Sind Univ. Res. Jour. (Sci. Ser.) Vol: 37(1) 25-36 (2005)

Studies on Helminth (Trematoda: Monogenea) Parasites of Nursery Juvenile Carp Fish of Mymensingh, Bangladesh

A. K. Barai and K. J. Chandra

Department of Aquaculture, Bangladesh Agricultural University, Mymensingh, Bangladesh.

Abstract

A study was made to investigate the monogenetic trematodes of common culture juvenile carp species of Mymensingh region from November, 2002 to February, 2004. The common culture species are four Indian major carps-*Labeo rohita*, Cirrhinus mrigala, *Catla catla*, *Labeo gonia* and five exotic carps-*Hypophthalmichthys molitrix*, *Cyprinus carpio*, *Ctenopharyngodon idella*, *Aristichthys nobilis*, *Barbodes gonionotus*. Five government farms Maskanda Fish Seed Multiplication farm, Trishal Fish seed Center, Shambhugonj Fish Seed Production and Training Center, Gouripur Fish Production Farm and Fulpur Nursery Farm and five private farms of Boira, Trishal, Churkhni, Gouripur and Fulpur were selected for this purpose. Althogether 618 fish were examined of which 402 were found to be infected with ten species of monogenetic trematodes viz-*Dactylogyrus labei*, *D. catlaius*, *D. yogendrai*, *D. chauhanus*, *D. laniellatus*, *D. hypophthalmichthys*, *D. lampam*, *Dactylogyrus fulpuri*. sp. nov. *Gyrodactylus* sp. 1 and *Gyrodactylus* sp. II. Eight species of these parasites were found in Indian major carps and six species were recorded from exotic carps. Among these, seven species were previously reported from adult hosts. One new species and five other are new species are newly reported for the first time from juvenile fishes in Bangladesh. The indigenous carp species are more infested with monogeneans in juvenile stage.

Keywords: Monogenean parasites, juvenile fish nursery ponds, Bangladesh.

Introduction

With the increasing aquaculture development in Bangladesh numerous nurseries have been established throughout the country. Interests have also grown among poor fish farmers as commercial enterprises. The trend actually originated with establishment of Fish Seed multiplication Farms by the GoB in different parts of the country. Previously nursery owners used to collect spawn from the natural waters,like the rivers Jamuna, Brahmaputra and Halda. Due to destruction of such natural spawning grounds due to siltation of the riverbeds, mixed spawn of different unidentified species, the farmers were attracted to collect spawn produced by induced spawning.

Though the number of nurseries is increasing, day by day the standard of management and rearing of the nursery seeds have not yet developed. So sudden mortalities of seeds occur and the nursery owners face economic losses. They visit the faculty of Fisheries asking for the remedies. Several factors may be associated with such mortalities like, unfavourable water quality, parasites play an important role causing diseases at this stage.

There is little information on the parasitic infestations of the fish seeds in nurseries in Bangladesh. Only few preliminary investigations are available on nursery carps. Mixosporean and microsporean protozoan infestation along with unidentified dactylogyrid monogeneans have been reported earlier (Hossain *et al.*, 1994; Chandra *et al.*, 1996; Nahar, 1997; Ahmed *et al.*, 1998 and Bari, 2004).

A detailed investigation was attempted as a part of research project on parasites and diseases of juvenile farm fishes

funded by the Ministry of Science Information and Communication Technology, Government of Bangladesh.

Materials and Methods

A number of nursery ponds and farms were selected including private and public sector from different Upazilla (Tehsils) of the Mymensingh area. The Government Farms are Maskanda Fish Seed Multiplication Farm, Trishal Fish Seed Center, Shambhugonj Fish Seed Production and Training Centre, Gouripur Fish Seed Production Farm and Fulpur Nursery Farm. The private nursery ponds and Farms are of Boira, Trishal, Churkhai, Gouripur and Fulpur. The investigations were started in November, 2002 and continued till February, 2004 with frequent visits to each farm. Juveniles are available throughout the year.

Carp species (rohu) *Labeo rohita*, (mrigal) *Cirrhinus mrigala*, (catla) *Catla catla*, (gonia) *Labeo gonia*, (silver carp) *Hypophthalmichthys molitrix*, (common carp) *Cyprinus carpio*, (grass carp) *Ctenopharynogodon idella*, (bighead carp) *Aristichthys nobillis* and (sharputi) *Barbodes gonionotus*, were sampled regularly by visiting the nursery areas. Live fishes were caught by cast net or seine nets. Most of specimens were examined on spot for external parasites with the help of a field binocular microscope. Other specimens were brought to the laboratory in live condition for further examination.

