Typhlocoelum Cucumerinum (Rudolphi, 1809): Morpho-Pathology of Rare Tracheal Fluke in an Indian Runner Duck

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ABSTRACT

The occurrence of tracheal flukes in ducks is uncommon. Among them, *Typhlocoelum cucumerinum* has not been reported yet in India. An Indian runner duck flock had a history of mortality in adult birds with clinical signs of nasal and ocular discharges, gasping and torticollis. A dead bird was presented for necropsy. Postmortem examination showed the presence of live dorso-ventrally flat, pink flukes in the anterior trachea. Flukes and representative tissue samples were collected and processed. Upper respiratory passage and nasal sinus mild mucosal congestion were covered by viscous contents and necrotic foci, respectively. Necrotic pneumonia, sub-acute tracheitis and bronchitis, chronic fibrino-purulent sinusitis with parasitic eggs were observed in the lungs and upper respiratory air passage, respectively. Collected flukes were identified as *T. cucumerinum* based on the morphology. Further, the presence of eggs in the nasal passage suggested that the pathology observed was due to *T. cucumerinum*. This paper describes the pathology and morphology of *T. cucumerinum* in the Indian runner duck.

Keywords: Indian Duck, *T. cucumerinum,* Morphology, Pathology

INTRODUCTION

Duck farming is a profitable venture among the landless and poor livestock farmers, over 90% of them in backyard (Naik *et al.*, 2022). Ducks' habitat is both on land and water, eating insects, snails and worms (Rajput *et al.*2014; Naik *et al. loc cit*). Snails are the main intermediate hosts for many internal parasites of ducks. Planorbid snails play a major role in the tracheal fluke life cycle in ducks (Assis *et al.*2021). Among the digenetic trematodes, *T. cucumerinum* is found to be fairly uncommon in ducks (Jeyathilagan *et al.,* 2019). Hence, the pathology of these parasites is poorly documented. Hence, this paper describes the occurrence of *T. cucumerinum* and its pathology in Indian runner ducks from the Cauvery delta region of Tamil Nadu, India.

MATERIALS AND METHODS

An Indian runner duck flock holding 1500 ducks (*Anas platyrhychosdomesticus*, Linnaeus, 1978) by a nomadic farmer had the mortality of 3 birds per day for one week. Affected birds had clinical signs of mucoid nasal discharge, watery ocular discharge, torticollis and gasping. A dead bird was brought to the Department of Veterinary Pathology, Veterinary College and Research Institute, Orathanadu, Tamil Nadu. Postmortem examination was carried out. Tissue samples from various organs were collected and preserved in 10% formalin and processed according to the paraffin embedding technique. Tissue sections of 3-4 µm thickness were prepared and stained with hematoxylin and eosin (H&E) (Bancroft and Layton, 2019). Tracheal flukes were collected and processed. Trematodes were pressed between clean glass slides, flattened and fixed in 5% formalin. Processed trematodes were stained with acetic alum carmine. Morphology of the trematodes was identified using a zoom stereomicroscope (Nikon SMZ1270) and measured with a calibrated micrometer eyepiece (10x).

RESULTS

Pathology

On gross examination, the nasal passage was found to be covered with viscous material. On sagittal section, the nasal septum showed a greyish depressed area surrounded by a yellowish firm elevated border (Figure 1). Anterior trachea revealed two live, elliptical, pinkish, dorso-ventrally flattened worms (Figure 2) with vermiform movements. Tracheal mucosa was covered with clear, viscous material. Both lungs were severely congested, and scattered areas showed dark reddish-brown firm foci (Figure 3). Brain revealed mild to moderate congestion of vessels. Microscopically, the nasal septum showed mucosal hyperplasia (Figure 4), diphtheritic sinusitis characterized by fibrino-haemorrhagic to fibrino-purulent exudate admixed with neutrophils (Figure 5). Nasal sinus mucosa revealed chronic fibrinous sinusitis (Figure 6) characterized by fibrinous exudate admixed with worm eggs having well-developed miracidium inside (Figure 7). Nasal turbinate mucosa revealed moderate thickening with oedema and Mono Nuclear Cell (MNC) infiltrations (Figure 8). Trachea revealed moderate thickening of mucosa with subacute tracheitis (Figure 9). Bronchi and bronchioles revealed sub-acute bronchitis and bronchiolitis respectively characterized by mucosal hyperplasia with moderate MNC infiltration and eosinophilic exudate with in the lumen (Figure 10). Lungs showed scattered foci of necrotic pneumonia characterized by necrotic center surrounded by bacterial colonies and zone of congestion (Figure 11). Brain revealed oedema in the perivascular space (Figure 12) and neuronal satellitosis (Figure 13).

