

DIPLOZOON HOMOIN (DISCOCOTYLIDAE, MONOGENOIDEA), A NEW PARASITE IN POND-REARED HYPOPHTHALMICHTHYS MOLITRIX

Z. LUCKÝ

Department of Diseases of Poultry, Fish, Game and Bee, University of Veterinary Science,
612 42 Brno

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Abstract

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Examination of health status of silver carp (*Hypophthalmichthys molitrix*) fry from the State Fishery, Pohořelice, revealed repeatedly infestation with the monogenean trematode of the genus *Diplozoon*.

Examination of 2-month-old fry, collected on August 10, 1976, revealed a 20 % extensity of 1 adult worm or larva. Examination performed one month later (September 6, 1976), however, showed an extensity of 70 % and intensity of 2.5 worms. The maximum invasion intensity found was 7 parasites.

The study presents the species determination of the material gathered from the gills of the invaded fish fry. The metrical characteristics of the trematode are as follows: total length 2.6–3.1 mm, length of the anterior part of the body 1.7 to 2.08 mm, the posterior part was 0.78–1.4 mm long. The ratio of the anterior and posterior parts was 2–2.17: 1. The clamps were 0.099–0.156 mm wide. The handle of the additional hooklets was 0.041–0.047 mm long, the hooklet proper was 0.018 to 0.022 mm long, the spike was 0.006 mm long. All specimens belong to the species *Diplozoon homoin* which is a frequent parasite of several cyprinid fish species (*Rutilus rutilus*, *Carassius carassius*, *Leuciscus cephalus*, *Alburnus alburnus*).

Hypophthalmichthys molitrix is a new host of the monogenean trematode *Diplozoon homoin*. The above-mentioned cyprinid fish present in ponds and supplying water sources should be regarded as reservoirs of the parasite.

Gills, parasite, morphology, reservoir fish.

Regular examination of health status of herbivorous fish reared in the fish culture unit (State Fishery, Pohořelice), performed in 1976, repeatedly revealed mild to heavier infestation of the silver carp fry with the monogenean trematodes of the genus *Diplozoon*.

Materials and Methods

The examinations were conducted on silver carp fry from the pond "Mírový" of the State Fishery, Pohořelice, after artificial spawning made between June 10 and 20, 1976. The fry was transferred into the nursery pond to be grown in monoculture. Prior to stocking, the bottom of the pond was disinfected. The nursery pond was supplied with water from the river Jihlava. There were no barriers or prefiltering so that uncontrolled various fish species were living in the system.

The first silver carp fry were fished for parasitological examination on August 10, 1976, the second sampling was done on September 6, 1976 before transfer of the fish into storage ponds.

From both fishings, 30 fry were examined for freedom from parasites by means of the complete parasitological dissection. All gill arches were examined thoroughly, the monogenean trematodes of the genus *Diplozoon* were collected, spread on the glass in one drop of water, gently pressed by the cover slide, fixed in glycerine-alcohol, transferred into clean glycerine. The cover slide was

then framed by varnish. The metrical data presented in this work were collected from the fixed parasites.

The infestation was evaluated in terms of extensity (i. e. percentage of silver carp infested) and intensity (parasite number in individual infested silver carp).

Results and Discussion

The first collection of silver carp comprised fry about 2-month-old and 36 to 54 mm long (mean 49 mm). Monogenean trematodes of the genus *Diplozoon* were found in 6 specimens (20 % extensity). Two fish were parasitized by one mature specimen and in 4 fish the larval stages (diporpa) were found.

