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Taxonomic Study of Chewing Louse (Psocodea: Insecta) *Chelopistes Meleagridis* (Linnaeus, 1758) Infesting Turkeyfowls (Ischnocera: Philopteridae) from Hyderabad, Sindh, Pakistan

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Abstract: Chewing louse (Psocodae: Insecta) Chelopistes meleagridis (Linnaeus, 1758) is usually called turkey louse. It was most prevalent species of turkey fowl Meleagris gallopavo (Linnaeus, 1758). It belongs to suborder of Phthiraptera (Ichnocera: Philopterodae). Chewing louse Chelopistes meleagridis (Linnaeus, 1758) was less occurring parasite and rare species of Turkey fowl Meleagris gallopavo (Linnaeus, 1758). The parasitic insect was less active, slow moving and remains attached to hairy feathers of hosts. 08 host birds were investigated for collection and identification of lice. 21 parasites were found from the body of the hosts. The prevalence of parasite causing irritation, insanity, madness, annoyance, botheration and angry behaviors are common in hosts. The increased population density of Chelopistes meleagridis (Linnaeus, 1758) on hosts body causes severe infestation, including, weakness, anemia, loss of feathers and reduced eggs and meat production, The collection, preservation and taxonomic studies of louse was conducted during August 2022 to September 2023. The chewing louse was large, broad and appeared brownish yellow in color. It was peculiar species with head prolonged far behind the occidental margin. The prevalence and taxonomic study of Chelopistes meleagridis (Linnaeus, 1758) was described in detail first time from reported area Hyderabad, Sindh, Pakistan.

Keywords: Ichnocera, Philopteridae, Turkey fowl, Insecta, Taxonomy, Hyderabad

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Introduction

The host Turkey fowl Meleagris gallopavo (Linnaeus, 1758) is poultry bird, domesticated, larger, colourful and ground feeding bird of family (Phasianidae: Galliform). The male bird is larger, attractive and more colourful than female and contain thick and fleshy wattles, named snood that hang at top of the beak. The Turkey fowl Meleagris gallopavo (Linnaeus, 1758) belongs to the genus Meleagris which is basically native to east and North America [1]. This resident bird is kept by the people all over the world especially tropical and subtropical regions for food, production of meat and eggs, energy, landscaping, ornamentation, and maintaining of ecosystem2. The bird usually lives in natural environment and easily infested by a number of chewing lice. The chewing lice (Psocodea: Insecta) are biting lice with strong mandibles. These are wingless, parasitic insects. These parasitic insects have an association of parasitism to hosts. These are small elongated insects and the body is

divided into three parts, cephalothorax, abdomen and tail. The chewing lice are host specific. The most prevalent species of turkey fowl [1]. The chewing lice Chelopistes meleagridis (Linnaeus, 1758) is Philopterid lice. It was less active insects and parasitized outer skin, or plumage of head and abdomen of the hosts and sucks the blood. In return the hosts turkey fowls Meleagris gallopavo (Linnaeus, 1758) become weak, emaciated, irritated and show annoyance behavior. The fascinating set of chewing lice has pronounced value in the study of economic system, systematics, genital studies and veterinarian in Pakistan and in the world [2]. Unfortunately from Sindh, unsatisfactory work was published on the prevalence, taxonomy, population density and biology of chewing lice of resident and migratory birds. Few data regarding species collection, prevalence and comparison are available from this region. Chewing lice (Phthiraptera: Amblycera: Ichnocera) are the main areas of research in Parasitology. The order (Phthiraptera: Insecta) was first time introduced by Hackel in 1896 [3]. Chewing lice have prime characteristics like two small eyes, small ocelli, small and segmented antennae, segmented abdomen, segmented legs, operculated eggs and continue have an association of parasitism to host feathers. Life cycle of the parasite was completed with three nymphal instars [4]. The chewing louse belongs to the suborder Ichnocera (Phthiraptera: Insecta). The lice are responsible for causing reduction in egg production, reckettsiasis, dermatitis, feathers loss, principally in poultry birds, spoiling of bills and poor skin condition in case of chronic infestation [5]. The present research study justifies host parasite interaction between host and parasites. The birds are also grow and produced in many parts of the country including Hyderabad, Sindh Pakistan. The turkey fowl is poultry bird. The raring and breeding maintain their population and in return the poultry products and economy of country is increased [6, 7, 8]. Temperature and humidity play significant role in increasing Population density of louse on host's body. The chewing lice causes parasitism on all birds of domestic to wild and from aquatic to terrestrial environment but their rate of population is specific to specific hosts [9]. The present investigation approved the knowledge of ectoparasitism towards the hosts.

