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On a New Species of Genus *Silurodescoides* (Achmerow, 1964) Gussev, 1973 with Redescription, Copulation Biology and Neuroanatomy of *S. vistulensis* (New Combination) from Meerut (U.P.), India

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Abstract : During the study of freshwater monogeneans of Meerut region, we came across single infected specimen of fish *Corydoras melanistius*, infected with monogeneans belonging to the genus *Silurodescoides* (Achmerow, 1964) Gussev, 1973. On subsequent study, the present form appears new to us and described here in as such.

Three specimens of teleost fish *W. attu* (Family: Siluroides), and two specimens of exotic aquarium fish *Puntius sutchii* (Tiger shark) were found infected with several worms of a rare monogenean *Silurodescoides vistulensis* (Siwak, 1932), Bychowsky and Nagibina, 1957* a gill parasite of teleost fishes. The worms at the disposal of the authors exhibit differences in the number of head organs, shape of male and female reproductive organs, number and distribution of polar filaments. The shape of ventral transverse bar and structure of ventral anchor also show minute variations. Like all Ancyrocephalids, monogeneans of genus *Silurodescoides* are oviparous. An attempt has also been made to study the copulation biology of this parasite. The present work also involved the use of 5-Bromo indoxyl acetate to explore the nervous system of *S. vistulensis* (Siwak 1932) Bychowsky and Nagibina, 1957.

Key words : *Silurodescoides exotica, S. vistulensis*, Copulation biology, Neuroanatomy

Introduction

Genus *Silurodescoides* (Achmerow, 1964) Gussev, 1973 (Monopisthocotylea: Anchyrocephalinae) has been recorded and described in detail from the gills of teleost fishes of Super Family Siluroidae. Several workers like Zandt (1924), Muller (1934), Jain (1952), Tripathi (1959) Achmerow (1964), Kulkarni (1969), Gussev (1973) and Singh *et al.* (1992) have reported different species of this genus from different teleost fishes as different name.

Several authors have used the method of demonstrating cholinesterase activity as indirect evidence of the presence of acetylcholine in the nervous system of flatworms, including monogeneans, digeneans and cestodes (Reda and Arafa, 2002).

During the study of freshwater monogeneans of Meerut region, we came across single infected specimen of fish *Corydoras melanistius*, infected with monogeneans belonging to the genus

* *Not consulted in original, as cited by Yamaguti, 1961*

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Three specimen of teleost fish *W. attu* (Family: Siluroides), and two specimen of exotic aquarium fish *Puntius sutchii* (Tiger shark) were found infected with several specimens of a rare monogenean *Silurodescoides vistulensis* (Siwak, 1932), Bychowsky and Nagibina, 1957* a gill parasite of teleost fishes. Like all Ancyrocephalids, monogeneans of genus *Silurodescoides* are oviparous. The present work involved the use of 5-Bromo indoxyl acetate to explore the nervous system of *S. vistulensis* (Siwak, 1932) Bychowsky and Nagibina, 1957.

Materials and Methods

The fishes for the present investigation were collected from freshwater bodies and aquarium fish vendors of Meerut region. The worms collected in live condition were washed thoroughly with cold distilled water. After washing, the worms were divided into two groups for the study of morphology and nervous system separately. For morphological details the worms were observed under the microscope in live condition only and microphotographs were taken with the help of Motic image plus Software. Camera lucida sketches were made and measurements presented in millimeters as mean followed by range in parenthesis. Study of nervous system was made with the help of histochemical localization of esterases, as suggested by Halton and Jennings (1964). Permanent mounts were made after dehydrating through ascending grades of alcohol, clearing in Xylene and mounting in Canada balsam. Camera Lucida sketches were made from permanent preparations within a week since the stain fades away in ten days. Microphotographs were taken with the help of Motic image plus Software.

Results

1. *Silurodescoides exotica* n. sp. (Fig. 1-9)

Description (based on 20 specimens). Body elongate, dorsoventrally flattened. Total length including haptor 0.45 (0.43 - 0.47). Maximum width 0.07 (0.06 - 0.08) at the level of vaginal opening. Eye spots two pairs, observed in live specimen. Seven pairs of glandular head organs are present in cephalic region. Sub terminal mouth leads to long pre-pharynx. On either posterio - lateral sides of the pharynx cephalic glands present. Pharynx oval 0.036 (0.034 - 0.038) X 0.0415 (0.035 - 0.048). Oesophagus is short and wide 0.020 (0.018 - 0.022). The intestinal crura are confluent posteriorly. At the point of confluence the crura are projected backwardly making a 'V' shaped termination.

Testis single, elongated, fusiform, intercaecal, post-ovarian, saccular 0.142 (0.124 - 0.16) long and 0.025 (0.014-0.036) wide. Median vas deferences long 0.122 (0.120 - 0.124) and convoluted. Seminal vesicle oval 0.035 (0.03 - 0.04) X 0.0175 (0.015 - 0.02) lies immediately anterior to, or at the level of ovary. Cirrus double walled, 0.071 (0.066 - 0.076) long sigmoid tube, with a broad funnel shaped, fleshy base that tapers gradually up to the distal part. Diameter of the base is 0.008 (0.006 - 0.010). Crochet shaped hook is present near the distal end of the cirrus. Accessory pieces dissimilar in shape and size. The distal accessory piece is small dagger shaped 0.018 (0.016 - 0.020) long. The second accessory piece longer 0.042 (0.040 - 0.044), spatulate with a broad and fleshy rectangular proximal part.