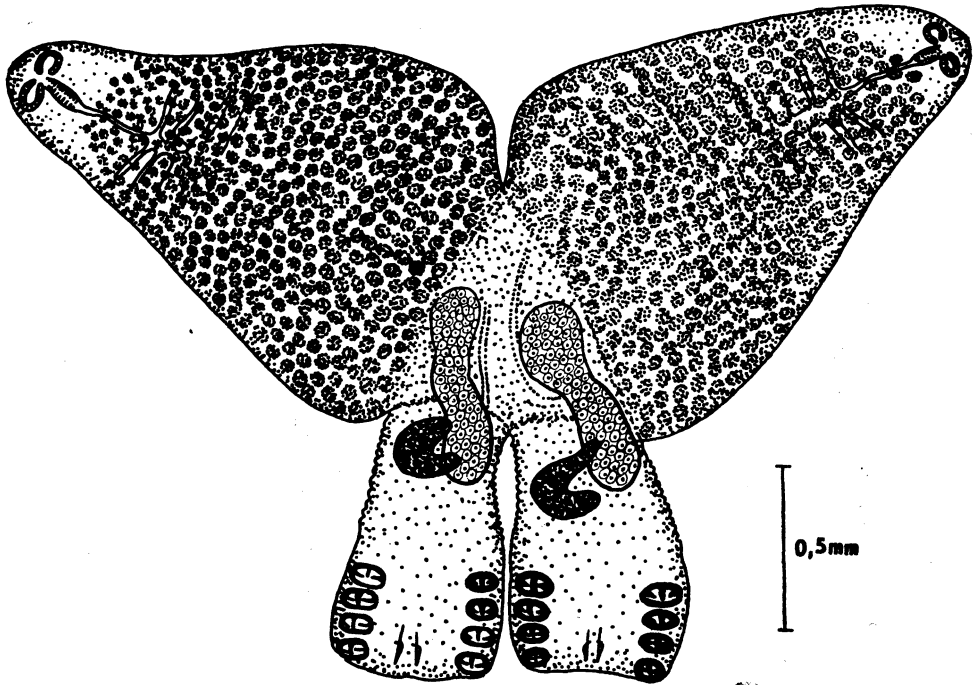


Fig. 1. *Diplozoon homoin* from the gills of the silver carp (adult individuals grown together)

The second fishing (about one month later) revealed almost completely impaired growth of the fry caused by advanced diplostomosis of the eye lens and kryptobiosis of the gills. The fish were 3 months old and only 39–53 mm long (mean 45 mm). The trematodes of the genus *Diplozoon* were found in 21 specimens (extensity 70 %). Sexually mature parasites were collected from 18 fish (extensity 60 %), larvae were found in 9 fish (extensity 30 %). Five fish were parasitized by both larval and adult trematodes. Maximum intensity with 2 larval and 5 adult flukes was found in one 40 mm long silver carp. In fry with higher invasion intensity invariably one trematode was found on one gill arch, only in one case 2 parasites on one gill arch were detected. The remaining gill arches were free from parasites of this genus.

Further examinations of the silver carp fry were made from 1976 to 1979 in several localities of the area and revealed no more parasites of this genus.

Results of the parasitological examinations made in 1976 are given in Table 1.

Table 1

Date	Number of fish examined	Size of the fish in mm		Trematodes of the genus <i>Diplozoon</i>		
		range	average	Extensity %	Intensity range average	
August 10, 1976	30	36-54	49	20	1-1	1
September 6, 1976	30	39-53	45	70	1-7	2.5

Species determination of the collected parasites was done according to the criteria presently used for the genus *Diplozoon* (Pejčoch 1968).

The body of the adult trematode was 2.6-3.1 mm long, with maximum width of 0.65-1.3 mm, width of the haptor was 0.5 to 0.6 mm. The anterior part of the body was 1.7-2.08 mm long and 0.65-1.3 mm wide. The posterior part was 0.78-1.4 mm long and 0.39 to 0.7 mm wide. The ratio between the anterior and posterior parts of the body was 2-2.17 : 1. Dimensions of the oral suckers were 0.049×0.059 -0.66 mm, those of the oval pharynx 0.046 - 0.049×0.066 -0.067 mm. The intestine had numerous branches sent off in its course and they were extremely deep. The caudal end of the intestine was not very clear in our fixed specimens. The reproductive tract was placed in the caudal part of the body which was folded just behind the junction. There were usually 11 to 12 folds.

The haptor was equipped with metamorphosed clamps of usual shape. The first pair of clamps was 0.099 to 0.115 mm wide the second pair was 0.117-0.140 mm wide, the third reached 0.125-0.148 mm, and the fourth pair was 0.125-0.156 mm wide.