The check list of the world reported about more than 300 species of chewing lice including 34 species of the genus Chelopistes Kéler, 1939 from the gallinaceous hosts have been described throughout the World [10]. The genus Chelopistes Kéler, 1939 is having circumfasciate head margin which is typical goniocephaloid type. Preantennal characteristics. Posterior head margins were present with temporal region. Pterothoracic lateral margins were also present. Sclerotized abdomen. Presence of preantennal carinae and sutures, anterior marginal carina. Gular region was present. Posterior margin and posterolateral marginal setae of pterothorax. Lateral margins on abdomen, chaetotaxy, sclerotization and ventral tubular extention of abdominal segment VIII. The peculiar genitalia, parameres were sac like. Occurrence of prolonged spatula-shaped basal apodeme. Reproductive organ with last curving horny structure on its end.

Method

The louse Chelopistes meleagridis (Linnaeus, 1758) was collected from turkey fowl Meleagris gallopavo (Linnaeus, 1758) from rural and urban areas of Hyderabad, Sindh, Pakistan. The present work was conducted from August 2022 to September 2023.The chewing lice were collected from feathers of head and belly with the help of forceps and brushes dipped with 80% alcohol. The samples were included male and female both. The anti-lice powder (Coopex) pyrethroid was used. It was rubbed on various parts of the hosts. After 25-35 minutes the feathers of the host birds were crooked on colourless sheath for the accumulation of lice. Fanted lice were fallen down and collected them in clean glass vials containing 75% alcohol. The vials of glass were rapped with white tap for

tagging of time and date of collection. The step of mounting of lice was beginning with maceration in 10% of aquaous solution of Potassium hydroxide for overnight. Next step was neutralizing lice with dilute acetic acid for 25-33 minutes. Then cleaning of lice by pressing. Then dehydration was begin by running specimens from alcohol series from 20% to 100%. Then clean the lice with clove oil. Finally mounting the specimens in Canada balsam permanently with cover slips. Then lice were examined under microscope and drawing was made by drawing tube attachments on thin tracing paper. Then photography was made with digital camera. 4-5 mature lice were boiled with 10% Potassium hydroxide solution. The genital organ was removed from the body of lice by dissection. Insect pins, pointed forceps and brush were used for dissection. The research methodology was followed by Smith [6].

Results

Philopterus stylifer Nitzsch, 1818: 294.
Rhopaloceras styliferum Taschenberg, 1882: 47.
Pediculus meleagridis Linnaeus, 1758: 613.
Type Host: Host bird Turkey fowl *Meleagris gallopavo* (Linnaeus, 1758).
Size: Body length of male louse: 0.819 mm (0.79-0.849); female louse: 0.859 mm (0.849-0.879); Female is is somewhat smaller than male (Figure 1 A & B).
Coloration: Pigmentation of body was dark yellowish from all sides, no stain was used (Fig. 1 A & B).

A B

Figure 1: The chewing lice. *Chelopistes meleagridis* (Linnaeus, 1758)
A Male B Female

General Body Shape: Generally the body is large, broad and smooth from anterior side and posterior end is narrow and rough. Male is slightly larger than female. Overall body is segmented with sensory structures antennae. (Figure. 2A & B).
Status: New locality and new host record from the reported area.
Present Study Host: *Meleagris gallopavo* (Linnaeus, 1758) Turkey fowl.