Ovary elongate - oval, 0.037 (0.031 - 0.043) X 0.027 (0.022 - 0.032) intercaecal, pre - testicular and pre - equatorial. Short and slender oviduct 0.045 (0.035 – 0.055) long. Ootype complex 0.025 (0.023 – 0.027) x 0.03 (0.01 – 0.05) bilobed, fusiform, surrounded by three pairs of darkly stained Mehli's glands.

* *Not consulted in original, as cited by Yamaguti, 1961*

0.013 (0.011 – 0.015) long fine vitelline ducts arise on either postero - lateral side of ovary from the vitelline reservoir. The vitelline ducts join near the posterior margin of the ovary to form a common vitelline duct, with a conical base, 0.078 (0.076 – 0.080) long. The common vitelline duct opens into ootype complex. Vestibule 0.142 (0.140 – 0.144) long. It connects the ootype complex and receptaculum seminis. *Receptaculum seminis* 0.022 (0.020 – 0.024) x 0.0235 (0.019 – 0.028) conical, purse shaped, pre – ovarian. Fine, convoluted vaginal duct 0.242 (0.240 – 0.244) long. Vagina sinistral, circular, bubble like. The vaginal opening 0.005 (0.003 - 0.007) in diameter. Egg oval 0.049 (0.048 - 0.050) X 0.075 (0.060 - 0.090). The egg is provided with a well - developed conical spur.

Opisthaptor globose, 0.07 (0.055 - 0.085) X 0.066 (0.045 - 0.087). Short peduncle separates body proper and haptor. Dorsal anchors 'Anchoratoid Wegeneri' type, 0.049 (0.046 - 0.052) in length. Dorso - apical length is 0.049 (0.046 - 0.052) while the ventro - apical length is 0.04 (0.038 - 0.042). Shaft cylindrical, 0.03 (0.028 - 0.032) long sleeve sclerite present. Point 0.022 (0.019 - 0.025) long. Small inwardly directed 0.011 (0.008 - 0.014) conical patches (capitulum) present at the base of inner root. The dorsal transverse bar also 'Anchoratoid Wegeneri' type. DTB 0.032 (0.031 - 0.033) long and 0.004 (0.003 - 0.005) in median width. The ventral anchors are 'Nanus' type, 0.0195 (0.018 - 0.021) in total length. Between two roots a small oval vacuity is present for the articulation of ventral transverse bar. Dorsal - apical length of ventral anchor is 0.017 (0.012 - 0.022) while the ventro - apical length of ventral anchor is 0.017 (0.013 - 0.021). Shaft short 0.0125 (0.011 - 0.014), cylindrical and supported by sleeve sclerite. Point 0.007 (0.006 - 0.008) long. Ventral transverse bar is a two - piece wide 'V' shaped bar with bluntly pointed outer ends. One half of ventral transverse bar 0.0265 (0.024 - 0.029) long. Marginal hooklets 'Larval' type 0.0145 (0.008 - 0.021) long. Sickle filament loop attached at the distal part of sickle on ventral side. Sickle 0.0055 (0.003 - 0.008), handle 0.011 (0.006 - 0.016) long respectively. The length of sickle filament loop is 0.009 (0.004 - 0.014). An opposable piece is attached dorsally with proximal part of sickle.

Remarks

The present form come closer to *S. aori* Gussev, 1973 and *S. parvulus* Gussev, 1973. However, it differs from *S. aori* in having different shape of ventral transverse bar and accessory piece of cirrus is ring shaped in *S. aori*. While, it differs from *S. parvulus* in having different shape of ventral transverse bar and accessory piece of cirrus, which has shape of 'gutter' shaped plate with claw like lateral processes in the end. Present form is described as a new species *viz., S. exotica* n. sp

Type Host: *Corydoras melanistius*

Type Locality: Meerut (India); (29.01°N, 77.45°E)

Microhabitat: Gills

Etymology: The specific epithet '*exotica*' refers to the exotic fish, from which the worms were collected.

2. *Silurodescoides vistulensis* (New combination) Siwak (1932) Bychowsky and Nagibina 1957 (Fig. 10 - 28).

Siwak (1932) described *Silurodescoides vistulensis* as *Ancyrocepahalus vistulensis* from the gills of *Silurus glanis* at Poland (Europe). Later, Bychowsky and Nagibina, 1957 transferred this species to the genus *Ancylodescoides* retaining the species valid. Since the previous accounts lack some morphological details including head organ pattern, gonads, seminal vesicle, ootype complex and difference in structure of egg etc., therefore, a brief redescription of the species, based on fresh material collected by authors, is given herein as such.