Morphology of the Fluke

The fluke was identified based on the morphology (Figure 14). It had an elliptical shape with a broader anterior and slightly narrower posterior end. Body measured 9.74-11.20 µm in length and 3.80-5.26 µm in breadth and was covered with tiny scales. The anterior border (Figure 15) measured 1.62 µm in breadth just above the cecal bifurcation. The anterior end showed a blunt knob at the middle and sub-terminal oral opening. The intestinal ceca were long, which diverged on both sides with several internal diverticulations from the lateral side and both ceca were fused posteriorly. Vitelline follicles occupied the lateral to the intestinal ceca from the cecal bifurcation, extended to the posterior end, but were not confluent. Oral and ventral suckers were absent. The uterus was intercecal and occupied a major portion of the body. It contained immature eggs at mid of the mid-uterus and contained mature eggs with miracidium towards the terminal uterus and genital pore. The genital pore was post-pharyngeal. The testes were tandem, lobated, irregular and placed posteriorly but diagonally. The anterior testes were on the left side, whereas the posterior testes were on the right side. The ovary was placed anterior to the posterior testes. The posterior end (Figure 16) measured 1.46 µm in breadth just below the cecal fusion. The eggs were oval with a bulge at the center and yellowish with an operculum. The mature eggs contained a miracidium inside with an eyespot.

DISCUSSION

T. cucumerium (Rudolphi, 1809) is the type species under the class Digenea, Order Echinostomida, Family Cyclocoelidae. It parasitizes air sacs, body cavities and trachea of waterfowl (Ensuncho Hoyos *et al.,* 2017).

The morphology of the fluke described in this study was in accordance with the earlier reports (Ensuncho Hoyos *et al.*2015; Assis *et al.*2021). Lobated, tandem testes arranged at the posterior end of the body and an entire round ovary located anterior to the posterior testes were considered to be a unique morphology for *T. cucumerium*. Further, the location of the genital pore in the pharyngeal or post-pharyngeal region and non-confluent vitelline follicles, border anterior end and narrow posterior end, differentiated it from *T. cymbius,* which is cymbal-shaped with unlobed testes, and the genital pore was pre-pharyngeal in location (Kakati *et al.,* 2015; Jeyathilakan *et al.,* 2019; Assis *et al.,* 2021).

The pathology of *T. cucumerium* was not adequately reported. In the present case, tissue changes such as necrotic pneumonia, sub-acute bronchitis and tracheitis, along with chronic fibrinous sinusitis, were the major pathological changes observed. The observation of necrotic pneumonia in this study indicated that the migration of immature stages occurred *via* blood stream from the lungs to the trachea. The life cycle of *T. cucumerium* starts when the eggs with a fully formed miracidium laid by adult flukes in the trachea are swallowed back into the digestive tract and eliminated in faecal droppings. Miracidium releases redia, which directly attach to the tissue of the intermediate host (planorbid snails). Upon ingestion of the snail, the metacercaria excyst inside the gut of the definitive host (ducks). Necrotic pneumonia observed in the present study suggested that the metacercaria might have possibly travelled via the bloodstream to the lungs and from the lung to the trachea. Migration in the lung tissue might possibly cause necrosis and secondary bacterial pneumonia. The movement of the immature flukes might have caused sub-acute bronchitis and tracheitis with mucosal hyperplasia recorded in this study. Necrotic rhinitis with evidence of egg having miracidium suggested that the fluke played a major role in the pathology of the upper respiratory tract.

CONCLUSION

Migration of ducks in free range rearing around the water bodies and paddy fields poses a risk to get exposure to infected snails. Planorbid snails were reported to be the intermediate host for tracheal flukes. It is documented that position, location, lobulations of testes, and position of the genital pore are notable characters that differentiate *T. cucumerium* from *T. cymbius.* The fluke was identified entirely based on its morphology, keeping the previous data as a reference. This report recorded the pathology of Typhloceoliosis by *T. cucumerium* and its morphology from an Indian runner duck.

