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REVIEW OF THE INDIAN SPECIES OF TREMATODE GENUS *PHILOPHTHALMUS* LOOSS, 1899 PARASITES IN THE CONJUNCTIVA OF BIRD'S EYE

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INTRODUCTION

Aquatic, terrestrial and arboreal birds are found to harbour in their conjunctival sac, various species of trematodes, belonging to the genus *Philophthalmus* Looss, 1899. More than thirty species have been described so far from various zoo-geographical region of the world. As many as fifteen species have been described or recorded so far from dove, pigeon, duck, fowl, vulture, eagle and kingfisher from India.

We obtained six specimens belonging to above mentioned genus from conjunctiva of three Black Drongo (*Dicrurus adsimilis*), constituting a new host record and showing some interesting variation of characters of taxonomic importance. A review of the species of the genus *Philophthalmus* described from India forms the subject matter of present communication.

MATERIAL AND METHOD

Six specimens were recovered from eye of Black Drongo (*Dicrurus adsimilis*) shot at Sikkim. These were stained in Borax carmine. Drawings were made with camera lucida. All the measurements used in this paper are in millimeters.

DESCRIPTION

Family : PHILOPHTHALMIDAE Looss, 1899

Subfamily : PHILOPHTHALMINAE Looss, 1899

Genus : ***Philophthalmus*** Looss, 1899

Philophthalmus nocturnus Looss, 1907

(Fig. 1)

Body aspinose, flattened and clavate with a narrow anterior and broadly rounded posterior end. 5.225 – 5.775 in length and 1.175 – 1.925 in maximum width in equatorial region. Oral sucker terminally

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placed, 0.3 – 0.42 × 0.475 – 0.5 and ventral sucker larger than oral sucker, 0.65 – 0.75 × 0.6 – 0.7 situated at anterior third of the body.

Mouth leads through a very short prepharynx into a large globular and strongly muscular pharynx, 0.35 – 0.4 × 0.47 – 0.525. Oesophagus short, divides into two slender intestinal caeca. Intestinal caeca lateral, extend almost upto hind end.

Testes tandem in last quarter of body, large, unequal, slightly lobate with smooth margins. Anterior testis larger or smaller than posterior one. Anterior one 0.475 – 0.675 × 0.7 – 0.925 and posterior one 0.425 – 0.625 × 0.725 – 0.925. Vasa efferentia distinct. Cirrus sac long, club-shaped, 1.325 – 1.5 in length, placed on the right side of the ventral sucker and extending posteriorly from the level of the intestinal bifurcation, may extend upto or behind the ventral sucker. Oval vesicula seminalis occupies the broad basal part of the cirrus sac, leads through a short narrow tubular part into the ductus ejaculatorious. Long ejaculatory duct, traverses the whole narrow part of the cirrus sac and ultimately terminates into a short eversible cirrus. Genital pore sub-median, on the right side of the caecal arch.

Globular ovary, situated in front of the anterior testis, median or sinistral in position, 0.2 – 0.25 × 0.22 – 0.275, partly covered on the ventral side by uterine coils. Tubular extra and intra caecal vitellaria mostly lateral, extends from the level of the posterior end of currus sac upto the level of ovary where they turn inwards, crossing the caeca dorsally, intruding into intercaecal field. In some places the vitellaria have a beaded appearence due to agglomeration of yolk cells. Narrow transverse vitelline ducts appear as prolongations of tubular vitellaria and they meet behind the ovary to form a vitelline reservoir, Laurer's canal is present. The complex lies slightly to the left of the median line, close to the postero lateral boarder of ovary and is partly masked by the initial coils of uterus. Receptaculum seminis uterinum present. Utrine coils occupy almost the whole space between anterior testis and cirrus sac, extending laterally into extracaecal field and posteriorly at the sides of testes. Muscular metraterm, wide, near the posterior end of cirrus sac, but distally it narrows and runs straight along cirrus sac to open outside by genital pore. Mature eggs are rather elongated, thin walled, broadened at one end; measures 0.074 × 0.033. These eggs contain fully developed miracidia which have two closely apposed cup-shaped eyes. Some of the miracidia are seen lying free in uterus which are possibly released from the eggs during flattening and fixing. Each micacidium is found to contain a well developed sporocyst, often packed with germ cells and germ balls.

Excretory pore is terminal. Excretory bladder appears 'T'-shaped with short transverse limbs from the ends of which arises lateral cornua.

DISCUSSION

Looss, 1899 established the genus *Philophthalmus* with the species *P. palpebrarum* (Fig. 3) collected from *Corvus cornix* and *Milvus parasiticus* from Egypt. Subsequently more than thirty species were added to this genus from Europe, Asia, Africa and America from various aquatic and terrestrial bird's eye.

Fifteen species under the genera *Philophthalmus* have been described so far from India. List of the species along with their host and feeding habit is given in Table 1, to indicate the wide range of the ecological habitats of the hosts in which the species of this genus have established.

