Eco. Env. & Cons. 30 (October Suppl. Issue) : 2024; pp. (S293-S297)

ISSN 0971–765X

DOI No. http://doi.org/10.53550/EEC.2024.v30i06s.043

Redescription of a parasitic ciliate *Trichodina acuta* (Lom 1961) (Protozoa: Ciliophora: Trichodinidae) in the gill of *Mystus gulio* (Actinopterygii: Siluriformes: Bagridae) for the first time from Hooghly Estuary, South 24 Parganas, West Bengal, India

Biplab Bhowmik*, Riya Mondal[1], Bipasa Dey[2], Lisa Basu[2] and Labani Halder[2]

[,1,2] Parasitology Laboratory, Department of Zoology, Diamond Harbour Women's University, Diamond Harbour 743 368, West Bengal, India

(Received 26 March, 2024; Accepted 28 May, 2024)

ABSTRACT

Members of the family of Trichodinae are best known as ectoparasites that infect diverse range of fishes. Infection from this parasite causes massive pathological development and leading to the mortality of host fishes. A preliminary study among different regions of Hooghly Estuarine fishes present in South 24 Parganas, West Bengal found *Trichodinid cilliophorans* infecting the gills of *Mystus gulio* (Hamilton, 1822) (Bagridae) that causes damage in the gill epithelium of many host fishes. Description based on wet silver nitrate impregnation method that is performed with compound microscopic study Olympus BX43, attached with digital camera Olympus- DP23. During the course of surveillance *Trichodinid Cilliophorans* were found Medium size, flattened, disc shaped body, cup shaped adhesive disc, surrounded by finely striated distinct and broad band-like border membrane. Denticulated ring containing 22-24 robust denticles with sickle shaped blade and 7–9 radial pins on each denticle were observed. This is identified as *Trichodina acuta* Lom, 1961 based on this study and described for the first time from the Hooghly Estuarine fish *Mystus gulio*. The observation finds that seasonal variations affect the count of this ectoparasite in the host body.

Key words: Mystus gulio, *Trichodinid Cilliophorans, Protozoa, Ectoparasite, Hooghly Estuary, Trichodina acuta*

Introduction

Mystus gulio (Hamilton-Buchanan, 1822); common name- long whiskered catfish, is a euryhaline fish that thrives in the low saline brackish waters (Pandian, 1966). They have wide distribution in Bangladesh, India, Sri Lanka, Indonesia, Vietnam, Pakistan, Nepal, Java, Thailand, Malaysia and Myanmar (Day, 1878; Weber and de Beaufort, 1913; Smith and Schultz, 1945; et al). *Mystus gulio* can be characterized by presence of a strong dorsal spine, small adipose fin inserted behind the rayed dorsal fin and rise of ventral fins vertically behind the last dorsal ray,

Mystus gulio is a rich source of lipids, proteins and several other macronutrients. Theycontain the highest level of proteins, lipid, sodium and phosphorus, compared to other species belonging to the same Genus. Due to the high levels of calcium, phosphorus and manganese, they help in formation and

(*Associate Professor)

strengthening of the bones and teeth. They also have rich amount of iron which helps in blood formation (Hossain, 1999).

The fish has a high consumer preference and market demand in Bangladesh and eastern part of India for its taste and high nutritive value (Tripathi 1996; Sarker *et al*., 2002; Begum *et al*., 2008b; Haniffa, 2009ab). It is cultured in many coastal and estuarine regions in monoculture farms and also in polyculture farms alongwith other fish, crabs and shrimps (Sarker *et al.*, 2002). Recently it is also documented as an indigenous ornamental fish export material from India (Gupta and Banerjee, 2014). Therefore, it can prove to be promising export commodity in the near future that can help in generating large sum of revenue in the commercial fish market.

