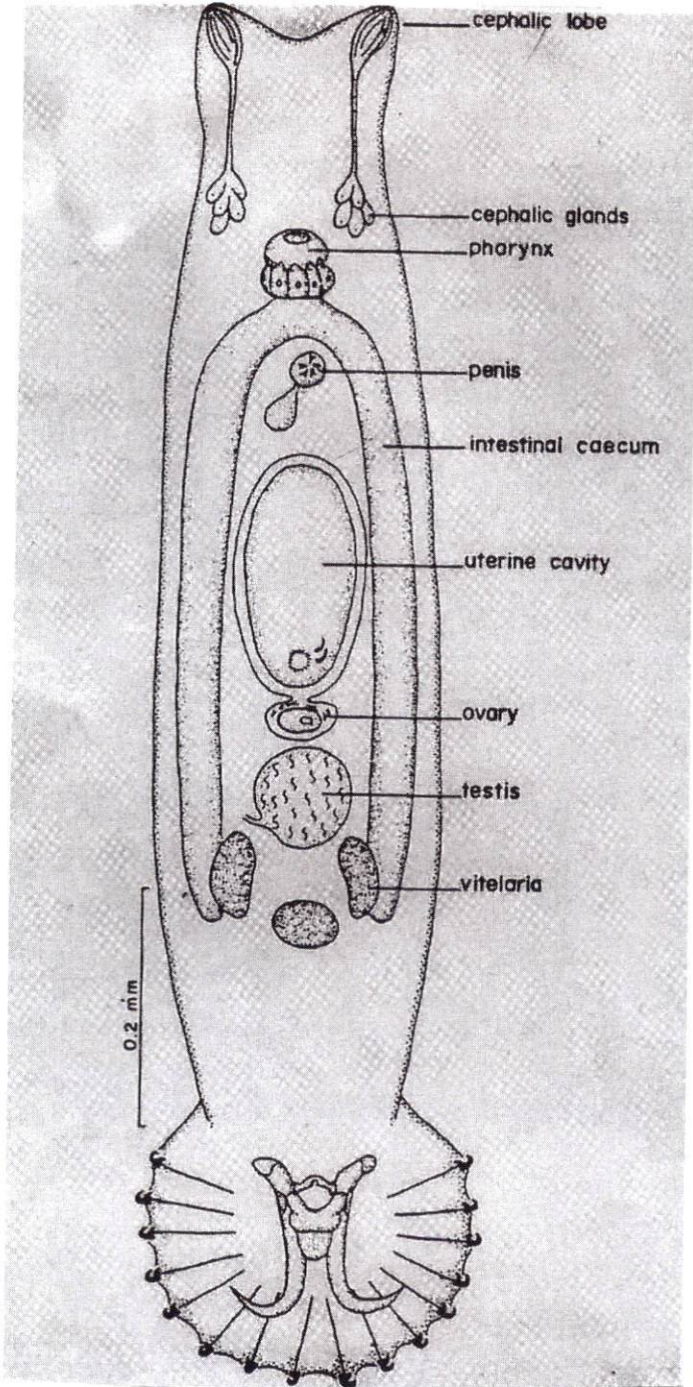


Figure 1: Generalized Gyrodactylidae family characters based on *Gyrodactylus* spp
(Modified from Malmberg, 1970 by Beverly-Burton, 1984)

Materials and Methods

The fish hosts were sampled from different faunal regions, namely the Caspian (Aral-Caspian region), Tigris (Mesopotamian great region), Jazmorian and Lut (Oriental region), in different seasons from 1993 to 2003. In total, 200 fish specimens belonging to 19 genera and 28 species were examined. Fish specimens were transferred to laboratory alive. Parasites were recovered under a compound microscope at magnifications of X40 to X100. Gyrodactylids were picked off the gills or body surface scrapings alive, placed under a cover slip, fixed according to Gussev (1983) and Malmberg (1970) in ammonium picrate solution.