Skrjabin, 1947 proposed two subgenera, *Philophthalmus*, for the species with distinctly few isolated large vitelline follicles and *Tubolecithalmus* for those species, not having widely separated follicles but singular tubular or closely placed innumerable follicles. He included *P. nocturnus* Looss, 1907; *P. gralli* Mathis et Leger, 1910; *P. nyrocae* Yamaguti, 1934 and *P. muraschikinzewi* Tretikowa, 1946 in the later subgenus. This, apparently sound basis, proposed by Skrjabin for splitting the species in two subgenera, seems to very much well conceived. All the Indian species so far described have apparently tubular or closely placed small vitelline follicles. Subsequently Karyakarte, 1967 found Philophthamids, possessing both the follicular and tubular vitellaria and proposed a third subgenus *Mixophthalmus* for his species *P. chrysommae.*

Ching, 1960 studied the developmental stages of *P. gralli* Mathis et Leger, 1910 in various hosts such as chickens, ducks, rats and rabbits in Hawaii and noted morphological variations in respect of many characters of taxonomic importance. He suggested closer similarity between *P. indicus* Jaiswal and Singh, 1954 (Fig. 7); *P. occulare* Wu, 1938 and *P. mirzai* Jaiswal and Singh, 1954 (Fig. 8) with *P. nocturnus* Looss, 1907. He stated that for specific identification in the genus *Philophthalmus* series of specimens have to be studied since great variations of characters are very common feature. Prokash and Pandey, 1968 after detail observation considered all the Indian species such as *P. indicus* Jaiswal and Singh, 1954; *P. aquilla* Jaiswal, 1955; *P. lucknowensis* Baugh, 1962 (Fig. 10) and *P. halcyoni* Baugh, 1963 (Fig. 9) as synonym of *P. mirzai*. Even about the validity of *P. mirzai*, they opined that, "A truely valid status, distinct from *P. nocturnus*, would need a detailed scrutiny of the specimens described under the genus."

Subsequently many species were added to this genus. Srivastava and Pande, 1971; Varghese and Sundaram, 1975; and Mehra, 1980 on the otherhand considered *P. mirzai* as synonym of *P. gralli* Mathis et Leger, 1910. Mehra, 1980 further listed *P.* (*Mixophthalmus*) *chrysommae* Karyakarte, 1967 (Fig. 11) as synonym of *P. gralli*. Srivastava, 1982 also considered *P. gralli* as the only valid species and considered *P.* (*P.*) *problematicus* Tubangui, 1932 of Karyakarte, 1967; *P.* (*P.*) *columbae* Karyakarte, 1968 and *P.* (*P.*) *acridotheres* Karyakarte, 1969 as synonym of *P. gralli*.

Murty, 1966, 1967 initiated life history studies on some specimens of this genus from India. Swarnakumari and Madhavi, 1992 studied the life hostory stages of *Philophthalmus* cercariae, obntained from naturally infected snail *Thiara tuberculata* at Vishakhapatnam, AndhraPradesh. They infected Leghorn Chickens with the cercariae and recovered 721 flukes from the eyes of 50 chickens. They observed after detail study and analysing allometric growth that "*P. nocturnus* stands close to *P. gralli* both in growth pattern and in the details of the development of adult form metacercariae. The similarities are also reflected in the morpholoogy of the adults of the two species.

Table 1. Host Prasite list and feeding behaviour of hosts of *Philophthalmus* sp. described from India.

Name of the Parasite	Host		Family of the Host	Feeding habitat of the host	Reference
	Common Name	Scientific Name			
1. *P. palpebrarum* Looss, 1899	Carrion crow	*Corvus cornix*	Corvidae	Scavenger	*Zool. Jaharb. Syst.* **12** : 521-784
2. *P. nocturnus* Looss, 1907	Little owl	*Anthena noctua*	Strigidae	Predator	*Curr. Sci.* **35** : 366-367
	Domestic fowl	*Gallus domesticus*	Phasianidae	Graminivorous & Insctivorous	
	Black Drongo/ King Crow	*Dicrurus adsimilis*	Dicruridae	Insectivorous/ Flower nector eater	
3. *P. gralli* Mathis et Leger 1910	Lesser whistling teal	*Dendrocygna javanica*	Anatidae	Chiefly vegeterian, but also take aquatic animal	*Bull. Path. Exot.* **3** : 245
	Domestic duck	*Anas boschas domesticus*	-do-	-do-	
4. *P. anatinus* Sugimoto, 1928	-do-	-do-	-do-	-do-	*Zool. Mag.* **40** : 343-351
5. *P. indicus* Jaiswal and Singh, 1954	Scanvager vulture	*Neophron percnopterus*	Accipitridae	Scavanger	*J. Helm.* **28** (3/4) : 135-142
6. *P. problematicus* Tubangui, 1932	Domestic fowl	*Gallus domesticus*	Phasianidae	Graminivorous/Ins	*Phillip. J. Sci.* **47** : 369-404
7. *P. mirzai,* Jaiswal and Singh, 1954	Pariah kite	*Milvus migrans govinda*	Accipitridaed Predator	Scavenger/	*J. Helm.* **28** (3/4) : 135-142
8. *P. aquilla* Jaiswal, 1955	Towny eagle	*Aquilla rapax nipalensis*	-do-	-do-	*Proc. Ind. Sci. cong.* **42.** IV. : 10
9. *P. halcyoni* Baugh, 1962	White breasted king fisher	*Halcyon smyrnensis*	Alcedenidae	Fish/Crustacean eater	*J. Helm.* **36** (3) : 243-258
10. *P. lucknowensis* Baugh, 1962	Towny eagle	*Aquilla rapax nipalensis*	Accipitridae Predator	Scavnger/ -do-	
11. *P. chrysommae,* Karyakarte, 1967	Yellow eyed babbler	*Chrysoma sinense*	Muscicapidae	Insectivorous	*Ind. J. Helm.* **18** Seminar supplement 25-28
12. *P. (P.) columbae,* Karyakarte, 1968	Blue rock pigeon	*Columba livia*	Columbidae	Graminivorous	*Rev. Parasit.*
13. *P. acredotheres,* Karyakarte, 1969	Common myna	*Acridotheres tristis*	Sturnidae	Grub eaters	*Marath. Uviv. J.* **8** (1) : 79-83
14. *P. (T.) alli,* Karyakarte, 1971	Indian ring dove	*Streptopelia decaocto*	Columbidae	Graminivorous	*Marath Univ. J.* **10** : 71-73
15. *P. peteri,* Sreekumaran and Peter, 1973	Domestic duck	*Anas boschas domesticus*	Anatidae	Chiefly vegeterian but also take aquatic animals	*Ind. Vet. J.* **50** : 946