Mystus gulio is often reported to be infected with several groups of parasites which include protozoans and metazoans. Trichodinid are the most often encountered protozoan parasites found to infect wild and cultured fishes both inmarine and freshwater environments (Urawa, 1992). Families of Trichodinidae consist of protozoans; they are the best known as ectoparasite which mainly infects the fish present in freshwater and euryhaline environment. More than 270 species belonging to trichodinid ciliates are recognized as parasite or symbiotic on marine and freshwater fish or other organisms. But very few of them have been properly studied in the Indian subcontinent. So, very little information is available on these groups of parasites. Out of the nine existing Genera from the family Trichodinidae, only five of which have been reported from India, namely, *Trichodina*: (Ehrenberg 1838); *Paratrichodina*: (Lom, 1963), *Trichodinella*: (Raabe, 1950 and Šramek-Hušek, 1953); *Dipartiella*: (Raabe; 1959 and Stein 1961) and *Tripartiella*: (Lom, 1959) (Hagargi and Amoji 1979; Mukherjee and Haldar, 1982; Mishra and Das, 1993; Saha *et al*., 1995; Asmat, 2000a, b; Mitra and Haldar, 2004a, b, 2005; Mitra and Bandyopadhyay, 2005, 2006a, b,2009; Mitra *et al.*, 2012a, b). Infection caused by *Trichodina* resulting in the secretion of excessive mucous in the gill tissues leading to their damage. Severely infected host fish shows symptoms like sloughing of scales, fading of skin colour, pale appearance of the gill tissue due to lack of proper blood supply, weakness and emaciation (Alyain, 1990 and Mostafa *et al*., 1991). This damage can also harm their overall growth and development leading to their untimely death and harming their population.

The present study portrays the redescription of a Trichodinid ciliophoran parasite, *Trichodina acuta*: Lom (1961) in an Indian estuarine catfish, *Mystus gulio* for the first time from a new locality in the Hooghly estuary, South 24 Parganas, West Bengal, India.

Materials and Methods

The host fishes, *Mystus gulio* were sampled from different sites of Hooghly Estuary of South 24 Parganas, West Bengal, India. Host fishes were caught by the use of fishing nets with the help of local fishermen. Gill, fin, and skin smears were made on grease free slides at the river side just after the live fish were caught. The smear was air-dried and then were transported to the laboratory for further studies and observed under field microscope for the presence of ectoparasitic trichodinid ciliophorans. Smears from infested fishes were air dried and impregnated for 10 minutes in 2 % aqueous AgNo3 solution (Klein 1958), washed in distilled water, and exposed to ultraviolet light for 20– 25 min. Prepared slides were examined under a compound microscope Olympus BX43 and photographs were taken with an Olympus digital camera. The measurements were taken in micrometers.

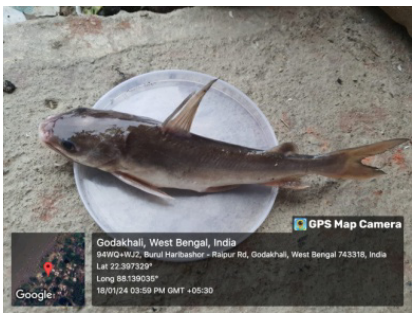

Fig. 2. Host Fish *Mystus gulio*

Results

Flattened body with Disc-Shaped outline. Diameter of the body ranges from 49.2 to 59.2µm. Adhesive disc is cup shaped with 36.2- 44.6 µm. A fine striated border membrane surrounds the adhesive disc. The disc centre bears a clear area, with some darker spots at the periphery that is encircled by highly impregnated wrinkled ring like structure of the central area (7.86-8.43 µm). The denticulate ring is 22.5-35.79 µm and has 20-24 robust denticles which fill

most of the area between the axes. Each denticle is divided into three regions: the lowermost part which is attached to the central disc is called ray. The middle part is called junction. The anterior portion is called blade which is 4.08-5.0 µm in length. The blade is relatively short in comparison to the other parts of the denticle and is sickle shaped filling most of the area between the Y axes. 7-10 radial pins are present at the tip of each denticle. Each denticle ranges from 7.19-11.06 µm in length. Distal margin of the blade is flat at the anterior part. It lies away from the border membrane and runs almost parallel to it. Apex of the anterior margin forms an angular curve and it never extends beyond Y+1 axis. Presence of a prominent apical depression. Sharp tangent point situated below the distal margin. Presence of prominent anterior and posterior blade apophysis. Central part junction of blade is well developed and is robust and triangular in shape. The blunt tip never extends beyond the midway to Y-1 axis. Prominent connection of the ray observed. Rays point towards the central part the adhesive disc. Apophysis of the ray is very prominent. Point of the ray is blunt and rounded and almost touches the clear area of central part. Adoral zone of the cilia makes a spiral turn of more than 380°. [Remarks Since its first description (Lom, 1961)].

