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Micromorphology of Egg of Chicken Louse, *Gallacanthus cornutus* (Schömmer) (Insecta: Phthiraptera: Amblycera, Menoponidae s. l.)

Adesh Kumar* & Rakesh Kumar**

With 5 figures

Summary

Chicken louse, *Gallacanthus cornutus* (Schömmer, 1913) (Menoponidae *s. l.*) have piercing and sucking-type mouthparts. They are haematophagous, chitinophagous and running rapidly on host's body which cause irritation, itching and discomfort to the infested bird. The egg of *G. cornutus* is highly specific measuring 0.70–0.80 mm in length and 0.27–0.32 mm in width. The operculum exhibited bee hive-like polygonal markings and bears 12–14 micropyles which are arranged at the circumference of operculum. One fifth of anterior egg chorion has bearing bristles arranged in 8–9 rows with characteristic markings. The egg of *G. cornutus* found to be quite specific and highly variable to intrageneric species. So, egg morphology could be used for development of new branch of science (phthirapteran oology), identification of species providing clue about present as well as past infestation on host and included as intrageneric characteristics in insects.

Zusammenfassung
Die Mikromorphologie des Eies vom Hühnerläusling *Gallacanthus cornutus* (Schömmer)
(Insecta: Phthiraptera: Amblycera, Menoponidae s. l.)

Die beim Haushuhn *Gallus gallus* forma domestica häufig anzutreffende Amblyzere *Gallacanthus cornutus* (Schömmer, 1913) ernährt sich von Blut und Federteilchen ihres Wirtes. Auch durch ihre flinke Bewegung auf der Hautoberfläche kann sie bei größerer Befallsintensität negativen Einfluss auf das Wohlbefinden des Wirtes nehmen. Das Ei (Niß) von *Gallacanthus cornutus* misst in der Länge 0,70–0,80, in der Breite 0,27 -0,32 mm. Hier vorgestellte rasterelektonenmikroskopische Aufnahmen zeigen, dass nur der zitzenförmige Eideckel polygonal gefeldert ist und in kreisförmiger Anordnung jeweils 12–14 Mikropylen besitzt. Auf der Spitze des Eideckels ist kein fadenförmiger Fortsatz nachweisbar. Unterhalb des Operculatum ist das Exochorion auf etwa einem Fünftel der Eilänge mit 8–9 Reihen von gekräuselten Fortsätzen (»Kräuselhaar«) besetzt. Darunter ist die Eioberfläche glatt. Die Morphologie des Eies von *Gallacanthus cornutus* ist vermutlich zumindest gattungsspezifisch, doch ist bisher noch keine andere *Gallacanthus*-Art beschrieben worden. Die Eimorphologie bei Tierläusen (Phthiraptera) interspezifisch genauer unter die Lupe zu nehmen, verspricht einen interessanten, nicht ganz neuen, aber bisher kaum über Ansätze hinausreichenden Zweig in der Phthirapterologie: die Oologie.

Keywords: Phthiraptera, micromorphology, egg morphology, *Gallacanthus cornutus*, Uttarakhand, India.

Introduction

Phthiraptera is a group of ectoparasitic insects infesting birds and mammals. The phthirapteran ectoparasites glued their nits (eggs) to host feather/hairs at specific sites to provide protection from host's preening and grooming. The eggs of Phthiraptera are generally milky-white translucent and highly polymorphic in appearance. Eggs of bird parasites (chewing

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lice, olim »Mallophaga«) are found the most extraordinary and apparently strange structures (Trivedi 1991). Thorough survey of literature has revealed that phthirapteran egg consists of three parts: anterior part, operculum (exit gate of nymph); middle, egg shell and posterior, hydropyles. These portions bear species specific characteristics on chorion marking, sculpturing and outgrowth on egg shell. Few Phthirapterists (Hohorst 1939, Blagovestchensky 1955, 1959, Eichler 1963, Richter 1870) have described the egg morphology of selected species of Phthiraptera under light microscope while they were working on the other aspects of phthirapteran ectoparasites.

