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Research Article

TWO SPECIES OF *DACTYLOGYRUS* (MONOGENEA) FROM CYPRINID FISHES FROM MAWANA (MEERUT) U.P.

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ABSTRACT
The genus *Dactylogyrus* Diesing, 1850 is the largest helminths genus; most *Dactylogyrus* species parasitize cyprinids. During the present study of freshwater monogeneans of Mawana (Meerut) we came across the two known species of the genus *Dactylogyrus*; *D. eucalius* and *D. intermedius* from freshwater fishes *Hypophthalmichthys molitrrix* (Valenciennes) and *Carassius auratus* (Linnaeus). Both the species were characterized on basis of their morphological characters.

Key Words: *Monogeneans, Dactylogyrus, D. eucalius, D. intermedius, Hypophthalmichthys molitrrix and Carassius auratus*

INTRODUCTION
Fishes have constituted as an important source of food for man and his cattle, from time immemorial. To date, this has developed into a flourishing fish industry because about 95% population of world dependent on the non-vegetarian food, humans consume the 40-45 % part of food as fish. Unfortunately, like other animals fishes are also attacked by various parasites and become diseased. This constitutes one of the most important problems confronting a fish culturist. The majority of the fish diseases are caused by many parasites and one group of them are monogeneans which after infection may cause the death of host fish (Thoneyand Hargis Jr, 1991). Fish parasites under favorable conditions, cause economic loss by affecting the health of fishes and causing high mortality especially trematodes, can cause gill infestations and inhibited oxygen exchange across gill lamella. Monogenean parasites are still wide spread in freshwater wildlife, on farm fishes and marine habitats (Koyun and Altunel, 2011).
Monogeneanns are group of ectoparasites; they parasitizing mainly fishes and are parasitic flatworms mostly found on the gills, fins, skin, and eggs of freshwater and saltwater fishes. They vary in size from about 100 µm to 2- 3 cm in length. They hold onto their hosts via a combination of hooks, anchors, and suckers at their posterior end, and use the anterior end for feeding and assisting in moving to other location on the host. They are hermaphroditic, and lay eggs or give birth to young ones. Their life cycle does not involve more than one species of host. Monogeneans harm their host through ingestion of mucus, skin, blood, so that much of fish's protective coating is destroyed and then potentially dangerous infections can set in.By injury to gill tissue that leads to fusion and hyperplasia of gill tissues, and the subsequent decrease in gill surface area and thus, a decrease in efficiency of respiration by mechanical blockage of respiratory surfaces by their huge numbers. The great majority of the infection diseases of fish are caused by many parasites and one of the monogeneans which cause the death. *Dactylogyrus* (Family: Dactylogyridae, Order: Dactylogyrida, Class: Monogenea, Phylum: Platyhelminthes) are the most common gill parasites infecting freshwater fishes all over the world (Yamaguti, 1958). This parasite is small to medium sized trematodes which complete their life cycle on one host. It has seven pairs of marginal hooks or hooklets, usually one pair of median hooks and two bars or one (connecting and supplementary or connecting bar) on the haptor. Four eye spots in the anterior fourth of the body. Copulatory complex consists of tubular cirrus provided with an accessory piece.
In this investigation *Hypophthalmichthys molitrrix* and *Carassius auratus* carp from local fish market were studied. Some fishes were infected with *Dactylogyrus eucalius* and *Dactylogyrus intermedius*. On detailed examination, it was found that worms at disposal of the writers exhibit several variations besides measurements. Moreover, it also exhibits a new host record and new type locality for these species. It is,

therefore, briefly redescribed. There-description is based on fresh materials collected by authors. The present investigation was carried out to identify *Dactylogyrus* species in infected fishes of mawana region and their morphological characterization.

MATERIALS AND METHODS

Fishes, for the present investigation, were collected from ponds and local fish markets of Mawana (Meerut) and Hastinapur (Meerut) fish market. They were brought to laboratory as soon as possible and examined within 24 hours and identification of piscine hosts was made with the help of classical works of Day (1989); Nelson (2006) and Srivastava, 1968). Monogeneans were collected by freezing technique of Mizelle, (1936) and Mizelle (1938). Gills were removed from both sides of fishes and placed in separate tubes, half filled with water and kept in the refrigerator for 8-48 hours and shaken vigorously. This solution was poured in Petri-dishes, diluted with water and examined under a stereoscopic binuclear microscope.