The gills were dissected from the host and placed into petri dish containing clean water. The flukes were gently rubbed to dislodge from the gill filaments using a bent needle. The monogeneans were then picked up using a micropipette to a small drop of water transferred on a clean slide under a dissecting microscope (Olympus) and covered with a cover slip. After few minutes the parasites were fixed on slide with ammonium picrate. Figures were drawn with the aid of a camera lucida. Measurements of the parasites were done by occulo-micrometer which was adjusted with stage micrometer and the microscope (w10x –18.5 mm). For the identification and classification Yamaguti (1963) and Gussev (1976) were followed.

Results

A total of 618 juvenile carp fishes of which 321 Indigenous carps *Labeo rohita, Cirrhinus mrigala, Catla catla, Labeo gonia*, and 297 exotic carps *Hypophtalmichthys molitrix,Cyprimus carpio, Ctenopharyngodon idella, Aristicgthys nobilis, Barbodes gontonotus* were examined during the study period. A list of the parasites and their hosts is shown in Table: 1.

Table 1: List of parasites and their hosts

Parasite	Host
Dactylogyrus labei	*Labeo rohita, Labeo gonia*
Dactylogyrus minutus	*Labeo rohita, ,Cyprimus carpio*
Dactylogyrus catlaius	*Catla catla*
Dactylogyrus mrigali	*Cirrhinus mrigala*
Dactylogyrus yogendrai	*Labeo rohita , Cirrhinus mrigala*
Dactylogyrus chauhanus	*Cirrhinus mrigala,*
Dactylogyrus lamellatus	*Ctenopharyngodon idella*
Dactylogyrus hypophtalmichthys	*Hypophtalmichthys molitrix, Aristichthys nobilis*
Dactylogyrus lampam	*Barbodes gonionotus*
Dactylogyrus fulpuri n.sp.	*Cirrhinus mrigala,*
Gyrodactylus sp. I	*Cyprimus carpio, Barbodes gonionotus*
Gyrodactylus sp. II	*Labeo rohita, Cyprinus carpio, Barbodesgonionotus*

All monogeneans were present on the gills except *Gyrodactylus* sp.II which was recovered from both the skin and gill. Among the investigated host it is also found that indigenous carps are more infested than exotic fishes, on the other hand *Barbodes gonionotus* is infested with more number of parasites Table 2.

Table 2: List of hosts examined and their infestation with monogenetic trematodes.

S. No	Host Species	No of host fish		Prevalence (%)	Mean intensity
		Examined	Infected		
1	*Labeo rohita*	102	85	83.33	5.06 ±0.25
2	*Cirrhinus mrigala*	91	82	90.11	7.02±0.22
3	*Catla catla*	73	52	71.23	4.29±0.21
4	*Labeo gonia*	55	33	60.00	3.45±0.26
	Total (indigenous)	**321**	**252**	**78.50**	**5.33±0.23**
5	*Hypophthalmichthys molitrix*	87	32	36.78	2.22±0.19
6	*Cyprinus carpio*	56	30	53.57	3.53±0.20
7	*Ctenopharyngodon idella*	48	25	52.08	3.12±0.23
8	*Aristichthys nobilis*	24	9	37.50	2.78±0.22
9	*Barbodes gonionotus*	82	54	65.85	4.39±0.22
	Total (exotic)	**297**	**150**	**51.50**	**3.45±0.21**

Brief description of the parasites

***Dectylogyrus labei* Gussev and Musseltus, 1976**

Host: *Labeo rohita, Labeo gonia*

Locality: Maskanda (Govt.), Shambhugonj (Govt.), Biora (private), Trishal (private) and Gouripur (private) farm.

No. of specimen measured: 13

Remarks

Dactylogyrus labei was first described by Gussev and Musselius (1976) from *Labeo rohita, L gonia and L. calbasu* from the Kalyani fish farm, West Bengal, India. In Bangladesh *D.labei* was reported by Jannat (2002) from *Labeo rohita, L. gonius* and *Catla catla*. The present investigation indicates that the infestation of this worm originated in the juvenile stage of *L. rohita* and *L. gonius* at nursery level.