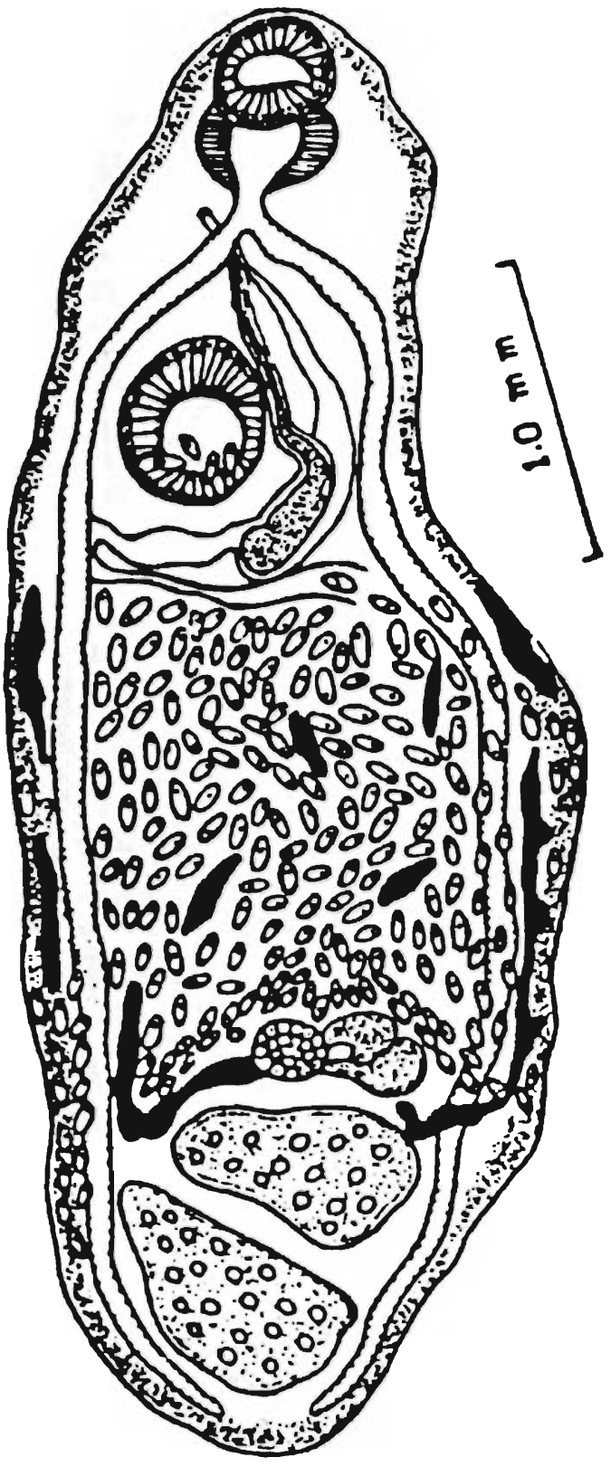

Fig. 1

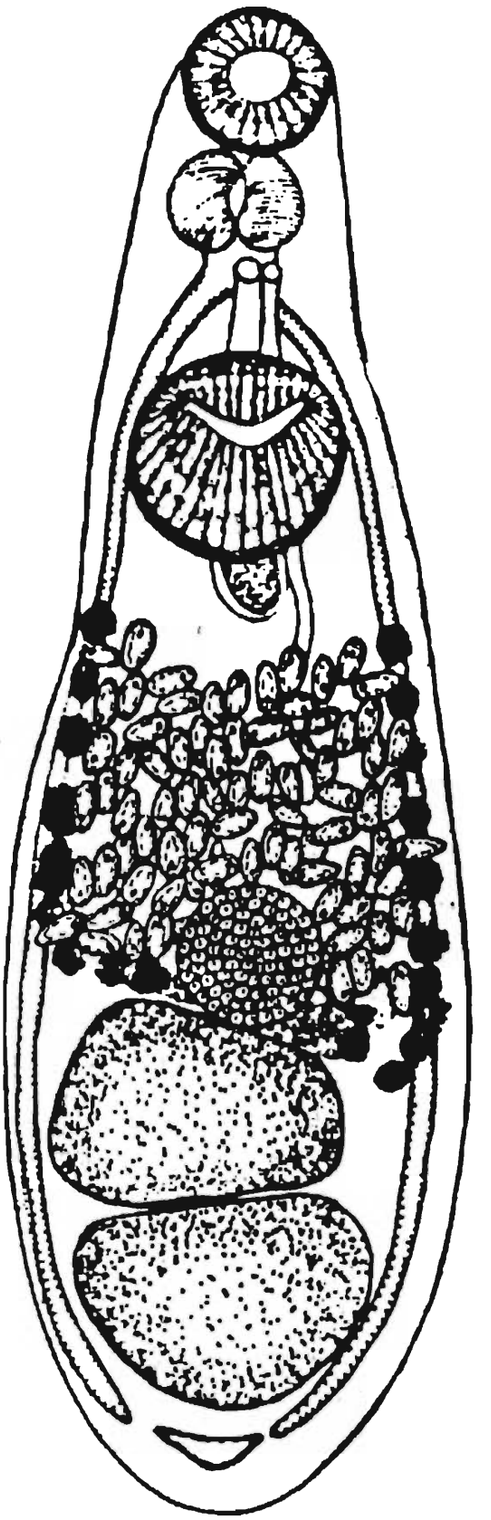

Fig. 2

Fig. 1. *Philophthalmus nocturnus* Looss, 1907 of Ghosh and Chakrabarti, 1994

Fig. 2. *P. nocturnus* Looss, 1907 of Swarnakumari and Madhavi, 1992

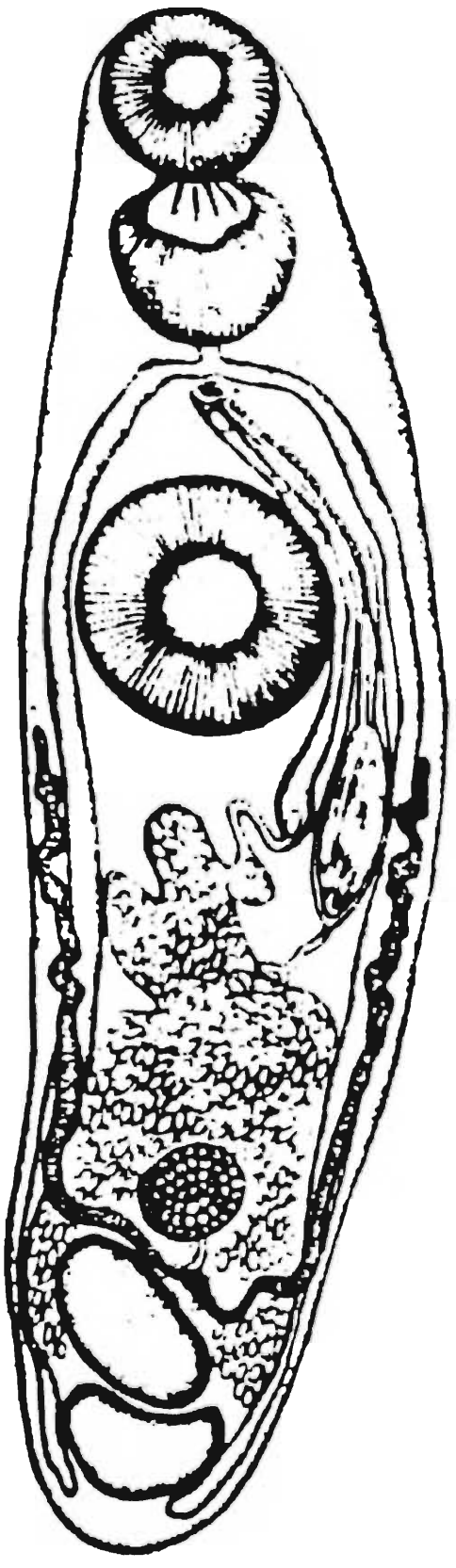

