Verminous pneumonia in a Hog Deer (*Axis porcinus*) caused by *Dictyocaulus eckerti* Skrajabin, 1931 with remarks on the present status of this species

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Diseases of wildlife received very little attention until 1932 (Seshadri, 1985). Studies on parasitism of wildlife are scanty and some parasites have been reported from captive wildlife and zoo animals (Jithendran and Bhat, 2001). Seshadri (1985) reviewed the diseases of wildlife in Mysore Zoo, Mini Zoo in Hassan and National Park / Sanctuary at Bannerghatta, Bandipur and Ranganthittu of Karnataka State, India confirmed by experts of the Veterinary College, Bangalore and Institute of Animal Health and Veterinary Biologicals, Bangalore. A case of verminous pneumonia in a hog deer was then documented. The present communication describes lungworms recorded from hog deer from Karnataka and the histo-pathological lesions in the lungs. Latest information on the identity of species encountered in deer and cattle is also discussed.

A hog deer (*Axis porcinus*) from the Mini Zoo, Hassan, Karnataka State died suddenly after showing signs of distressed breathing. Detailed post-mortem examination revealed the presence of about 500 ml sero-sanguineous fluid in the thoracic cavity. Numerous short thread-like nematodes were found in the lumen of trachea, bronchi and bronchioles causing blockage. The worms were collected, washed in normal saline and preserved in 70% alcohol. The lung parenchyma showed areas of emphysema, congestion and consolidation. lung tissue preserved in.

The lung tissues were collected in 10% buffered formalin and processed by paraffin technique. The sections of 5 to 8 micron thickness were cut, stained by haematoxylin and eosin and examined. Histologically the changes observed comprised of areas of congestion, collapse and emphysema in addition to features of eosinophilic, hyperplastic bronchitis and bronchiolitis, lymphoid hyperplasia and granulomas around eggs and cut sections of parasites. Many of the alveoli showed their lumina filled with eosin stained sero-proteinaceous material as well as cellular exudate that included eosinophils. The histo-pathological details observed in this case matched with the histopathology of verminous pneumonia in cattle caused by *Dictyocaulus* sp. (Thomson, 1989). Nashiruddullah, *et al.* (2007) described histo-pathological lesions in natural infection of *D. viviparus* in Kashmiri stag or hangul (*Cervus elaphus hangalu*). They observed vascular changes in lungs as well as patchy pneumonia and inflammatory exudates in the aleveoli and squamous metaplastic changes in the bronchial epithelium. The epithelial cells showed typical rounding with large nuclei. The severely affected airways revealed atelectatic patches and interalveolar congestion and oedema along with emphysema. The lungs showed occasional epithelization and variable cellular reaction comprising of scattered lymphocytes and scanty eosinophils around the parasites more or less similar to the present findings.

The worms were identified at the CAB International Institute of Parasitology, St Alberts, Herts, U.K. by Gibbons and Khalil and assigned to the species *Dictyocaulus eckerti* Skrajabin, 1931 (CIP No. 5038). *D. eckerti* has been reported from the bronchi of deer in Europe, Asia and North America and considered a synonym of *D. viviparus*. Gibbons and Khalil (1988) on the basis of detailed study on the morphology of the various species of the genus by light and scanning electron microscopy considered *D. eckerti* as a separate and valid species. Differences in the shape of mouth opening between *D. viviparus*, *D. eckerti* and *D. cameli* was the main basis. In the case of *D.eckerti* a well developed cephalic vesicle has been described. According to Divina, *et al.* (2008), the shape of buccal capsule has been considered as the most reliable morphological character for the diffrentiation of *D. viviparus* and *D. eckerti*. There are physiological barriers to the three species freely infecting the natural hosts of each species along with small morphological differences and they have been retained as a separate species by Gibbon and Khalil (1988). Some researchers have succeeded in infecting cattle with larvae of *D. eckerti* from deer but could not infect deer with larvae of *D. viviparus* from cattle. Johnson *et al.* (2003) demonstrated cross-species transmission of *Dicytocaulus* spp. between red deer and cattle using species specific strains of *D. viviparus* (cattle) and *D. eckerti* (deer). A recent development of species–specific polymerase chain reaction (PCR) for differentiation of *D. viviparus* and *D. eckerti* larvae provided further evidence of difference between these two species (von Samson- Himmelstjena *et al.*, 1997). Divina, *et al.* (2008) demonstrated the usefulness of PCR-linked hybridization assay as the epidemiological tool for the specific identification of lungworm of cattle and wild cervids. Therefore, *D. eckerti* has been considered a valid species and it is a rare record of this species in hog deer (*A. porcinus*) in India.