***Dactylogyrus minutus* Kulwiec, 1927**

Host: *Cyprinus carpio, Labeo rohita*

Locality: Maskanda (Govt.), Trishal (Govt.), Biora (private), Trishal (private) and Fulpur (private) farm.

No. of specimen measured: 8

Remarks

Dactylogyrus minutus was described by Kulwiec (1927) Ky and Te (1999) also reported it form Cuu Long river delta of Vietnam in *Cyprinus carpio, Syualiobarbus curricullus*. Das (2003) reported this species from *Cyprinus carpio* in Bangladesh for the first time. Now this is the first report of *D. minutus* from a new host *Labeo rohita* in Bangladesh. This indicated that exotic parasites are adapting to indigenous host species.

***Dactylogyrus mrigali* Gussev 1976**

Host: *Cirrhinus mrigala*

Locality: Maskanda (Govt.), Fulpur (Govt.), Buira (private), Trishal (private) and Fulpur (private) farm.

No. of specimen measured: 7

Remarks

Dactylogyrus mrigali was first reported by Gussev, (1976) from *Cirrhinus mrigala* from the water bodies near Lucknow and from a hybrid *C. mrigala* x *Labeo rohita* in Bhavanisagar water reservoir in India. In Bangladesh it was first reported by Nahar, 1997) from *C. mrigalus* from Jhalak Matsya Khamar. However, the present specimens are slightly smaller than the Indian specimens. It is also interesting to report this from juvenile nursery carps.

***Dactylogyrus yogendrai* Gussev and Musselius, 1976**

Host: *Labeo rohita Cirrhinus mrigala*

Locality: Trishal (Govt.), and Fulpur (Govt.), and Gouripur (private) farm.

No. of specimen measured: 9

Remarks

Dactylogyrus yogendrai was first reported by Gussev and Musselius (1976) from gill filaments of *Cirrhinus mrigalus* from the water bodies near Lucknow. Jannat (2002) first reported it from Bangladesh in the host *C. mrigalus*. It has minute variation in the size (slightly longer than Indian specimens) and measurements of chitinoid elements of haptor.

***Dactylogyrus chauhanus* Gussev and Musselius, 1976**

Host: *Cirrhinus mrigala*

Locality: Trishal (Govt.), Gouripur (Govt.), Gouripur (private) and Fulpur (private) farm.

No. of specimen measured: 5

Remarks

Gussev and Musseliur (1976) first described this monogenean from the water bodies in the region of Lucknow form the host *Cirrhinus mrigalus*. Simultaneously it was described from Calcutta and Bhawanisagar reservoir, also on fish from Kalyani, West Bengal, India. In Bangladesh *D. chauhanus* was first reported by Jannat (2002) from *Cirrhinus mrigala* from Mymensingh. The present investigation indicates that this parasite begins to attack at the early stage of life cycle of this fish.

***Dactylogyrus hypophthalmichthys* Achmerov, 1952**

Host: *Hypophythalmichthys molitrix, Aristichthys nobilis*

Locality: Trishal (Govt.), Shambhugonj (Govt.), Fulpur (Govt.), and Trishal (private) farm.

No. of specimen measured: 8

Remarks

Dactylogyrus hypophthalmichthys was for the first time described by Achmerov (1952) from gills of Chinese silver carp. Ky and Te (1999) also reported from Cuu Long river delta of Vietnam in *H.harmandi*. Das (2003) reported this species first in Bangladesh in the *H. molitrix*. *Radulescu et al.* (1971) mentioned this parasite as host specific. But the present study indicates the infestation of this species in *H. molitrix* and also from a new host *Aristichthye nobilis*.

***Dactylogyrus lampam* Lim and Furtado 1986**

Host: *Barbodes gonionotus*

Locality: Trishal (Govt.), Gouripur (Govt.), Biora (private) and Trishal (private) farm.

No. of specimen measured:10
Remarks

The present specimen agrees and coincide with the description f the *Dactylogyrus lampam* (Lim and Furtado, 1986) in the type of anchors, marginal hooks, copulatory tube and also in the measurements except the body size.

***Dactylogyrus catlaius* Thapar, 1948 (Fig.1)**

Host: *Catla Catla*

Locality: Maskanda (Govt.), Boira (pivate) and Churkhai (private) farm.