The morphology of egg shell of Phthirapteran species, e.g. *Eomenacanthus stramineus* (Nitzsch), *Menopon gallinae* (L.), *Goniocotes gallinae* (De Geer), *Uchida kalatitar* Ansari, *Numidilipeurus tropicalis* (Peters), *Lipeurus caponis* (L.), *Cuclotogaster heterographa* (Nitzsch in Giebel), and *Stenocrotaphus gigas* (Taschenberg), infesting *Gallus gallus* forma domestica have already been documented (Saxena *et al.* 1993, Zawadzka *et al.* 1997, Kumar *et al.* 2010). Saxena *et al.* (2000) has also been described the egg morphology of four pigeon lice, e.g. *Columbicola columbae* (L.), *Campanulotes bidentatus compar* (Burmeister), *Neocolpocephalum turbinatum* (Denny), *and Hohorstiella lata* (Piaget). Kumar *et al.* (2003) have been studied the architecture of egg of five phthirapteran species, e.g. *Bovicola caprae* (Gurlt), *B. ovis* (Schrank), *Linognathus africanus* Kellogg & Paine, *L. ovillus* (Neumann) and *L. pedalis* (Osborn), infesting goats and sheeps. Furthermore, there are widely scattered many descriptions of egg morphology of Phthiraptera in literature (Ash 1960, Foster 1969, Złotorzycka *et al.* 1974, Mey 1983, 1984, Saxena *et al.* 1994, Zawadzka 1997, Cicchino 2007, Cicchino & Mey 2007, Valim & Cicchino 2015).

In the present investigation authors documented the SEM micromorphology of egg shell of *Gallacanthus cornutus*.

Materials and Methods

The nits of *Gallacanthus cornutus* have been collected from the oviposition sites (mostly head, neck and nape) from infested domestic fowl under control condition. 50 eggs were separate out from feathers under stereozoom trinocular microscope with the help of entomological needles. Kumar *et al.* (2003 and 2010) first time processed the eggs through following methodology. Eggs were subjected to prefixing and post fixing in 12.5 and 25 % neutral glutraldehyde (pH 7 ±1) for 12 hours in each respectively. Subsequently fixed eggs were dehydrated in ascending series of alcohol-acetone mixtures. Dehydrated and air dried eggs were mounted on glued tape at aluminum stub and coated with gold-palladium alloy. The coated eggs were observed under scanning electron microscope (Mode Leo-435 VP SEM) and selected parts were photographed.

Observations

Gallacanthus cornutus is fast moving amblyceran louse apparently look similar to *Eomenacanthus. stramineus* (Nitzsch) still it is smaller in size (Fig. 1). It is commonly found on the feathers of breast, vent and back region. But it is drifting on the feathers of head, neck and nape region for laying eggs. *Gallacanthus cornutus* is small, active, brownish pale menoponid have semilunar head with distinct lateral antennary sinus, hair and several setae in front. Prothoracic lateral angles angulate with anterolateral spine. Pterothorax is larger than head. Abdomen is elliptical with marked terminal segment and long hairs. Two sexes are apparently alike but the males are distinctly smaller than the females. The male genitalia has distinctly smaller and feebly sclerotized. The bases of feathers of head, neck and crown region are found wrapped with egg deposits. *G. cornutus* have piercing and sucking-type mouthparts. This species are haematophagous and chitinophagous in habit and the louse running over

Fig. 1. Female *Gallacanthus cornutus* (Schömmer). Body length 1.7–1.9 mm.

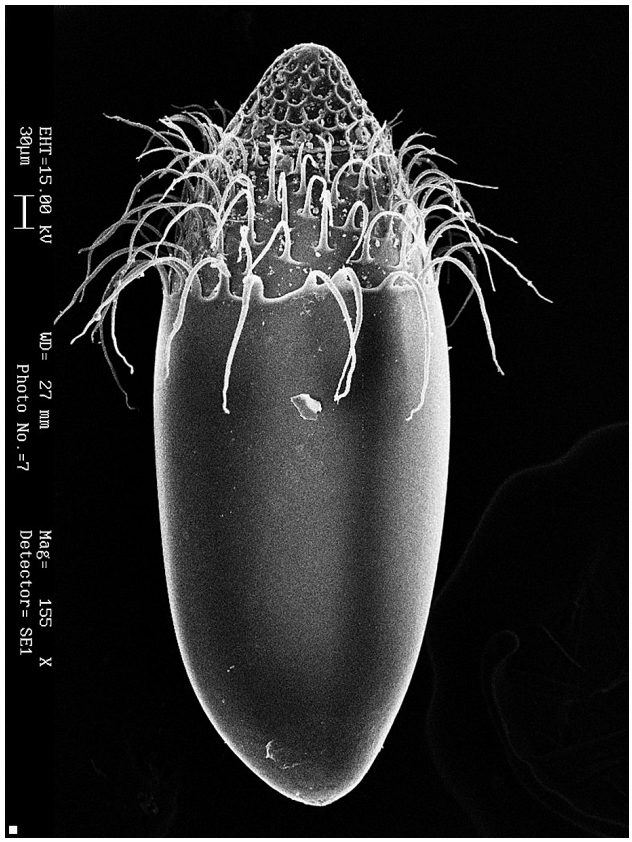

Fig. 2. SEM of egg of *Gallacanthus cornutus* (Schömmer).

hosts very rapidly. Both these activities cause irritation, itching and discomfort to the infested bird. So, it affects the health and productivity of poultry bird.

