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Taxonomical studies of metazoan parasites of fresh water catfish Mystus species (Family: Bagridae) from two different habitats of Andhra Pradesh, India

[1] Satyanarayana Murthy CHV, [2] T Baby Ratnakumari
[1] Department of Zoology, Andhrauniversity, Visakhapatnam, Andhra Pradesh, India
[2] Prof., Department of Zoology, Andhrauniversity, Visakhapatnam, Andhra Pradesh, India

Abstract
Mystus species commonly known as catfish belonging to the family Bagridae is valued food fish. They are protein rich, able to breath atmospheric oxygen and hence remain alive for long periods out of water and can be sold for high prices. The present investigation on the helminth parasites from three species of Mystus namely *M. vittatus, M. gulio* and *M cavasius* collected from the Mehadrigedda stream and river Nagavali of andhrapradesh state in India. The various species recovered, monogenean *Bifurcohapter indicus*, digenean *Haplorchoides mehrai*. Nematode *Spirocamallanus mysti*, and an acanthocephalan *Neoechinorhynchus n.sp.* All the parasites have been described and illustrated.

Keywords: Mystus species, *Bifurcohapter, Haplorchoides, Spirocamallanus, Neoechinorhynchus*

Introduction

In view of the importance of need for protein rich food in the diet of man to maintain good health and growth, Fish and fishery products are gaining importance as an item in the food of even a common man. Besides major carps Mystus species commonly known as catfish belonging to the family Bagridae is valued food fish. They are protein rich, able to breath atmospheric oxygen and hence remain alive for long periods out of water and can be sold for high prices. Besides high quality flavor and texture of their flesh, and easily digestible rich proteins.

The fish Mystus species are available throughout the year, the smaller size of the fish is preferred by the common man and poorer sections of the society. Because of the facts stated above the present investigation on the helminth parasites of Mystus species collected from the Mehadrigedda stream and river Nagavali. The catfish is one of the dominant species of fish in various fresh water bodies. Three species of Mystus namely *M. vittatus and M. gulio* and *M cavasius* occurs in these regions is widely distributed and is found in all freshwater habitats such as lakes, streams and irrigation channels and by virtue of this property the parasite fauna of this fish may be expected to be of a diverse nature. It was for this reason that this species was selected for the detailed study. Much work on the parasitic fauna of these three species of *M. gulio, M. vittatus and M. cavasius have* been already published and very few helminth parasites were recorded from the above two hosts from time to time. The available information indicates that *M. vittatus, M. gulio and M. cavasius* are suitable hosts for several species of helminthes, both larval and adult stages. However, the monogenean fauna of this fish are scanty and the only record is that of Agrawal & Singh (1850), who reported *Bifurcohaptorsohani, Bifurcohaptorjain* from the gills of *Mystusvittatus.* Agrawal & Singh (1985) reported Neomurraytrema, shuklai from gill filaments of *M. Vittatus*. Pandey&Singh (1989), reported *Bifurcohaptorjain* from the gills of *M. vittatus*. Dubeya&Gupta, (1990), reported *Gyrodactylusmizellei* from the gills of *M. vittatus*, Dubey *et al*., (1992) reported parancylodiscoides parvulus from the gills of *M. Vittatus*, Keran & Bijukumar (1997), reported Bifurchohaptorindicus from the gills of *M. vittatus* on the other hand the digenean fauna of these two fishes are quite rich and several species of adult as well as larval digeneans were recorded.

Srivastava (1935), Chen (1949), Dayal (1949), Rai and pande (1967), Agrawal (1968), Rai & pande (1968), Yamaguti (1971), Rai (1971) , Narth (1972), Pande & Shukla (1976), Gupta and Gupta (1977) pande (1979), Rakesh Kumar & Agarwal (1980), Agrawal & Agrawal (1981), Gupta & Singh (1982), Agarwal & Kumar (1983), Gupta & Govind (1985), Shameem and Madhavi (1988) reported adult digeneans from *M. vittatus*.