No. of specimen measured: 14

Remarks

Dactylogyrus catlaius was described by Thapar (1948) from *Catla catla* from Lucknow, India. Jain (1959) also reported it from *Catla catla* Gussev (1976) from *Labeo gonius* and *L. calbasu*. Gussev (1976) stated that the point of the anchors was not close to the inner root, but the present specimen shows that anchors may be relaxed, close to or touching the inner root. He further added that the dorsal bar was straight but in the present specimen dorsal bar was found to be straight, slightly curved or even V-shaped. Actually position of extension of curved point are observed in the present specimen. This is a unique chacacteristics which has not been observed previously. Some distinguishing measurements found in these forms are presented in the Table: 3.

Table 3: Comparison of *Dactylogyrus catlaius* measurements with Indian a Bangladeshi specimens.

Morphological structure	*D. catlaius* of India (mm)	*D. catlaius* of Bangladesh(mm)
Body length	< 0.90	0.847-1.204
Body width	<0.20	0.149-0.208
Anchor length	0.031-0. 035	0.038-0.043
Main part	0.025-0.027	0.029-0.033
Inner root	0.009-0.010	0.009-0.014
Outer root	0.003-0.005	0.003-0.006
Point		0.022-0.032
Dorsal bar length	0.007-0.008	0.007-0.009
Dorsal bar width	0.042-0.044	0.053-0.66
Ventral bar length	0.021-0.039	0.025-0.044
Ventral bar width	0.003-0.004	0.003-0.005
Hooks	0.015-0.029	0.022-0.035
Length measured over the curve of copulatory tube	0.110-0.130	0.120-0.130
Diameter of the initial part	0.015-0.018	0.016-0.025
Length of the copulatory complex	0.085-0.120	0.104-0.126

***Dactylogyrus lamellatus* Achmerov, 1952 (Fig.2)**

Host: *Ctenopharyngodon idella*

Locality: Goupur (Govt.), Fulpur (Govt.) and Gouripur (private) farm

No. of specimen measured: 8

Remarks

Achmerov (1952) originally described *Dactylogyrus lamellatus*. Later it was reported by Ky and Te (1999) from gill filaments of *Ctenopharyngodon idellus* from Vietnam and Cambodia. Its morphology coincides with *D. lamellatus* reported from Vietnam (Ky and Te, 1999) and is slightly longer than the specimens of Vietnam. It has also minute variation in the chitinoid elements of haptor.

***Dactylogyrus fulpuri* n. sp. (Fig.3)**

Host: *Cirrhinus mrigala*

Locality: Fulpur (Govt.) and Fulpur (private) farm.

No. of specimen measured: 5

Description

Large size worms, cylindrical in shape length 1.56-1.72 mm, width 0.38-00.40 mm. Size of haptoral part 0.025-0.026 mm x 0.281-0.284 mm. Pharynx massive rounded 0.012-0.013 x 0.085-0.087 mm. Anchors have large inner root and small outer root, nearly half of outer root. Total length of anchor 0.073-0.075 mm, main part 0.034-0.035 mm, inner root 0.038-0.039 mm, outer root 0.019 mm and point 0.019 mm, connective dorsal bar with anterior process in middle and with extended ends. Its size 0.006-0.007 mm x 0.021-0.023 mm. Seven pairs of hooks present. One pair large and fleshy, its length 0.052-0.058 mm with point 0.004-0.005 mm. Hooks comparatively small and their length 0.025-0.032 mm with point 0.003 mm. Copulatory tube consists of tube and accessory piece. Tube is roughly S-shaped with bubble-like initial part, almost cylindrical in remaining part, with slanting cut-off ends. Its length along curve 0.011-0.012 mm, diameter of initial part about 0.013-0.014 mm, middle 0.004 mm and posterior part 0.001 mm.

Remarks

The specimen described here has very stout and robust anchors. The hooks are unique for this form. Such marginal hooks are not ordinarily found in many dactylogyrid flukes. The only form *Dactylogyrus sphyrna, Lonstow* (1878) showed some relations mainly in the stout and robust hooks on its haptoral part. But the size of the present form is larger in comparison to *D. sphyrna,* 1.400 x 0.200 mm. The connecting bar is curved upwardly with an extra piece attached to it whereas in *D. sphyrna* it is very simple and slightly thinner in the middle. Copulatory complex is spirally twisted with more than two turns. significantly differs from the present form. It also differs in the shape of the hook and in having filament which are absent in *D. sphyrna.* In all aspects the present form is unique and differs from other known specimens of the genus *Dactylogyrus.* On the basis of its morphology particularly the hooks and anchors on the haptor, it warrants to erect it as a new species and the name *Dactylogyrus fulpuri* is proposed from name of the place the specimens were collected.