Worms thus collected, were washed thoroughly and fixed in 70% alcohol. Worms were removed from the alcohol by a small pipette and placed onto slide. Permanent mounts were also made after staining in Aceto alum carmine, dehydrating through ascending grades of Alcohol, clearing in Xylene and mounting in Canada balsam. Parasites were identified according to shape of the sclerotized parts of the haptor (median hooks or anchors, connecting bars, supplementary bars and hooklets or marginal hooks) and reproductive organs (copulatory organs and vaginal armment), using light microscope equiped. The measurement of parasites was achived by ocular micrometer. The figure were drawn by using Camera Lucida with the help of stage micrometer and occulometer as method suggested by Gusev (1955); Malmberg (1957); Mizelle (1936) and Mizelle (1938).

RESULTS AND DISCUSSION

Two species monogenetic trematodes of the genus *Dactylogyrus* (Family Dactylogyridae) have been described from the gill filaments of two cyprinid fishes *Hypophthalmichthys molitrrix* and *Carassius auratus*, from Mawana, Meerut. Which are distinguished from allied species by characteristic copulatory complex and other characters of haptoral armature.

Dactylogyrus eucalius (Mizelle and Regensberger, 1945)

(Plate 1, Fig. 1-8)
Host: *Hypophthalmichthys molitrrix* (Valenciennes)
No. of hosts examined: 35
No. of hosts found infected: 11
No. of worms collected:17
Site of infection: Gills

Dactylogyrus eucalius (Mizelle and Regensberger, 1945) has been reported for the first time from Winconsin Lake USA from the fish *Eucalia inconstanus*. This species has so far been abstracted from Neo-tropical region only. This species found on gill filament of *Hypophthalmichthys molitrrix* and it appears to be the recorded from this region, minor variations were noted in various body parts. The probabale reasons are discussed in detail. The redescription is based on fresh materials collected by the author.

The worm is elongated with bluntly pointed anterior and broad posterior ends measuring 0.26-0.34 mm in length and 0.060-0.070 mm in maximum width which is attained at the level of gonads. The cephalic region is equipped with five pairs of head organ. Five pairs of cephalic glands are also observed adjacent to the pharynx which supplies their secretions to the head organs through ducts. The pharynx is spherical in outline, muscular structure and measures 0.019-0.025 mm in diameter. Two pair eye spots were observed over the pharynx. The size of posterior paor seems to be larger than the anterior pair due to

greater number of melanistic granules. The oesophagus is short measuring 0.004-0.009 mm. the intestinal crura are simple, bifurcater and confluent.

The male reproductive system comparises of testis, vas deferens, seminal vesicle, vasa efferentia and cirrus.the testis is single, inter-caecal, pear-shaped, post-equatorial, and post ovarian in position and measures 0.030-0.037 mm in length and 0.010-0.020 mm in width.the testis is connected to seminal vesicle through a long vas deferens measuring 0.080-0.013 mm in length. The vas deferens opens onto an inverted comma shaped seminal vesicle in the pre-equatorial region which measures 0.020-0.030 mm in length and 0.009-017 mm in width. From the seminal vesicle a fine long as efferentia measures 0.054-0.065 mm in length. The cirrus is a long, double tube. The length of the cirrus is 0.033-0.039 mm.the accessory piece is spiral in shape and measures 0.019-0.026 mm.

The female reproductive system comparises of ovary, oviduct, ootype complex vestibule, receptaculum seminis, vaginal duct and vagina. The ovary is post-bifurcal, post-equaqtorial, and slightly sextral in postion. The ovary is almost spherical in outline and measures 0.016-0.025 mm in length and 0.015-0.025 mm in width.the overy opens into ootype complex, whichisoval in shape and measures 0.016-0.046 mm, leads ootype complex into receptaculum seminis which measures 0.015-0.022 x 0.009-0.018 mm and is oval in structure. The receptaculum seminis leads to vagina through vaginal duct which measures 0.005-0.01 mm in length. The vaginais serrated. It measures 0.015-0.022 x 0.005-0.009 mm and the vaginal opening measures 0.009-0.011 x 0.001-0.006 mm. the egg is oval in outline and measures 0.072-0.084 in length and 0.043-0.055 mm in width. A pointed polar filament can be seen on the narrow end of the egg and measures 0.005-0.010 mm in length. Agonopore arising from ootype can also be observed on the opposite side of vaginal opening.

