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STUDIES ON THE TREMATODE GENUS *LEUCOCHLORIDIUM* CARUS, 1835 (DIGENEA: LEUCOCHLORIDIIDAE (POCHE, 1907) DOLLFUS, 1934 WITH DESCRIPTION OF *LEUCOCHLORIDIUM MEHRII* SP.NOV. FROM THE SPOTTED REDSHANK *TOTANUS FUSCUS*

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ABSTRACT – Notwithstanding the enormous work done on the family Leucochloridiidae (Poche, 1907) Dollfus, 1934 and a vast literature available on the family and the genus *Leucochloridium* Carus, 1835, confusion still prevails on the classification of the family and position of a number of genera. While Carus in 1835 created the genus *Leucochloridium,* Zeller (1874) and Heckert (1889) followed the course of development of larva and worked out its life history. The earliest record of *Leucochloridium* from the new world is *L.americanum* reported by Dall in 1892 followed by other species viz., *L. cerecatum* and *L. insignis* described by Monticelli (1893) and Looss (1899) respectively. Several other species were thereafter described from various parts of the world. While Braun (1901, 1902) synonymised various species of *Leucochloridium,* Witenberg (1925) revised the taxonomy of the genus and Szidat (1936) revised the concepts of the taxonomy of the genus. Kagan (1952) revised Leucochloridiinae and clarified the relationship of various species. A significant contribution to the family/genus was also made by Mehra (1936, 1962), Yamaguti (1958,1971,1975), Bakke (1980, 1982), Pojmanska(2002) and others. The paper presents a detailed history and classification of the family/genus. *Leucochloridium mehrii* sp.nov. is described from *Totanus fuscus* which is a new host record.

Key Words : Leucochloridiidae, *Leucochloridium,* Digenea, *Totanus fuscus,* Allahabad.

INTRODUCTION

Genus *Leucochloridium* Carus, 1835: Though with a long and confused history, the classification of the family Leucochloridiidae (Poche, 1907) Dollfus, 1934 and the position of a number of genera is still controversial notwithstanding the enormous work done on the family since the turn of nineteenth century. The literature dealing with the genus *Leucochloridium* is vast. The generic name *Leucochloridium* was erected by Carus in 1835 for the pigmented sporocysts found in the snail of the genus *Succinea.* The corresponding adult of the same was described in 1803 by Rudolphi as *Fasciola macrostomum* though not recognized until Zeller (1874) and Heckert (1889) followed the course of development of larva and gave a full historical account of the genus respectively. They used metacercariae obtained from these sporocysts and succeeded experimentally in obtaining adults in birds which they believed to be identical with *Distoma macrostomum* described previously by Rudolphy in 1803 from naturally infected birds. Thereafter the generic name *Leucochloridium* has been established in the record books of Parasitology. For several decades before and after the turn of nineteenth century, an era of confusion prevailed in the identification of the species associated with the genus *Leucochloridium* because no importance was given to the arrangement of genital glands in the species known.

Though the earliest record of the genus from the new world is *L.americanum* reported by Dall in 1892 but due to lack of any description it was ignored by later authors. In 1893 Monticelli described *L.cerecatum* without knowing its host. Looss in 1899 described *L.insignis* from a Coot in Egypt and created the subfamily Urogoniminae to include *Leucochloridium* Carus, 1835 apart from other genera on account of the presence of genital pore at the posterior end. However, at about the same time a new genus *Urogonimus* Monticelli, 1888 was introduced with *U.macrostomum (*Rud.,1803) as type species. But Stiles and Hasel (1898) accepted the validity of *Leucochloridium* as per the law of priority and synonymised *Urogonimus* with it. Notwithstanding all these statements, the generic name of both was in use in the beginning of nineteenth century. Though Looss (1899) created the subfamily Urogoniminae and Poche (1907) the Leucochloridiinae but only the latter was accepted by the subsequent authors. The author also accepts the validity of the subfamily Leucochloridiinae for maintenance of nomenclature stability.