***Gyrodactylus* sp. 1 (Fig.4 -A)**

Host: *Cyprinus carpio, Barbodes gonionotus*

Locality: Trishal (Govt.), Shambhgonj (Govt.), Gouripur (Govt.) and Fulpur (Govt.) farm.

Site of Infection: Gill filaments and skin

No. of specimen measured: 12

Body short and cylindrical Length of the body 0.360-0.132mm and width 0.135-0.148mm, anterior end notched with three pair of head organs. Haptor oval with one pair of long anchors and two pair of horizontal bars and 16 long marginal hooklets. Length of the anchor 0.041-0.050mm, main part 0.028-0.035 mm, inner root 0.015-0.017 mm, outer root 0.002-0.003 mm. Anchor points nearly half of anchor length. Length of the point recurved 0.022-0.025 mm. Two bars attached with anchors, ventral bar thinner than the dorsal bar. Size of the dorsal bar 0.004 mm x 0.029-0.032 mm and size of the ventral bar 0.003 mm x 0.021-0.024

mm. Pharynx spheroidal slightly pointed at anterior end. Intestinal crura simple extending posteriorly down to haptor. Testis post-ovarian. Testis and ovary both spherical. One embryo which may further have "daughter" and "grand daughter" embryos in it.

***Gyrodactylus* sp. II (Fig. 4 -B)**

Host: *Labeo rohita, Cyprinus carpio, Barbodes gonionotus*

Locality: Fulpur (Govt.), Trishal (private) and Gouripur (private)

Site of Infection: Gill filments

No. of specimen measurement: 11
Body short and cylindrical. Anterior end noticed with three pairs of head organs. Small or medium size fluke with length of 0.392-0.0404 mm and width 0.130-0.154 mm. Pharynx slightly pointed at anterior end. Esophagus particularly absent. Intestinal crura simple and extending down to haptor. Opisthohaptor more or less oval, the end of opisthoptior forked. One pair of dorsal anchors with well developed inner root. Length of anchor 0.42-0.051 mm, length of main part 0.030-0.034 mm, inner root 0.016-0.017 mm, outer root 0.002mm, recurve point 0.015-0.017 mm. Bar short measuring 0.004 x 0.026-0.028 mm. Size of the marginal hook 0.004-0.005 mm. Testis post ovarian. Testis and ovary both spherical, one embryo, with daughter in it.

Discussion

Gyrodactylus is popularly known as skin fluke. There are some reports to infect the fins and opercula. Tripathi (1957) recorded three specimens of *Gyrodactylus* from the fins of a rohu in the fish farms of Lucknow. In Bangladesh, Mohanta and Chandra (2000) reported *Gyrodactylus* sp. from *Barbodes goniontus*. The present specimens were recovered from the gills of *Barbodes gonionotus, Cyprinus carpio* and *Labeo rohita.* The relevant paper lacks the identification of the specimen. So that it could not be identified up to species level.

Among 10 *Dactylogyrus* species seven species; *Dactylogyrus labei, D. minutus, D. mrigali, D. yogendrai, D. chauhanus, D. hypophthalmichthuys, D. lampam* were previously reported from Bangladesh from adult fishes. *D. catlaius, Dactylogyrus fulpuri* n. sp. and *D. lamellatus* have been recorded for the first time in Bangladesh. The juveniles seem to be more infested with dactylogyrid flukes. They have equal distribution both in India and Bangladesh waters.

Dactylogyrus minutus was first described by Kulwice (1927) and Ky and Te (1999) in *Cyprinus carpio* and *Squaliobarbus curricullus* of Vietnam. Bykhovskaya-Pavabvskya *et al.* (1962) and Ogawa and Egusa (1977) also reported *D. minutus* form *C. carpio.* In the present study for *D. minutus* a new host (*L. rohita*) has been recorded. It is also found on juveniles of the exotic fish. Introduction of exotic fish might be the source of exotic parasite in some local host. Their slow adaptation to our indigenous species in the new environment at the early stage of fish life, is another cause of dispersal.