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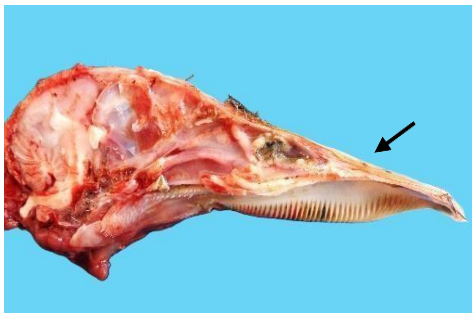

Fig. 1: Necrotic foci – Nasal septum

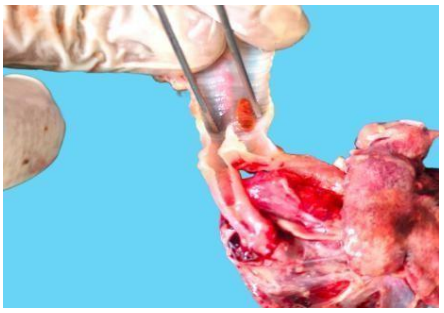

Fig. 2: Fluke in the tracheal lumen

Fig. 3: Congested and consolidated lung

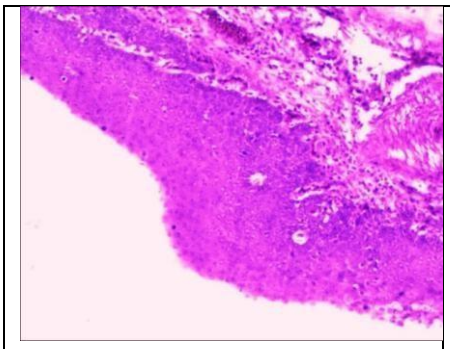

Fig. 4: Nasal sinus – Mucosal hyperplasia

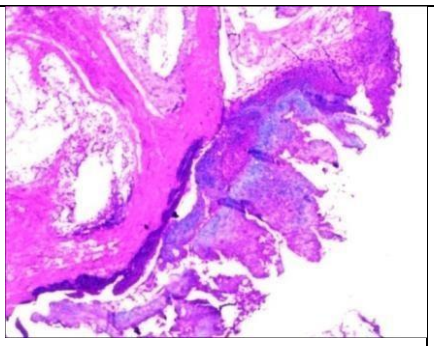

Fig. 5: Diphtheritic sinusitis – mucosal necrosis

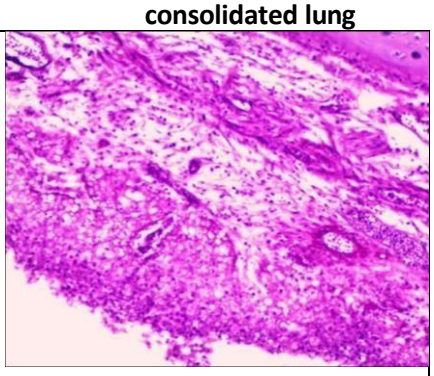

Fig. 6: Fibrinous sinusitis

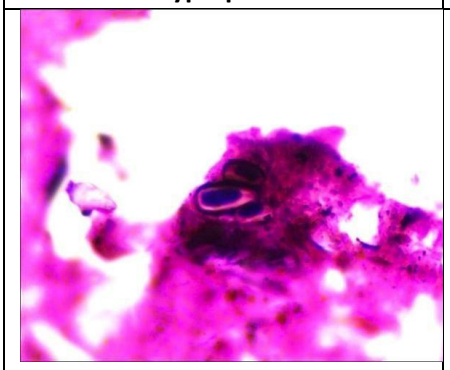

Fig. 7: Fluke egg in the exudate of the nasal sinus

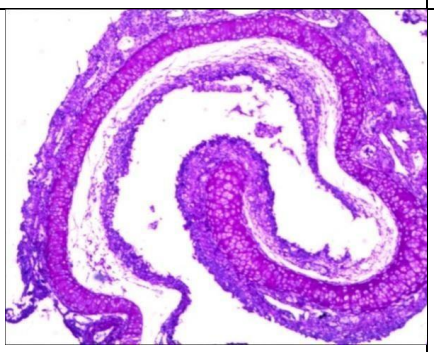

Fig. 8: Congestion with mononuclear cell infiltrations – Nasal turbinates

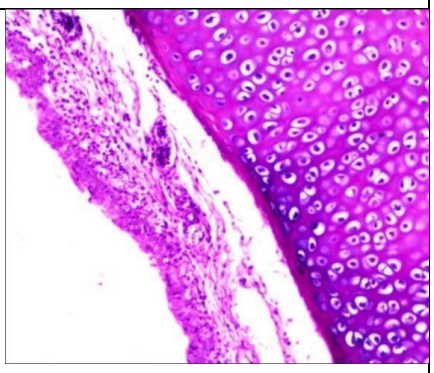

Fig. 9: Congestion with mononuclear cell infiltrations – Sub-acute tracheitis