The haptor is fairly set off from the body proper and measures 0.032-0.039 x 0.04-0.07 mm. The haptoral armature comparises of a pair of anchor, a dorsal transverse connective bar and seven pairs of marginal hooklets. The anchors are 'Robusts Type' with fairly divided roots, recurved points and elongated inner roots. The anchors are with further strengthened by the presence of sleeve sclerites. The shat is highly curved, the anchor points are recurved. The dorsal transverse bar is 'wunderoid' type. Marginal hooklets are *Dactylyogyrus* type.

Table 1: Various measurements of the haptoral armament (in millimeters)

Anchor	**Size (mm)**
Dorso apical length	0.037-0.046
Ventro apical length	0.038-0.049
Base of the anchor	0.016-0.21
Shaft of the anchor	0.018-0.022
Length of point	0.015-0.021
Dorsal transverse bar	
Length of the bar	0.019-0.031
Median width of bar	0.004-0.034
Total length	0.025-0.034
Width of the bar	0.006-0.009
Marginal hooklet	
Total Length	0.017-0.032
Length of pivot	0.004-0.009
Length of heel	0.005-0.012
Distal width of sickle	0.002-0.004
Length of sickle filament loop	0.009-0.017

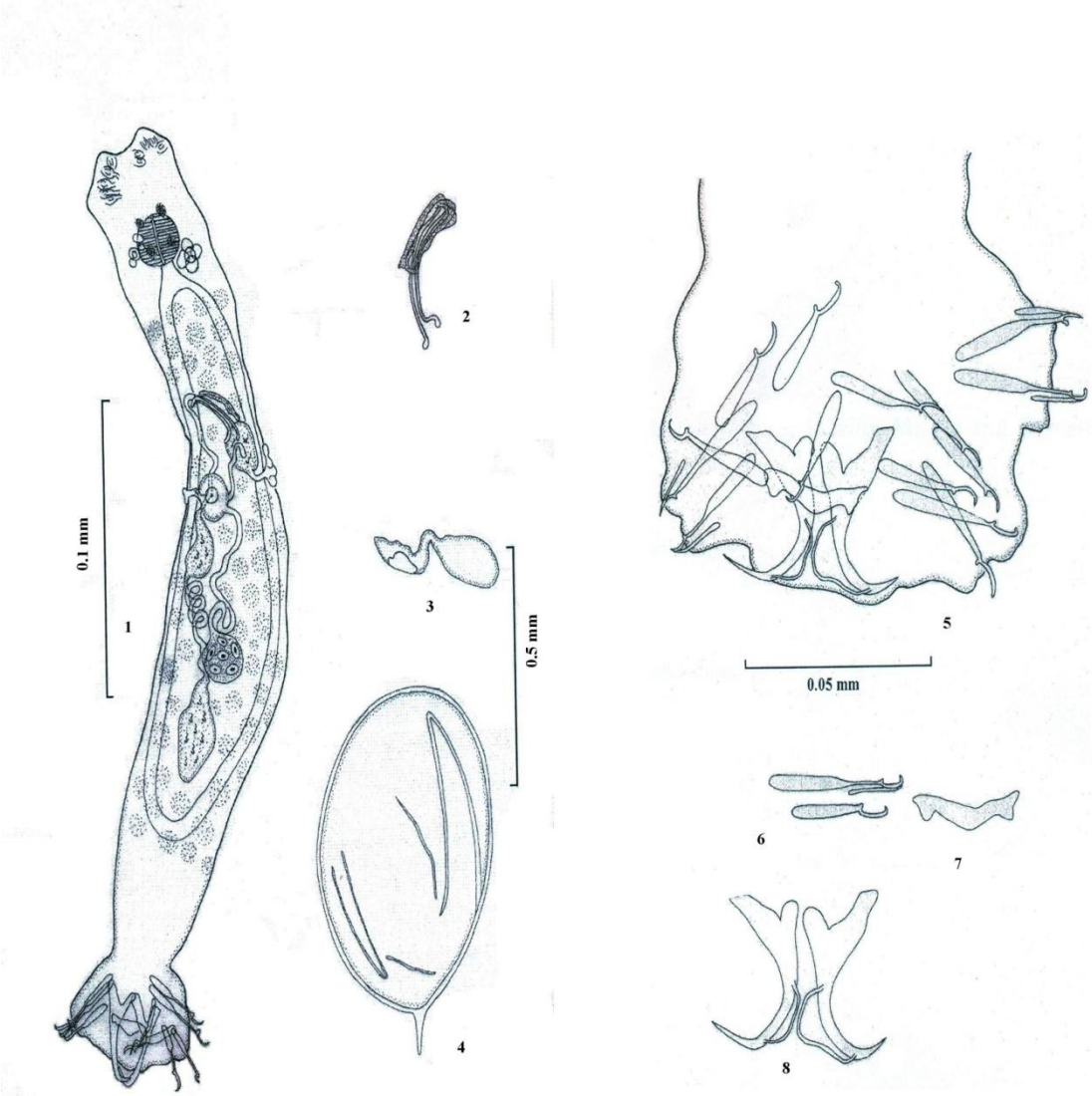

Plate 1: Fig.1. *Dactylogyrus eucalius* (Mizelle and Regensberger, 1945) whole mount; Fig.2. Cirrus; Fig.3. Vagina; Fig.4. Egg; Fig.5. Haptor; Fig.6. Anchors; Fig.7. Dorsal Transverse bar; Fig.8. Marginal Hooklets

Remarks: Some important morphological variation were difference in shape of Dorsal Transverse bar, difference in shape of inner root of the anchors and difference in structure of marginal hooklets especially in its base. In my opnion these variations sould be due to the difference of ecological niche of the worm.

Datylogyrus intermedius (Wegener, 1910)

(Plate 2, Fig. 1-8)
Host: *Carassius auratus* (Linnaeus)
No. of Hosts examined: 32
No. of Hosts infected: 08
No. of worms collected: 14
Site of infection: Gills

Dactylogyrus intermedius was first of all reported by (Wegener, 1910)from *Carassius carassius* and *C. auratus* from China. During the course of study of monogeneans fuauna present in exotic fishes of India, investigator came across a few specimens of *C. auratus* infected with this species. On detailed study it was found that minor variation lakes soft anatomical details of the worm, vaginal armature and description of egg. It is therefore briefly redescribed. The description is based on fresh materials collected by the author.

