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Studies on *Lissemysia ocellata* n. sp. from *Vivipara bengalensis* at Raipur

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Introduction

Aspidogastrea are distinctly different in their ventral disc, septate oviduct and direct development in molluscs. Occurrence of sexually mature worms in several molluscan species is suggestive of their being the original hosts. Sexually mature worms of several species are described from intestine of vertebrate hosts; it is, however, yet to be demonstrated that sexual maturity is reached in vertebrates or that worms can grow in these hosts (with the only possible exception of *Lobatostoma manteri* Rohde, 1973).

Sinha (1935) established the genus *Lissemysia* for forms with three longitudinal rows of alveoli (like *Cotylaspis* Leidy and *Cotylogaster* Monticelli), single testis (unlike *Cotylogaster*) and with cirrus sac absent (unlike *Cotylaspis* and *Cotylogaster* both). Najarian (1961) considered the description of 3 rows of longitudinal alveoli in *Cotylaspis, Cotylogaster and Lissemysia* as inaccurate and observed that this character be restated as a peripheral rim of alveoli surrounding a single longitudinal row of alveoli. The present authors entirely agree with this proposition.

Lissemysia includes, till date, *L. indica* Sinha, 1935 (from intestine of tortoise), *L. ovata* Tandon, 1949 (from gill filaments of *Vivipara bengalensis*), *L. sinhai* Srivastava and Singh, 1959, *L. mehrai* Srivastava and Singh, 1959, *L. macrorchis* Siddiqui, 1965, *L. jagatai,* Singh, 1973 (all from intestine of tortoise) and *L. hepatica* Dandotia, 1972 (from liver of tortoise). Except *L. ovata* (from ctenidia of *V. bengalensis*), all other species of *Lissemysia,* described so far, were recovered from chelonian hosts.

In this paper is described another form from ctenidia of *V. bengalensis.* It has prominent eyes. Since aspidogastrids described so far (with the exception of *Cotylaspis reelfootensis* Najarian, 1961) are not known to possess eyes in the adult stage, the present worms are being designated as *Lissemysia ocellata* n. sp.

Materials and Methods

One hundred and eighty five *V. bengalensis,* collected from a tank nearby university campus, were examined from August '82 through April '83 at 20 snails a month. Ctenidia were dissected out from snails and worms located under a dissecting binocular microscope. They were studied both in living and in fixed

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conditions through whole mounts and serial sections. Alkaline phosphatase activity was studied in cold formalin fixed worms by calcium cobalt method (after Gomori, Pearse, 1968) and polyphenol oxidase activity was made out in buffered formalin fixed worms incubated in 0.2% catechol solution for 70 min at 40°C (after Johri and Smyth, 1956).

Lissemysia ocellata n.sp.

(all measurements are in mm; figures in parenthesis represent mean of 10 observations of cold formalin fixed specimens)

One hundred and sixty six out of 185 (89.7%) *Vivipara bengalensis* harboured 1 to 18 worms (5 to 12 generally) in their ctenidial leaflets (Fig. 1). Several other species of snails (*Lymnaea luteola* and *L. accuminata, Indoplanorbis exustus, Melanoides tuberculatus* and *Lamellidens* sp.) collected from different tanks and examined during this period never showed any infection of this worm and, further, worms were never found in any visceral organ other than ctenidial leaflets. *Lissemysia ocellata* is thus narrowly specific both to its host and habitat.

Worms have an anterior dorsal forebody capable of great power of extension and contraction (Fig. 2) and a posterior ventral disc. When taken out in water, in a cavity block, worms cling to glass substratum or swim on the water surface with ventral disc directed upward. Sexually mature worms quickly shed eggs in water (cf. *L. ovata,* Tandon, 1949, the only other species of *Lissemysia* recovered as adult from snail host).

Worms measure 1.480 to 1.765 (1.588) long and 0.825 to 0.982 (0.901) broad; anterior dorsal forebody from 0.503 to 0.645 (0.570). The posterior ventral disc is spherical to ovoid, 0.930 to 1.162 (1.022) by 0.825 to 0.982 (0.901) and has 8 median and 18–19 peripheral alveoli (Figs. 2, 3). This variation in number of peripheral alveoli is due to the posterior median alveolus being divided into two in some worms. Transverse muscles bring median and peripheral alveoli of each transverse row very close together during contraction. Eighteen to 19 marginal organs, narrow at base, swollen in the middle and tapering to a point at tip lie in the spaces between successive peripheral alveoli. As many marginal organs exist as are the number of peripheral alveoli.