The handles of the hooklets situated between the clamps was 0.041-0.047 mm long, the hooklets proper were 0.018-0.022 mm long, and the spikes were 0.006 mm long.

We give no description of the sexually mature individual, its dimensions are presented in Table 2.

Review of to date found species of the genus *Diplozoon* Nordmann, 1932, published by Pejčoch (1974) indicates that on the gills of the silver carp the species *Diplozoon inustiatum* Nagibina 1965, and *Diplozoon marinae* Achmerov, 1974 were described.

The species *Diplozoon inustiatum* described by Nagibina (1965) is characterized by a large and prominent

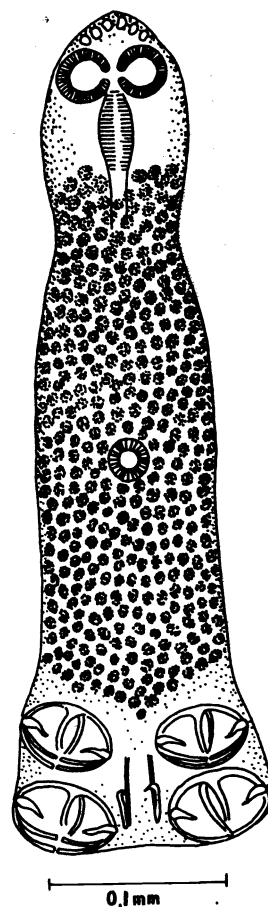


Fig. 2. *Diplozoon homin* from the gills of silver carp (larva - diporpa)

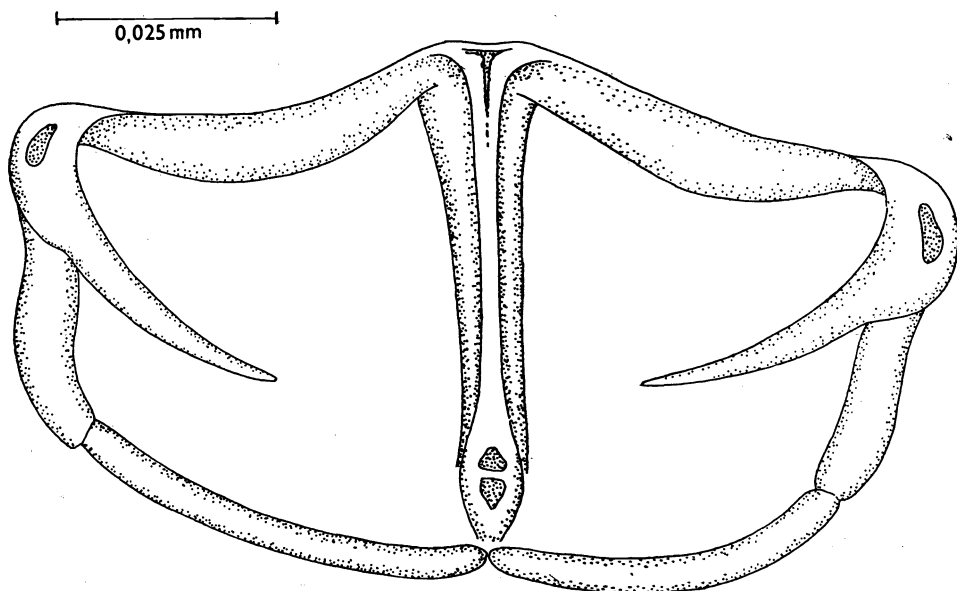


Fig. 3. *Diplozoon homoin* — the shape of the metamorphosed sucker of the first pair

“disc”, 1.3–2.1 mm in diameter. The size of the parasite and the handle of the hooklets (0.058–0.060 mm) surpass several times that of our specimens.

The species *Diplozoon marinae* is described in detail by Achmerov (1974) and our specimens do not differ from this description except for the length of the handle of the hooklets which was invariably longer in our material. Maximum length of the handle described by Achmerov (1974) reached only the sizes found in the smallest individuals of our collection. However, the hooklet proper was found to be twice as long as that described by the above-mentioned author.

Although according to Ergens and Lom (1970) the majority of determination criteria employed for identification of species of the genus *Diplozoon* have to date no verified taxonomic value, we cannot include our specimens into the species *Diplozoon marinae*.

