

## MASS MORTALITY ASSOCIATED WITH *DACTYLOGYRUS* INFECTION IN FARMED LONG WHISKERS CATFISH, *MYSTUS GULIO*

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**ABSTRACT :** The present work was conducted to identify the cause of mass mortality taken place in farm reared *Mystus gulio*. More than two thousand advanced fry died overnight without any prior symptoms. Sixty specimens were necropsied for parasitological analysis. Skin, gill and intestine biopsies were prepared from each specimen following standard methods for microscopic analysis. The severity of infection were estimated by calculating parasitological indices including dominance (D), prevalence, mean intensity and abundance according to standard formulae. Farmed *M. gulio* were found infested with a total of one hundred and forty individuals of *Dactylogyrus* sp. Dominance index showed that the species were eudominant ( $D$ -value > 10%). The prevalence (85%) of *Dactylogyrus* sp. indicated that the parasite was abundant in freshly died fish sample. The organo-specificity of the parasite was evident by the presence of the parasite maximum in gill followed by skin and intestine. Present study seems to be the first report of *Dactylogyrus* infection in farm reared long whiskers catfish, *M. gulio* causing mass mortality.

**Key words :** Eudominant, prevalence, abundance, organo specificity.

### INTRODUCTION

The role of aquaculture in improving food security and meeting the nutritional need of the world population, made it the most promising food producing sectors. Since the initiation of intensive aquaculture, infectious diseases have emerged as a limiting factor for further expansion of the sector. The impact of disease on aquaculture and fisheries cannot be under estimated. Parasitic infestations are reportedly playing a major role in disease occurrences (78%) in Indian freshwater aquaculture. There is now an increasing economic importance of fish parasitic diseases in aquaculture and fisheries. Parasites interfere with the nutrition, metabolism and secretory function of alimentary canal, damage nervous system and also upset the normal reproduction of the host (Akter *et al*, 2007). Moreover, parasitic diseases also affect the general perception of people towards aquaculture. Thus, parasitic diseases play a crucial role in aquaculture, not only resulting in mortality and growth retardation of fish but also decreasing marketability of the product and thereby cause significant economic losses. *Mystus gulio*, locally known as Nona tangra is a very popular food fish in the Indian subcontinent eastwards to the Indochinese peninsula and southwards to the South-east Asia.

Primarily being a brackish water catfish of the order siluriformes, family bagridae, it enters and lives in fresh water. During an experiment conducted for acclimatization of wild *Mystus gulio*, and standardization of their breeding and seed production in freshwater, more than two thousand advance fry died overnight in the rearing tank.

In India, problems of disease caused by parasites are quite frequent in fish farms leading to poor growth performance, high mortalities and monetary losses. This indicates the significance of epidemiological studies in Indian fish farms so that proper management strategies should be adopted. However, report on the occurrence of parasites in farmed *M. gulio* is scarce. Therefore, the objective of this study is to determine the etiology leading to mass mortality and to study the prevalence, mean intensity, and abundance of the identified parasites.

### MATERIALS AND METHODS

#### Study site

The specimens of the long whiskers catfish, *M. gulio* were collected from Kalyani Field station (22.9622989° N – 88.4434967° E) of Regional Research Centre of the institute located at West Bengal, India in October, 2016

for parasitological analysis.

### Sample collection

Moribund and freshly died fish samples (n = 60) were collected from the rearing tank, where advance fry (length  $3.61 \pm 0.33$  and weight  $0.70 \pm 0.16$ ) were stocked @ 500 nos./m<sup>2</sup>.

### Parasitology

The clinical signs of the fish sample were noted. The fish were examined for the presence of parasites if any from the skin, gills and intestine. The fish specimens were necropsied for parasitological analysis. The gills and intestine were dissected aseptically and wet mount preparation was done. Skin biopsies were prepared from the entire length of the lateral body wall and gill biopsy was collected from the second arch as described by Roohi *et al* (2014). The skin and gill sample of each fish were collected separately into sterile petridish containing 0.85% physiological saline. The gill mucus was gently scrapped using sharp scalpel and spread on a clean dry glass slide with coverslip after mixing with a drop of physiological saline. Presence of endoparasites in fish samples were determined following wet mount preparation and photomicrographical analysis. The fish were dissected ventrally with a sharp sterile scissor, the whole gut was removed in a watch glass containing 0.85% physiological saline. The gut was cleaned several times with physiological saline to remove unwanted material and wet mount preparation was done by taking the intestinal content.