Ky and Te (1999) and Salih *et al.* (1988) reported *D. hypophthalmichthys* from *Hypophthalmichthys molitrix.* Bykhovskaya - Pavlovskaya *et al.* (1962) also described *D. hypophthalmichthys* from *H. molitrix* in Iraq. Radulescu *et al.* (1971) described *D. hypophthalmichthys* as host specific. The present study indicates that the host of *D. hypoophthalmichthys* is not only the *H.molitrix* but also the *Aristichthys nobilis.* So *A. nobilis* is a new host for *D. hypoophthalmichthys.*

Lim and Furtado (1986) and Chinabut and Lim (1993) described *Dactylogyrus lampam* in *Barbodes gonionotus* from

Thailand. Mohanta and Chandra (2000) reported this species for the first time in the same host from Bangladesh. Present study further supports the idea that infestation of *D. lampam* starts from fingerling stage of *B. gonionotus*. Tripathi (1957) reported three species of *Gyrodactylus G. elegans, G. medius, G. rarus* from *L. rohita* and *Barbodes gonionotus*. The present investigation reports only one species *Gyrodactylus* sp. 1 from *B. gonionotus* and two species *Gyrodactylus* sp. 1 and *Gyrodactylus* sp. II from *Cyprimus carpio* and *Labeo rohita* from juvenile hosts. However, the intensity rate of infestation are variable in different farm management system (private and government), depending upon species of the juveniles and seasons.

In conclusion it could be stated that monogenean infestation starts at the early stage of fish life. Indigenous fish hosts are more susceptible to these parasites. There is tendency to adapting and spreading the exotic parasites to indigenous fish and vice versa. However, further work is essential on the diseases and their control measures to improve nursery management for higher survival of juvenile carps.

Acknowledgement

Financial supports provided by the Ministry of Science and Information and Communication Technology, Government of Bangladesh, through a research grant, is gratefully acknowledged.

Explanation of figures

Fig. 1. Hard parts of haptor and copulatory complex of *Dactylogyrus catlaius*

A. Entire worm
B. Copulatory complex
C. Vaginal armament
D_1 and D_2- Marginal hooklets
E_1. E_2 and E-Dorsal anchors of different specimens
F_1. F_2 and F_3- Dorsal bars of different specimens

Fig. 2. Hard parts of haptor and copulatory complex of *Dactylogyrus lamellatus*

A. Entire worm
B. Dorsal anchors
C. Dorsal bars
D. Ventral bar
E. Additional bar
F. Marginal hooklets
G. Copulatory complex
H. Vaginal armament

Fig. 3. Hard parts of haptor and copulatory complex of *Dactylogyrus fulpuri* n. sp.

A. Entire worm
B. Dorsal anchors
C. Dorsal bars
D_1. D_2 and D_3- Marginal hooklets
E. Copulatory complex

Fig. 4. *Gyrodactylus* sp. 1 and *Gyrodactylus* sp.II

A. Entire Body of *Gyrodactylus* sp. 1
B. Dorsal anchors of *Gyrodactylus* sp. 1
C. Dorsal bar of *Gyrodactylus* sp. 1
D. Entire body of *Gyrodactylus* sp. II
E. Dorsal anchor of *Gyrodactylus* sp. II
F. Dorsal bar of *Gyrodactylus* sp. II

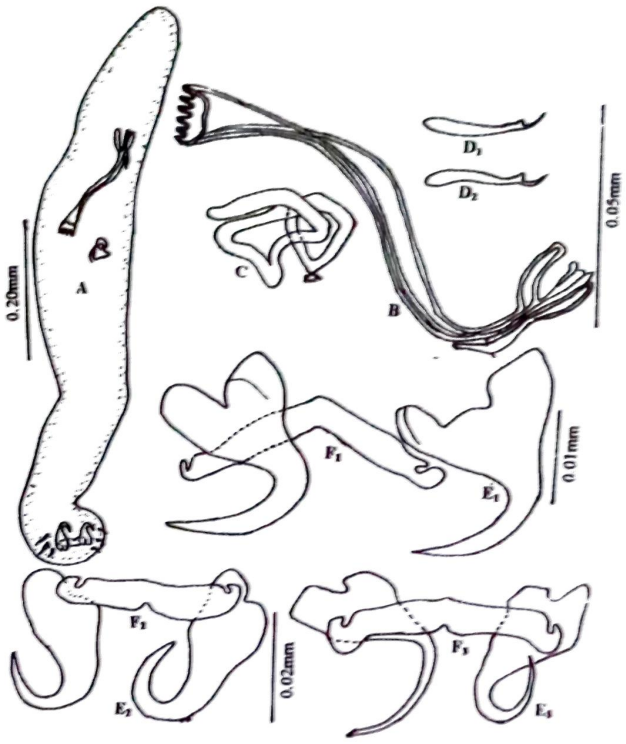
0.20mm
A
C
B
D_1
D_2
0.05mm
F_1
E_1
0.01mm
F_2
E_2
0.02mm
F_3
E_3