Fig. 3. *Trichodina acuta* Lom 1961

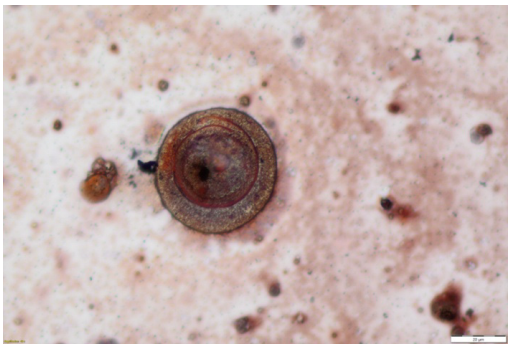

Fig. 4. *Trichodina acuta* Lom 1961 (magnification- 40x)

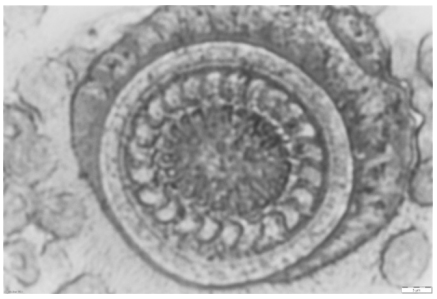

Fig. 5. *Trichodina acuta* Lom 1961 (Magnification- 100x)

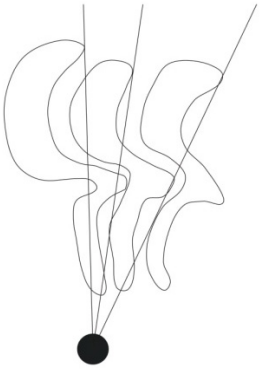

Fig. Drawing diagram of the denticles present in *Trichodina acuta* Lom 1961

Taxonomic Summary

Type Material: *Trichodina acuta*
Host: *Mystus gulio*
Study Site: Hooghly Estuary, South 24 Parganas district, West Bengal
Locality: South 24 Parganas, West Bengal, India
Latitude: 22.1367° North
Longitude: 88.5565°East
Site of Infection: Gill
Total number of samples observed: 43
Number of infected samples: 21
Prevalence: 31/43 (48.83%)
Symbiotype: MH/02 is deposited in the museum of Department of Zoology, Diamond Harbour Women's University, Sarisha, Diamond Harbour 743 368, West Bengal, India
Holotype: TA/06 is deposited in the museum of Department of Zoology, Diamond Harbour Women's University, Sarisha, Diamond Harbour 743 368, West Bengal, India
Paratype: TA/03, TA/07 and other slides are deposited in the collection of the Parasitology Laboratory, Department of Zoology, Diamond Harbour Women's University, Sarisha, Diamond Harbour 743 368, West Bengal, India

Discussion

The present paper deals with the morphological identification of a parasitic ciliate *Trichodina acuta* collected from estuarine catfish, *Mystus gulio*. The morphological characters observed using compound microscopy showed similarities with that of *Trichodina acuta*, first identified by Lom 1961. The species has been first reported from a new area along the estuarine Coast of Hooghly River in South 24 Parganas district of West Bengal.

Acknowledgement

The authors are grateful to the Department of Zoology, Diamond Harbour Women's University for granting us the permission to carry out this research work.

Conflict of Interest

We have no conflict of interests.

References

Asmat G. S. M. 2000a. Trichodina cuchiae sp. n. (Ciliophora: Trichodinidae) from Gangetic mudeel, Monopterus cuchia (Hamilton-Buchanan, 1822) (Synbranchiformes: Synbranchidae) in India. *Chittagong Univ. J. Sci.* 24: 55-61

Alyain, S.A. 1990. Studies on certain internal protozoal infections of Egyptian fresh water fish. Ph.D. Thesis, Alexandria University

Begum M., Mamun, A.A., Islam, M.L. and Alam, M.J. 2008b. Morphometric characters and their relationship in estuarine catfish. *Journal of Bangladesh Agricultural University.* 6(2): 349-353.

Day, F. 1878. The fishes of India; being a natural history of the fishes known to inhabit the seas and fresh waters of India, Burma, and Ceylon. William Dowson and Sons, London. 778 p.

Gupta, S. and Banerjee, S. 2014. Indigenous ornamental fish trade of West Bengal. Narendra Publishing House, New Delhi, 63 pp

Hagargi, S. S. and Amoji, S. D. 1979. Occurrence of Trichodina pediculus Ehrenberg, 1838 on fresh water carps. *Barbus spp. Curr. Sci.* 48:789-790

Haniffa, M.A. 2009. Native catfish culture-a technology package for fish farmers. *Aquaculture Asia Magazine.* 14(3): 22-24.

Hossain, M. A., Afsana, K., and Azad Shah, A. K. M. 1999. Nutritional value of some small indigenous fish species (SIS) of Bangladesh.

Klein, B. M. 1958. The "dry" silver method and its proper use. *The Journal of Protozoology.* 5(2): 99-103.

