A Study of Gastrointestinal Parasites in Bonnet Macaque (Macaca radiata) of Pookode, Wayanad, Kerala

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Abstract
Bonnet macaque (Macaca radiata) is an endemic primate restricted to penninsular India. Bonnet macaque is diurnal omnivorous, feeds on a variety of diets such as fruits, leaves, insects, lichens, eggs etc. They are highly adapted to live in the wild and in human settlements and interact with humans than any other wild animal. There is a great chance for spreading zoonosis from monkeys to humans. Similar situation is observed in the Pookode Lake region (N 11.53315, E 076.02567) at southern part of Wayanad district of Kerala. Pookode Lake is one of main tourist attractions in Wayanad and also identified as one of major human-monkey conflict areas of Wayanad. A study on gastrointestinal parasites of monkeys was conducted based on identification of ova of parasites in their faecal sample. Ova of Strongyle sp., Strongyloides sp. and E. vermicularis were identified from the faeces of bonnet macaque.

Introduction
Parasites are marvelously well-adapted organisms. Their adaptations are complex since they involve intimate inter-relationship with their host, with which they co-evolved (Barnard & Behenke, 1990). The result is a counter-adaptive arms race between host and parasite with far-reaching consequences on the physiology, ecology and behaviour of both (Jog & Watve, 2005). Parasite richness and prevalence in wild animals can be used as indicators of population and ecosystem health (Teichroeb et al., 2009).

Wild primates can host an incredible diversity of parasites. More than 50 different species of parasites were documented in primates (Nunn & Altizer, 2006). Monkeys are the intermediate host of many parasites which have the potential to be transmitted to humans. Bonnet macaque (Macaca radiata) which is very common in forests of southern India, successfully adapt to almost any kind of environment and they enjoy the intense love and hate relationship with the people (Schlotterhausen, 1999).

A study was undertaken to assess the various parasites affecting the gastrointestinal system of bonnet macaque by microscopical examination of faeces for demonstration of ova of parasites.

Materials and Methods
Faecal samples of bonnet macaque were collected from an area (Fig 1) near Pookode Lake (N 11.53315, E076.02567), which is identified as one of the major man-monkey conflict areas of Wayanad. Examination of faecal samples for parasitic ova was conducted to study gastrointestinal parasitic diversity. They were collected using a scalpel from the ground and stored in collection bottles. They were processed for concentration of ova present in them through sedimentation by centrifugation. Briefly, 5-10g sample was mixed with 12 ml of water in a mortar and triturated with the help of a pestle. The mixture was passed through a sieve to remove coarse debris. The filtrate was collected in a test tube and then centrifuged at 2000 rpm for 2 minutes. The sediment was collected after discarding the supernatant. A drop of the sediment mixed with water was examined using 10X objective of a compound microscope after putting a cover slip. Parasitic ova were detected based on the descriptions provided by Soulsby (1982).

Results and Conclusions
A total of 20 faecal samples of bonnet macaque were collected. Ova of three gastrointestinal parasites were observed viz., Strongyle sp. (4), Strongyloides sp. (2) and Enterobius vermicularis (1). Coop & Holmes (1996) reported that, the gastrointestinal nematodes reduce voluntary food intake, efficiency of food utilization, and increased endogenous loss of protein into the gastrointestinal tract. Hence, the presence of these worms in the gastrointestinal tract definitely affects the general health of the monkey.

Fig 1. Map of study area near Pookode Lake, Wayanad, Kerala

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The Strongyloides sp. was reported previously (Varadharaajan & Pythal, 1999a,b; Parmar et al., 2012; Hussain et al., 2013 & Hernandez et al., 2009) in the macaques and is a common parasitic infection in them. Strongyle sp. is another nematode which is commonly seen in the macaques (Teichroeb et al., 2009; Parr et al., 2013 & Gunasekera et al., 2012).

In the present study, ova of Enterobius vermicularis were reported from bonnet macaque. They were colourless and showed thick shell flattened on one side. Previously, E. macaci was reported in Japanese macaque, (Macaca fuscata) (Hasegawa et al., 2012). However, its presence in bonnet macaques from India is not known. Other species seen in primates include E. buckleyi in orang-utan (Foitová, 2014) & E. (E.) anthropopithecus in chimpanzee. V. vermicularis is common in human children and transmitted via the faecal-oral route. Humans are the only natural host of E. vermicularis (Panidis et al. 2011). E. gregorii, another human species is morphologically indistinguishable from E. vermicularis except the spicule size (Hasegawa, 1998). There are no reports on the presence of E. gregorii from India.

Ova of Enterobius sp. observed in bonnet macaque in the present study raises serious concern as there is no available report of the E. vermicularis in them. When one child is affected, eggs of E. vermicularis may remain viable for two to three weeks on clothing and bedding, facilitating easy spread among family members and other children (Panidis et al., 2011). Hence, further studies are required for confirmation of this zoonotic situation.

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References