



First Report of *Goniocotes gallinae* (De Geer, 1778) Parasitizing *Gallus gallus domesticus* (Linnaeus, 1758) from Haryana, India

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ABSTRACT: The study on morphology of phthirapteran species is a challenging task. The genus *Goniocotes* Burmeister, 1838 infest the birds of order Galliformes all over the world having about 60 species of phthirapteran ectoparasites, which were reported from hosts belonging to the order Galliformes. A scrutiny of literature indicated that the morphological features of the ischnoceran louse, *Goniocotes gallinae* (De Geer, 1778) on domestic hen, *Gallus gallus domesticus* (Linnaeus, 1758) are negligible from Haryana. The present report provided first information on the morphological characters and antennal sensilla of an ischnoceran louse, *Goniocotes gallinae* (De Geer, 1778) infesting domestic hen, *Gallus gallus domesticus* (Linnaeus, 1758) studied under Scanning Electron Microscope from Haryana, India.

Keywords: Morphology, Ischnocera, Antennal sensilla, Lice, *Goniocotes gallinae*, Phthiraptera, SEM, Haryana.

INTRODUCTION

The species of *Goniocotes gallinae* (De Geer, 1778) is found worldwide on birds of the Phasianidae family. It is commonly known as the poultry fluff louse and pale yellow smallest poultry louse, usually seen attached to the down or fluff at the base of the feathers or around the vent of the feathers of the hosts, but may occur on feathers on any part of the body. It can be differentiated from other phthirapteran species of poultry by the presence of two long setae on the posterior margin of the head and also by the prothorax margin.

Price *et al.* (2003) noted twelve species belonging to eight genera of phthirapteran ectoparasites on domestic hen, *Gallus gallus domesticus* (Linnaeus, 1758). Out of these, eight species are ischnoceran, *Cuclotogaster heterographus* (Nitzsch, 1866), *Goniocotes gallinae* (De Geer, 1778), *Goniodes dissimilis* (Denny, 1842), *Goniodes gigas* (Taschenberg, 1879), *Lipeurus tropicalis* (Peters, 1931), *L. caponis* (Linnaeus, 1758), *Lagopoecus sinensis* (Sugimoto, 1930), *Oxylipeurus dentatus* (Sugimoto, 1934) and four species are amblyceran, *Menacanthus cornutus* (Schommer, 1913), *M. pallidulus* (Neumann, 1912), *M. stramineus* (Nitzsch, 1818), *Menopon gallinae* (Linnaeus, 1758). Lakshminarayana (1979), recorded eight species on domestic fowl, *G. g. domesticus* (Linnaeus, 1758) from India and its neighboring countries. Most of the species are widespread and apparently, highly adaptive in various geographic regions and climatic conditions (Emerson, 1956; Elele *et al.*, 2021; Price and Graham 1997; Prelezov and Koinarski 2006; Saxena *et al.*, 2010; Shaikh *et al.*, 2020; Khan *et al.*, 2003; Trivedi *et al.*, 1991; Sychra *et al.*, 2008).

Agarwal *et al.* (2011); Bhatnagar *et al.* (2004); Arya *et al.* (2010, 2012); Ahmad *et al.* (2014); Cruz and Mateo (1996); Zlotorzycska and Kassner (1986); Kassner and Zlotorzycska (1987) had specific studies on the antennal sensilla through the scanning electron microscopy of antennal sensilla. Many morphological characters, *i.e.*, antennal sensilla, ctenidea, spiracles, mouth parts, *etc.*, of the phthirapteran ectoparasites were not visible under light microscopic study; hence, in the present study the scanning electron microscopic study was used for observation of the specific characters of the aforesaid species. Literature revealed that the taxonomic studies on the phthirapteran fauna of *G. g. domesticus* deserved further investigation. In the present studies an attempt was made to provide the morphology of adult lice and its antennal sensilla through the Scanning Electron Microscopy and the occurrence of *G. gallinae* on domestic hen, *Gallus gallus domesticus* (Linnaeus, 1758) was recorded for the first time from Haryana, India.