Fig. 1

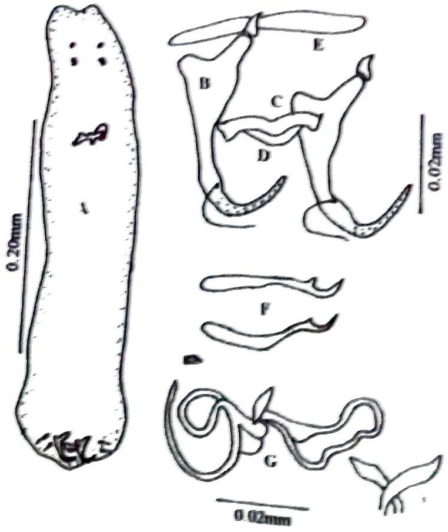
0.20mm
A
E
B
C
D
0.02mm
F
G
0.02mm

Fig. 2

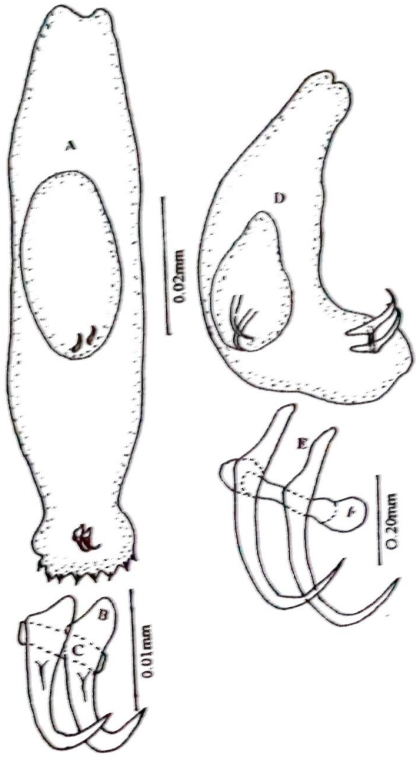

Fig. 4

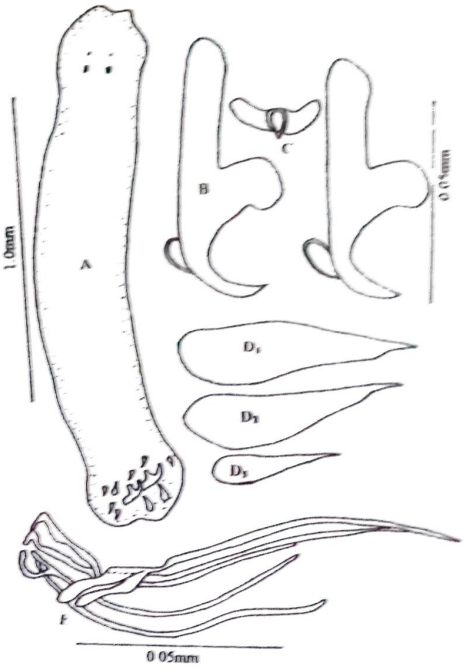

Fig. 3

References

Achmerow, A. C. (1952) New species of monogeneans for fishes of Amur-river. Parasitol. Sborn. Zoological Inst. A. N. USSR, **14:** 181-212 (Russia).

Ahmed, G.U; M. M. Haque and M. J. Haque, (1988) Gill pathology of juvenile carps in nursery pond. Bangladesh J. Fish. Res. **2:** 63-65.

Barai A. K. (2004) Management practices of carp nursery ponds and parasitic diseases problems in Mymensingh region. M. S. Thesis, Department of Aquaculture, BAU, Mymensingh, Bangladesh. 118 p.

Bykhovskaya-Pavlovskaya, I. E; A.V; Gussev; M. N. Dublinina, N. A; Izyunova, T.S; Smirnova, I. L. Sokologskaya, G. A. Shteir; S. S. Shulman and V. M. Epshtein, (1962) Key to Parasistes of Freshwater Fish of the USSR. Acad. Sci. USSR Zool. Inst. pp 239-445.