The mouth funnel is a cupshaped organ (Fig. 4) measuring 0.155 to 0.220 (0.189), situated subterminally on the ventral surface and is without an oral sucker; the worms ingest gill tissue rapidly. Pharynx (preharynx absent), measuring 0.100 to 0.115 (0.108) by 0.123 to 0.147 (0.131), leads into a broad sacculate caecum (oesophagus absent), measuring 1.005 to 1.357 (1.159) by 0.14 to 0.23 (0.18). All these lie dorsal to the other visceral organs. Caecum contains numerous refractile granules (Fig. 5), ingested snail tissue and is lined with a layer of elongated clubshaped cells with very prominent nuclei (can be made out distinctly more posteriorly) and terminates 0.072 to 0.205 (0.144) from posterior end of the body. A pair of eye spots lie one on each side at anterior level of pharynx; each eye spot of a crystalline lens and pigmented portion of 15 to 20 ocelli (Fig. 6) and 0.015 to 0.030 (0.022) by 0.010 to 0.022 (0.016).

Excretory pore lies dorsally near posterior end of the body; it leads into a large bilobed bladder (Fig. 7). Common collecting duct of each side extends from the bladder anteriorly to the level of pharynx and bends backward. Recurrent duct receives three branches, namely, one anteriorly to the ventral disc, the second at the level of anterior fourth of (the ventral disc) and the third at the level of posterior fourth of it. Further branching of these could not be exactly made out.