M. vittatus harbours a rich fauna of nematodes as well. Important Contributions are made by Li (1935), pereira *et al*., (1936), Bashirullah, (1973), Bashirullah and Ahmed (1976), Fusco (1980), De *et al* (1986a), Olsen (1952), Baylis (1923), Ali (1956), Yamaguti (1961) Yeh L.S (1960), Ferhando *et al* (1963), Bashirullah (1952) Agrawal (1965), Gupta &Jaiswal (1988), Rajyalakshmi & Rao (1993). As for the *Acanthocephala* Amin (1987), reported *Neoechinorhynchusn. Sp.*, Rai (1967) reported by *Raosentisthapari* from Intestine *of M. vittatus*, Najib (1986) reported Acanthosentis Oligospinus from the intestine of *M.gulio*, Anantaraman (1980) reported Acanthosentis sp. From the Intestine of *M. gulio*. These are the only papers dealing with Acanthocephalan parasites of the fish.

Material and methods

The present investigation is concerned with a survey of helminth parasites of *Mystus vittatus, Mystus gulio and*

*M*ystus cavasius. The material required for the study was collected from two different stations, Mehadrigedda reservoir at Visakhapatnam and Nagavali river Srikakulam.

For collecting helminth parasites fishes were killed by a blow on head and then treated in the following manner. The length of the fish was measured from the tip of the snout to fork and the tail. The Average length of the fish *Mystus vittatus* is 8-9.5 cm, *Mystus gulio* is 15-19cm and *Mystus cavasius* is 9-10.5cm. Sex was determined by examining the gonad, gills, scales, stomach, intestine, liver, gallbladder, muscles were observed separately for the presence of parasite. Gut contents mostly copepods and insects. Gut contents were washed with water to clear them from mucus and debris.

All the parasites found were first collected in 7% saline water and fixed. Adult trematodes were fixed in AFA solution under a cover glass pressure. Wash the parasites thoroughly with distilled water and the specimens were subsequently stained with alum carmine. Dehydrate the flukes by passing through graded series of alcohols and then cleared in neutral beech wood creosote and mounted in Canada balsam.

Nematodes were fixed in hot 70% alcohol and preserved in glycerin alcohol mixture (1:1). Temporary mounts of nematodes were made using glycerin and details were studied.

Acanthocephala were at first collected in saline and then fixed appropriately. Acanthocephala were fixed in AFA solution under cover glass. The specimens were subsequently stained with alum carmine dehydrated by placing in graded series of alcohol and then cleared in creosote and mounted in Canada balsam.

The drawings were drawn with the help of camera lucida. Measurements are given in microns. Scale is given in millimeters.

Observations

Description of the Species

Bifurcohaptor indicus.

Sub family: Tetraonchinae (Monticelli, 1903)
Synonmys: B.minutum Kulkasnni 1969
B.srham Agarwal 1982
B.pedenculata Pande et2002
Host: *M.vittatus, M.gulio, M. cavasius.*
Location: gill filaments
Locality: Mehadrigedda & Nagavali river.

Description

Stout tetraonchids (Plt. 1, Fig.1), measuring 0.55-0.82 in length, with width at cephalic lobes 0.04-0.07 and maximum body width 0.075. Head organs not clearly divisible into lobes. Eye-spots, 2 pairs, posterior larger than anterior pair. Pharynx, oval, 0.030x0.032.Intestine bifurcate, crura confluent posteriorly.

Haptor (Plt.10, Fig.2) forceps like and deeply bifurcate, occupying nearly 1/3 total length of trematode. Peduncle short and stout. Haptor 0.2-0.25 long by 0.13-0.25 wide. Armature of Haptor consisting of a pair of large dorsal anchors, a median dorsal bar, a pair of small ventral anchors, a pair of ventero-lateral bars and 6 pairs of hooks. Each dorsal anchor consists of a stout base, a long shaft and recurved point; each has a wing reaching up to point. Length of dorsal anchor 0.15-0.2. Base of each dorsal anchor bears 3 chitinized plates, left, right and medium according to position each one occupies. Plates measures in greatest diameter. Dorsal bar stout cubical body with blunt irregular projections at the corners, measuring 0.040-0.043x0.032-0.035 in greatest diameters ventral anchor situated at the 2 lateral extremities of the haptor, each with bifurcate base, stout shaft, fined recurved point and wing reaching to the point. Each ventral anchor 0.018-0.027 long with width of base 0.013. Dorsal anchors 8 to 9 times larger than ventral anchors. Each ventro lateral bar a straight shaft with a slight depression at one end and 0.032-0.040 long. The 6 pairs of hooks are all similar in shape and size. Each consists of a base, a short shaft, a sickle shaped portion and an opposable piece.