The validity of the genera *Urogonimus* and *Leucochloridium* has been a topic of discussion for a long time. The original material of the poorly described *Distoma macrostomum* described by Rudolphy in 1803 was revised by Braun (1901, 1902). He examined various species of the genus *Leucochloridium* and synonymised all with *L. macrostomum* (Rud. 1803). He also united several species of Leucochloridiids with *U. macrostomum* which had terminal genital pore and gonads present in hind body. Odhner in 1912 created the family Harmostomidae and divided it into two subfamilies, Harmostominae Braun, 1899 and Liolopinae Cohn,1902 to include *Leucochloridium* into the former apart from classifying other genera. Viana (1924) added one more subfamily Leucochloridiinae Poche, 1907 to the list. Several other species of *Leucochloridium* were subsequently described from other parts of the world (Europe, USA, Asia and Australia). Whereas Solowiow (1912) described *L.turanicum* in *Totanus glareola* from Turkey, Travassos in 1922 established two new species, *L.parcum* and *L.flavum* from South America. Though Luhe (1909) had reported presence of *L.macrostomum (Rud.)* in Germany but Nicoll reported the same species in 1923 from British Isles. in addition to *L.turanicum s*olowiow and *L.insignis* Looss from some of the birds. McIntosh in 1927 described five new species of the genus from birds in Minnesota, Michigan (USA) and again another six new species from the birds of the same locality and one new species from Alaska. He is also credited with giving a comparative data of European species. Tubangui in 1928 and 1932 described two new species from birds in Philippine islands. Dollfus, 1934 created the family Leucochloridiidae to accommodate the genera *Leucochloridium,Urotocus* and *Urorgyma*. Yamaguti(1935) while recognizing Leucochloriidae Dollfus,1934 described under it a new species *L. sime* from Japan.

The painstaking approach towards the genus *Leucochloridium* by Szidat has been exemplary. Szidat (1936b) is credited with laying the foundation for a thorough revision of the concepts of the taxonomy of the genus *Leucochloridium*. He restudied the original material of Rudolphi deposited in Berlin museum. He redescribed and accepted the validity of Rudolphy's species, *D. macrostomum* and D.holostomum. He indicated that the species identified by Zeller (1874) and Heckert (1889) as *D.macrostomum* and so accepted for sixty years were different from Rudolphy's *D. macrostomum* and *D. holostomum.* He categorized *Leucochloridium* into three morphological types viz, digenes with genital glands in a straight line represented by *D. macrostomum* Rudolphy; digenes with genital glands in a triangle resembling the species of Heckert and Zeller and those with glands in a triangle and an intracaecal uterus as in *D.holostomum* Rudolphy.

Witenberg (1926) and Kagan (1951) stressed upon the taxonomic importance of the sporocysts and accordingly grouped sporocysts on the basis of broodsac colours, though it had little effect upon the concept of classification. Pojmanska (1969) studied and compared sporocysts from different geographical regions but erroneously did not regard sporocysts with similar characteristics as conspecific.

A revision of the subfamily Leucochloridiinae Poche, 1907 by Kagan (1952) clarified the relationship of the various species previously assigned to the genus *Leucochloridium*. He divided the genus *Leucochloridium* into three genera on the basis of the morphology of the adults; *Urogonimus* Monticelli, 1888, *Leucochloridium* Carus, 1835 and *Neoleucochloridium* Kagan, 1952. These three genera and the genus *Urotocus* Looss, 1899, he included in the Leucochloridiinae. He validated *Urogonimus* by removing it from synonymy with *Leucochloridium* and established the two genera considering the differences as of generic value. He further characterized *Leucochloridium* by having genital glands in a triangle arrangement; long cirrus sac, pointed or smooth; uterus encircling acetabulum and Laurer's canal opening into excretory bladder. He recognized only ten species in the genus *Leucochloridium* and reduced the following to synonymy: *L.insigne* Witenberg (1925) with *L.heckerti* Kagan (1950); *L.sp.*Hsu (1936) from *Pavoncella pugnax* with *L.paradoxum* Carus, 1835; *L.sp.*Hsu(1936) from *vanellus vanellus* with *L.heckerti* Kagan(1950) ; *L.actitis* McIntosh(1932) with *L.cyanocittae* McIntosh(1932) and *L.pricei*(1932) *McIntosh* with *L.varie McIntosh*(1932).