The species of lungworms reported from India in domestic and wild herbivores were mostly confined to cooler hilly tracts of North India, but they were rarely recorded from warmer southern plains. In Karnataka state there are few isolated reports of lungworm infections including *Metastrongylus salmi* from pigs and *D. viviparus* from cattle (Krishna Rao and Jagannath, 1969; Muraleedharan *et al.*, 1991). A species of *Dictyocaulus* sp. recovered during post-mortem of a gravid female Kashmir red deer was the first report of this infection in deer species (Nashiruddullah, *et al.*, 2005). Sharma *et. al.* (1996) described verminous pneumonia due to *Muellerius capillaries (minutissmus)* in a barking deer.

Al though this condition was detected in the early eighties no specific description of *Dictyocaulus* pneumonia in hog deer and histopathological details were available. Therefore this case is placed on record.

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Parasitic infections in wild animals of Kerala

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A wild animal is typically host to a whole community of parasites of different species. Wild animals harbour numerous parasites in their free living stage, but seldom lead to harmful infection unless stressed (Gaur *et al*., 1979). Arora (1994) described a detailed account of infections and parasitic diseases of mammals, reptiles and amphibians in India. The present communication reports the parasitic infections in various wild animals of forests of Kerala.

Faecal samples of Sloth bear (5 nos), Gaur (12 nos), Nilgiri Thar (5 nos), Porcupine (2 nos) Sambar deer (15 nos) and Wild boar (8 nos) were collected from Periyar Wildlife Sanctuary. Faecal sample from one leopard was collected from Muthanga forest of Wayanad district. All samples were collected from rectum during post mortem examination of dead animals and were preserved in 10 percent formalin until processed. They were processed for concentration of ova by centrifugation and sedimentation technique. A drop of sediment was examined under low power objective of light microscope. The ova were identified based on Soulsby (1982).

Results of faecal sample examination were shown in the Table 1. Out of 48 samples examined, 16 showed parasitic ova. Most of them had mixed infection.

Strongyle ova were the most common ova detected. Strongyle ova seen in wild boars were presumed due to *Stephanurus dentatus*, since many worm specimen of this species was also frequently observed in internal organs of the same animals. Similarly, the strongyle ova detected in leopard could be due to the hook worm *Galocnchus perniciossus*.

In sambar deer, an ovum similar to *Fasciola* was observed. But the occurrence of *Fasciola*, in domestic ruminants is still equivocal in the state.

Eventhough, the death in many cases could not directly attributed to parasitism, the parasites definitely predisposes many other diseases. The parasitic burden and its relationship with the host have been successfully used by modern scientists in the control of wildlife pests and predators in our forests and agricultural system. Most of the parasites are reputed for their abundance and have great impact in maintaining the stability of various ecosystems (Sharma, 2003).

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Table. 1. Parasitic ova detected in various wild animals

Animal	Number of samples examined	Number of sample positive	Ova detected
Sloth bear (*Melursus ursinus*)	5	1	*Strongyloid*
Gaur (*Bos gaurus*)	12	4	*Strongyle*
Nilgiri tahr (*Nilgiritragus hylocrius*)	5	1	*Strongyloid*
Porcupine (*Hystrix indica*)	2	1	*Trichuris*
Sambar deer (*Rusa unicolor*)	15	4	*Eimeria* oocyst *Fasciola* (?), *Trichuris*, Strongyle
Wild Boar (*Sus scrofa*)	8	4	*Ascaris suum*, Strongyle, Strongyloides, Spirurid, Coccidian oocysts, cyst of *Balantidium coli*
Leopard (Panthera pardus)	1	1	Isospora, *Ancylostoma* sp.

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