Fig. 3

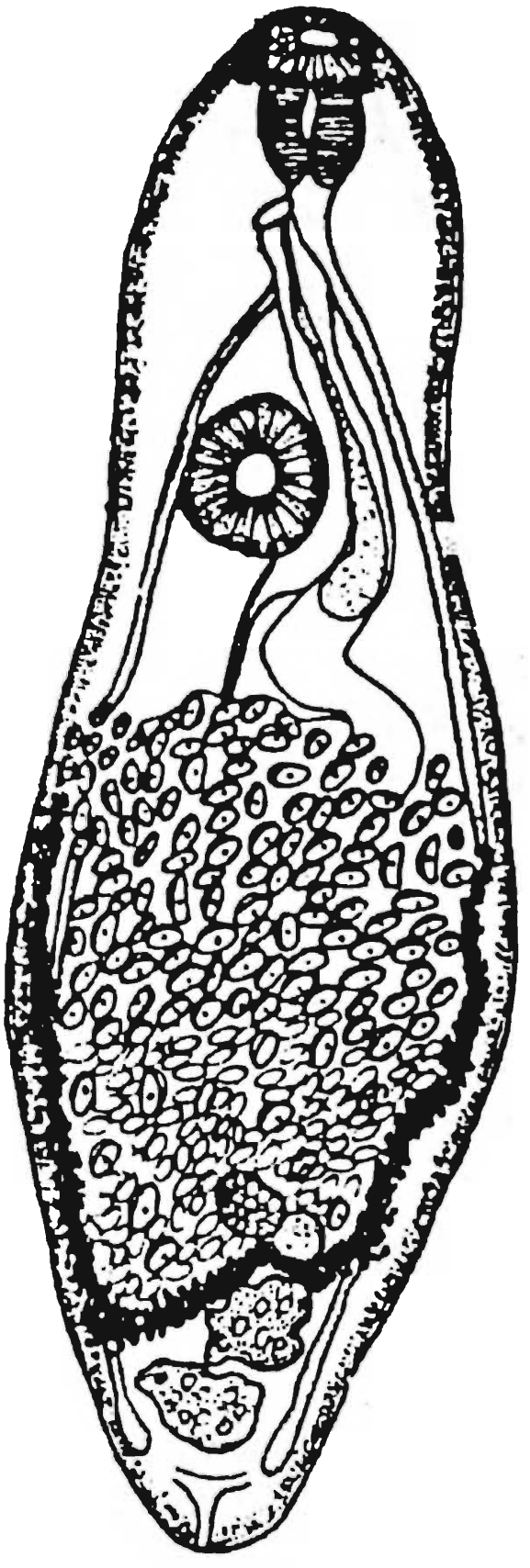

Fig. 4

Fig. 3. *P. palpebrarum* Looss, 1899

Fig. 4. *P. gralli* Mathis et Leger, 1910 of Varghese and Sundaram, 1975

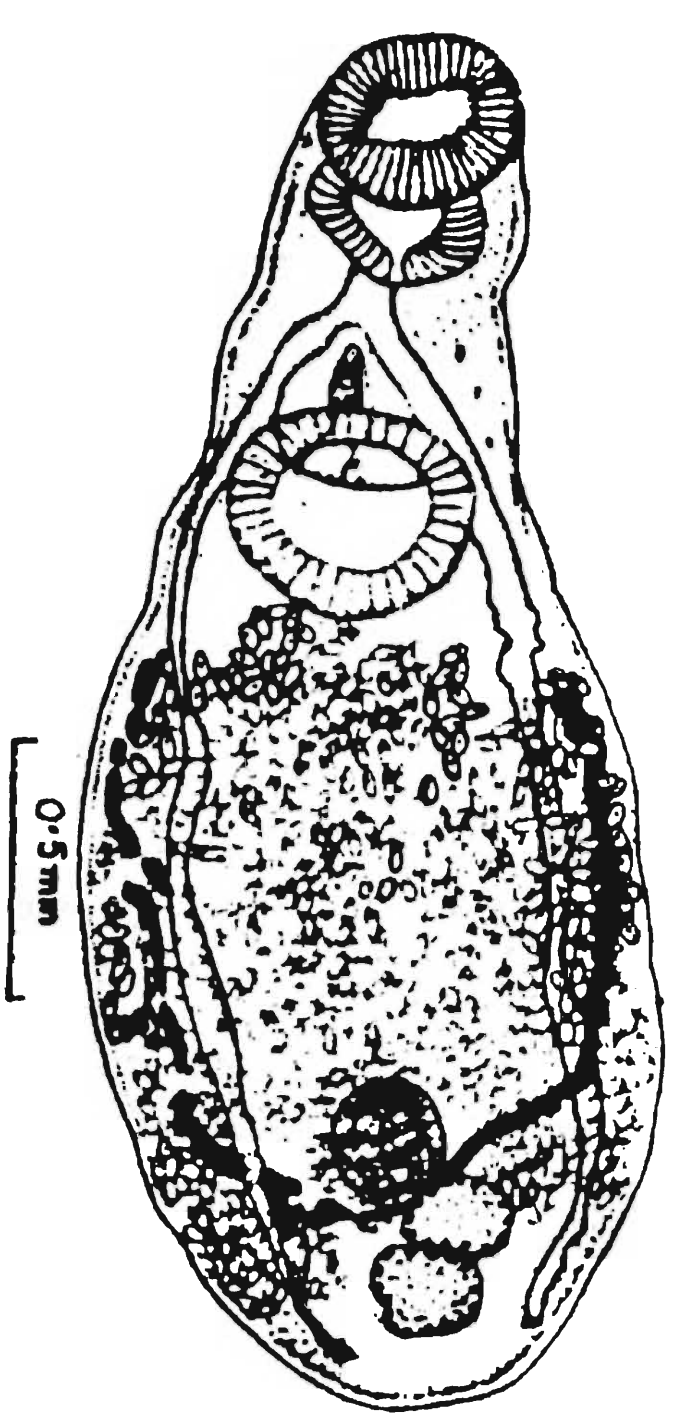

Fig. 5

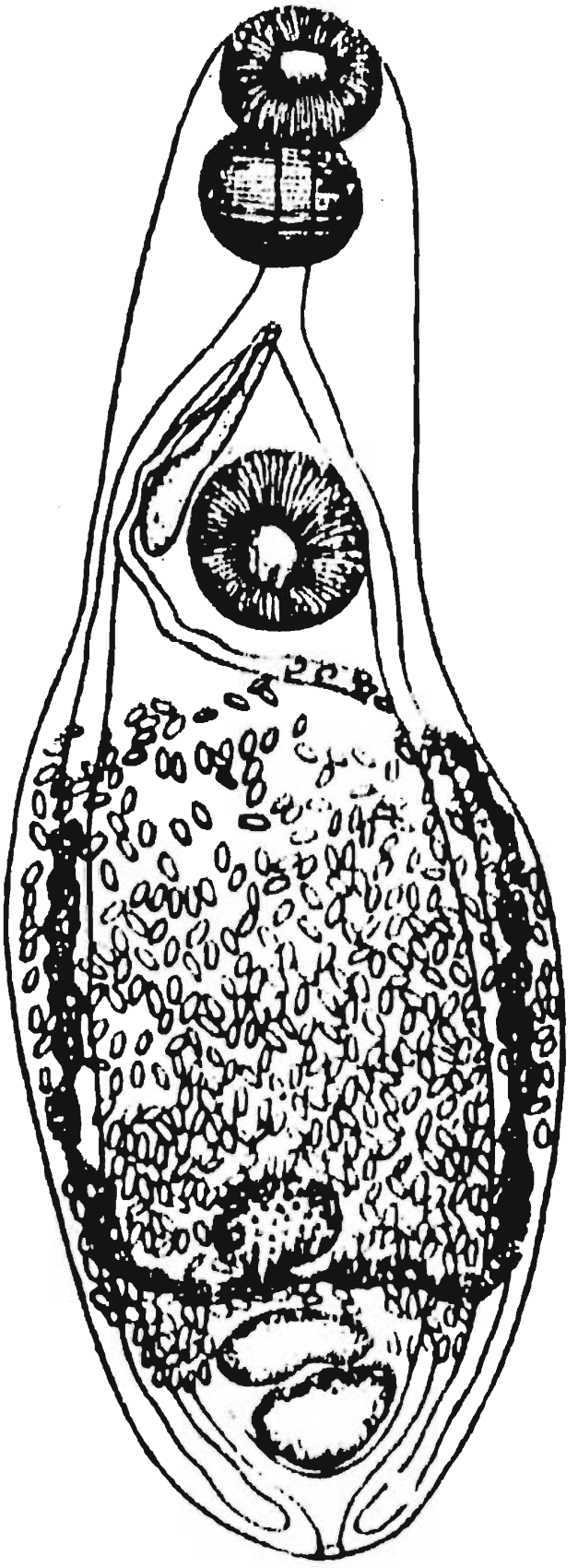

Fig. 6

Fig. 5. *P. gralli* Mathis et Leger, 1910 of Mehra, 1982

Fig. 6. *P. problematicus* Tubangui, 1932

Hence the detailed study of the biology and the host-parasite relationship of the two species may disclose *P. gralli* to be synonym with *P. nocturnus* (Fig. 2).