Yamaguti (1958) accepted the Leucochloridiidae Dollfus, 1934 and divided it into three subfamilies only: Urotocinae Yamaguti, 1958, Urorgyminae Yamaguti, 1958 and Leucochloridiinae Poche, 1907. He also synonymised *Urogonimus* and *Neoleucochloridium* with *Leucochloridium.* Out of 44 species described world wide, he accepted the validity of only 32 species, synonymised 8 and declared 4 as Sp.inq. Mehra.1962 while reviewing the family Brachylaemidae Joyeux et Foley, 1930 did not accept the status of Leucochloridiidae as a full fledged family but maintained it as subfamily Leucochloridiinae under Brachylaemidae which he had earlier in 1936 included under Harmostomidae as a subfamily. He included the single genus *Leucochloridium* in Leucochloridiinae and also supported Yamaguti in

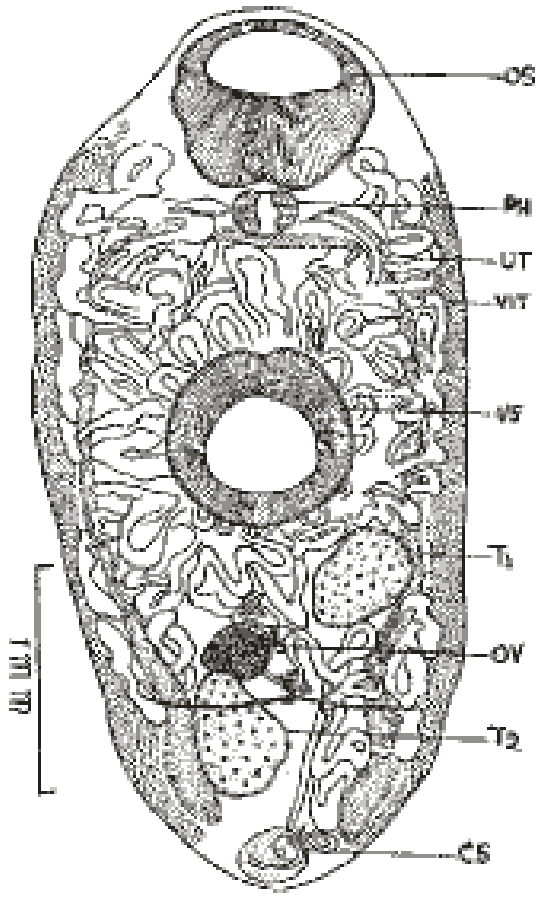

Fig. 1 : *Leucochloridium mehrii* sp. nov., Holotype, entire worm, dorsal view.

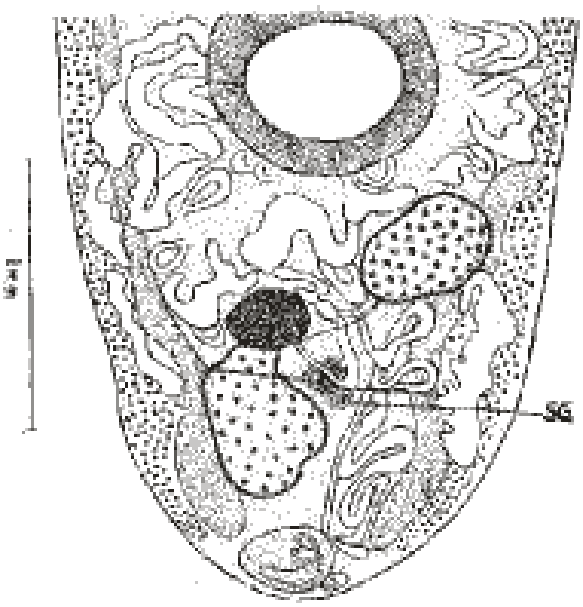

Fig. 2 : *Leucochloridium mehrii* magnified view of posterior part.