Testis (Fig.1) median, spindle-shaped, intercecal, measuring 0.08-0.11x0.015-0.020. Vasdeferens long but no well-defined vesicular seminalis. A pair of prostate glands present, their ducts opening at base of cirrus. One of prostate glands contains a highly granular fluid and other contains a hyaline fluid. Copulatory complex (Plt. 10, Fig.4) consists of a chitinized tubular cirrus and an accessory piece, free at base but articulating distally. Cirrhal gland globular, joining at point of articulation of cirrus and accessory piece. Ovary ovoid, pre-testicular and intercecal in position, measuring 0.070-0.080x0.04-0.029. Ova large at the anterior end and smaller at posterior end of ovary. Vagina sinistral, chitinized, opening into globular receptaculum seminis by slender vaginal tube. Single egg present in some specimens, triangular. Vitellaria densely spread over body from pharynx to cecal union.

Remarks

Jain did not observe well divisible head organ structure accessory piece of copulatory tube and well defined vesicular seminalis. He observed only six parts of hooks. It has been redescribed by Pandey and Singh (1989). K.C. Pandey *et al*, 2002 observe 4 pairs of head organs. Triangular plate like accessory piece and well defined pear-shaped seminal vesicle and seven pairs of hooks. The present recovered specimen is closely resembles with that of Jain's description.

Adult Digenea

***Haplorchoides mehrai* (Pande & Shukla, 1976)**

Family : Heterophyidae.
Host : *M.vittatus &M.cavasius*
Location : Intestine
Locality : Meghadrigedda & River Nagavali

Description

Body elliptical, 588-840 long (Fig2,2A), 180-324. Wide, with numerous, pigment granules scattered in fore body. Tegumental spines dense in regular rows in anterior part of body. Oral Sucker sub-terminal, 48-60 x 60-96, Ventral sucker small, in ventro – genital sac. Long: Oesophagus shorter than pre-pharynx; bifurcation at about one third of body length form anterior end; Caeca narrow, long, exceed posterior border of testis, rarely terminate at anterior border of testis. Testis single, large, elliptical, 48-72 x 48-84, in middle of hindbody. Cirrus Sac absent. Seminal vesicle bipartite, Situated obliquely behind Caecal bifurcation; anterior part 90-130x90-110, larger than posterior part which measures 60-

80x45-55, leads into short thick-walled pars prostatica surrounded by numerous prostatic cells. Ejaculatory duct short, opening together with metraterm into ventro-genital sac. Ventro–genital sac sub-median, dextral, lying just behind caecal bifurcation, encloses ventral sucker, opens on ventral side through slit-like genital pore. Ventral sucker small, 60-120 x 60 – 180, divisible into nucleatd part, enclosed in muscular capsule embedded in parenchyma, and non-nucleated part, projecting in to ventro – genital sac and bearing shallow central cavity and 18-26 sclerites arranged in 3 groups anterior group with 6-10 tooth-like sclerites; medium group of 6-8 peatinate scalerites arranged on thumb-like lateral projection; and posterior group at 6-8 peatinate sclerites. Gonotyl absent. Numerous small gland cells dispersed in parenchyma surrounding ventro-genital sac and metraterm.

Ovary oval, 84-10 x 96- 108, median pre-testicular, separated from testis by uterus. Seminal receptacle large postero dextral to ovary, size variable, either larger or smaller than vary. Vitellarium follicular, consisting of few large, tear-shaped follicles distributed in space lateral and posterior to testis and few follicles between testis and ovary. Uterus with descending and ascending limbs, occupying all available space behind ventro-genital complex. Eggs small, numerous, 28-30 x 20 in size. Excretory bladder sac-like, pore terminal.

Remarks

The present specimens are *H. Mehrai* Pande&Shukla (1976). The genus Haplorchoides was established by Chen (1949) with *H. cahirinus* (Looss, 1896) as the type species. The genus was included in the subfamily haplorchiinae of the family Heterophyidae several species belonging to this genus have been reported from fresh water fishes of India. Some of these species were previously assigned to the genera Haplorchis Looss (1899) *Pseudohaplorchis* Srivastava1935 and *Monorchotrema* Dayal (1949); but were subsequently transferred to the genus *Haplorchoides*. Rai and Pande (1967), in a review of the genus, considered only two Indian species *H. attenuatus* (Srivastava, 1935) and *H. Piscicola* (Srivastava, 1935), as valid. Yamaguti (1971) listed 12 Indian species under the genus and included in the subfamily Tubanguinae in the family cryptogonimidae. Pande&Shukla(1976) described two new species. *H. pearsoni* and *H. mehrai*, and considered only *H. atternuatus* as valied among the previously described Indian species. Subsequently *H. venodei* Gupta and Gupta, 1977, *H. vacha* Agrawal&Agrawal, 1981, *H. mystusi* Gupta and Singh, 1982. H. Kherai Gupta *et al*., 1985 and *H. srivastava* Gupta and Govind, 1985 was described. Thus the genus presently contains nine Indian species in addition to the type species from Egypt.

