



Parasitic invaders: A report on *Trinoton querquedulae* lice and helminthiasis in a nomadic duck flock

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ABSTRACT

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A nomadic flock of 1500 ducks was sheltered in paddy fields near Orathanadu, Thanjavur district. The flock owner reported that the ducks showed symptoms like dullness, reduced feed intake, decreased egg production and body weight gain. Physical examination of the birds revealed the presence of lice over the body surface, which were identified as *Trinoton querquedulae*. Faecal samples were collected for screening of endoparasites revealed the ova of *Echinostoma* spp., *Raillietina* spp., *Capillaria* spp. and oocysts of *Eimeria* sp. The present study highlights the economic importance of ecto- and endo-parasitic infections in nomadic duck rearing practices.

Keywords: *Capillaria* spp., *Echinostoma* spp., Nomadic ducks, *Raillietina* spp., *Trinoton querquedulae*

INTRODUCTION

Ducks are waterfowls belonging to the family Anatidae and they are close to other birds like geese and swans which can be found extensively all over the world except Antarctica. Ducks are one of the important poultry species in India next to chicken, are reared by many rural people of India as subsidiary source of income (Jowel *et al.*, 2020). They are reared for production of copious number of eggs and meat due to their faster growth rate, meat quality, low cost of maintenance and efficient converters of feed (Borah *et al.*, 2018) and also provide efficient source of animal protein in the form of eggs and meat to the people. In southern parts of India, ducks are mostly reared as nomadic flock rather than intensified rearing and they are mostly raised in wetlands and harvested agricultural fields due to its dabbling and scavenging type of feeding. Duck farming and paddy cultivation can be easily integrated and it provide enormous benefits to the farmers, but they suffer with economic losses in duck farming due to parasitic infections which causes poor growth rate, poor feed conversion rate, decreased egg and meat production and mortality of birds (Soulsby, 1982). As they are reared as nomads, they can easily acquire infection from other birds as cross transmission. Nomadic ducks are highly susceptible to ecto- and endoparasites due to their foraging behavior and habitat. While feeding, they disrupt soil, inadvertently ingesting parasitic stages and intermediate hosts. Their presence in aquatic and semi-aquatic areas exposes them to trematodes via infected snails. Scavenging ducks are

prone to nematodes like *Capillaria* spp., *Subulura* spp., *Echinuria* spp. and protozoa such as *Cryptosporidium* sp. and coccidian oocysts (Larki *et al.*, 2018). Intestinal parasites cause enteric disease, leading to undernutrition, reduced feed efficiency, lower meat and egg production and economic losses for rural communities. Mixed parasitism often results in severe effects on the birds which includes stunted growth, low egg production and susceptibility to other diseases (Muthusamy *et al.*, 2020; Preena *et al.*, 2020). Among ectoparasites, lice are the most commonly encountered in ducks. Chewing lice are widespread ectoparasites which exist inside the feathers or plumage of mammals and birds. They never evacuate their host during their life cycle. Normally, chewing lice exhibit vertical transmission as they brood on eggs and chicks (Clayton *et al.*, 2016). Lice infestations in ducks can cause feather damage, skin irritation, anemia and secondary infections, leading to reduced growth, egg production and overall productivity (Soulsby, 1982). Severe infestations increase stress and susceptibility to other diseases, resulting in significant economic losses for duck farmers, particularly those in rural areas who rely on duck farming for their livelihood. This paper deals with the finding of a rare species of lice *Trinoton querquedulae* and endoparasitic infection in a nomadic flock of delta region of Tamil Nadu with its morphological characterization.

MATERIALS AND METHODS

Collection of samples

A nomadic flock of 1,500 ducks was camped (Fig. 1, 2) in paddy fields near Orathanadu, Thanjavur region,

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for foraging during August 2023. The flock was managed under a free-range system, moving between agricultural fields for feeding. The flock owner reported clinical signs including dullness, reduced feed intake, decreased egg production and loss of body weight. A thorough physical examination of randomly selected ducks was conducted to assess ectoparasitic infestation and general health status. The presence of lice was observed across the body surface of affected birds, and specimens were carefully collected using fine forceps. The collected lice were preserved in 70% ethanol for morphological identification. Cloacal swab was collected randomly and preserved in 70% alcohol for screening of endoparasites.