synonymising *Urorgonimus* and *Neoleucochloridium* with *Leucochloridium.*

Schmidt (1965) and Lewis (1974) studied the life cycles of the representatives of *Urogonimus* and the simultaneous publication of life cycles of the representatives of *Leucochloridium* by Pojmanska (1967,1969,1975,1978) have revealed that the nature of the sporocysts of the two genera differ considerably. Following revision of the family Leucochloridiidae by Kagan (1952), though Yamaguti (1971,1975) did not accept the separate identity of *Urogonimus* and *Leucochloridium* but Bakke (1980) accepted the distinctness of the two genera. Bakke (1980) while revising the family Leucochloridiidae recognized four genera, *Leucochloridium, Urogonimus, Urotocus* and *Michajlovia* (Pojmanska, 1973). On the basis of larval similarities he changed the status of *Neoleucochloridium* with *Leucochloridium*. He further subdivided the genus *Leucochloridium* into three subgenera, *Leucochloridium, Neoleucochloridium* and *Pappilloleucochloridium* primarily on sporocyst characteristics and tabulated their larval and adult characters. He commented that "The taxonomic importance of the sporocysts of these flukes is now accepted (Pojmanska, 1969b), especially as specific sporocyst types may give rise to adults which only with difficulty can be differentiated on morphological characters (e.g., Pojmanska, 1978; Bakke, 1978c)". Further in 1982, Bakke studied the adult morphology of *Leucochloridium* (L.) *varie,* MaIntosh, 1932 by light and electron microscope on experimentally reared adults from *Larus canus* and *Taeniopygia guttata* from Nearctic and Palaeartic regions and compared them with the earlier information on this and other species described within the same species complex. He observed that there are no significant differences within the Nearctic and palaearctic material. He accordingly concluded that *L.variae* McIntosh, *L.pricei* McIntosh, the "Rensselaerville-Sporocyst" described by Ingram and Hewitt, *L. fuscostriatum* Robinson, *L. perturbatum* Pojmanska, *L.subtilis* Pojmanska, *L. fuscum* Rietschel and *Leucochloridium* sps. Bakke are conspecific and

Table 1 : Comparative Measurements of some species of *Leucochloridium* Carus, 1835 (All Divisions are in mm. unless stated otherwise)

S. No.	Name of Species	Host	Site	Length	Breadth	Oral Sucker	Pharynx	Ventral Sucker	Ant. Testis	Post. Testis	Cirrus Pouch	Ovary	Ova
1	*L.cyanocittae* McIntosh,1933	*Cyanocitta cristata*	Cloaca	2.1	1.33	560 x 630	140 x 210	540 x 575	130 x 200	140 x 180	Size 0f Post. testis	130 x 250	24/18
2	*L.beauforti* Hunter et Vernberg,1952	*Ammospiza maritima macgillivraii.*	Bursa and rectum	0.456 - 0.683	0.226- 0.439	0.208 - 0.267 (diam.)	0.050-0.099 x 0.093-0.119	0.176 x 0.257	0.060 – 0.082 (diam.)	0.062 – 0.110 (diam.)	0.066 – 0.126 (diam.)	0.064- 0.099 (diam.)	0.018- 0.029
3	*L.perisorisae* Neiland,1953	*Perisorus o. obscurus*	Intestine	1.42 - 2.02	0.61 - 0.80	0.32-0.39 x 0.35-0.4	0.011-0.014 x 0.13-0.17	0.39-0.46 x 0.40-0.48	0.13 -0.28 x 0.09 – 0.20	0.12 -0.28 x 0.07 -0.19	0.1-0.17 x 0.05-0.08	0.12 – 0.15 x 0.09 – 0.15	0.020-0.025 x 0.011- 0.013
4	*L.indicum* Singh,K.S.,1963	*Garrulous bispecularis*	Intestine	1.157 - 1.442	0.579 - 0.801	0.356 -0.401 (diam)	0.16-0.176 (diam.)	0.356 – 0.427 (diam.)	0.12 -0.17 (diam.)	0.12 -0.17 (diam.)	0.056 long	0.1 – 0.16 (diam.)	0.026 -.0.03 x 0.016-0.018
5	*L.parcum* (Travassos,1922) Odening,1963	*Thraupis ornata*	Intestine	1.6-2.7	0.91- 1.13	0.411-0.528 x 0.411-0.484	0.125-0.154 x 0.158-0.206	0.375-0.477 x 0.389-0.470	0.081 – 0.197 x 0.128 -0.179	0.097 – 0.193 x 0.121 – 0.173	-	0.097 – 0.15 x 0.104 -0.162	-
6	*L.gallinuli* Kharoo,V.K. et Dhar,R.L.,1981	*Gallinula chloropus*	Intestine	3.514 - 3.542	1.204 - 1.302	0.826-0.828 x 0.868-0.938	0.280-0.294 x 0.322-0.336	0.840 x 0.812-0.826	0.07 – 0.084 x 0.29 - 0.33	0.126 x 0.238 -0.280	0.08 x 0.096	0.14 x 0.238–0.266	0.018-0.021 x 0.015
7	*L.mehrii* Sp.Nov.	*Totanus fuscus*	Bursa fabricii	3.88	1.94	0.776 x 0.873	0.23 x 0.29	0.72 x 0.80	0.388 x 0.543	0.582 x 0.426	0.2522 x 0.3298	0.232 x 0.310	0.018 – 0.0216 x 0.0108- 0.0144