Several species of the genus *Diplozoon* have been found in fish from the river Danube (Pejčoch 1968). Among these, the species *D. homoin* seems to be the closest to our specimens in terms of dimensions. This conclusion is also supported by data of By-

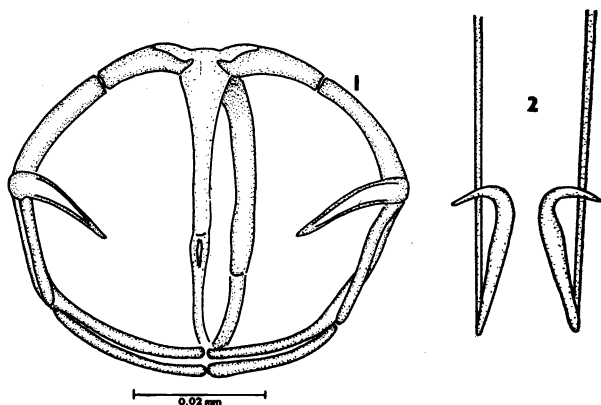


Fig. 4. *Diplozoon homoin*: 1 — metamorphosed sucker of the diporpa, 2 — hooklets

Table 2
Metrical data of Diplozoon homoin

Size in mm Host	Own material		ACHMEROV, 1974		NAGIBINA, 1965		PEJČOCH, 1968		BYCHOWSKI a kol 1962	
	Adult parasite	Diporpa	D. marinae	D. inustiatius	D. homoin	D. homoin	D. homoin	D. homoin	D. homoin	D. homoin
	Hypophthalmichthys molitrix		H. molitrix	H. molitrix	Rutilus rutilus	Rutilus rutilus	Rutilus rutilus	Rutilus rutilus	Rutilus rutilus	
Body length	2.6 - 3.1	0.48	2.38 - 2.95	6.5 - 10.5	2.2 - 4.3	3.0 - 5.3				
Body width	0.65 - 1.3	0.1	—	2.0 - 2.3	—	0.7 - 1.4				
Width of the haptor	0.5 - 0.5	0.126	—	—	—	—				
Anterior part of the body length	1.7 - 2.08	0.3	1.34 - 2.0	—	1.2 - 3.3	—				
Anterior part of the body width	0.65 - 1.3	—	0.6 - 0.85	—	0.3 - 1.1	—				
Posterior part of the body length	0.78 - 1.04	0.24	0.72 - 0.95	—	0.8 - 1.8	—				
Posterior part of the body width	0.39 - 0.7	—	0.22 - 0.28	—	—	—				
Ratio of the anterior and posterior parts	2 - 2.17 : 1	1.25 : 1	1.8 - 2.1 1 : 1	2 - 2.5 : 1	1.2 - 2.2 : 1	2 - 2.5 : 1				
Abdominal sucker	—	0.22	—	—	—	—				
Oral sucker	0.049 × 0.059 - 0.066	0.03 - 0.032	0.06 - 0.065	0.07 - 0.08	0.039 - 0.088 ×	0.06 - 0.09				
Pharynx	0.046 - 0.049 ×	0.039 - 0.024	0.05 - 0.055 ×	0.07 - 0.09	0.036 - 0.078 ×	0.07 - 0.08				
No. of folds	0.066 - 0.067	—	0.05 - 0.052	—	0.049 - 0.081 ×	0.07 - 0.08				
Hooklets length of the handle	12	—	—	—	0.039 - 0.065	—				
Hooklets length of the length of hooklet	0.041 - 0.047	0.040 - 0.042	0.036 - 0.040	0.058 - 0.060	—	0.042				
Hooklets length of the spike	0.018 - 0.022	0.022 - 0.025	0.008 - 0.010	0.030 - 0.033	0.040 - 0.052	0.017				
Width of the clamps	0.006	0.006	0.004 - 0.005	—	0.019 - 0.023	—				
I.	0.099 - 0.115	0.060	0.128 - 0.156	0.07 - 0.08	0.088 - 0.146	0.120 - 0.140				
II.	0.117 - 0.140	0.054	0.132 - 0.160	0.09 - 0.11	0.101 - 0.179	0.150 - 0.200				
III.	0.125 - 0.148	—	0.130 - 0.167	0.09 - 0.11	0.117 - 0.192	—				
IV.	0.125 - 0.156	—	0.114 - 0.170	0.09 - 0.11	0.130 - 0.201	—				