Results

Among 33 *Gyrodactylus* spp found on the gills, fins and skin of Iranian wild and cultured freshwater fish, 9 species were identified to species (Table 1) and identification of the rest, mostly from wild freshwater fishes, needs further studies (Table 2)

Table 1: Known *Gyrodactylus* spp, found on Iranian cultured and wild freshwater fishes

No	Parasites	Host(s)	Locality	Fauna region	Reference(s)
1	<i>Gyrodactylus cyprini</i> Diarova, 1969	<i>Cyprinus carpio</i>	Sefid_rud river	Caspian	Jalali, 1995
2	<i>G. derjavini</i> Mikhailov, 1975	<i>Salmo trutta caspius</i> <i>Oncorhynchus mykiss</i>	Sardab-rud river Sardab-rud river	Caspian Caspian	Jalali, 1995 Shamsi & Jalali, 1997
3	<i>G. elegans</i> Nordman, 1832	<i>Abramis brama</i> <i>Cyprinus carpio</i> <i>Alburnus filippi</i>	Sefid-rud river Sefid-rud river Behesht-abad river	Caspian Caspian Tigris	Jalali, 1995 Mokhayer, 1981 Barzegar <i>et al.</i> , 2004
4	<i>G. fossilis</i> Lupu et Roman, 1956	<i>Heteropneustes fossilis</i>	Karoon river	Tigris	Jalali, 1995
5	<i>G. kobayashii</i> Hukuda, 1940	<i>Carassius auratus</i> <i>C. auratus gibelio</i>	Sefid-rud river Sefid-rud river	Caspian	Jalali, 1995 Jalali, 1995
6	<i>G. prostaе</i> Ergens, 1963	<i>Rutilus frisi kutum</i>	Sefid-rud river	Caspian	Jalali, 1995
7	<i>G. shulmani</i> Ling, 1962	<i>Cyprinus carpio</i>	Dez river Sefid-rud river Zayandeh-rud river	Tigris Caspian Esfahan	Jalali, 1995 Jalali, 1995 Jalali, 1995
8	<i>G. sprostonae</i> Ling, 1962	<i>Cyprinus carpio</i> <i>Hypophthalmichthys molitrix</i> <i>Aristichthys nobilis</i>	Dez river Vahdat reservoir Sefid-rud river Sefid-rud river	Tigris Tigris Caspian Caspian	Jalali, 1995 Jalali & Barzegar (under publishing) Jalali, 1995 Jalali, 1995
9	<i>G. stankovici</i> Ergens, 1970	<i>Cyprinus carpio</i>	Dez river Zarivar lake Sefid-rud river Zayandeh-river	Tigris Tigris Caspian Esfahan	Jalali, 1995 Jalali & Barzegar (under publishing) Jalali, 1995 Jalali, 1995

Table 2: Unknown *Gyrodactylus* spp found on Iranian freshwater cultured and natural fishes