Mitra A. K. and Haldar D. P. 2004a. First record of Chilodonella hexasticha (Kiernik, 1909) Kahl, 1931 (Ciliophora: Chilodonellidae) infesting a frehwater fish Nandus nandus (Hamilton) from Gangetic West Bengal, India. Animal Biol. 54: 111-118

Mitra, A. K. and Haldar, D. P. 2004b. First Record of Trichodinella epizootica (Raabe, 1950)] Šramek-Hušek, 1953, with description of Trichodina notopteridae sp. n. (Ciliophora: Peritrichida) from freshwater fishes of India. *Acta Protozool.* 43: 269-274

Mitra, A. K. and Haldar, D. P. 2005. Descriptions of two new species of the genus Trichodina Ehrenberg, 1838 (Protozoa: Ciliophora: Peritrichida) from Indian freshwater fishes. *Acta Protozool*. 44:, 159-165.

Mitra, A.K. and Bandyopadhyay, P.K. 2005. First records of Trichodina japonica Imai, Miyazaki et Nomura 1991 and Trichodina mutabilis Kazubski et Migala 1968 (Ciliophora, Trichodinidae) from Indian fishes. *Protistology* 4(2): 121–1

Mitra, A.K. and Bandyopadhyay, P.K. 2006a. First records of ectoparasitic African Trichodinids (Ciliophora: Peritrichida) in a Cichlid fish Oreochromis mossambicus (Peters 1852) from the Churni River System, West Bengal, India. *Animal Biol.* 56(3):323–333

Mitra, A.K. and Bandyopadhyay, P.K. 2006b. Trichodina haldari n.sp. and Paratrichodina bassonae n.sp. (Ciliophora: Peritrichida) from Indian freshwater fishes. *Acta Protozool* 45: 289–294.

Mitra, A.K. and Bandyopadhyay, P.K. 2009. Dipartiella kazubski sp. nov. (Ciliophora: Peritrichida), a new ectoparasitic trichodinid species from the gills of freshwater fishes in India. *Protistology.* 6(1):33–38

Mitra, A.K., Bandyopadhyay, P.K., Gong, Y., Bhowmik, B. 2012a. Occurrence of Trichodinid Ciliophorans (Ciliophora: Peritrichida) in the freshwater fishes of river Churni with description of Trichodina glossogobae sp. nov. in West Bengal, India. J Parasit Dis 36(1):34–43

Mitra AK, Bandyopadhyay PK, Gong Y, Goswami M, Bhowmik B (2012b) Description of two new species of ectoparasitic Trichodina Ehrenberg, 1830 (Ciliophora: Trichodinidae) from freshwater fishes in the river Ganges, India. *J Parasit Dis.* doi:10.1007/s12639-012-0126-z

Mishra, R. K. and Das, M. K. 1993. Urceolariid ciliate, Trichodina reticulata infesting gills of Catla catla in India. *J. Inland. Fish Soc. India.* 25: 54-56

Mukherjee M. and Haldar, D. P. 1982. Observations on the urceolariid ciliates of the genera Trichodina and Tripartiella in freshwater teleosts. *Arch. Protistenkd.* 126: 419-426

Pandian, T. J. 1966. Feeding and reproductive cycles of the fish Mystus gulio in the Cooum backwaters, Madras. *Indian Journal of Fisheries.* 13(1 & 2), 322-333.

Saha, B. S., Bandyopadhyay, P. K. and Haldar, D. P. 1995a. Biodiversity of trichodinid ciliates in freshwater fishes of West Bengal. *Environ. Ecol.* 13: 814-823

Sarker, P.K., Pal, H.K., Rahman, M.M. and Rahman, M.M. 2002. Observation on the fecundity and gonadosomatic index of Mystus gulio in brackishwater of Bangladesh. *Online Journal of Biological Sciences.* 2(4): 235-237.

Smith, H.M. and Schultz, L.P. 1945. The freshwater fishes of Siam, or Thailand. Washington United States Government Printing Office. 622 p.

Tripathi, S.D. 1996. Present status of breeding and culture of catfishes in south Asia. In: M. Legendre, J.P. Proteau (ed.). The biology and culture of catfishes. Aquatic Living Resources. 9, Hors Serie. pp: 219-228.

Urawa, S. 1992. Trichodina truttae Mueller, 1937 (Ciliophora: Peritrichida) on juvenile chum salmon (Oncorhynchus keta): pathogenicity and host-parasite interactions. *Fish Pathology.* 27(1): 29-37.

Weber M.C.W. and de Beaufort, L.F. 1913. The fishes of the Indo-Australian archipelago. II. Malacopterygii, Myctophoidea, Ostariophysi: I Siluroidea. E.J. Brill Ltd. Leiden. 404 p