Information on life cycle in the genus is restricted to only two species EL – Naffar(1980) described life cycle of H. Cahirinus and Agrawal&Agrawal (1981) demonstrated the life cycle of *H. vacha* In addition, metacercaria of *Haplochoidesspp* have been recorded from fresh water fishes of India (Nath, 1972) pande&shukla 1976, pande, 1979). The life cycle of *H. mahrai* is described by Shameem and Madhavi (1988).

Nematoda

***Spirocamallanus mysti* (Karve, 1952)**

Family: Camallanidae

Synonyms

- ***Metaquimperiahanumanthal (Gupta &Jaiswal (1988)***
- ***Porrocaecumvittati (Rajyalakshmi&Rao (1993)***
- ***Neometaquimperiavittatusi (Agarwal (1965)***
- ***Spirocamallanustimmi (Bashirullah (1952)***
- ***Procamallanusvittatusi (Sood (1962)***

Host **:** *M. vittatus, M.gulio & m. cavasius*
Location **:** Intestine
Locality **:** Mehadrigedda & Ngavali river

Description

The worms were found (Fig - 3) lying free in the intestine. The worm measures 804x25.2 in length. Different stages of the worm is collected. The adult worm measures 324x840 length14.4-25.2 in width. Buccal capsule long. Oesophagus with long muscular long glandular parts. Nerve ring lies at distance of cephalic end. Excretory pore not found. Both Vulva and Vagina developed. Tail (40 long) conical with blunt tip bearing three small mucrones.

Remarks

The genus *Spirocamallanus* has so far been studied. S. fluvidraconis (Li, 1935) by Li(1935) S. Cearensis (Perenina, DiasetAzevedo, 1930) S. intestinecolas (Bashirullah 1973) S.mysti by Bashirullah and Ahmed (1976) and S. Cricotus by Fusco (1980). In general, S. mysti follows the course of development similar that of other members of the family camallanidae. Bashirullah and Ahmed (1976) reported diffentiated oesophagus found only during the second moulting. The development and life cycle of *Spirocamallanus mysti* reported by De(1995).

Spirocamallanus mysti (Karve, 1952) is a common nematode parasite inhabiting the stomach of different species of fresh water fishes that are widely distributed over the Indian subcontinent (De *et al* 1986). The structure of the present forms agrees with original description given by De (1995). In addition to the above nematodes recovered from the intestine *M. vittatus* and *M.cavasius* All the foms are Juveniles and two female and one male is found. In *M. gulio* also Jueveniles recovered the internal organization is not clearly seen so these are unidentified.

***Neoechinorhynchus n.sp* (STILES AND HASSAL 1905)**

Order **:** **Neoechinorhynchidea**
Host **:** Mystus gulio
Location **:** Intestine
Locality **:** Mehadrigedda.

The present species (Fig.4,4a,4b)is described, based on 5male specimens body in 450-520 in length and 15-17 in breadth. Probosis long by wide hooks in anterior circle 48-58 long in middle circle 48-54 (51) long, in posterior circle 38-48 (44) long probocis receptacle 294-476 (357) long by 126-168 (139) wide. Double nucleated luminisus 1,680 – 3,520 (2,156) long by 112-266 (153) wide usually extends post anterior margin of anterior margin of anterior testes Reproductive system in posterior 51-77 of trunk cement gland usually with 8 giant nuclei markedly longer than either testis 630-2170 (1,147)

long by 196-532 (289) wide genital pore terminal.

Female

The present species is described, based on 10Female speciemes (Fig.5,5a,5b) body in mm in length and mm in breadth. Proboscis 128-163(150) long by 131-160 (149) wide. Hooks in anterior circle 48-61(56) long, in middle circle 48-61(56) long, in posterior circle 40-51(46) long. Proboscis receptacle 294-420(368) long by 126-210(150) wide. Reproductive system short with well-developed lateral pouch cells, 560-1,176(782) long. Gonopore almost ventral in young juveniles but is gradually displaced ventrally with progressive development of posterior trunk swelling ultimately marking the beginning of the jully developed swelling in adults eggs avoid about twice as long as wide, 32-51(44) by 16-29(21) in where mounts and 48-58(50) by 18-29(23) in teased preparations, membranes in concentric layers in fully developed

Remarks

The present specimens come close to order *Neoechnorchynchusae*. It is very close to *N. venecstess*. earlier been reported by Amin (1987). This species is being new and reported first time from India.