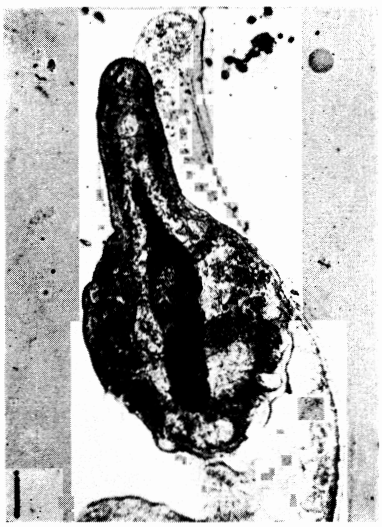

Fig. 1

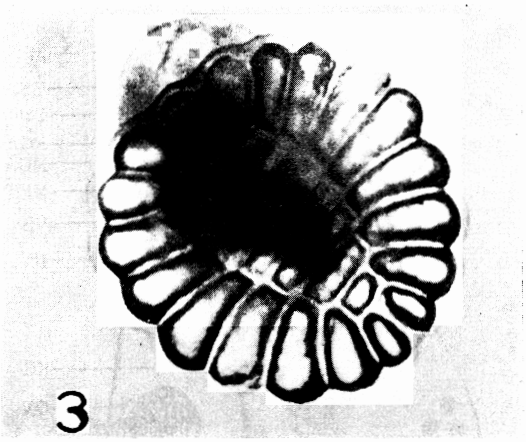

Fig. 3

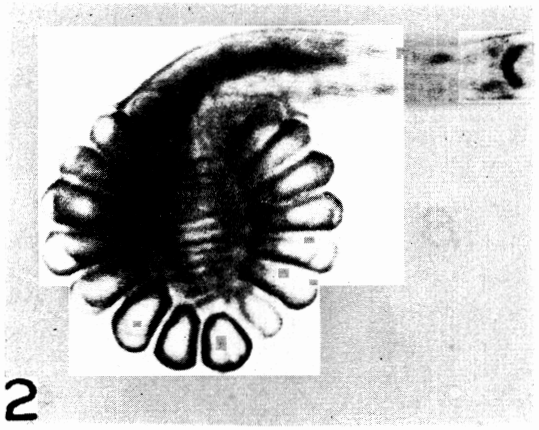

Fig. 2

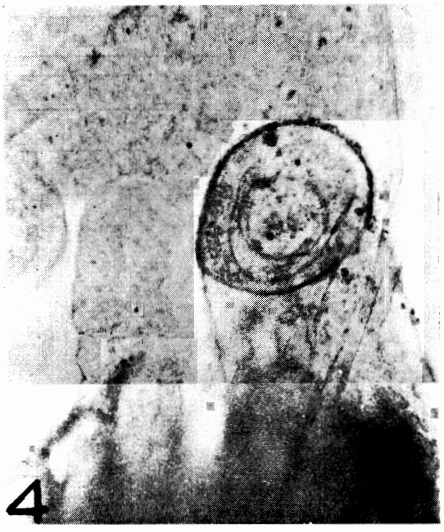

Fig. 4

Fig. 1 Adult worm on gill lamina of snail host.
Fig. 2 Extended worm; 18 peripheral and 8 central alveoli in ventral disc.
Fig. 3 Contracted worm; 19 peripheral alveoli; posterior median alveolus being divided into two.
Fig. 4 Worm ingesting host tissue through circular mouth funnel.
Fig. 5 *Lissemysia ocellata* n. sp.
Fig. 6 Eye magnified; pharynx prominent; caecum with several refractile granules.
Fig. 7 Bilobed excretory bladder; median excretory pore dorsal.
Fig. 8 Vesicula seminalis externa present; extention of excretory duct up to pharyngeal level; recurrent duct and its first branch.
Fig. 9 L. S. body showing median testis; retort shaped ovary and septate oviduct.
Fig. 10 Egg operculate and unembryonated.
Fig. 11 Vitelline reservoir prominent along with transverse vitelline ducts; 2 eggs in uterus.
Fig. 12 Vitelline system of worm following catechol technique.