Description (based on 50 specimens). Body elongate, dorsoventrally flattened (fig. 10). Total length including haptor 0.601 (0.576 - 0.626) long. Maximum width 0.09 (0.07 - 0.11) at the level of gonads. Blunt and triangular cephalic region having 8 pairs of head organs. Fine ducts arise from head organs and join the cephalic glands on either side posterior to pharynx. Eyespots two pairs. Posterior pair larger. Pharynx spherical, 0.039 (0.036 - 0.042) diameter. Oesophagus short 0.0075 (0.006 - 0.009). Intestinal crura confluent posteriorly and projected backwards making a 'V' shaped termination. A pair of excretory pore 0.003 (0.002 - 0.004) in diameter is present ventrally at the level of receptaculum seminis. Excretory duct slightly convoluted (Fig. 21).

Testis single, intercaecal, post - ovarian, post - equatorial and saccular 0.089 (0.086 - 0.092) long 0.0465 (0.032 - 0.061) wide (Fig. 10). Vas deferens 0.357 (0.354 - 0.360) highly convoluted. Seminal vesicle elongated, pre - equatorial, inter - caecal pre-ovarian 0.109 (0.108 - 0.110) long 0.0155 (0.011 - 0.02) in median width (Fig. 14). Vasa efferentia or ejaculatory duct 0.239 (0.213 - 0.265) long, narrow and highly convoluted, opens at the base of male copulatory complex. Cirrus (Fig 11-13) is a long double walled sclerotized tube, 0.115 (0.09 - 0.14) in length. Distal part of cirrus is a long convoluted, non - sclerotized, single walled tube 0.24 (0.17 - 0.31). Diameter of the proximal part (base) of cirrus is 0.0065 (0.004 - 0.009). Small, semicircular, tri lobed accessory piece is located near the base of the cirrus. It is 0.011 (0.010 - 0.012) long.

Ovary pre-equatorial, intercaecal, pre – testicular overlapping ¼ anterior portion of testis, elongated and oval 0.076 (0.072 - 0.080) long and 0.0415 (0.032 - 0.051) wide. Oviduct convoluted 0.211 (0.142 - 0.028) long. Ootype complex fusiform 0.03 (0.025 - 0.035) long 0.0245 (0.020 - 0.029) wide. Vitelline reservoirs (Fig. 17) present on either antero - lateral side of ovary. A common vitelline duct 0.051 (0.050 - 0.052) long is formed by the fusion of vitelline ducts of either side. It supplies nutrients to the developing zygote in the ootype complex. Highly convoluted 0.3195 (0.302 - 0.337) long vestibule leads from ootype complex to receptaculum seminis (Fig. 18). Receptaculum seminis oval, 0.035 (0.03 - 0.04) long and 0.03 (0.028 - 0.32) wide. Vaginal duct 0.152 (0.145 - 0.159) short, looped. Genital aperture funnel shaped 0.016 (0.014 - 0.018) in diameter (Fig. 19). The male copulatory complex opens above the vaginal opening (Fig. 13). Egg fusiform, bipolar 0.0945 (0.069 - 0.12) long and 0.031 (0.03 - 0.032) wide. Outer egg membrane projected into polar filament at both the narrow (anterior and posterior) ends (Fig. 20). The posterior polar filament longer. The anterior and posterior polar filaments measure 0.10 (0.08 - 0.12) and 0.147 (0.13 - 0.164) respectively.

Opisthaptor globose, 0.0985 (0.08 - 0.117) X 0.057 (0.042 - 0.072), separated from body proper by a short peduncle. Dorsal anchors 'Anchoratoid Wegeneri' type (Fig. 22) 0.067 (0.064 - 0.070) long. Dorso - apical length of dorsal anchor is 0.067 (0.064 - 0.07), while its ventro - apical length is 0.058 (0.054 - 0.062). The base is swollen 0.015 (0.012 - 0.018) long. Shaft cylindrical 0.048 (0.046 - 0.05) long, sleeve sclerite present. Point recurved, 0.029 (0.027 - 0.031) long. Small inwardly directed 0.033 (0.031 - 0.035) conical patches (capitulum) present at the base of inner root (Fig. 23). Dorsal transverse bar is also 'Anchoratoid Wegeneri' type 0.035 (0.032 - 0.038) long. Median width of the bar is 0.009 (0.008 - 0.010) (Fig. 24). The ventral anchors are 'Wunderoid Nanus' type (Fig. 25) 0.020 (0.016 - 0.024) long. Its dorso apical length is 0.022(0.019 - 0.025), while its ventro apical length is 0.023(0.021 - 0.025). Between two roots a small oval vacuity is present for the articulation of ventral transverse bar. Base swollen 0.010(0.009 - 0.011) long. Shaft short 0.011(0.010 - 0.012), cylindrical and supported by the sleeve sclerite. Point recurved, 0.008 (0.007 - 0.009) long. Ventral transverse bar is a single piece wide '**V**' shaped bar with swollen outer ends (Fig. 26). First half of the ventral transverse bar 0.022 (0.018 - 0.024) long. While, second half of the bar 0.020 (0.019 - 0.021) long. The width of the bar at the ends is 0.005 (0.004 - 0.006) while the median width of the bar is 0.001(0.0009 - 0.0011). The marginal hooklets Larval type (Fig. 27), 0.016 (0.013 - 0.019) long. Handle 0.011 (0.009 - 0.013), sickle 0.008 (0.007 - 0.009) and sickle filament loop 0.0105 (0.009 - 0.012) long respectively.