No	Parasites	Host(s)	Locality	Fauna region	Reference(s)
1	<i>Gyrodactylus</i> sp	<i>Alburnoides bipunctatus</i>	Zayandeh-rud river	Caspian	Jalali, 1995 Mahdipoor <i>et al.</i> , 2004
2	<i>Gyrodactylus</i> sp	<i>Alburnus alburnus</i>	Zayandeh-rud river	Caspian	Jalali, 1995
3	<i>Gyrodactylus</i> sp	<i>Alburnus</i> sp	Khersan river	Tigris	Jalali, 1995
4	<i>Gyrodactylus</i> sp	<i>Aristichthys nobilis</i>	Sefid-rud river	Caspian	Jalali, 1995
5	<i>Gyrodactylus</i> sp	<i>Barbus</i> sp	Fahlian river	Tigris	Jalali, 1995
6	<i>Gyrodactylus</i> sp	<i>Barbus luteus</i>	Dez river	Tigris	Jalali, 1995
7	<i>Gyrodactylus</i> sp	<i>Capoeta aculeate</i>	Behesht-abad river	Tigris	Barzegar <i>et al.</i> , 2004
8	<i>Gyrodactylus</i> sp	<i>Capoeta buhsei</i>	Spring water Bam	Oriental	Jalali, 1995
7	<i>Gyrodactylus</i> sp	<i>Capoeta damascina</i>	Zarivar lake	Tigris	Jalali & Barzegar (under publishing)
9	<i>Gyrodactylus</i> sp	<i>Capoeta damascina</i>	Behesht-abad river	Tigris	Barzegar <i>et al.</i> , 2004
10	<i>Gyrodactylus</i> sp	<i>Capoeta</i> sp1	Fahlian river	Tigris	Jalali, 1995
11	<i>Gyrodactylus</i> sp	<i>Capoeta</i> sp2	Spring water Yazd river	Oriental	Jalali, 1995
13	<i>Gyrodactylus</i> sp	<i>Carassius auratus</i>	Sefid-rud river	Caspian	Jalali, 1995
14	<i>Gyrodactylus</i> sp	<i>Chalcalburnus</i> sp	Beshar river	Tigris	Jalali, 1995
15	<i>Gyrodactylus</i> sp	<i>Chodrostoma nasus</i>	Dez river	Tigris	Jalali, 1995
16	<i>Gyrodactylus</i> sp	<i>Chodrostoma nasus</i>	Karoon river	Tigris	Jalali, 1995
17	<i>Gyrodactylus</i> sp	<i>Cyprinion watsoni</i>	Minab river	Tigris	Jalali, 1995
18	<i>Gyrodactylus</i> sp	<i>Cyprinion watsoni</i>	Halil-rud river	Oriental	Jalali, 1995
19	<i>Gyrodactylus</i> sp	<i>Cyprinus carpio</i>	Kaftar lake	Tigris	Barzegar & Jalali, 2000
20	<i>Gyrodactylus</i> sp	<i>Cyprinus carpio</i>	Karoon river	Tigris	Jalali, 1995
21	<i>Gyrodactylus</i> sp	<i>Garra rufa</i>	Heleh river	Tigris	Jalali, 1995
22	<i>Gyrodactylus</i> sp	<i>Leuciscus cephalus orientalis</i>	Sefid-rud river	Caspian	Jalali, 1995
23	<i>Gyrodactylus</i> sp	<i>Leuciscus ulanus</i>	Barandooz river Halaj river	Caspian Caspian	Jalali, 1995 Jalali, 1995
24	<i>Gyrodactylus</i> sp	<i>Rutilus frisi kutum</i>	Sefid-rud river	Caspian	Jalali, 1995

Discussion

With the exception of report by Mokhayer (1981) who reported *G. elegans* from the common carp in Sefid-rud river and that of Shamsi & Jalali (1997), who reported *G. derjavini* from Salmonid fish farm in the Iranian part of the Caspian basin, this is the first complete survey on *Gyrodactylus* spp from freshwater fishes of Iran.

According to our finding, *Gyrodactylus* species found on freshwater fishes from the Iranian part of the Caspian basin are mostly known and are the same as those that exist in Europe and central Asia (Jalali, 1995)(Table 1).

Fishes not belonging to the Caspian basin are however infected by *Gyrodactylus* species, which seem to be unknown ((Jalali, 1995)(Table 2).

The parasites with the widest host range is *Gyrodactylus sprostonae*, which was found on *Cyprinus carpio*, *Hypophthalmichthys molitrix* and *Aristichthys nobilis* and in almost all fish farms in Iran (Fig. 2).

Gyrodactylus shulmani was found on the gills of *Cyprinus carpio* only. But according to Ergens (1970), this parasites is considered to be specific to the gills of *Carassius auratus* in Eurasia. But it has been found on the other fish species such *C. auratus gibelio*, *Cyprinus carpio* and *Hypophthalmichthys molitri*, not only the gills, but also on the fins and skin of those fish in Russia (Gussev, 1985).