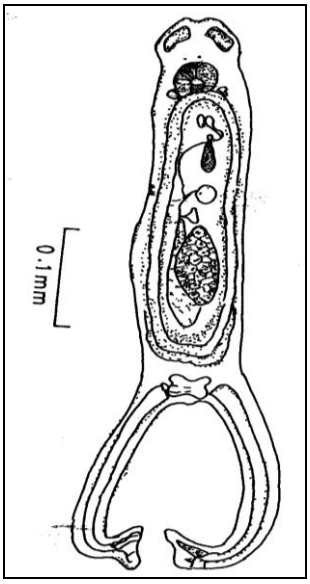

Fig 1: *Bifurcohaptor indicus*

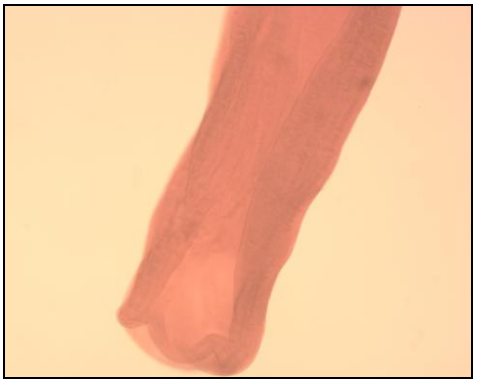

Fig 1a: *Bifurcohaptor indicus* (ventral view)

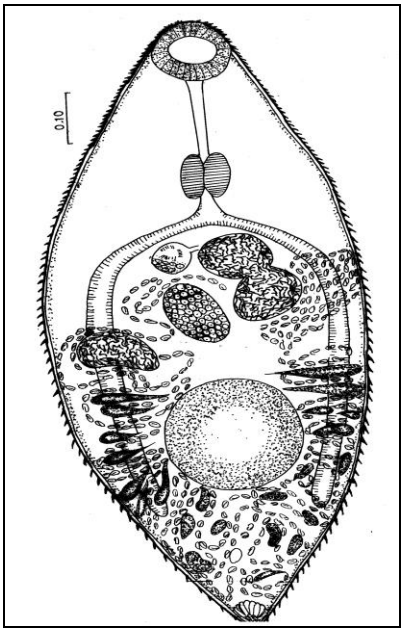

Fig 2: *Haplorchoides mehrai*

Fig 2a: *Haplorchoides mehrai*

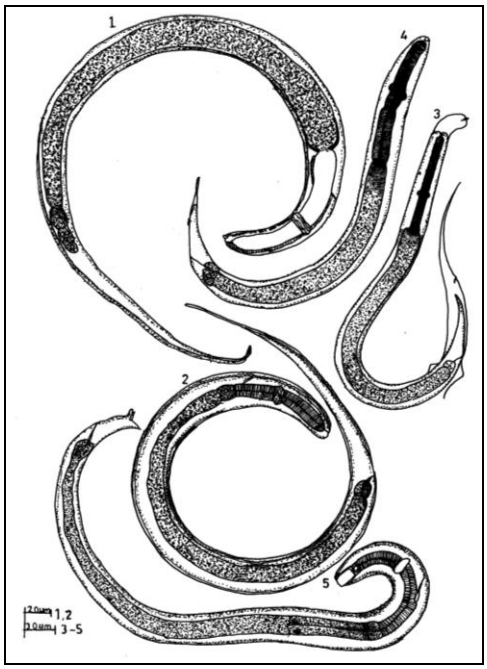

Fig 3: *Spirocamallanus mysti*

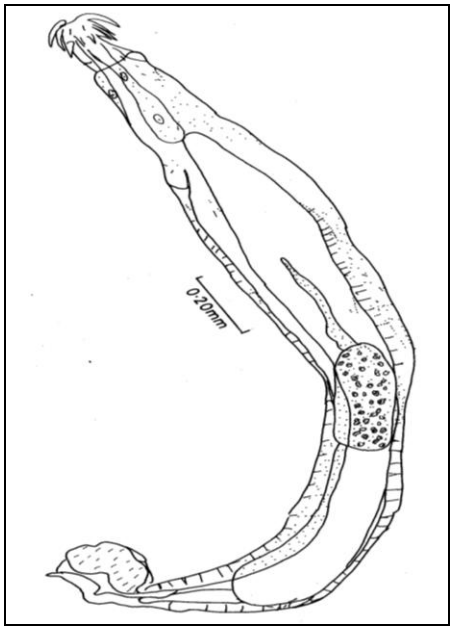

Fig 4: *Neoechinorhynchus n.sp* (Male)