### Identification of parasite

Photomicrographs were taken using a Motic BA400 phase contrast microscope with in-built digital camera to detect the parasite species and parasitic load. *Dactylogyrus* spp. was identified by descriptive morphometric characters such as hamuli, marginal hook, copulatory organs and associated structure according to Bychowskaya-Pavlovskaya (1962).

### Analysis of parasitological indices

Parasitic dominance, parasitic frequency index or prevalence, mean intensity and abundance were calculated to evaluate parasitological indices as described by Roohi *et al* (2014) and Oscar *et al* (2015).

$$\text{Dominance} = \frac{N}{N \text{ sum}}$$

Where, N = abundance of monogenean parasite species and N sum = sum of the abundance of all monogenean parasite species found. The monogenean parasites were classified based on their dominance values

according to Niedbala and Kasprzak (1993) as eudominant (> 10%), dominant (5.1%-10%), subdominant (2.1%-5%), recedent (1.1%-2%) and subrecedent (< 1.0%) of given species.

$$\text{Parasitic frequency index or prevalence (\%)} = \frac{\text{No. of infected fish}}{\text{Total no. of fish examined}} \times 100$$

The Parasitic Frequency Index (PFI) was calculated by taking the percentage of the number of fish (hosts) infected by an individual parasite species against the total number of fish (hosts) examined in a particular area under investigation. The PFI was classified into rare (0.1 – 9.9%), occasional (10-29.9%), common (30 – 69.9%) and abundant (70-100%) as described by Paperna (1996).

$$\text{Mean intensity} = \frac{\text{No. of collected parasites}}{\text{No. of infested fish}}$$

$$\text{Abundance} = \frac{\text{No. of parasites}}{\text{No. of fish examined}}$$

### Physico-chemical parameters of water in rearing tank

pH, dissolved oxygen, temperature and ammonia of water from the rearing tank were measured. Dissolved oxygen was measured in mg/L by using oxygen meter, and pH was measured by using pH meter; water temperature was measured using thermometer while ammonia was measured as per the standard protocol by APHA (2007).

## RESULTS

### Clinical signs

A total of 2193 advance fry (length  $3.61 \pm 0.33$  and weight  $0.70 \pm 0.16$ ) of farm reared *M. gulio* died overnight in the rearing tank of the farm (Fig. 3). On examination of the freshly died advance fry (n= 60) of *M. gulio* revealed overall darkening in body colour, thickened cuticle, emaciation with excessive mucus secretion and in few cases detachment of the barbels. White discolouration of gill was evident due to severe parasitic infestation (Fig. 4).

### Parasitological indices

*Dactylogyrus* sp. was isolated and identified from the moribund and freshly died fish (Fig. 5). Out of the total fish species (n=60) examined, 51 specimens were infested with 140 *Dactylogyrus* sp. The prevalence of *Dactylogyrus* sp. was 85%, intensity of the parasitic infestation was 2.74 whereas the abundance of the same was recorded as 2.33 in the rearing tank.

### Prevalence, intensity and abundance of parasites in relation to specific organs

The prevalence of *Dactylogyrus* sp. in relation to organ specificity showed that the parasites were most prevalent in the gills, followed by the skin and the least in the intestine. A total of 101 *Dactylogyrus* sp. were recovered from gill, 32 *Dactylogyrus* sp. were reported from skin and 7 were isolated from intestine. *Dactylogyrus* sp. recovered from the gills had a dominance value of 72.10, prevalence of 71.67%, mean intensity of 2.52 and abundance of 1.68. The dominance value of *Dactylogyrus* sp. in skin and intestine was 22.75 and 5.1 (Fig. 1), respectively, whereas the prevalence of the same was recorded as 30% and 8.33%, mean intensity as 1.77 and 1.4 and abundance as 0.53 and 0.12, in skin and intestine, respectively (Fig. 2).

### Physico-chemical parameters of water in rearing tank

The physico-chemical parameters of water in the rearing tank is depicted in Table 1.