The worm is elongated with broad posterior and bluntly pointed anterior end measuring 0.50- 0.52 mm in length and 0.114-0.118 mm in width. The cephalic region is equipped with six pairs of head organs. Three pairs of cephalic glands are also observed adjacent to pharynx. The pharynx is spherical in outline, muscular structure and measures 0.044-0.048 mm in diameter. Two pairs of eye spots are also present over the pharynx. The pharynx is spherical in outline, muscular structure and measures 0.044-0.048 mm in diameter. Two pairs of eye spots are also present over the pharynx. The size of posterior pair of eye spot is larger than the anterior pair due to the presence of greater number of melanistic granules. The oesophagus is short measuring 0.009-0.013 mm in length. The intestinal caeca is simple, bifurcate and end blindly.

The male reproductive system comprises of testes, vas deferens, seminal vesicle, vasa efferentia and cirrus. The testes are single, elongated post-ovarian, dextral and overlapping the intestinal crura measuring 0.041-0.045 in length and 0.01-0.05 mm in width. From the anterior end of testes, a fine vas defrences arises which is fairly long measuring 0.215-0.235 mm in length. It extends anteriorly in the interaceal field and dilates to form an oval seminal vesicle, a fine vasa efferentia arises which opens at the cirrus. The vasa efferentia measures 0.120-0.124 mm in length. The cirrus proper is a long double walled chitinoid tube with a broad base and narrow distal part. The length of cirrus is 0.036-0.054 mm. the accessory piece of cirrus is chitinoid and made up of two parts. The is ‘Y’ shaped and it measures 0.080-0.090 mm in length and the distal arm of Y is longer in comparioson to the proximal arm. The second accessory piece is like a trapezium in shape with bulging broad end and it is attached to base of cirrus and measures 0.02-0.06 mm in length.