It may be noted here that most of the Indian species have been described on the basis of few specimens only. Evaluations of various characters relied upon for differentiating species, reveals that the following characters are to be taken into account for correct diagnosis.

Ratio of suckers, length and breadth, nature of vitellaria whether tubular or follicular; extension of vitellaria is a variable character as it is found to vary as per the stage of maturity. Extension of cirrus is also an important character. In some species cirrus sac extends further below to acetabulum or not crossing even half to the length of the acetablum. Uterine coils appear to be variable to a great extent, possibly depending upon the stage of maturity. Shape and the size of the vesicula seminalis, recepticulum seminis uterinum, are also much variable. Position of the genital pore may be a dependable character, provided observed in large number of specimens.

Thus on the basis of our study along with observations of Murthy, 1966, 1967; Prokash and Pandey, 1968; Swarnakumari and Madhavi, 1992, we consider *P. gralli* as synonym of *P. nocturnus.*

Distinguishing characters of the species *P. anatinus* Sugimoto, 1928, *P. (L) alli* Karyakarte, 1971 (Fig. 12) and *P. peteri* Sreekumaran and Peter 1973 subsequently recorded from India are well within the wide range of variations in *P. nocturnus*. As such they are also considered as synonymous with *P. nocturnus.*

Thus in our opinion *P. nocturnus* stands as the specific trematode parasites of eye, found in different species of birds throughout Indian subcontinent.

Distribution : Europe, Africa, America, Asia.

SUMMARY

Taxonomic status of all the Indian species under the genera *Philophthalmus* described and recorded so far from India have been revaluated. Critical studies on the extent of variation in respect of genital pore, nature & distribution of vitellaria, genital complex etc., have been made. It has been inferred that *Philophthalmus nocturnus* Looss, 1907 is the only valid species under the genus *Philophthalmus* in Indian subcontinent.