The most attention should be given to *Gyrodactylus derjavini*, which causes frequent problems in salmonid farm in Iran where *Oncorhynchus mykiss* which is dominantly cultured (Jalali, 1995; Shamsi & Jalali, 1997). The parasite was first described by Mikhailov (1975) and then redescribed by Ergens (1983) both from *Salmo trutta* as original host (Fig. 3). According to Prost (1991), *G. derjavini* is found on skin and fins of all Salmonids of Poland.

Investigation carried out by Malmberg (1993) on *Gyrodactylus* spp of Salmonids within Eurasia area indicated that different fish species might have one or more host specific *Gyrodactylus* spp. Some of the species may survive for a short time on an accidental host and still others can use one or more temporary hosts. According to his opinion, the *Gyrodactylus* species on the *Salmo trutta caspius* of the Iranian part of the Caspian Sea are most likely specimens of *G. derjavini*, to which is *Salmo trutta* true host. In our study the parasites were

transferred along their host, *Salmo trutta* from the Caspian Sea (with salinity 13 ppt) during its spawning migration. Then in warm water the parasites, which can successfully tolerate the freshwater environment, can transfer to *Oncorhynchus mykiss* when both of them are cultured together in Kelardasht Salmonid farm, (Shamsi & Jalali, 1997). According to Cone and Odense (1984) the disk-shaped haptor attached itself to the host skin surface by means of blade tips of 16 peripherally located marginal hooks with the two vertically located hamulus blades. Compressing the underlying epithelium into a small depression and cause minimal or extensive damages based on the pathogenicity capability of species. Johnson and Jensen (1986) believed that, the principal pathogenicity effects are from the feeding action of parasites.

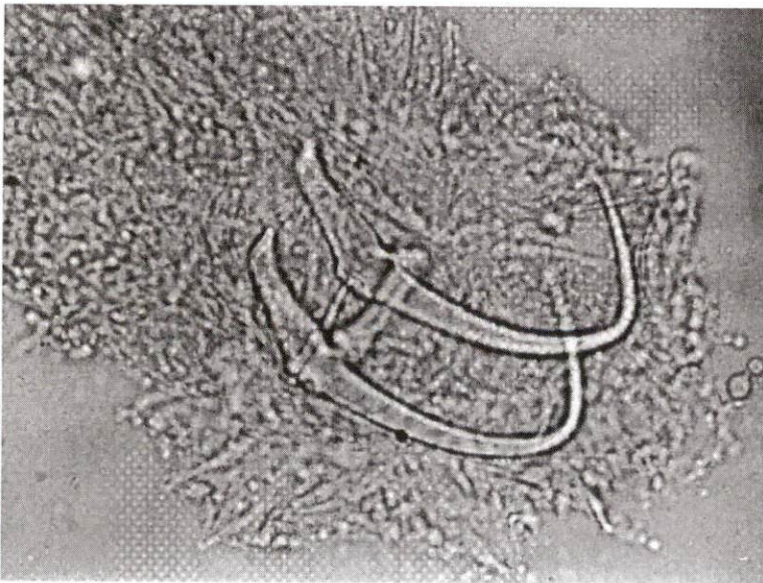


Figure 2: *Gyrodactylus sprostonae* on the gills of common carp
Opisthaptor, side view X1000

At last, it must be taken to consideration that the great diversity of gyrodactylus species is displayed in the large range of fish hosts, the shape of attachment apparatus and marginal hooks (Malmberg, 1970). But it has been demonstrated that these hand parts of opisthaptor show a high degree of variation in size and shape that depend on water temperature, age of parasites, species of host fish, geographical distribution on their mironment on hosts (Mateyusona *et al.*, 2001). In our observation, gyrodactglus species infesting Iranian fishes show much morphometric similarity, thus molecular techniques to precise diagnose parasite species is strongly recommended..



Figure 3: *Gyrodactylus derjavini* on the skin of rainbow trout
Opisthaptor, ventral view X1000

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