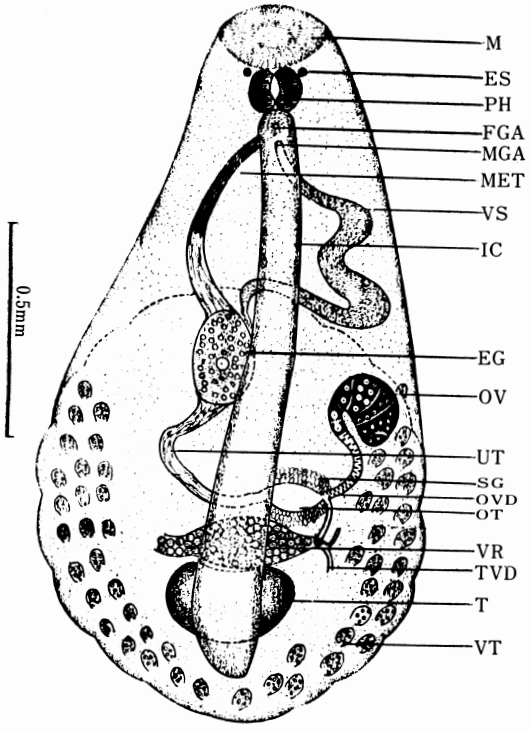

Fig. 5

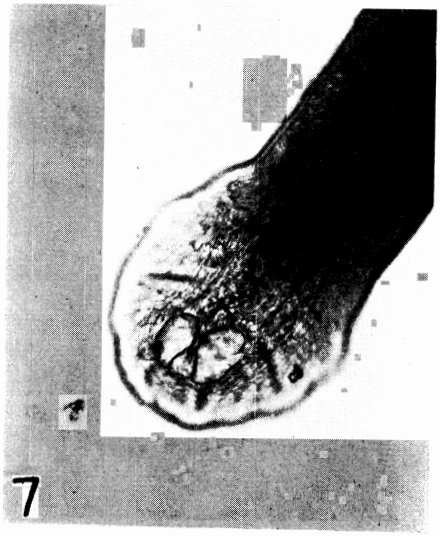

Fig. 7

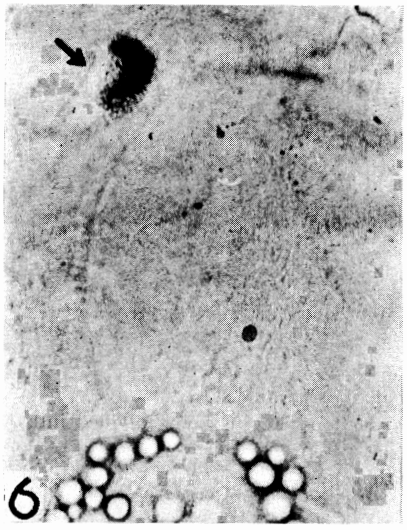

Fig. 6

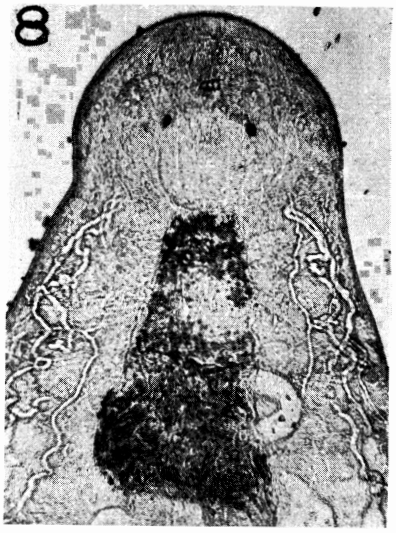

Fig. 8

M-mouth; ES-eyespot; PH-pharynx; FGA-female genital aperture; MGA-male genital aperture; MET-metraterm; VS-vesicula seminalis; IC-intestinal caeca; EG-egg; OV-overy; UT-uteurs; SG-shell gland; OVD-oviduct; OT-ootype; VR-vitelline reservoir; TVD-transverse vitelline duct; T-testis; VT-vitellaria.

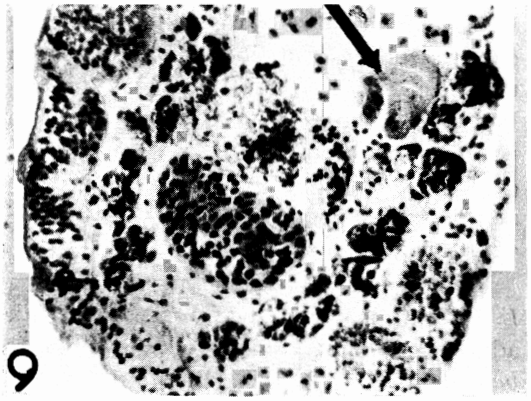

Fig. 9

Fig. 11

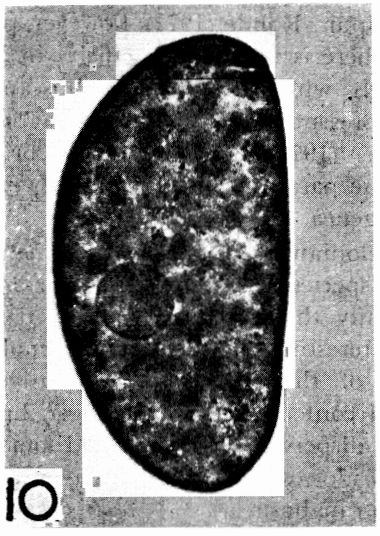

Fig. 10

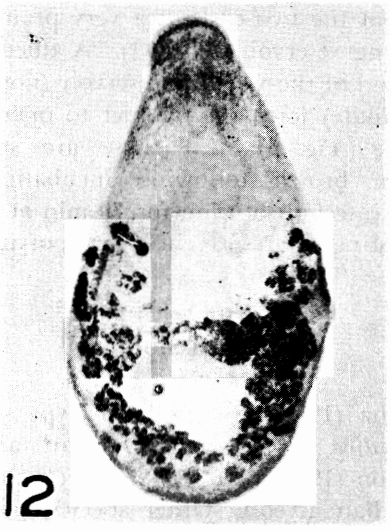

Fig. 12

Non terminal flames were made out in all the excretory ducts and their branches. Recurrent excretory duct and its branches were found positive for alkaline phosphatase activity.

Testis median, single, ventral to caecum (Fig. 5); much broader than long (relatively narrow on the left), 0.180 to 0.252 (0.207) by 0.260 to 0.379 (0.319), vas deferens extends anteriorly to the left, turns to the right at the anterior level of ventral disc to open into a massive vesicula seminalis externa, which describes two large loops (Figs. 5 and 8) before entering the male genital pore, lying medially just behind pharynx; cirrus sac and cirrus are both absent. Ovary retort-shaped (Fig. 9), lies on right at anterior level of ventral disc and 0.114 to 0.126 (0.120) by 0.169 to 0.195 (0.179); oviduct is septate and ciliated; it descends to receive a duct from vitelline reservoir and opens in ootype; receptacu-

lum seminis is absent; laurer's canal was not traceable. Uterus at origin lies almost parallel to vitelline reservoir, extends anteriorly to the left to open into metraterm, the latter measuring 0.205 to 0.403 (0.255) by 0.032 to 0.042 (0.035) and has longitudinally folded appearance. Uterus shows strong alkaline phosphatase activity and contains 2–3 mature operculate eggs (Fig. 10) which have greenish yellow tinge and measure 0.236 to 0.245 (0.242) by 0.148 to 0.162 (0.155); metraterm opens through a medially situated female genital pore, which is lying between pharynx and male genital pore and has a sphinctor (Fig. 5).