Fig. 1: Ducks inside the fencing



Fig. 2: Ducks in harvested paddy fields for grazing

Processing of sample

The lice which were collected in 70% alcohol were further dehydrated using ascending grades of alcohols from 50%, 70%, 80%, 90% and absolute alcohol. In each grade of alcohol, the specimen was kept for 10 minutes, followed by clearing in xylene for 2 hours. After clearing, the specimen was mounted with DPX carefully on a glass slide. The mounted samples were subjected to

high power microscopy for morphological characterization. Concentration methods of faecal examination including sedimentation and floatation (with saturated salt solution, specific gravity 1.18) were used with the cloacal swab for detection of endoparasites as described by Soulsby (1982).

RESULTS AND DISCUSSION

Ectoparasite

The louse *Trinoton querquedulae* (Fig. 3) exhibits distinctive morphological features of triangular head (Fig. 4) with a rounded and broader temporal region. A single pair of antennae emerges laterally on each side, comprising four to five segments. Notably, the gular region is adorned with short, stout spine-like papillae, adding a unique aspect to its morphology. The mouthparts include a pair of well-developed mandibles (Fig. 5), structures adapted for biting and chewing. The exoskeleton of the thorax is robustly developed and chitinized, imparting strength and resilience to this vital segment. The prothorax (Fig. 6), occupying the anterior portion, stands out prominently with its substantial size. Following the prothorax, the mesothorax and metathorax are clearly demarcated, revealing a distinct separation between these segments. The mesothorax, centrally positioned, is characterized by a narrower and shorter profile compared to the metathorax, emphasizing structural asymmetry. Most distinctive feature of the thorax is the presence of numerous short and long bristles, unevenly arranged. Three pairs of well-developed legs attached to the thoracic segments with two tarsal claws at the terminal end (Fig. 7). The abdomen is characterized by its elongated structure with unevenly arranged bristles, divided into eight to nine segments (Fig. 8, 9). It exhibits a specific arrangement of bristles, particularly concentrated in the posterior angle of the alternate abdominal segments (Fig. 10), and features setae on the sternites. The terminal abdominal segments having rounded abdominal border (Fig. 11).



Fig. 3: *Trinoton querquedulae* lice - Gross



Fig. 4: Triangular head – *T.querquedulae* x40



Fig. 7: Tarsal claws (arrow) – *T.querquedulae* lice x400

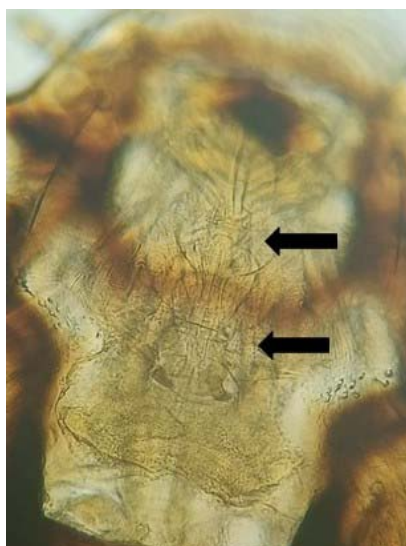


Fig. 5: Well developed mandibles (arrow) – *T.querquedulae* x100



Fig. 8: Abdominal segments – *T.querquedulae* x100



Fig. 6: Chitinized prothorax – *T.querquedulae* lice x100

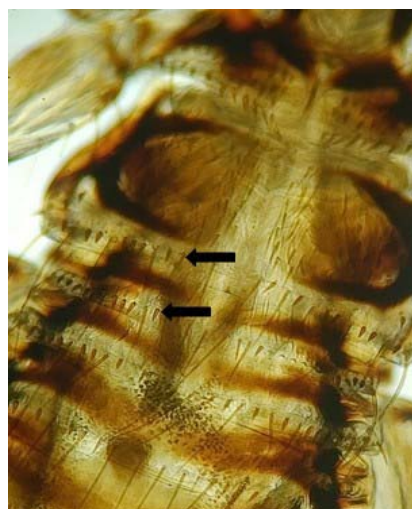


Fig. 9: Numerous unevenly arranged bristles (arrow) – *T.querquedulae* ×100



Fig. 10: Numerous bristles in the lateral side of abdominal segments (arrow) – *T.querquedulae* x100