Host - *Wallago attu* (Family: Siluroides); *Puntius sutchii* Tiger shark

New Locality: Meerut (India); (29.01°N, 77.45°E)

Microhabitat: Gills

Copulation Biology of *S. vistulensis* (Siwak 1932) Bychowsky and Nagibina 1957 (Fig. 11-16):

The male copulatory complex of *S. vistulensis* (Siwak, 1932) is exceptionally long. The sclerotized and non - sclerotized duct of cirrus are associated with each other like needle and thread (Fig. 11-12). The distal sclerotized part of the cirrus projects out from the common genital opening like point of a needle, pulling the non sclerotized part in its stride, in a manner similar to needle and thread (Fig. 13). The semicircular accessory piece holds the proximal base of the cirrus in position as the distal end of the cirrus enters the common genital opening of its mate (Fig. 15). The vasa efferentia opens at the base of the cirrus. The spermatozoa are ejaculated from the cirrus into the female genital opening of its mate. The sperms are collected into the receptaculum seminis, from where they reach the ootype complex to fertilize the ovum.

Neuroanatomy (Fig. 29 and photomicrographs 1 - 10)

The central nervous system (CNS) of *Silurodescoides* sp. consists of paired cerebral ganglia (cg) from which anterior and posterior neuronal pathways arises and interlinked by cross connectives and commissures. The peripheral nervous system (PNS) includes innervations of the alimentary tract, reproductive organs and attachment organs (anterior adhesive areas and haptor). Both the CNS and PNS are bilaterally symmetrical, and better developed ventrally than laterally and dorsally.

The CNS and PNS were found to be highly reactive for ChE, and stained extensively in a dark blue and purple colour. The CNS consists of a thick, curved mass of paired cerebral ganglia (Cg) located ventrally just anterior to the pharynx. A single anterior ventral commissure (Avc) originates from the postero - lateral regions of the cerebral ganglia, and runs in a semicircular manner in the anterior region of the head, just posterior to the head lobes. Two considerably thick projections (Ap) extend from the anterior median region of the cerebral ganglia, imparting to this organ a butterfly - like appearance. Each projection gives rise to cerebral nerves (Cn), which extend anteriorly to enter the head lobes where they innervate the anterior adhesive areas.

Two thick ventral nerve cords (Vnc) arise one from each lateral region of the cerebral ganglia, and run posteriorly where each joins a prehaptoral ganglion (Phg1). Another pair of prehaptoral ganglia (Phg2) is located one on each side of the body a short distance posterior to the prehaptoral ganglia (Phg1) in the region anterior to the haptor. One thin branch arises from ventral nerve cord at a point posterior to termination of intestinal crura and reconnects to the ventral nerve cord at a short distance. Nine ventral transverse connectives (Vc1 - Vc9) were also detected, seven before prehaptoral ganglia (Phg 1) and two after the prehaptoral ganglia (Phg2).

Two considerably thin lateral nerve cords (Lnc) arise from the posterolateral region of the cerebral ganglia and run posteriorly, one adjacent to each lateral margin of the body where they join the pre - haptoral ganglia Phg1. Four lateral transverse connectives (Lc1 - Lc4) were also detected, one at the region of ovary, second at the region of testis, third and fourth in the pre - peduncular region behind the confluence of intestinal crura. At regular intervals, the ventral nerve cords communicate with the lateral nerve cords by means of seven pairs of ventrolateral connectives (Vlc1 - Vlc7). Two thin dorsal nerve cords (Dnc) arise from the posterolateral region of the cerebral ganglia and connect to the ventral nerve. It is connected to the lateral nerve at two positions, first in posterior region of cirrus (Dlc1) and second in posterior region of intestinal crura (Dlc2), whilst they are linked to the ventral nerve cords via three dorsoventral connectives (Dvc1 – Dvc3) at the posterior most extremity of intestinal crura.

Staining for cholinergic elements revealed the presence of four pairs of large neurons distributed bilaterally down the main body of the worm. These cells are located on the lateral side of the body (L1 - L4). The first pair of lateral cell bodies (L1) is positioned at the level of the cirrus, the second pair (L2) at the level of the ovary, the third pair (L3) in the region of the posterior part of the testis and fourth pair (L4) in the region of the peduncle.

The haptor is innervated extensively by relatively thick haptoral nerves i.e. two outer (Ohn) and four inner (Ihn). The outer of these arise one from each posterior prehaptoral ganglion (Phg2) while the inner haptoral nerves are derived from the ventral connective (Vc9). The outer and inner haptoral nerves run ventrally in the posterior direction before branching into a plexus of numerous fine nerves in the anterior region of the haptor. There are two dorso - lateral haptoral nerves (Dhn) arising one from each posterior prehaptoral ganglion (Phg2), and these run posteriorly and eventually branch into five pairs of posterior hook nerves (Phn) and one pair of antero - lateral hook nerves (Ahn).