L.melospizae McIntosh as *sp.inquirenda.*

Pojmanska (2002) while reviewing the family Leucochloridiidae did not maintain the division of the family into three subfamilies, Urotocinae, Urorgyminae and Leucochloridiinae as propounded by yamaguti. He distinguished *Leucochloridium* Carus, 1835, *Urogonimus* Monticelli, 1888 *and Urotocus* Looss, 1899 in the family and accepted their separate identities but reduced *Neoleucochloridium* Kagan, 1952 to sub generic level. Furthermore, besides transferring a few genera and synonymising others he pointed out that "Genera of this family are distinguished on the basis of proportions of the suckers, position of ventral sucker, arrangement of gonads, position of genital pore and the course of uterus." He accordingly distinguished *Leucochloridium* with: Body oval, often with fine spines; both suckers well developed; pharynx muscular, caeca usually reach closer to posterior extremity. Oral sucker, pharynx and ventral sucker close to each other, sometimes overlapping one another. Gonads between ventral sucker and caecal extremities in triangle, sometimes almost in line. Cirrus sac quite large in relation to size of gonads. Vitelline fields long, extending from region of oral sucker to caecal extremities or more posteriorly. Uterus forming one ascending and one descending limb crosses body anterior to ventral sucker.

Aggressive mimicry: An interesting phenomenon in the life history of *Leucochloridium* is "aggressive mimicry" of the flatworm where the parasite vaguely resembles the food of the host to gain entry into host's body. The adult trematodes living in the bursa fabricii of the birds release eggs into ponds through defecation. The eggs hatch to produce miracidia that enter into the digestive system of snail to develop into next stage sporocyst which grows into long tubes which form coloured "broodsacs" containing cercariae. The earliest description of the coloured broodsac was reported in Europe by Ahrens in 1810 (Kagan, 1951). Thereafter

this broodsac has been studied and illustrated subsequently by Carus,1835; Zeller,1874; Heckert,1889; Monnig,1922; Hsu,1936; Hohorst,1937; Pojmanska,1967 and Rietschel,1970,1972 (Bakke,1980).These long tubes invade snail's tentacles to transform them into pulsating and colourful objects imitating the appearance of a caterpillar or grub. These broodsacs pulsate in response to light but do not pulse in darkness. The infection of the tentacles of eyes hinders the perception of light intensity. Whereas the uninfected snails hide themselves in dark places to prevent their predation but infected snails lacking in light detection are more exposed to predators such as birds. The cercariae infest the birds which are the definitive hosts and the life cycle is thus completed.

The only two species of *Leucochloridium* which have been recorded from India are: *Leucochloridium indicum* by Singh, 1962 from Himalayan Red Crowned Jay *Garrulus bispecularis* in Kumaon region and *Leucochloridium gallinuli* by Kharoo and Dhar, 1981 from Indian Moorhen *Gallinula chloropus* in Kashmir.

The aim of the present investigation is to present a detailed history of the genus *Leucochloridium* apart from describing a new Diplostomid digenean Species parasitizing the Spotted Redshank in India.