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Fig. 7

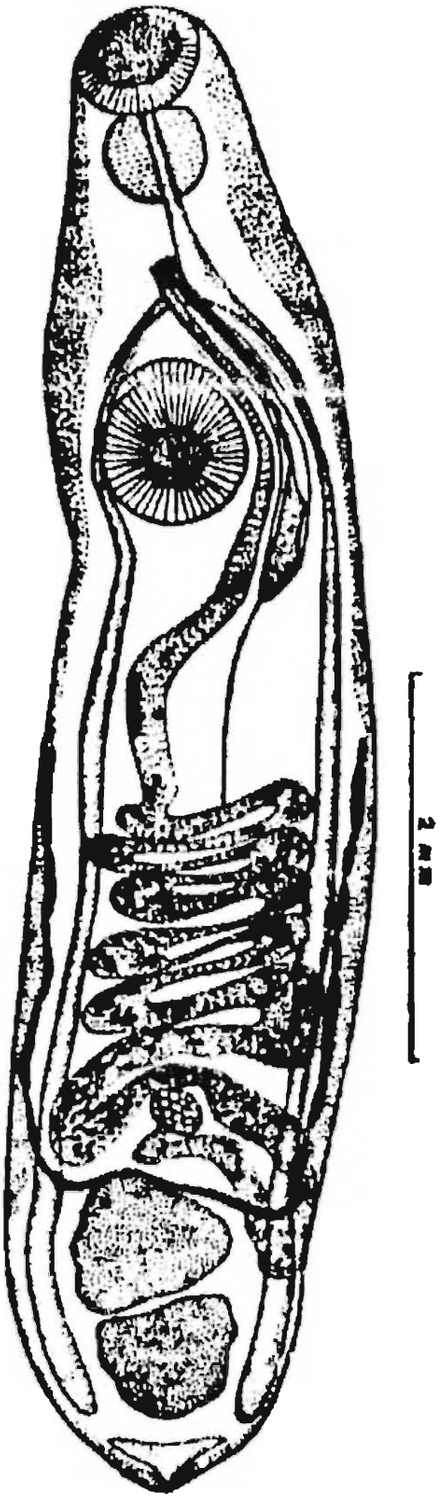

Fig. 8

Fig. 7. *P. inducus* Jaiswal and Singh, 1954

Fig. 8. *P. mirzai* Jaiswal and Singh, 1954

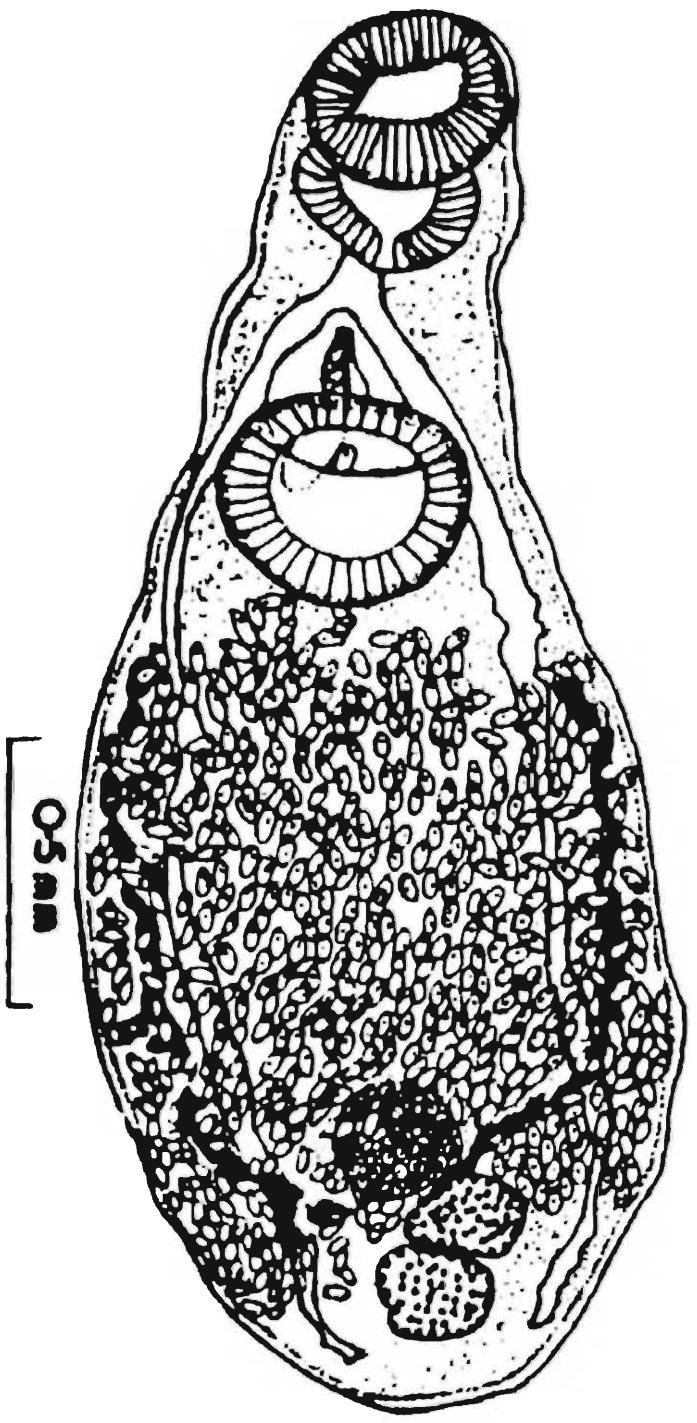

Fig. 9

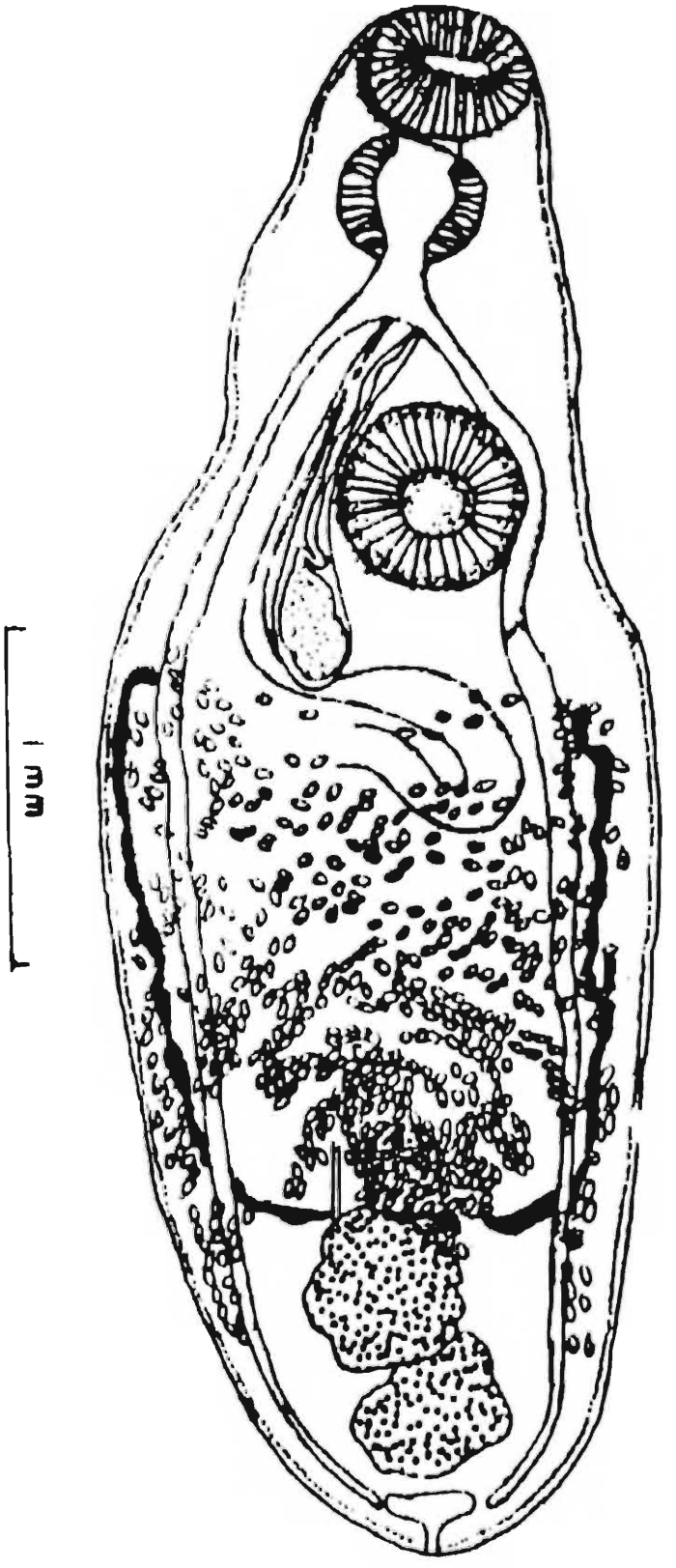

Fig. 10

Fig. 9. *P. halcyoni* Baugh, 1962

Fig. 10. *P. lucknowensis* Baugh, 1962

Fig. 11

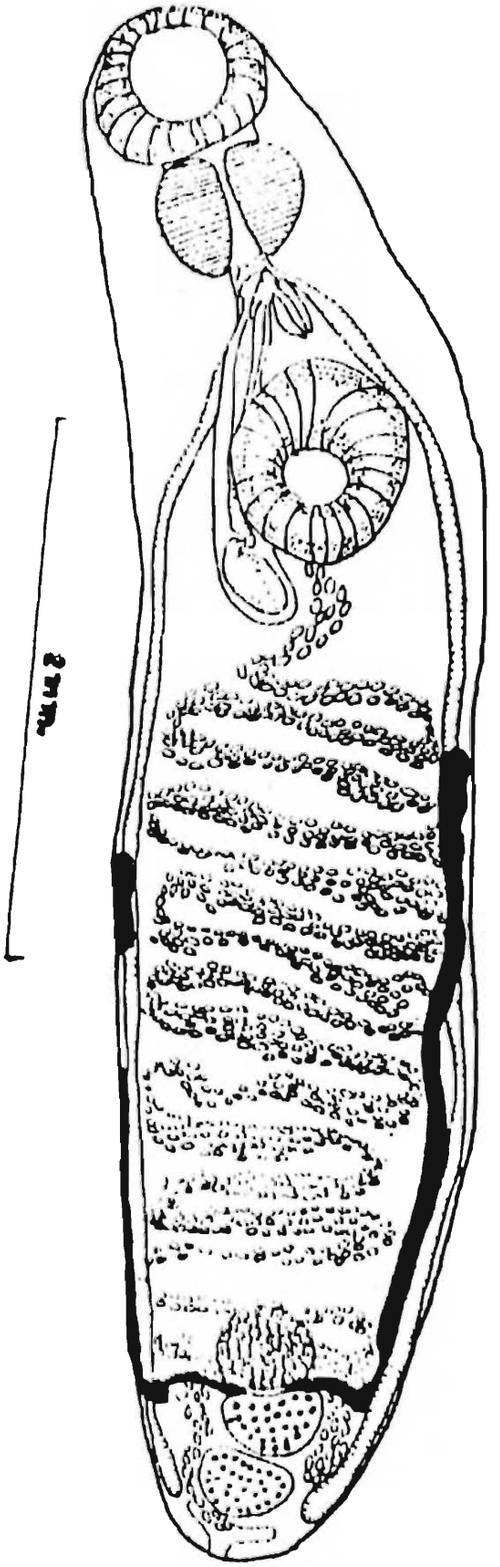

Fig. 12

Fig. 11. *P. (M.) chrysommae* Karyakarte, 1967

Fig. 12. *P. (T.) alli* Karyakrate, 1971

REFERENCES

Baugh, S. C. 1962. "Contribution to our knowledge of digenetic trematodes, Part V. On two new species of *Philophthalmus* Looss, 1899 and discussion of the family Philophthalmidae." *J. Helm.* **36**(3) : 243-258.

Ching, H. L., 1960. "Some digenetic trematodes of shore birds at Friday Harbour, Washington." *Proc. Helm. Soc. Washington.* **27** : 53-62.

Ghosh, R.K. & Chakrabarti, S., 1994. "Review of the Trematode Genus *Philophthalmus* Looss, 1899 Parasites in the Conjunctiva of Bird's Eye" *Proc. eighty first session of the Ind. Sci. Cong.* 1994, *Part IV : Section of Zoology, Antomology and Fisheries* : 81.

Karyakarte, P. P., 1967b. "*Philophthalmus* spp. (Trematoda : Philophthalmidae) from the eye of the valture in India." *Curr. Sci.* **36**(14) : 381.

Karyakarte, P. P., 1967c. "Report on *Philophthalmus (Tubolecithalmus) problematicus* from India." *Marathwada Univ. J.* **6**(2) : 253-256.

*Mathis, C., and Leger, M., 1910. "Douve oculariae de la poule." *Bull. Path. Exot.* **3** : 245.