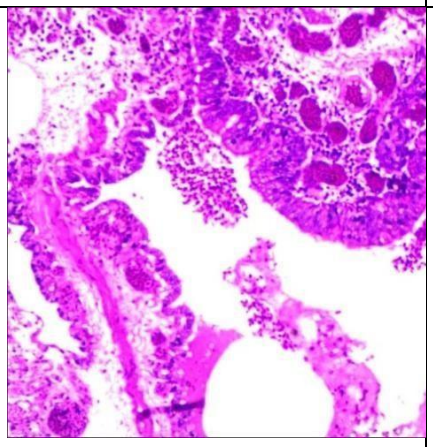

Fig. 10: Mucosal hyperplasia, congestion and luminal exudate – Sub-acute bronchitis

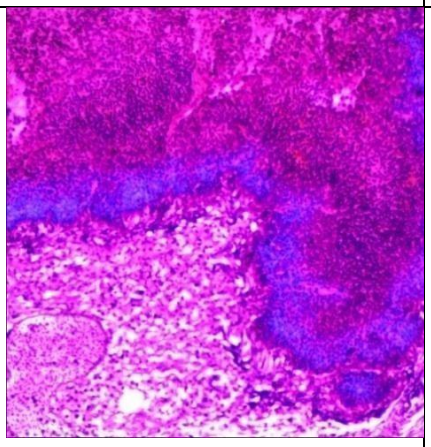

Fig. 11: Necrosis with bacterial colonies – Necrotic pneumonia

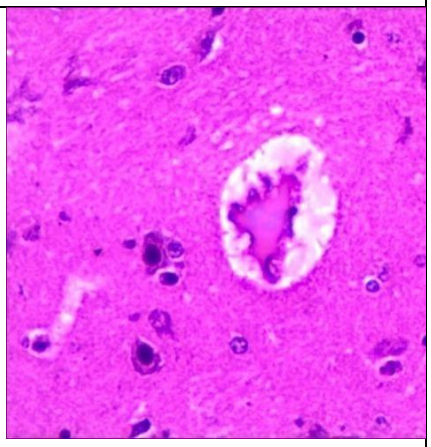

Fig. 12: Perivascular oedema – Cerebrum

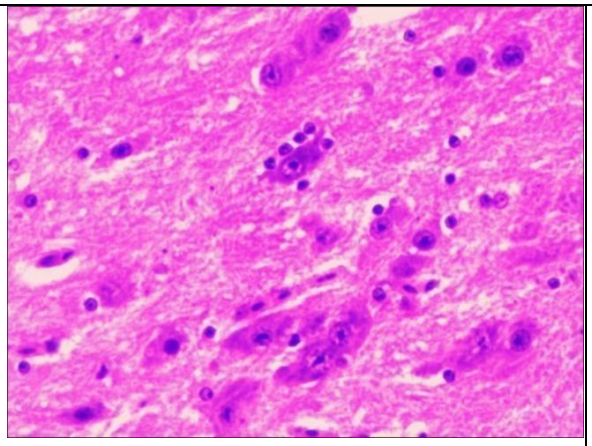

Fig. 13: Satellitosis - Cerebrum

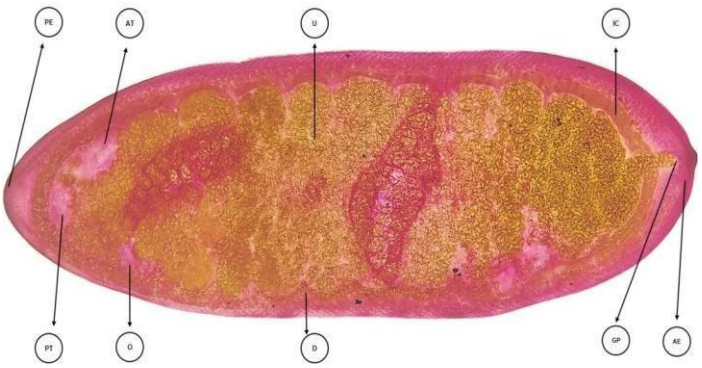

Fig. 14: Morphology of *T. cucumerium*: AE – Broader anterior end; GP – Pharyngeal genital pore; IC – Intestinal caeca; U – Uterus; D – Diverticulation; O – Ovary; AT – Anterior testis; PT – Posterior testis; PE – Narrow posterior end

Fig. 15: Anterior end of *T. cucumerium*

Fig. 16: Posterior end of *T. cucumerium*; Scaly cuticles