Fig 4a: *Neoechinorhynchusn.sp* (Male) (anterior part)

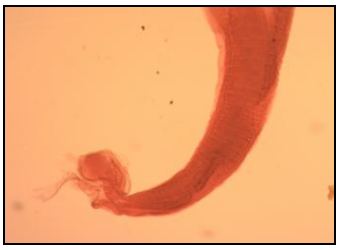

Fig 4b: *Neoechinorhynchusn.sp* (Male) (posterior part)

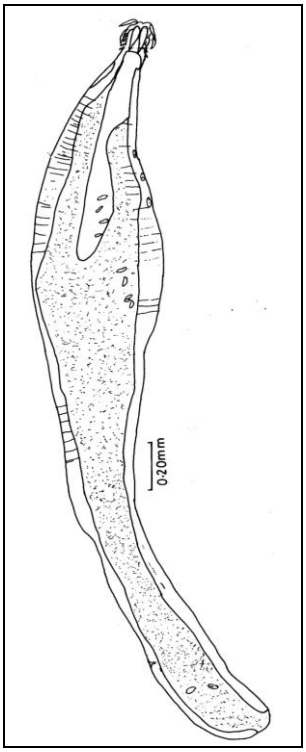

Fig 5: *Neoechinorhynchus n.sp* (Female)

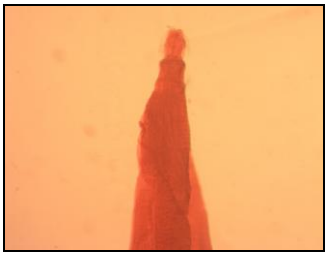

Fig 5a: *Neoechinorhynchus n.sp* (Female) (anterior part)

Fig 5b: *Neoechinorhynchus n.sp* (Female) (posterior part)

List of Helminth parasites so for recorded

From two species of Mystus

NAME OF THE PARASITE	AUTHOR
MONOGENEANS	
Neomurraytrema shuklai	Agrawal & Singh (1985)
Parancylodiscoides parvulus	Dubey et al.,(1992)
Bifurcohaptor sohani	Agrawal & Singh (1982)
Bifurcohaptor indicus	Keran & Bijukumar(1997)
Bifurcohaptor jain	Pandey & Singh (1989)
DIGENEANS	
Pseudoparamacroderoides keni	Agarwal & Agarwal(1968)
Haplorchoides piscicola	Gupta & Govind (19850
Opisthorchis gorakhpurensis	Rai,(1971)
Oudhia hardayali	Rakeshkumar & Agarwal(1980)
Eumasenia morabadensis	Rai & Pande (1968)
Asymphylodora loss	Rai,(19720
Pseudoparamacroderoides raychaudhurii	Agarwal& Kumar (1983)
NEMATODES	
Metaquimperia hanumanthai	Gupta & Jaiswal (1988)
Porrocaecum vittatii	Rajyalakshmi & Rao (1993)
Neometaquimperia vittatusi	Agarwal(1965)

Summary

Investigation on the helminth fauna of Mystus vittatus and Mystus gulio and Mystus cavasius were carried for a period of 6 months (July 2009-December2009). The host fishes were obtained from Mehadregedda reservoir (Visakhapatnam) and Nagavali River (Srikakulam).

Ninety five specimens of *M. vittatus*, Forty specimens of *M. gulio* and Forty Specimens of *M. cavasius* were examined for parasites. Helminth parasites were recorded, of these one monogenean, one digenean, one nematode and one acanthocephalan.

The various species recovered monogenea *Bifurcohapter indicus*, digenean *Haplorchoides mehrai*. nematode *Spirocamallanus mysti*, and acanthocephalan *Neoechinorhynchus n.sp.*.

All the parasites have been described and illustrated. A classified list of helminth parasites collected is provided. List of helminth parasites so far recorded in Mystus species is compiled.

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