### DISCUSSION

The present study revealed that farm reared *M. gulio* were infested with a single species of monogenean parasite *Dactylogyrus* sp., which resulted in mass mortality overnight without any prior symptom. Monogenean parasites are reported to cause high mortality of fish in tanks since they have a tremendous reproductive capacity, leading to a rapid buildup of infections causing mortality in the hosts (Paperna, 1996). According to the Parasitic frequency index (PFI), *Dactylogyrus* sp. was found abundant (85%) and 140 parasites were identified from 51 infected freshly dead fish samples. The Observations in this study was in accordance with findings of Reed *et al* (2015) that the fish infested with monogeneans were dark in body colour. Dogiel (1956) suggested several factors including age, diet, season, which directly influence the parasitic infestation in fish. The present study revealed that only the advance fry stage of *M. gulio* was infected with *Dactylogyrus* sp., which corroborate to the study of Dash *et al* (2015), who reported that the monogenean infection was more in early life stages of *Catla catla*. In contrary, Dactylogyrosis was also reported to occur more in older fish than in younger one (Ozer and Ozturk, 2005; Ozturk and Altunel, 2006). In the present study, the parasite was observed mainly in the gills followed by skin and intestine of the host catfish due to their ectoparasitic nature. Similar results were observed by Wooten (1974) in Eurasian ruffe (*Gymnocephalus cernua*) where *Dactylogyrus* sp. was reported in certain areas of the gills and skin. Dominance

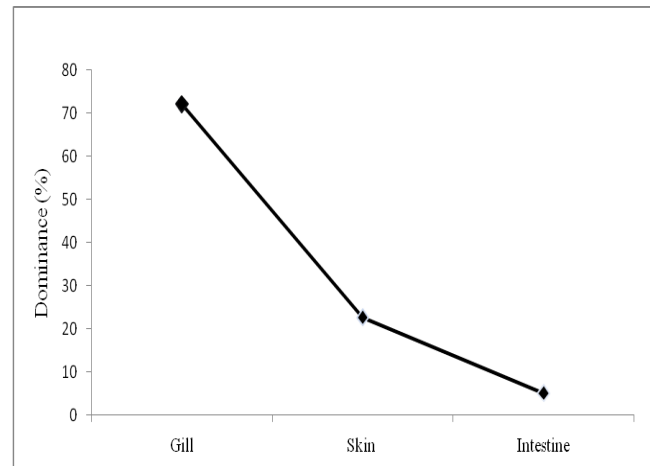


Fig. 1 : Dominance of *Dactylogyrus* sp. in different organs of *M. gulio*.

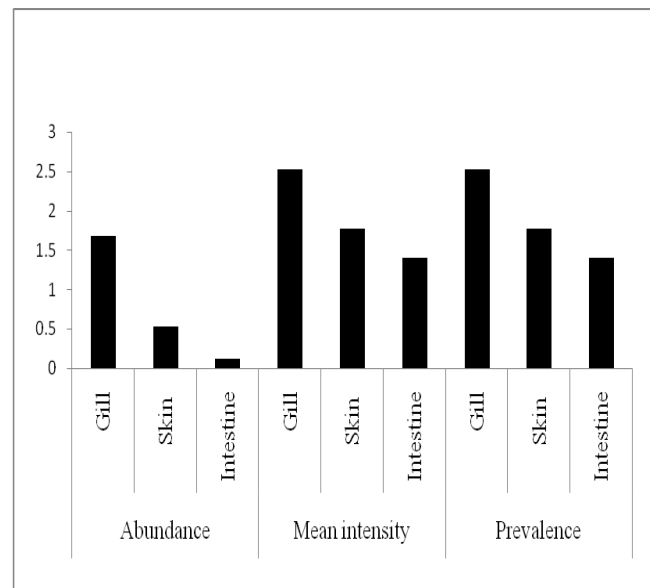
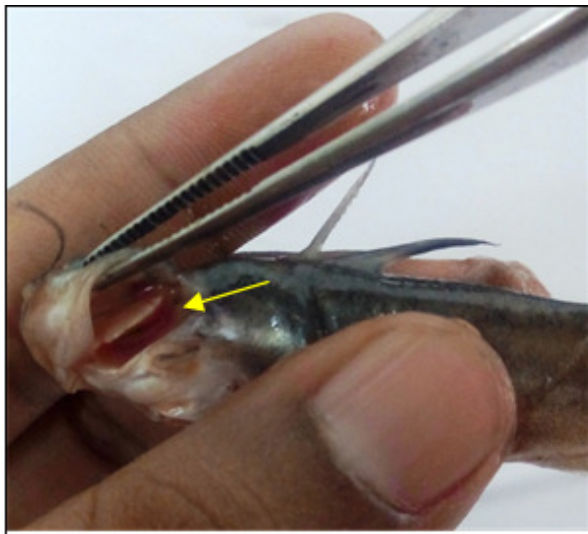