Remarks

Siwak (1932) described *Silurodescoides vistulensis* as *Ancyrocepahalus vistulensis* from the gills of *Silurus glanis* at Poland (Europe). Later, Bychowsky and Nagibina (1957) transferred this species to the genus *Ancylodescoides* retaining the species valid. Gussev (1973) synonymised *Ancylodescoides* with *Silurodiscoides.* The authors agree with the synonymy proposed by Gussev (1973). Hence *Ancylodescoides vistulensis* is renamed as *Silurodescoides vistulensis* (new combination), retaining the species valid

The worms at the disposal of writer exhibit differences in following parts.

1. The present specimens possess eight pairs of head organs (4 pairs in forms described by earlier workers).
2. Shape of male and female reproductive organs is different.
3. The egg in present form is bipolar with prominently long polar filaments. The eggs drawn by earlier workers are unipolar with short polar filament
4. The patches attached at the base of dorsal anchor are slightly curved.
5. The ventral anchors possess a distinct vacuity at the base of its outer root.

These differences present in the specimens at the disposal of the authors could be either due to difference in degree of maturity (in case of reproductive organs). Or the differences might be due to the presence of parasite in different ecological niche or Siwak, 1932 *and* Bychowsky and Nagibina (1957) made a cursory observation on these structures.

As far as is known, the present study is the first to describe cholinergic components of the nervous system of any member of the genus *Silurodescoides*, a monogenean gill parasite of the teleost catfish *Wallago attu*. The central nervous system (CNS) of the worm comprises mainly a mass of cerebral ganglia and three pairs of ventral, lateral and dorsal longitudinal nerve cords connected by transverse commissures; it is better developed ventrally than dorsally and laterally. In these respects, the CNS of *S. vistulensis* resembles in basic structure that of all previously studied flatworms, including monogeneans, digeneans and cestodes (Reuter, 1987; Halton and Gustafson, 1996; Reuter *et al.*, 1998*;* Reda and Arafa, 2002*;* Arafa and Reda, 2002).

The CNS of *S. vistulensis* as revealed by cholinergic staining confirms to the basic orthogonal pattern described for other monogeneans (Bullock and Horridge, 1965; Reisinger, 1976; Halton *et. al.*, 1993). Typically, the PNS innervates the alimentary system, reproductive organs, attachment organs and subtegumental muscles in the prohaptor and opisthaptor region. These neural pathways and their organization have previously been described in 14 other monogeneans: *Diplozoon paradoxum* (Halton and Jennings, 1964), *Polystoma integerrinum* (Rahemo and Gorgees, 1987*)*, *Gyrodactylus salaris* (Reuter, 1987), *Pseudodactylogyrus anguillae* (Buchmann and Mellergaard, 1988; Reda and Arafa, 2002), *Eudiplozoon nipponicum* (Lyukshina and Shishov, 1988*;* Zurawski *et al*., 2001), *Diclidophora merlangi* (Maule *et al.*, 1990 (a), 1990 (b)), *Pseudodactylogyrus bini*, *P. anguillae* (Reda and Arafa, *2002*), *Entobdella soleae* (Marks *et al*., 1994), *Discocotyle sagittata* (Cable *et al*., 1996), *Protopolystoma xenopodis* (Mc Kay *et al.*, 1991), *Macrogyrodactylus clarii* (El - Naggar *et al*., 2004) *M. congolensis* (El - Naggar *et al*., 2006) and *Chauhanellus indicus* (Rastogi *et al., 2007).*

Cholinergic staining revealed numerous pairs of neuronal cell bodies associated with the cerebral ganglia, pharynx, prehaptoral nerve plexuses and prehaptoral commissure of *Silurodescoides*, together with scattered cell bodies along the ventral nerve cords and in the vicinity of the uterus

In the present study, intense reactions of cholinergic components have been observed in the cerebral ganglia, which lie immediately anterior to the pharynx, together with the longitudinal nerve cords, and nerve fibers, which innervate the head lobes, pharynx and haptor.

The authors feel that the nerves supplying the head lobes of *S. vistulensis* play an important role in temporary attachment of the anterior adhesive sacs (head organs) during locomotion and feeding. These nerves are also responsible for the coordination of muscular movements involved in the release of histolytic enzymes from the gland cells (cephalic glands) of the anterior adhesive apparatus. Extensive innervations of the head lobes, particularly the adhesive sac nerves, resemble that of *M. clarii* (El - Naggar *et. al.,* 2001, 2004; Arafa *et al*., 2003) and *M. congolensis* (El - Naggar *et. al.*, 2006). Contact perception (and possibly contact chemoreception) by the pro - haptor is likely to be important during temporary leech - like locomotion.