MATERIAL AND METHODS

Fifty domestic hen, *Gallus gallus domesticus* (Linnaeus, 1758) were examined from the several localities of district Panchkula Haryana, India. Each bird was thoroughly searched for the presence of lice by the visual examination with the help of magnifying lens equipped with light source. Un-infested hosts were released in their respective places and infested hosts were subjected to delousing by the modified Fair Isle method (Gupta *et al.*, 2007). In this process the life of the bird is safe and secure. Entire louse load was transferred to 70 % alcohol in separate labeled vials. After that the samples were separated species -wise, sex

-wise and stage-wise under the Stereozoom Trinocular Microscope. For light microscopic study, specimens will be macerated with 10% KOH, washed with distilled water, treated with acetic acid, dehydrated in ethanol series, cleared in Xylene and mounted in canadabalsom. For SEM study, specimens will be fixed in 2.5% Glutraldehyde, post fixed in 0.25M Phosphate buffer, critically dried, arranged on metal stub, covered with double sided cello tape, gold coated in Neo Coater 100-240V and examined under the JCM-6000 scanning electron microscope at varying magnifications, and selected areas were photographed.

RESULTS AND DISCUSSION

The detailed studies on *Goniocotes gallinae* (De Geer, 1778) (**Plate I & II, Figs. a-i**) was conducted under SEM as details given below.

Host: Domestic hen, *Gallus gallus domesticus* (Linnaeus, 1758) (Galliformes: Phasianidae).

The genus *Goniocotes* Burmeister, 1838 occurs on Galliformes birds and is characterized as follows: Head with marginal carina complete, antennae usually monomorphic, ventral carina present but weakly sclerotized, pulvinus and pulvinal bars present, pre-antennal nodi usually well developed, temporal carina absent, gular plate weakly sclerotized, marginal temporal carina well developed, Pronotum usually laterally enlarge, at least one long stout setae on posterolateral corner and few long to short posterior marginal setae. Abdominal tergum II usually enlarge than rest of the terga, pleurites usually well developed, sterna membranous, vulval margin with a row of short to minute setae of which at least few are spine like.

Female (Plate I, Figs. a-e): Color of mounted specimens is pale. General shape and chaetotaxy of both sexes much as in Figs. a & f. Head with marginal carina moderately developed, antennae filliforms, eyes prominent and well developed ocular setae minute, marginal temporal carina moderately developed. Pronotum with posterolateral angle slightly protruded. Pteronotum without any indication of division medially, with 02 long setae on posterolateral angle and 02 slender setae on posterior margin each side with their alveoli closely associated. Abdominal terga II (fused I and II) comparatively larger, Terga II-VIII separated medially; IX-X fused and continues. Spiracles and post spiracular setae on III-VIII, last tergum with 2 long and 3 short minute setae on each side marginally. Vulval margin appears to membranous with 3-4 short spine like and 5-6 short slender setae on each side. The lateral margins of vulva are devoid of patch of setae.

Male (Plate II, Figs. f-i): Except for the characteristics of the head antennae and terminalia, males had the same general shape and chaetotaxy as females. The head of the male was broader across the pre-antennal region. Pteronotum without any sign of division. All abdominal terga were widely separated medially, with membranous sternum.

In male abdominal segment IX protrudes in form of prominent lobe extending beyond the natural margin of the abdomen. It is raised in the form of thickened ridges

centrally and bears 03 pairs of setae on the lateral most margins and two pairs of large seata on the distal margins. Dorsally, the weakly bilobed plate appears quite thickened and is centrally produced in arc like structure.

The antennae both individuals were not sexually dimorphic and consist of a scape, a pedicel and three terminal flagellomeres. The scape is a small rod like structure whereas, pedicel is elongated and cylindrical. The IInd and IIIrd flagellomeres resemble and Ist flagellomere is comparatively longer. The Ist and IInd flagellomere bear a sensilla placodea. The former is saucer shaped with central raised area surrounded by varying number of radiating ridges, separated by narrow grooves. The apical end of IIIrd flagellomere bears 08-11 tectile hairs. The distribution of placodean sensilla and tectile hairs appears similar in both sexes.