Vitelleria follicular, including about 30 follicles on each side and confluent in post testicular zone; transverse vitelline ducts open at the two ends of a very prominent vitelline reservoir (Fig. 11). A duct from one end of the vitelline reservoir (not from its middle) joins the oviduct to open into ootype (Fig. 5). All these are stained golden brown following incubation in 0.2% catechol solution for 70 min at 40°C, suggesting the presence of polyphenol oxidase (Fig. 12).

Discussion

Sinha (1935) described the type species *L. indica* to have 10 median alveoli. Tandon (1949) described *L. ovata* to have 8 median alveoli. Other species, namely, *L. sinhai, L. mehrai, L. macrorchis, L. jagatai, L. hepatica* and the present form, *L. ocellata* n. sp. all have 8 median alveoli. While *L. ovata* and *L. ocellata* n. sp. occur as adults in ctenidium of *V. bengalensis,* all other species were recovered from chelonian hosts. *L. ocellata* n. sp. differs from *L. ovata* and all other species in the presence of a pair of prominent eyes. In fact it is most unusual for an adult aspidogastrid to have such a pair of prominent eye spots. Other points of differences from *L. ovata* include their broader than long pharynx, absence of oesophagus, median testis, absence of a cirrus sac, uterus with only ascending limb, besides difference in the size of body and visceral organs. Further, *L. ocellata* n. sp., when kept in water, shed their eggs readily, while *L. ovata* never do so. All these differences are pertinent enough to justify their recognition as a new species.

Recovery of juvenile and very young *L. ocellata* on several occasions, along with adults, in the ctenidium confirms *V. bengalensis* to be the sole host for this species and that, they are specific to their host and habitat. In spite of repeated efforts, this infection could not be located either in *V. bengalensis* or in any other species of snail in the different other tanks at Raipur. Rohde (1972), however, pointed that there is no strict specificity in aspidogastrids with regard to molluscan host. The present authors, however, agree with Rohde (1973) that they are primarily mollusc parasites and are possibly close to Prodigenea.

Chelonian hosts described for the several other species of *Lissemysia,* in our opinion, are only the facultative hosts. It would be interesting to identify the molluscan hosts of those species. Facultative host would confer certain advantages, bringing about dispersal of parasites and some times help tide over periods unfavourable to molluscan hosts.

Summary

Lissemysia ocellata n. sp. is described from *Vivipara bengalensis.* Juveniles, immature and sexually mature worms, containing fully developed eggs in uterus, were all recovered from the ctenidium of *V. bengalensis* from a tank in university campus. The species is narrowly specific both for molluscan host and habitat since no other species of snail in any other tank at Raipur was found to harbour this

parasite. It differs from all species of *Lissemysia* in the presence of a pair of prominent eye spots in all stages including sexually mature worms and is a most unusual aspidogastrid in this respect. Of the species included in *Lissemysia*, *L. ovata* Tandon (1949) alone is described from molluscan host. All others were described from chelonian hosts. It differs from *L. ovata* besides in respect of a pair of eyes, in broader than long pharynx, absence of an oesophagus, median testis, absence of cirrus sac, uterus with only ascending limb and size of body and is clearly distinct from the same.

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インド Raipur 地区の巻貝 *Vivipara bengalensis* から見い出された *Lissemysia ocellata* n. sp. に関する研究

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インド，Raipur 地区のため池に生息する巻貝 *Vivipara bengalensis* の稚貝，未成熟貝および成貝の鰓鰓から *Lissemysia ocellata* n. sp. を見い出した．

この種は他の *Lissemysia* 属とは異なり成虫を含めた全発育ステージを通じ一対の明瞭な眼点を有する．

さらに他の *Lissemysia* 属がカメを宿主とするのに対し *L. ovata* (1949) は貝を宿主とする唯一の種である．

L. ocellata n. sp. は一対の眼点を有し，咽頭は巾広く，食道を持たず，*testis* が体中央に位置しており，cirrus sac を欠き，子宮は向上枝のみを持つことおよび虫体の大きさの点で *L. ovata* とは異なっていた．