The egg of *Gallacanthus cornutus* is highly species specific, white, translucent and oval in structure. Eggs measures 0.70–0.80 mm in length and 0.27–0.32 mm in width (Fig. 2). The anterior of the egg consists of operculum somewhat hat-like elaborate with polygonal bee hive-like sculpturing. The operculum surrounds with large number of bristles and clearly visible through the bristles. The rim of operculum is 0.16–0.20 mm in diameter bears 12–14 protruding micropyles (diameter 0.01–0.13 mm) which are arranged in a circle at the circumference of the operculum. The micropyles are positioned in the centre or on the side of quadrilaterals sculpturing at the circumference (Fig. 3). The micropyles facilitate respiratory function for embryo developing inside the egg. The anterior one fifth part of egg shell occupies with 8–9 rows of bristles which are somewhat broader at the base and tapering at the ends. Length and numbers of the bristles are decreasing from the lowest rows towards topmost rows. The lowest row bears 20–22 longest bristles. The bristles of topmost row are the smallest and erect towards operculum while rest of the bristles inclined posteriorly (Fig. 4). The function of bristle may be to protect the eggs form other hyperparasites (mites, ticks, hippobosid fly etc.) and entangle eggs with feathers. The egg chorion of bristle region bears very characteristic sculpturing somewhat axe edge shaped markings which give rise to bristles (Figs. 4–5). Rest of egg chorion is smooth. The hydropyles and polar thread are absent.

Discussion

The intrageneric morphological similarities among phthirapteran ectoparasites made it quite complex to classify them. Although, the

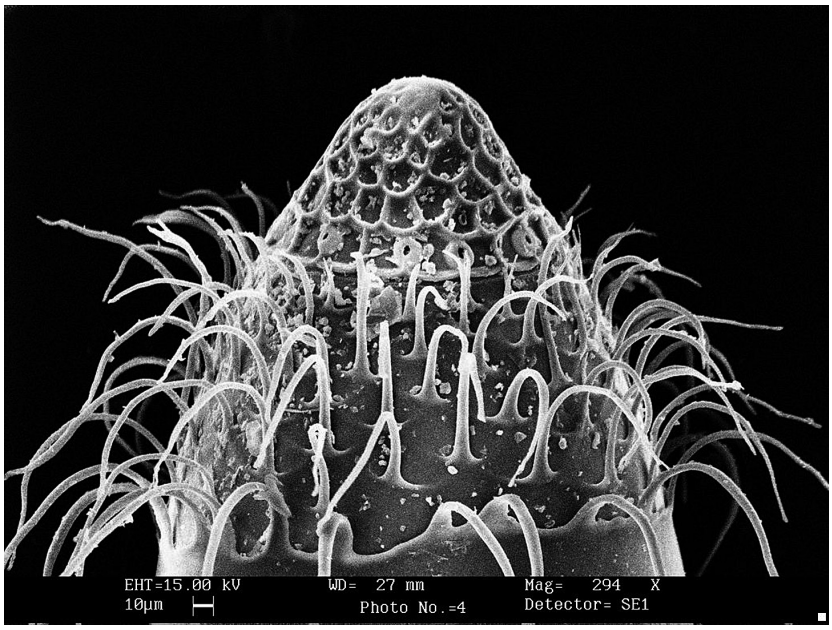

Fig. 3. Enlarge side view of anterior region of egg of *Gallacanthus cornutus* (Schömmer).

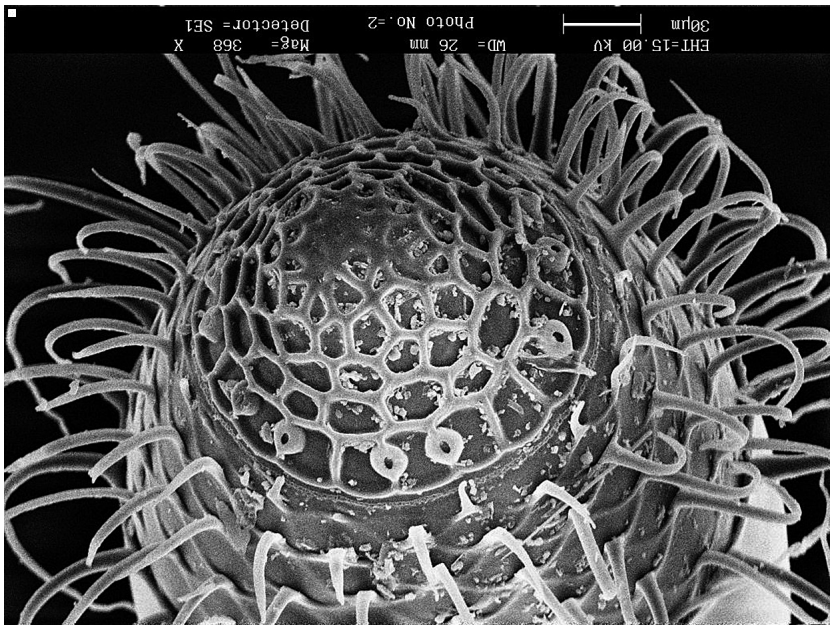

Fig. 4. Enlarge dorsal view of operculum egg of *Gallacanthus cornutus* (Schömmer).