Discussion

Genus *Silurodescoides* (Achmerow, 1964) Gussev 1973 was established a new combination to accommodate a few parasites of freshwater cat fishes (Siluroides) of Urasia and Africa. Gussev pointed out that, a new name has been given to the genus *Parancylodiscoides* suggested by Achmerow in 1964. Gussev (1973) suggested following generic diagnosis: -

Dactylogyridae, Ancylodiscoidinae. Two pairs of head lobes each of them having 1 - 3 pairs of head organs. Two pairs of eyespots. Pharynx is muscular. Intestinal crura bifurcate, united posteriorly and extend towards haptor in united form to considerable length. The copulatory complex consists of a tube and accessory piece. Prostate glands present? The vas deferences is looped around the intestinal crura. Seminal vesicle present? Vaginal opening dextral or sinistral at the level of copulatory complex. Vitelline follicles co - extensive with intestinal caeca. Egg oval and provided with a spur. Haptor is slightly separated from the body. Its armature consists of seven pairs of hooks, two pairs of anchor; the ventral anchors are smaller in comparison to the dorsal anchors. An unpaired dorsal transverse bar and paired ventral transverse bar. A pair of patches additional supporting bars. Parasites of fresh water teleosts (Siluroides).

To the best of our knowledge, Kulkarni (1969) for the first time reported specimens of this genus from the Indian subcontinent, but he reported it under the different genus *Ancylodescoides* Yamaguti, 1937. Gussev (1973) gave new combination and shifted it from the genus *Ancylodescoides* Yamaguti, 1937 to the genus *Silurodescoides* with *S. siluri* (Zandt, 1924) as type species, a parasite of European catfish *Silurus glanis*. Besides this, he further pointed out about the presence of 48 species from Europe, Far East, India and Indo - China. Moreover, he also synonymised a few other genera of this family with *Silurodescoides* viz., *Ancylodescoides* Yamaguti, 1937; *Haplocleidus* Muller, 1937; *Urocleidus* Muller, 1934; *Thaprocleidus* Jain, 1952; *Neomurraytrema* Tripathi, 1959; *Wallagotrema* Tripathi, 1959 etc.

Various authors have discussed this synonymy from time to time. At this juncture, the authors do not want to enter into this controversy. However, synonymy of a part of *Haplocleidus* Mueller, 1937 is admissible.

On study of Indian *Haplocleidus* we found that —

H. pangasi Tripathi, 1959 and *H. vachi* Tripathi, 1959 have the characters more or less similar to that of *Silurodescoides viz,*

1. Presence of patches on the base of dorsal anchors.

2. Paired ventral transverse bar

Thus, they should also be shifted from *Haplocleidus* to *Silurodescoides* remaining the species valid *viz,*

S. (H.) pangasi (Tripathi, 1959) Gussev, 1973

S. (H.) vachi (Tripathi, 1959) Gussev, 1973

Subsequently, following species have been abstracted from different hosts and places as shown in the Table 1

Diagnostic morphological characters: Several workers used these characters to identify different species of the genus *Silurodescoides* (Achmerow, 1964) Gussev, 1973 -

1. Shape of male copulatory complex
2. Shape of seminal vesicle
3. Shape of vagina
4. Degree of development of inner and outer roots of dorsal anchor and shape of point
5. Shape of dorsal transverse bar
6. Degree of development of inner and outer roots of ventral anchor and shape of ventral transverse bar.

Characters used by different workers and the observations of the author warrant, the amendment of generic diagnosis.

Amended generic diagnosis of the genus *Silurodescoides* (Achmerow, 1964) Gussev, 1973 -

Dactylogyridae, Ancyrocephalinae. Two pairs of head lobes each of them are having 1 - 8 pairs of head organs. Two pairs of eyespots. Pharynx muscular. Intestinal crura bifurcate, united posteriorly and extend towards haptor in united form up to considerable length in some forms. The copulatory complex consists of a tube and accessory piece. Prostate glands present. The vas deferens looped around the intestinal crura. Seminal vesicle present. Vaginal opening dextral or sinistral at the level

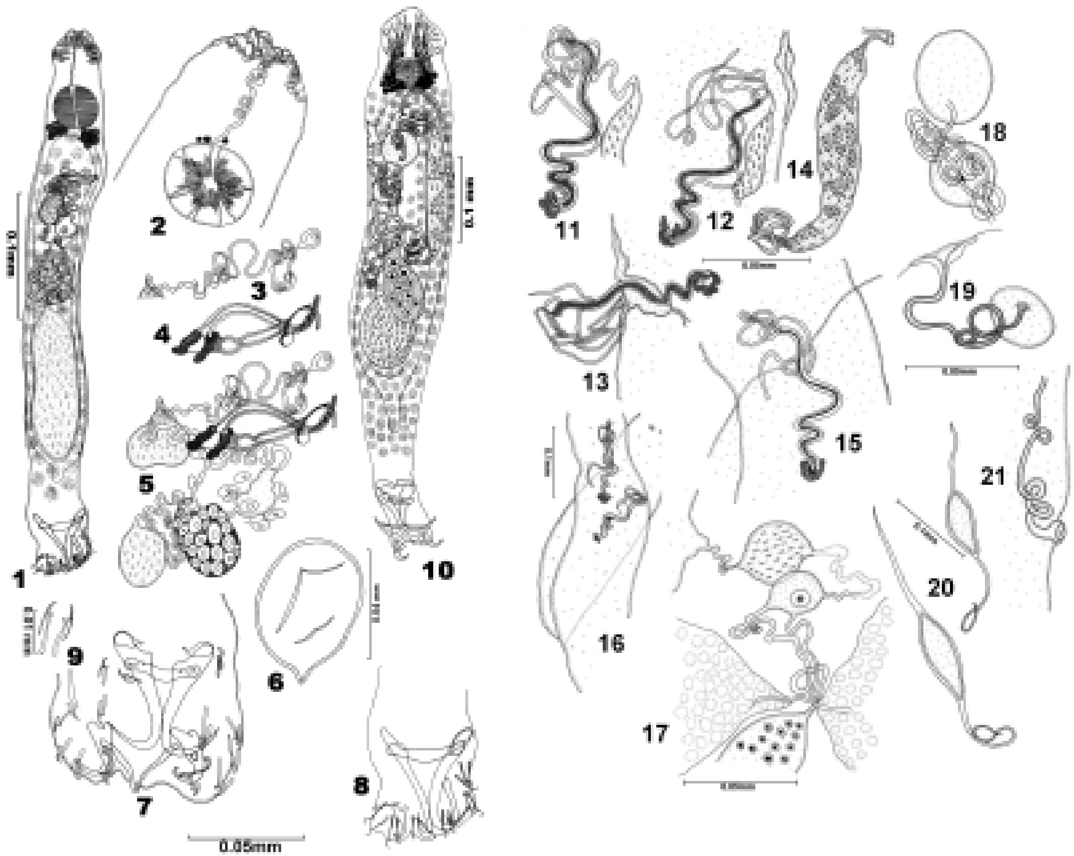
Table 1 : Host parasite list of *Silurodescoides* (Achmerow, 1964) Gussev, 1973 (From India)