MATERIALS AND METHODS

Totanus fuscus commonly known as Spotted Redshank is a small, stocky wader, long billed migratory sandpiper with red legs, dwelling among marshes, muddy habitats, shallow ponds and river banks. Though widespread, solitary, secretive and inconspicuous, it is found throughout India during winter and also in Srilanka and Myanmar. The new species is a digenetic trematode of the genus *Leucochloridium* inhabitating bursa fabricii of *Totanus fuscus* caught from the plains of Allahabad. The worm is an endoparasite of *Succinea* snails and of various birds. The species of this parasite have also been reported from Crows and Jays (Corvidae), Sparrows (Emberizidae, passeridae) and Finches (Fringillidae) : (Dawes, 1946; Roberts and Janovy Jr. 2000). During the course of survey of the endohelminth parasites of the birds of Allahabad, one adult specimen of the Redshank was investigated for helminthes. The bird was necropsied in accordance with ethical procedures and dissected organs kept in Petri dishes with a 0.85 NaCl solution and examined under a high power microscope. Only two mature specimens belonging to the genus *Leucochloridium* were recovered from the bursa fabricii of the bird. One of the two worms was lacerated at the anterior end and therefore it was not considered for recording morphological and anatomical dimensions but only the unaffected posterior half was magnified for studying fine details especially of the reproductive system. The living worms were mounted in toto, compressed-fixed in Bouin's fluid, stained with haematoxylin, dehydrated in graded series of alcohol, cleared in xylol and kept as whole mount in Canada balsam. Drawings were made with the help of Camera Lucida. The identification of the parasite was done at the Zoology Department, University of Allahabad. The specimens were deposited in the helminthological collections of Zoology Department of the said University. Classification of the parasite is in accordance with Freitas (1951, 1959), similar to the taxonomic catalogue of helminth authorities recorded by Selgado-Maldonado (2005).

OBSERVATIONS

Family - Leucochloridiidae (Poche, 1907) Dollfus, 1934

Sub-family - Leucochloridiinae Poche, 1907

Genus - *Leucochloridium* Carus, 1835

Species - *Leucochloridium mehrii* sp.nov. (Fig. 1-2; Table-1)

Description: Based on one mounted specimen *in toto*; measurements are in mms.

Body roughly oval with broad rounded ends, measuring 3.88 in length and 1.94 in maximum breadth in the anterior third region. Cuticle smooth and devoid of spines. Well developed oral sucker situated sub terminally at the anterior end, 0.776 x 0.873 in size with its opening measuring 0.442 x 0.642. It is attached directly to pharynx without intervention of pre-pharynx which is absent. Pharynx is globular with anterior side slightly concave and the posterior convex, measuring 0.232 x 0.291 in size. At its posterior end the intestine at once divides into two caeca, the oesophagus being absent. Caeca extend laterally at right angles to the length of the body, running close and parallel to the body wall and curve inwards before terminating at the posterior end behind posterior testis. They are narrow at the point of bifurcation but broader at the posterior end. Muscular ventral sucker lies at the equatorial line, slightly smaller than oral sucker, 0.72 in length and 0.8 in width.

Testes two, obliquely placed in posterior half of the body. Anterior testis 0.388 x 0.543 in size lies to the right side of median line, 0.135 behind acetabulum. It is roughly oval in outline, situated obliquely and overlapping partly the right caecum. Posterior testis lies slightly to left side at 0.388 distance from hinder end, 0.58 x 0.42 in size. It is also more or less oval, having a blunt anterior end slightly curved inwardly on the right side with posterior margin

notched in the middle. Vasa efferentia arise from the posterior inner end of anterior testis and the inner side of anterior margin of the hinder testis and run obliquely towards each other to unite in the median line to form vas defferens which runs straight down to posterior end till it enters cirrus sac. Cirrus sac roughly triangular with apex pointing towards left, 0.252 x 0.329 in size and situated subterminally at the posterior end; coiled eversible cirrus when extended measures 0.349. Genital atrium with a dorsal opening lies 0.135 from posterior end.