Fig. 11: Rounded abdominal border with reproductive organ-*T.querquedulae* x100

Lice (Insecta: Phthiraptera) are permanent parasites of their hosts and usually exhibit high host specificity (Soulsby, 1982). The duck has been the host for seven distinct lice species: *Anaticola crassicornis*, *Anatoecus dentatus*, *Anatoecus icteroides*, *Holomenopon leucoanthum*, *Holomenopon maxbeieri*, *Holomenopon transvaalense*, and *Trinoton querquedulae* (Aksin, 2011; Jeyathilakan et al., 2016). Soulsby (1982) stated that *Trinoton* sp., commonly found in ducks and swan, where, Kettle (1995) also emphasizes the occurrence of *Trinoton querquedulae* lice infestation in ducks. Jeyathilakan et al., 2023 reported the occurrence of *Trinoton querquedulae* lice infestation in nomadic duck flock from the Thanjavur district of Tamil Nadu, aligns with our study. The duck population in Tamil Nadu resides mainly in wetland ecosystems and raised in semi-intensive

conditions. These environments also promote the prevalence of different types of parasites in ducks. Lice infestations can negatively impact duck growth and productivity as a result of their severe irritation, as reported in our study. Lice are external parasites that typically pose a nuisance rather than a hazard to their hosts and significantly influence the economy of the nomadic farming community.

Endoparasites

The cloacal swab of ducks revealed the presence of eggs of trematode *Echinostoma revolutum*, acestode *Raillietina* sp. and nematode *Capillaria* sp., The ova of *Echinostoma revolutum* (Fig. 12) morphologically characterized by the ellipsoidal yellowish egg with typical operculum measuring 80×55 µm. *Raillietina* sp., ova (Fig. 13) were identified by a single egg capsule with a peculiar hexacanth embryo. *Capillaria* sp., (Fig. 14) egg was identified by thick, barrel shaped egg containing bipolar plugs. The oocysts of *Eimeria* sp., morphologically characterized by the unsporulated sporocysts, measuring 18×13 µm.



Fig. 12: Ova of *Echinostoma revolutum* x400



Fig. 13: Ova of *Raillietina* spp., x400



Fig. 14: Ova of *Capillaria* spp., x400



Fig. 15: Unsporulated oocysts of *Eimeria* spp. x400;

Ducks raised in free-range conditions are more prone to get parasitic diseases such as helminthiasis and intestinal protozoans (Farjana *et al.*, 2008). Parasitic diseases in these nomadic birds are largely caused by their feeding habits. They mainly scavenge on wide range of aquatic and terrestrial stuff including aquatic insects, crustaceans, worms, small amphibians, weeds and grasses. These substances are capable of serving as intermediate hosts for parasite larvae of trematodes and cestodes. Furthermore, climatic factors including temperature and humidity influence the occurrence and severity of these parasitic helminths (Elahi *et al.* 2014). Ducks in the investigation zone were found to be harboring intestinal parasites similar to those reported in domestic chickens (Muhairwa *et al.*, 2007). The current study detected eggs of *Echinostoma revolutum* in ducks, which was similar to the study conducted by Yousuf *et al.* (2009), who observed extensive *Echinostoma* infection in ducks from Bangladesh. *Echinostoma* has an intricate life cycle, with intermediate hosts such as *Planorbis* sp. snails and definitive hosts such as birds,

primarily ducks. *Raillietina* spp., is the common cestode to be found in nomadic ducks, tends to cause severe intestinal lesion in heavier infection (Soulsby, 1982; Adejinmi and Oke, 2011). The study by Adejinmi and Oke, (2011) reported the presence of *Capillaria* spp., in domestic ducks from Southwestern Nigeria was in parallel with our study. Gastrointestinal parasites, while pervasive and highly detrimental to duck productivity, pose a significant challenge in nomadic duck farming. Although their prevention remains elusive, effective control measures are imperative to sustain the economic viability of this farming practice. *Eimeria* spp. are the most prevalent coccidia detected in birds, particularly ducks, with mixed infections occurring often. As a subclinical infection is believed to enhance the protective immunity to subsequent infections in nomadic duck species, it is recommended that the coccidial infection in a nomadic flock should be monitored and controlled, rather than eradicated (Ballweber, 2004). The flock was treated with fenbendazole (10 mg/kg) orally along with the drinking water. The lice infested birds were treated with 1.25% deltamethrin (BUTOX®) liquid. The ducks were monitored for one week, post therapeutic examination showed improvement in feed intake and egg production. Random faecal sample examination was negative for helminthic eggs.

CONCLUSION

This study highlights the importance of vigilant monitoring, prompt diagnosis and targeted interventions in mitigating the economic losses associated with parasitic infections in nomadic duck rearing. By addressing both ecto- and endo-parasitic challenges through a tailored treatment approach, the well-being and productivity of the duck flock were restored, emphasizing the significance of comprehensive parasite management strategies in sustainable duck farming practices.

CONFLICT OF INTEREST

The authors do not have any conflict of interest for this article.

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