Fig. 2 : Parasitic indices of *Dactylogyrus* sp. in different organs of *M. gulio*.

of *Dactylogyrus* sp. was observed to be highest (71.67%) in gills indicating eudominance ( $D$ -value  $> 10\%$ ) of the parasite as studied by Oscar *et al* (2015). It may be due to the tendency of most of the parasites to select a site where exposure to direct full force of water current is minimal. *Dactylogyrus* sp. was also found dominant ( $D$ -value 5.1%-10%) in intestine, which indicated that the parasites multiplied in intestine to feed the digested contents of the host's intestine, interfering the nutrition of hosts, disrupting metabolism and secretory functions of alimentary canal as reported by Markov (1961). The mass mortality was taken place before the onset of winter and the finding of the present study was same as mentioned by Ahmad *et al* (2013). In contrary, the prevalence of *Dactylogyrus* were reported to be higher in the spring and summer when water temperature was



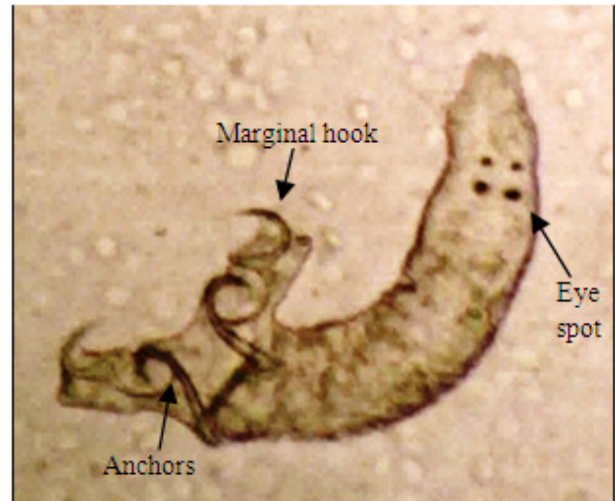
**Fig. 3 :** Mass mortality of farmed *M. gulio* due to Dactylogyrid infection.



**Fig. 4 :** Heavy infestation of *Dactylogyrus* sp. and white discolouration of gill (arrow) in farmed *M. gulio*.

higher and their occurrence were lower in autumn, winter and spring (Stojanovsky *et al*, 2010; Koyun, 2011; Turgut *et al*, 2011; Dash *et al*, 2015). However, the seasonal variations of Dactylogyrids are influenced by temperature, oxygen concentrations of water, size of fish host and fish maturity (Zitnan, 1978; Pojmanska and Chabros, 1993).

Present study seems to be the first report of *Dactylogyrus* infection in farm reared long whiskers catfish, *M. gulio* causing mass mortality. Monogenans have a narrow host range and often does not show pathogenicity. However, under favourable aquaculture



**Fig. 5 :** *Dactylogyrus* spp. collected from a gill biopsy from *M. gulio* (Wetmount, 100X).

**Table 1:** Water quality parameters during mortality of *M. gulio*.

Parameters	Value
pH	7.5
Temperature (°C)	32
Dissolved oxygen (ppm)	6.1
Ammonia (ppm)	0.03
Alkalinity (ppm)	160
Salinity (ppt)	0.02

condition monogeneans may become pathogenic to the host. Therefore, having more information on the host range of the parasite, the season of occurrence and size dependent variability would be helpful in understanding the parasite diversity, their biology and thus to prevent the economic loss associated with Dactylogyrid infection.

In conclusion, the present study indicates that *Mystus gulio*, being a urihaline species are vulnerable to monogenean parasite like other freshwater fish. Before and during the onset of winter, fish become immune suppressed, which favours parasitic infestation. *Dactylogyrus* were found mostly on gills followed by skin and intestine of *Mystus gulio*. The advanced fry stage of the fish were susceptible than the mature brooders due to their poor immunity power, which resulted in colonization of more parasites. Avoidance of overcrowding in the pond, using pathogen free quality water for fish culture are the advisable approaches to maintain proper health of fish. Balanced feed supplemented with suitable immunostimulant and antioxidant can help to boost the immunity of fish during the winter. Though, chemotherapeutants are not that much effective in treating parasitic disease and often the side effects result in deleterious health condition, yet some approved antiparasitic drugs at a recommended dose can be used to eradicate the parasites.

**Conflict of interest**

The authors declare that there is no conflict of interest.

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