S. No.	Parasite	Host	Locality
1	*S. (H.) vachi* (Tripathi, 1959) Gussev, 1973	*Eutropiichthys vacha*	Allahabad; Buxar
2	*S. (H.) pangasi* (Tripathi, 1959) Gussev, 1973	*Pangasius pangasius*	Matla; Buxar; Cavery; Hooghly
3	*S. octotylus* (Kulkarni, 1969) Gussev, 1973	*Callichrous pabada*	Lucknow; Hyderabad
4	*S. indicus* (Kulkarni, 1969) Gussev, 1973	*Wallago attu*	Hyderabad; Bhavanisagar reservoir
5	*S. sudhakari* Gussev, 1973	*Wallago attu*	Bhavanisagar reservoir
6	*S. devaraji* Gussev, 1973	*Callichrous malabaricus*	Bhawanisagar reservoir
7	*S. malabaricus* Gussev, 1973	*C. malabaricus*	—
8	*S. vaginalis* Gussev, 1973	*Prevdentropius garua*	Lucknow
9	*S. aori* (Rizvi, 1971) Gussev, 1973	*Mystus aor*	Lucknow and river Indus
10	*S. pussillus* Gussev, 1973	*Mystus vittatus*	Lucknow
11	S. parvulus Gussev, 1973	*Mystus vittatus*	Lucknow
12	*Silurodescoides* sp. Sharma and Sheikh, 1986	*Wallago attu*	Etawah
13	*S. meerutenis* Singh and Jain, 1987	*Rita rita*	Meerut
14	*S. gussevi* Singh *et. al.* 1992	*Wallago attu*	Meerut
15	*S. exotica* n. sp.	*Corydoras melanistius*	Meerut
16	*S. vistulensis* (Siwak, 1932)	*Wallago attu* ; Tiger shark	Meerut

of copulatory complex. Vitelline follicles co - extensive with intestinal caeca. Egg oval, may be uni- or bipolar and provided with a spur or polar filament. Haptor is slightly separated from the body. Its armature consists of seven pairs of hooks, two pairs of anchors; the ventral anchors are smaller in comparison to the dorsal anchors. An unpaired dorsal transverse bar and paired ventral transverse bar. A pair of patches or additional supporting bars. Parasites of fresh water teleosts (Siluroides).