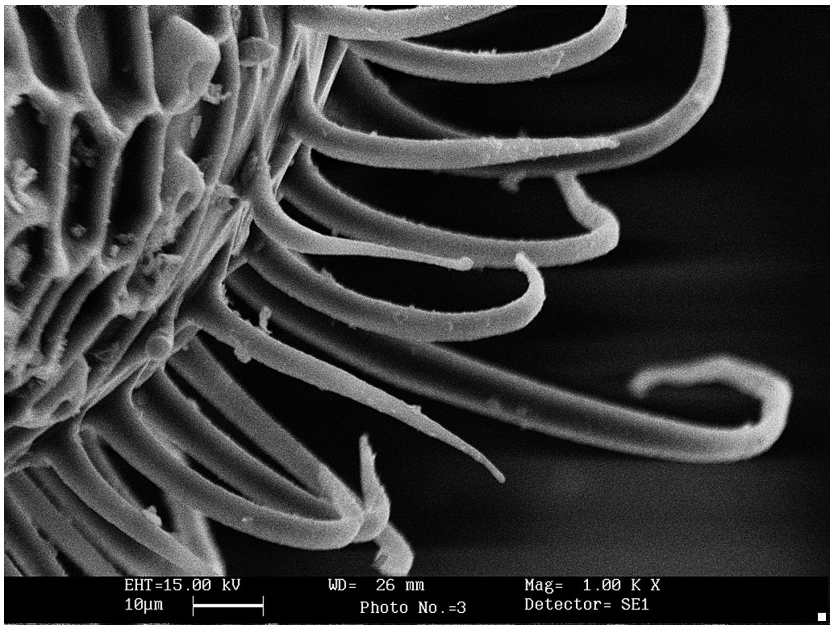

Fig. 5. Enlarge view of bristle on egg of *Gallacanthus cornutus* (Schömmer).

eggs of intrageneric species have exhibited remarkable differences. *Gallacanthus cornutus* has encountered less as comparison to *Eomenacanthus stramineus* and *Menopon gallinae* (L.). Moreover, the identification of *Gallacanthus cornutus* creates confusion with *Eomenacanthus stramineus* might be due to morphological similarities as well as similar oviposition sites or niche on the host body. Furthermore, the egg's micromorphology of both species have been extremely diverse to each other. The egg of *Eomenacanthus stramineus* has been thoroughly described by a number of Phthirapterist (Hohorst 1939, Blagovestchensky 1959, Balter 1968 b, Zawadzka *et al.* 1997). The operculum of *Gallacanthus cornutus* having 8–9 rows of bristles and lacking polar thread while in case *Eomenacanthus stramineus* bears polar thread and several rows of bristles on the anterior end of egg shell. The bristles of *E. stramineus* are tapering bearing hooks and anchoring shape at the tip. Several bristles overhang the operculum and hiding it (Saxena *et al.* 1993). On the other hand, the bristles of *Gallacanthus cornutus* are smooth and tapering at the top only and inclined towards posterior to the eggs. The operculum is quite visible. The micropyles in *G. cornutus* are 12–14 whereas it is 8 in *Eomenacanthus stramineus*. The micromorphology of egg of third amblyceran species, *Menopon gallinae* (infesting domestic fowl) bears disc like operculum with single large polar thread which is formed by fusion of fine strands. The rim of the egg mouth bears outer and inner rows of apophyses. Outer rows of apophyses are solid stumpy and hang outwardly while the inner row is long, cylindrical, bifid, spongy in appearance and directed towards anterior which obscuring the base of the operculum (Saxena *et al.* 1994). The micropyles are invisible. The egg of *Gallacanthus cornutus* has greatly diverse micromorphology as compared to *Menopon gallinae* and *Eomenacanthus stramineus*. So, the present study also supports that egg morphology could be used for the preparation of taxonomic key for the identification of phthirapteran ectoparasites (Balter 1968 a). Furthermore, presence of egg of any phthirapteran species gives clue about the present and past infestation on host body. Phthirapterist also suggest that egg morphology could be included as intrageneric characteristics in insects (Saxena *et al.* 1993). Finally, present study could add information for development of the young discipline of Phthirapteran oology appealed for (Kumar *et al.* 2010).

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