Ovary small, egg shaped with entire margin, 0.232 x 0.31 in size, situated slightly to the left of median line close in front of hinder testis partly overlapping its anterior margin. Oviduct arises from the hinder margin of ovary and runs downward towards the median line close inside to middle of posterior testis where it forms ootype surrounded by shell gland cells. After emerging from the ootype, uterus runs forward in a straight course for a short distance and then becomes convoluted. The coils of the uterus occupy most of the intercaecal space and extend outside caeca reaching anteriorly as far as oral sucker. Terminally the uterus descends behind ovary to open into metraterm which opens to the exterior through genital atrium close to male genital opening. Oviduct contains a few ova while the uterus is full of brown thick shelled small ova, 0.018-0.216 x 0.0108-0.0144 in size. Vitellaria extensively developed and confined laterally along the body wall occupying the entire space between caeca and body wall. The small pear shaped or irregular follicles extend from the level of posterior third of oral sucker to blind ends of caeca. The transverse vitelline ducts arise at the level of ootype and run towards the median line to form yolk reservoir. They run dorsal to caeca, the left one crossing posterior testis. Yolk reservoir triangular in shape, dorsal to shell gland mass, 0.108 x 0.036 in size.

DISCUSSION

That these flukes belong to the genus *Leucochloridium* is evident from the fact that they possess two powerful suckers, muscular pharynx, reproductive organs confined to posterior half of body with ovary in between testes in a triangular arrangement, uterus with numerous eggs filling most of intercaecal space and opening to exterior through genital atrium situated at posterior end. Though the new species resembles all the species described so far in the characters mentioned above but differs markedly from all in many morphological and anatomical features. The new form under discussion comes closer to *L.cyanocittae* McIntosh, 1932, *L.varie* McIntosh, 1932, *L.melospizae* McIntosh, 1932 and *L. hypotaenidiarum* Tubangui, 1932 in equatorial position of ventral sucker, triangular arrangement of gonads and confinement of uterus outside caeca. However *L.cyanocittae, L.varie,* and *L. hypotaenidiarum* can be sharply contrasted from the new species in body dimensions, extension of intestinal crura and vitellaria into zone of cirrus pouch besides presence of fairly large testes and caeca with swollen ends in the new species. Moreover in *L. hypotaenidiarum* gonads are smaller and situated at a longer distance from acetabulum; in *L.melospizae* anterior testis is located in the ovarian zone and gonads placed close to one another. The new species can be separated from *L.sime* Yamaguti, 1935 by larger gonads, greater distance between ventral sucker and gonads, almost equal size of suckers (variable in size in the latter) and absence of prepharynx and oesophagus in the former. It can be contrasted with *L.fuscostriatum* Robinson (Jr.) 1948 in the relative size of suckers and distribution of vitellaria. *L.beautiforti* Hunter et Vernberg, 1952 differs from the new species in body dimensions (smaller in the former), distribution of vitelline follicles, extent of uterine coils besides shape and location of gonads. In *L. perisorisae* Neiland, 1953 the anterior one fourth of the body is beset with spines and the fairly larger vitelline follicles do not cross the anterior tip of posterior testes at the hinder body end which is quite contrary to new species which is devoid of spines and vitellaria reach upto the hinder body end beyond posterior testis. *L.parcum* (Travassos, 1922) Odening, 1963 can also be distinguished from the new species primarily in body dimensions, relative size of pharynx, size and ratio of suckers and location and size of gonads (considerably large in the later).

From *L. indicum* Singh (1962) the new species can be differentiated primarily in size of body, suckers and gonads which are more than double the size in the latter, length of caeca, distribution of vitellaria, position of gonads and in total absence of spines in the new species. *L. gallinuli* Kharoo and Dhar, 1981 differs sharply from the new species in body shape which is slightly constricted in the middle, shape and size of testes which are transversely elongated and small and placed distantly apart from ventral sucker contrary to *L. mehrii* n.sp. where body is devoid of any constriction, testes are large and roughly oval and the relative distance between ventral sucker and gonads is considerably less. In *L. gallinuli* vitellaria and uterus are restricted to the space behind horizontal wings of intestinal caeca, never extending beyond transverse wings of caeca anteriorly; whereas uterus is confined to the intercaecal space mostly and vitellaria terminate well before blind ends of caeca but in the new species vitellaria and uterine coils cross the transverse wings of caeca anteriorly to reach upto the

posterior third of oral sucker and posteriorly vitellaria reach upto caecal terminations.

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