Explanation of figures

1. *Silurodescoides exotica* n. sp. whole mount
2. *S. exotica* prohaptor
3. *S. exotica* vaginal duct and vaginal opening
4. *S. exotica* male copulatory complex
5. *S. exotica* male and female reproductive complex
6. *S. exotica* egg
7. *S. exotica* opisthaptor type
8. *S. exotica* opisthaptor paratype
9. *S. exotica* marginal hooklet
10. *S. vistulensis* (Siwak, 1932) Bychowsky and Nagibina, 1957 whole mount
11. *S. vistulensis* cirrus type
12. *S. vistulensis* cirrus paratype
13. *S. vistulensis* cirrus coming out of genital opening in search of mate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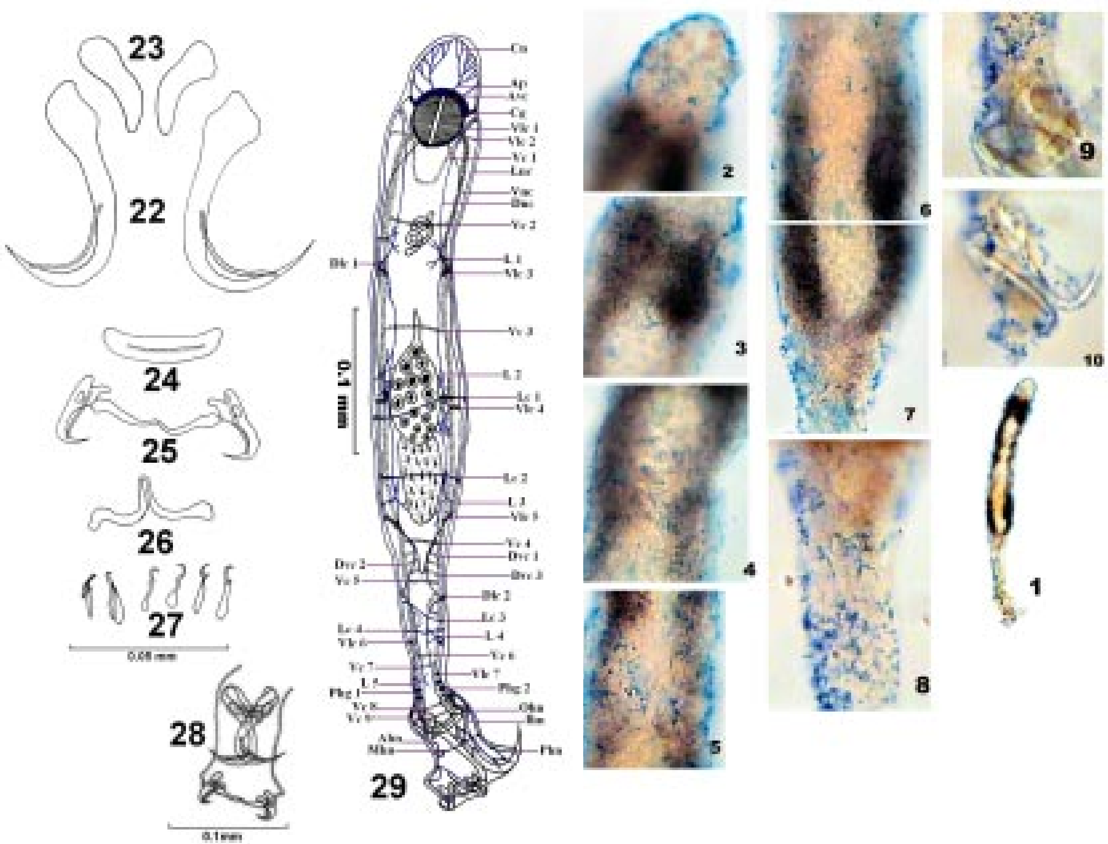
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14. *S. vistulensis* seminal vesicle
15. *S. vistulensis* copulation
16. *S. vistulensis* copulation lower magnification (10 x 40x)
17. *S. vistulensis* female reproductive system
18. *S. vistulensis* ootype complex and receptaculum seminis
19. *S. vistulensis* receptaculum seminis and vaginal opening
20. *S. vistulensis* bipolar egg
21. *S. vistulensis* excretory pore and excretory duct
22. *S. vistulensis* dorsal anchor
23. *S. vistulensis* capitulum
24. *S. vistulensis* dorsal transverse bar
25. *S. vistulensis* ventral anchors and transverse bar
26. *S. vistulensis* ventral transverse bar
27. *S. vistulensis* marginal hooklets
28. *S. vistulensis* opisthaptor
29. *S. vistulensis* neuroanatomy

Explanation of Photomicrographs *S. vistulensis* (Siwak, 1932) Bychowsky and Nagibina, 1957

Photomicrograph 1: *S. vistulensis* Bychowsky and Nagibina, 1957 Nervous system (10 X 10x)

Photomicrograph 2: Anterior head region showing cerebral ganglia (*Cg*) with two anterior projections (*Ap*) and anterior ventral commissure (*Avc*). Innervations of pharynx (10 X 100x).

Photomicrograph 3: Middle portion of the body showing Ventral nerve cord and ventral connective near the cirrus (male copulatory complex) (10 X 100x).

Photomicrograph 4: Middle portion of the body showing Ventral nerve cord ventral connective (Vc2) and lateral nerves (L) in the pre - ovarian region (10 X 100x).

Photomicrograph 5: Middle portion of the body showing Ventral nerve cord ventral connective (Vc2) and ventro lateral connective (Vlc3) in the pre - ovarian region (10 X 100x).

Photomicrograph 6: Middle portion of the body showing Ventral nerve cord ventral connective (Vc3) in the pre - ovarian region (10 X 100x).

Photomicrograph 7: Middle portion of the body showing Ventral nerve cord ventro - lateral connective (Vlc4), lateral nerves (L2) and lateral connective (Lc1) in the posterior part of ovary (10 X 100x).

Photomicrograph 8: Testis region showing lateral connective (Lc2) (10 X 100x).

Photomicrograph 9: Posterior region showing ventral connectives (Vc4 - Vc7), dorsoventral connective (dvc1 - dvc3), lateral connectives (Lc3 - Lc4), Lateral nerve (L4 - L5) and pre haptoral ganglia (Phg 1& Phg 2) (10 X 100x).

Photomicrograph 10: Haptoral region showing haptoral nerves (10 X 100x).

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