The female reproductive system comprises of ovary, oviduct, ootype complex, vestibule, receptaculum seminis, vaginal duct and vagina. The ovary is intercaecal, post-bifurcal, post-equatorial and dextral in position. The ovary is pear shaped and measures 0.061-0.065x0.010-0.050 mm. The ovary opens into ootype complex through and oviduct measuring 0.04-0.08 mm in length. The ootype complex is pear shaped and measurs 0.031-0.035 x 0.017-0.021 mm in length. The vitliline reservoirs are present on either lateral side at the level of ootype complex. A vitlline duct leads from each reservoir which combines in the middle of the body to form common vitlline duct which opens into ootype complex. The vestibule measuring 0.13-0.17 mm leads ootype complex into receptaculum semminis is 0.050-0.054 x 0.044-0.048 mm and is oval in structure. The receptaculum seminis leads to vagina through vaginal duct which measures 0.06-0.10 mm in length. The vagina is funnel shaped and measures 0.037-041 x 0.010-0.014 mm and the vaginal opening measures 0.011-0.015 x 0.001-0.005 mm. the egg is oval in outline and bears stub-like polar filament at its narrow end and measures 0.130-0.134 x 0.074-0.078 mm. the polar filament measures 0.005-0.009 mm in length.

The haptor is fairly set off from the body proper and measures 0.055-0.059 mm x 0.068-0.088 mm. the haptoral armature comprises of a pair of anchors, a dorsal transvers connective bar and seven pairs of marginal hooklets. The anchors are ‘vastator’ type with fairly divided roots, open points and considerably elongated inner root. The shaft is curved, the anchor points are open. The anchors are further strengthened by the presence of sleeve sclerite. The dorsal transvers bar is ‘vastator, type and the marginal hooklets are *Dactylogyrus* type.

Remarks: Besides describing soft anatomy of the worm for the first time the investigator reported the structure of vagina, ootype complex and the ova. Some morphological variations were noticed in shape of chitinoid hard parts of the worm that could be due to the presence of this parasite in different ecological niche. The present worm appears to be the first report from oriental region.

Table 2: Various measurements of the haptoral armament (in millimeters)

Anchor	**Size (mm)**
Dorso-apical length	0.027-0.31
Ventro-apical length	0.039-0.043
Length of base	0.004-0.008
Length of shaft	0.002-0.006
Length of point	0.002-0.006
Transverse Bar:	
Total length	0.032-0.36
Median width	0.002-0.006
Width at ends	0.003-0.007
Marginal Hooklets:	
Total length	0.031-0.036
Length of the Handle	0.021-0.025
Length of sickle	0.007-0.011
Proximal width of sickle	0.001-0.003
Distal width of sickle	0.001-0.003