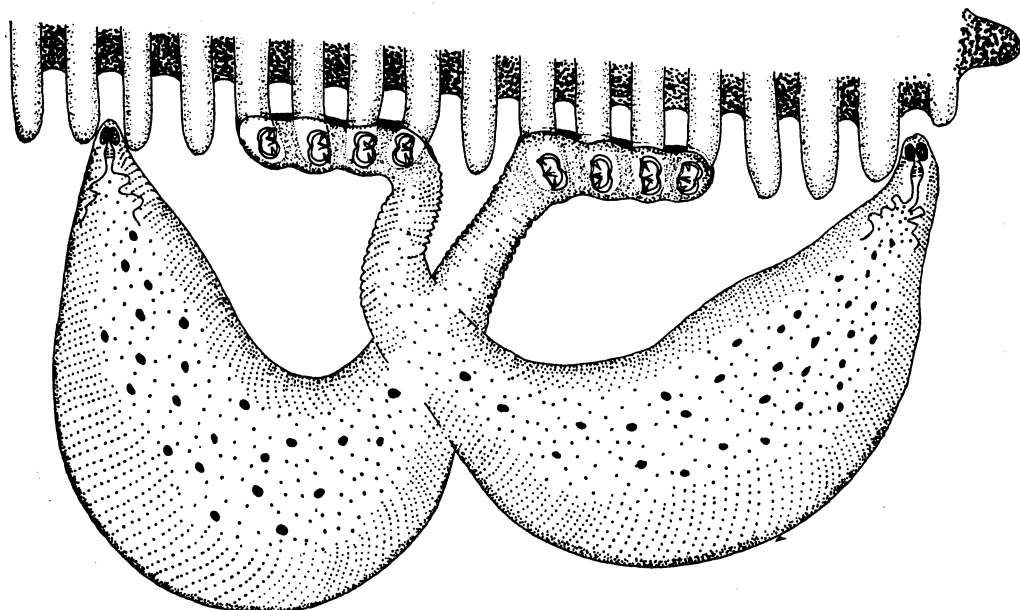


Fig. 5. The mode of fixation of the monogenean trematode *Diplozoon homoin* on the gill filament drawn according to real situation in situ

chowski et al. (1962), who found sizes of the handles of hooklets similar to those found in our specimens.

On the basis of our findings and data of other authors it seems correct to classify the investigated specimens as *Diplozoon homoin*.

Moreover, our study indicates that a detailed zoological elaboration of parasites found in acclimatized herbivorous fish is of great importance in that it may prevent incorrect conclusions concerning transmission of parasites from the basin of the river Amur or some other areas with fish importation.

The study has further shown that the monogenean trematode *Diplozoon homoin* parasitizing in *Rutilus rutilus*, *Carassius carassius*, *Leuciscus cephalus* and *Alburnus alburnus* has been repeatedly found also in fish from the river basin of South Moravia. However, the definitive host of the parasite is the silver carp. Only in this fish species the sexual maturation of the trematode occurs. The above-mentioned hosts of the trematode are frequent weed fish species also under fish farming conditions and they should be considered as reservoirs of the trematode for the silver carp. This herbivorous fish belongs to economically important species to which intensive veterinary care is given.

***Diplozoon homoin* (Discocotylidae, Monogenoidea), nový cizopasník *Hypophthalmichthys molitrix* při rybníčním odchovu**

Při sledování zdravotního stavu plůdku tolstolobika bílého (*Hypophthalmichthys molitrix*) v rybníčních soustavách Státního rybářství — Pohořelice (povodí řeky Jihlavy) byly opakovaně na zábrách ryb zjišťovány monogenetické motolice z rodu *Diplozoon*, ve slabých až středních invazích.