Chandra, K. J; A. A. Begum; G. U. Ahmed and R. Wootten, (1996) Infection of Myxosporean ectoparasites of juvenile carps in nurseries of Mymensingh. Bangladesh, Bangladesh J. Aquacult., **18:** 39-44.

Chinabut, S. and L. H. S., LIM, (1993) Seven new species of *Dactylogyrus*. Diesing, 1850 (Monogenea) from *Puntius* Hamilton (Cyprinidae) of Thailand. Raf. Bull. Zool., **41** (1): 47-59.

Das, A. K. (2003) Investigation into the parasitic infestations of three exotic fishes of Banglaesh. M. S. Thesis, Department of Aquaculture, BAU, Mymensingh, Banglaesh. 94pp.

Gussev, A. V. (1976) Freshwater Indian Monogenea, Principles of systematics, analysis of the world faunas and their evaluation. Ind J.Helminth., **25/26:** 1-241.

Hossain, M A; A. N. H, Banu and M. H, Khan. (1994) Prevalence of ectoparasites in carp nurseries of greater Mymensingh. Progress. Agric., **5:** 39-44.

Jannat, M. S. (2002). Monogenean gill parasites of major carps form different fish farms of Mymensingh. M. S. Thesis Department of Aquaculture, BAU, Bangladesh. 65pp.

Jain , S.L (1959) Some observation on the Monogenetic trematodes from the gill filaments of some Indian freshwater fishes. Curr. Sci. **28:** 322-333.

Kulwiec. Z. (1927) Untersuchungen an Arten des genus *Dactylogyrus* Diesing Bull. Acad . Polon. Sc. Et Letter. Cl. Sc. Math. Et. Nat. ser. B: 113-144.

KY, H. and B.Q. TE. (1999) Parasites of Freshwater Fishes in Vietnam. Research Institute for Aquaculture No **1:** 370.

Lim, L.H.S. (1991) *Dactylogyrus lampan* a replacement name for *Dactylogyrus puntil* Lim and Furtado (Monogenetic *Dactylogyriae*). Raf. Bull. Zool. **40:** 81.

Lim , L.H.S. and J. I. Furtao, (1986) Five new species of *Ancyloiscoidens* (Monogena: *Ancylodiscoinea*) from *Notopterus chitata* (Hamilton)and *Notopterus* notopterus (Pallas) in peninsular Maleysia. Floia Parasnol., **33:** 315-325.

Linstow, O. F. B. (1878) Neue Beobachtungen an Helminthen. Arch. Naturag. 44 J. 1: 218-245.

Mohanta, S. K. and K. J. Chandra, (2000), Menogenean infestation in Thai Silver barb (*Barbodes gonionotus* Bleeker) and their adaptetion in Bangladesh waters. Bangladesh J. Fish. Res. **1:** 117-115.

Nahar, S. (1997) Monogenean parasites of juvenile carps in nurseries of Mymensingh. M. S. Thesis, Department of Aquaculture, Bangladesh Agricultural, Mymensingh. 58 pp.

Ogawa, K. and S. Egusa, (1977) The first record of *Dactylogyrus minutus* Kulwice, 1927 (monogonea. Dactylogyriae) from the reared carp (*Cyprinus carpio*) in Japan. Bull Jap. Sci. Fish. **43:** 1029-1034.

Radulescu. I; R. Georgescu and N. Angelescu (1971) Contribution to the knowledge of the parasites in two *Hypophthalmichthys* species reared in fish farms of Romania. Buletinul de Certari Piscicola, **30:** 87-91.

Salih, N. E; N. M. Ali and K. A. Ammer, (1988) Helminthic fauna of three species of carp raised in ponds in Iraq. J. Biol. Sci. Res., **19:** 369-387.

Thapar, G. S. (1948) A new monogenetic trmatode from the gills of an Indian fish, *Catla catla* for Lucknow: Ind. J. Helm. **1:** 1-10.

Tripathi, Y. R. (1957) Monogenetic trematodes from fishes of India. Ind. J. Helminth. **11:** 1-149.

Tripathi, Y. R. (1975) Monogenetic trematodes of India-Reappraisal. Ind. J. Helm., **27**: 62-105

Yamagutti, S. (1963) Systema *Helminthum* IV: Monogenea and *Aspidocotylea*. Interscience Publication, N. Y. 699 pp.