Mehra, H. R., 1980. "The fauna of India and Adjacent countries - Platyhelmintnes, *Vol. I* Trematoda." 1-418, *Zoological Survey of India, Calcutta.*

Murty, A. S., 1966. "Experimentalk demonstration of the life cycle of *Philophthalmus* sp. (Trematoda : Philophthalmidae)." *Curr. Sci.* **35** : 366-367.

Murty, A. S., 1967. "Studies of larval forms and life hostories of some digenetic trematodos from Andhra Pradesh." *Unpublished Ph. D. Thesis, Andhra University.*

Prokash, R. and Pandey, B. P., 1968. "On some of the known and hitherto unknown teematode parasites in the Pariah kite, *Milvus migrans* (Buddaert)." *Ind. J. Helm.* **20** : 1-24.

Skrjabin, K. I., 1947. *"Trematodes of Animals and Man : Fundamentals of Trematodology* Vol. **I** : 1-407.

Srivastava, C. B., 1982. *"The fauna of India and Adjacent countries. Platyhelminthes* Vol. **I** (Supplement, Trematoda : Digenea) : 1-163. *Zoological Survey of India, Calcutta.*

Srivastava, S. C. and Pandey, B. P., 1971. "The eye flukes *Philophthalmus gralii* Mathis et Leger, 1910 in two anatid hosts with remarks on this genus" *Ind. J. Anim. Sci.,* **41**(8) : 740-743.

Swarnakumari, V. G. M. and Madhavi, R., 1992. "Growth, development and allometry of *Philophthalmus nocturnus* in the eyes of domestic chicks" *J. Helm.* **66** : 100-107.

Narghese, C. G. and Sundaram, R. K., 1975. "On the incidence of *Philophthalmus gralli* from domestic fowl (*Gallus gallus domesticus*)." *Kerala J. Vet. Sci.* **6** (1 & 2) : 101-107.

Yamaguti, S., 1971. *"Synopsis of digenetic trematodes of vertebrates* Vol. **I**" 1-1074. Published by author.

* Not consulted in original.