The genus *Goniocotes* Burmeister, 1838 infest the birds of order Galliformes all over the world having 60 species of phthirapteran ectoparasites, which were reported from hosts belonging to the order Galliformes (Price *et al.*, 2003; Lakshminarayana 1979; Emerson, 1956; Prelezov and Koinarski, 2006; Saxena *et al.*, 2010; Khan *et al.*, 2003; Trivedi *et al.*, 1991; Sychra *et al.*, 2008; Clay, 1940). Aldryhim (1991); Aksin and Oncel (2011); Nasser *et al.* (2014); Naz *et al.* (2011); Naz and Rizvi (2018) had described various species on galliformes birds in different regions of the world but there is no significant work from the state of Haryana of phthirapteran ectoparasites on Galliformes birds. The primary function of insect antennae appears to be sensory. The antenna of most ischnoceran lice is made up of segments *i.e.* the scape, pedicel and flagellum. The flagellum also divided into three segments called flagellomere but in some species such as *Coloceras* species, the three flagellomeres fuse to form a single structure. A scrutiny of literature reveals that there is considerable superficial diversity in the form of antennal sense organ, even within genera. Bhatnagar *et al.* (2004) recorded the antennal sensilla in the species *i.e.* *Lipeurus heterographus*, *L. caponis*, *L. lawrensis tropicalis*, *Goniocotes gallinae* and *Menopon gallinae* of poultry through Scanning Electron Microscopy. In these studies, the IInd and IIIrd flagellomere of ischnoceran species bear sensilla coeloconica and the pore organ. The apex of terminal flagellomeres of four species carries a cluster of eleven tectile hairs. The IIIrd flagellomere of amblyceran lice bears a diverse assemblage of spines, cones and pits. Surman and Suneel (2012) studied the antennal sensilla of *Menopon gallinae* and observed a small, ovoid scape and pedicel on the antennal sensible of *M. gallinae* under Scanning Electron Microscop. Presence of any structure resembling coeloconic chaemo-receptor, pit organs and pore were not observed on any segments of *G. gallinae*. In the present study an attempt was made to provide information on the morphology and its antennal sensilla by Scanning Electron Microscopy on the species of *G. gallinae* on domestic hen, *Gallus gallus domesticus* (Linnaeus, 1758) which was recorded first time from Haryana, India.

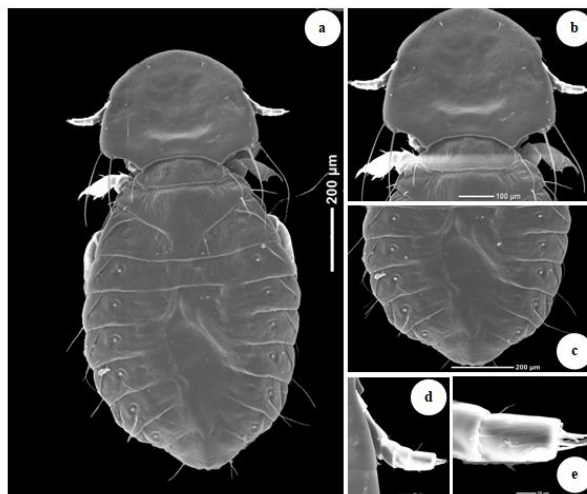


Plate I, Fig. a-e: SEM photographs of *G. gallinae* (Female). a. Adult Female x 75, b. Enlarged view of the head x170 c. Enlarged view of the posterior end x150, d. Whole antennae x 700 e. Enlarge view of I flagellomere x 1300.

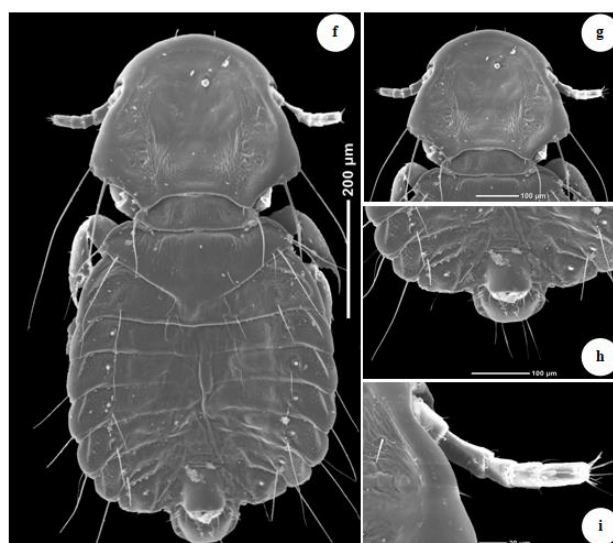


Plate II, Fig. f-i: SEM photographs of *G. gallinae* (Male). f. Adult male x 130, g. Enlarged view of the head x 200, h. Enlarged view of the posterior end x 270, i. Whole antennae x 650.

CONCLUSIONS

There is no information on the morphological features and antennal sensilla of *G. gallinae* infesting domestic hen, *Gallus gallus domesticus* (Linnaeus, 1758) from Haryana. Hence, present study is first report and furnish information on the morphology of both sexes of adult ischnoceran species *G. gallinae* on domestic hen *Gallus gallus domesticus* (Linnaeus, 1758) through Scanning Electron Microscopy from Haryana, India.

FUTURE SCOPE

The phthirapteran species exhibits distinctive characteristics and are difficult to resolve by light microscopic studies. Therefore, Scanning Electron Microscopic studies proved to be an ideal instrument for this purpose, revealing the minute characters on the body of the phthirapteran species.

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