Ze sledovaných lokalit bylo vyšetřeno vždy 30 kusů ryb. Vyšetřování bylo provedeno parazitologickou pitvou ryb a zjištěné invaze byly vyjádřeny absolutním počtem cizopasníků.

U vzorků odebraných 10. VIII. 1976, asi dva měsíce po narození ryb, byla zjištěna extenzita výskytu 20 %, při intenzitě 1 dospělý červ nebo larva u jedné ryby, u vzorku odebraného 6. IX. 1976 stoupla extenzita invazí na 70 %, při průměrné intenzitě 2,5 červa. Maximální intenzita byla 7 červů.

Studie se zabývá druhovou determinací dokladového materiálu s použitím současně platných kritérií pro druhové rozlišování příslušníků tohoto rodu.

Červi byli 2,6—3,1 mm velcí, délka přední části měřila 1,7—2,08 mm, zadní části 0,78—1,4 mm. Poměr přední k zadní části těla byl 2—2,17:1. Šířka metamorfovaných přísavek měřila 0,099—0,156 mm. Rukojeť středních háčků je dlouhá 0,041—0,047 mm, vlastní háček měří 0,018—0,022 mm, délka hrotu 0,006 mm. Po podrobném prostudování speciální literatury bylo zjištěno, že všechny dokladové exempláře patřily druhu *Diplozoon homoin*, který je častým cizopasníkem některých druhů kaprovitých ryb (*Rutilus rutilus*, *Carassius carassius*, *Leuciscus cephalus*, *Alburnus alburnus*).

Rybí druh *Hypophthalmichthys molitrix* je novým hostitelem monogenetické motolice *Diplozoon homoin* a uvedené kaprovité druhy ryb, pokládáné v rybníčních soustavách za plevelné, je třeba považovat za rezervoáry tohoto druhu cizopasníka pro chovný druh — tolstolobik bílý, který je intenzivně odchováván ve sledovaném rybářském závodě.

Diplozoon homoin (Discocotylidae, Monogenoidea) новый паразит в рыбоводстве *Hypophthalmichthys molitrix*

Наблюдая за состоянием здоровья мальков белого толстолобика (*Hypophthalmichthys molitrix*) в прудовом хозяйстве Государственного рыбоводства — Погоржелице (бассейн реки Йиглавы) были повторно в жабрах рыб выявлены моногенетические двуустки рода *Diplozoon*, в слабом, даже среднем нашествии.

Из числа подвергаемых исследованию мест проверялось всегда 30 штук рыб. Обследование было проведено паразитологическим вскрытием рыб и выявленное нашествие было выражено абсолютным числом паразитов.

У образцов, отобранных 10 августа 1976 г., месяца два после рождения рыб, была установлена 20 % экстенсивность наличия, при интенсивности 1 взрослый гельминт или личинка у одной рыбы. У образца, отобранного 6 сентября 1976 г. экстенсивность нашествий дошла до 70 %, при средней экстенсивности 2,5 гельминтов. Максимальная интенсивность достигала 7 гельминтов.

Работа занимается видовым определением исследуемого материала с одновременным использованием действительных критериев для видового различения индивидов данного рода.

Гельминты достигали 2,6—3,1 мм величины, длина их передней части составляла 1,7—2,08 мм, задней части — 0,78—1,4 мм. Диаметр передней и задней частей тела достигал 2—2,17:1. Ширина метаморфированных присосок достигала 0,099—0,156 мм. Черешок средних зацепок достигает длины 0,041—0,047 мм, собственная зацепка — 0,018—0,022 мм, длина кончика — 0,006 мм. После тщательного изучения специальной литературы было уста-

новлено, что все исследуемые экземпляры принадлежали виду *Diplozoon homoin*, который является частым паразитом карповых рыб (*Rutilus rutilus*, *Carassius carassius*, *Leuciscus cephalus*, *Alburnus alburnus*).

Вид *Hypophthalmichthys molitrix* является новым хозяином моногенетической двуустки *Diplozoon homoin* и приведенные карповые виды рыб, считаемые в системах прудов сорными рыбами, необходимо считать резервуарами данного вида паразита для племенных видов — белый толстолобик, который интенсивно разводится в наблюдаемом рыбопитомнике.

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