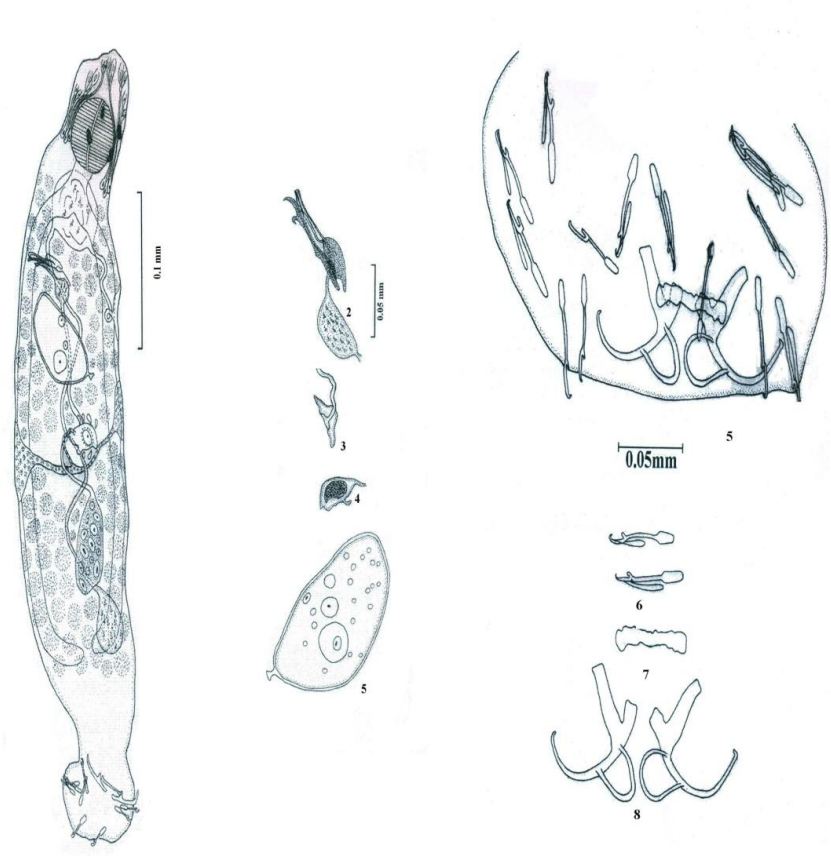

Plate 2: Fig.1. *Dactylogyrus intermedius* (Wegener, 1910) whole mount; Fig.2. Cirrus; Fig.3. Vagina; Fig.4. Ootype complex Fig.5. Egg; Fig.6. Haptor; Fig.7. Anchors; Fig.8. Marginal Hooklets.

REFERENCES

Day F (1989). The Fauna of British India including Ceylon and Burma. Retrieved from http://41.215.122.106/dspace/handle/0/2802

Diesing K (1850). M. 1850. *SystemaHelminthum, 1*.

Gusev AV (1955). Monogenetic trematodes from fishes of the Amur River system. *Trudy ZoologicheskogoInstitutaAkademiyaNauk SSSR, 19*, 171–399.

Koyun M and Altunel FN (2011). Prevalence of Two Monogenean Parasites on Different Length Groups of Crucian carp (*Carassius carassius* Linneus, 1758). *Notulae Scientia Biologicae*, *3*(1), 17–21. Retrieved from http://www.notulaebiologicae.ro/index.php/nsb/article/view/5597

Malmberg G (1957). On the occurrence of Gyrodactylus on Swedish fishes. *Skrifterutgivnaav Södra Sveriges Fiskeri föreningen*, *1956*, 19–76.

Mizelle John D (1936). New species of trematodes from the gills of Illinois fishes. *American Midland Naturalist*, *17*(5), 785–806. Retrieved from http://www.jstor.org/stable/10.2307/2420687

Mizelle John D, and Regensberger R (1945). Studies on Monogenetic Trematodes XII. Dactylogyridae from Wisconsin Fishes. *American Midland Naturalist*, *34*(3), 673–700. Retrieved from http://www.jstor.org/stable/10.2307/2421092

Mizelle John Dary. (1938). *Comparative studies on trematodes (Gyrodactyloidea) from the gills of North American fresh-water fishes*. University of Illinois Press.

Nelson JS (2006). *Fishes of the World*. Wiley. Retrieved from http://books.google.co.in/books?hl=enandlr=andid=exTV-GLnCB4Candoi=fndandpg=PR5anddq=Nelson,+J.S.+(1984)+fishes+of+the+World.+2nd+Edition+andots=aW0dQCHY7pandsig=g-TagbiTMHhKEzP-ZCqSdKtavCY.

Srivastava GJ (1968). *Fishes of Eastern Uttar Pradesh*. Vishwavidyalaya Prakashan Varanasi. Retrieved from http://www.getcited.org/pub/100479721.

Thoney DA and Hargis Jr WJ (1991). Monogenea (Platyhelminthes) as hazards for fish in confinement. *Annual Review of Fish Diseases*, *1*, 133–153. Retrieved from http://www.sciencedirect.com/science/article/pii/095980309190027H

Wegener G (1910). *Die Ektoparasiten der Fische Ostpreussens*. Albertus-Universitatzu Konigsberg i. Press.

Yamaguti S (1958). *Systema helminthum*. Retrieved from http://41.215.122.106/dspace/handle/0/4840.