Head

The anterior margin of head was broad, thick and convex. It was goniocephaloid type, head was more than length and expanded at angular temples. Not evidence of hyaline margin and dorsal marginal

Biosight 2025; 06(1,2): 55-62

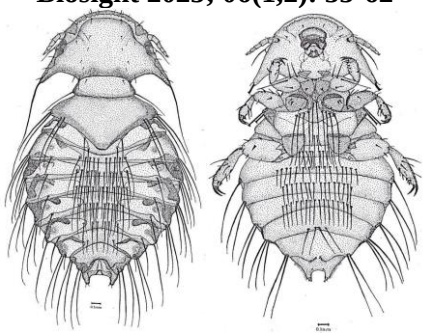


Figure 2: The chewing louse *Chelopistes meleagridis* (Linnaeus, 1758) of female
A. Dorsal view B. Ventral view.

setae. Evidence of two-three pairs of submarginal setae. Premarginal carina was weakly developed but continues with the post marginal carina which was reasonably thick. Not evidence of indentations and internal margin. Not evidence of completion of ventral carina and dorsal carina. No evidence of transverse carina near pulvinus. Presence of small and blunt preantennal nodus. Presence of pointed female conus which was smaller than scape. No evidence of trabecular and clypeus. Both ventro-anterior and dorso- anterior plates were absent. Single lobed pulvinus was present which was enclosed within ventral carina. Torma was clearly separated from pulvinus band. Heteromorphic antennae was present. Antennae were smaller in female than male. Separation of flagellomeres and pedicel and jointed terminally. No evidence of lateral extended apex in flagellomere III. Gular plate was completely absent. Complete temporal marginal carina was present which was sclerotized thickly, from back side of the head margin. Temporal margin was enlarged and pointed posteriorly. Temporal marginal setae 5 and seta 3 were dominant. Post temporal setae were present, from backside of the lens. Postocular setae are fine microsetae on the lens. Ocular setae fine macro setae. Post ocular nodus was highly reduced (Figure 1, 2, & 3).

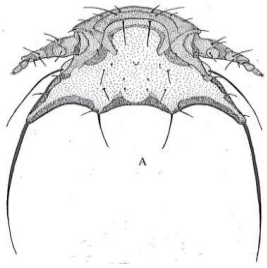


Figure 3: The chewing louse. *Chelopistes meleagridis* (Linnaeus, 1578), A head ventral view.

Thorax

Generally thorax was small polygonal shape attached between head and abdomen. Its margin was much smaller toward the head and much broad toward the abdomen (Figure 1 & 2).

Prothorax: Prothorax was cup like and rhombic sclerite was present. Evidence of one pair of postero-lateral setae, normal and fine microsetae were arranged as 1 + 1.

Pterothorax: Pterothorax was triangular in shape. It bears radiating margins laterally. Consolidated pteronotum was present with convex posterior margin. It was not deep conical and V-Formed appearance. Four pairs of posterior to lateral macro setae were present with the

Biosight 2025; 06(1,2): 55-62

arrangement of 2, 2 + 2, 2 pairs.

Mesothorax: Prominant appearance of meso- metasternal plate. It was present laterally and thin anteriorly and wide posteriorly. It was bearing different number of tergal setae. Not evidence of trichoid setae. But clear evidence of thorn like setae. Evidence of ventro- lateral mesothoracic spiracles which bearing large atria.

Metathorax: Proepimeron was prominant and expended and then was divided adjacent to abdominal region. Not clear evidence of mesofurcal pit. Presence of meso thoracic and meta thoracic legs which were sterno coxal in connection.

Abdomen of Male and Female (Figures 4A & 5)

Abdominal region was broad, oval, segmented, flat and long. It was blunt toward the anterior end and pointed posteriorly upto the terminalia. Lateral margin was highly convex. Tergoplurites were sclerotized heavily and isolated medially with thin gap. Segment II of abdomen was closed with pterothorax anteriorly and shallow into segment III of abdomen. division of tergum II medially. Pleural ribs of abdomen was enlarged, prominat and expanded, with pleural knote.

Presence of male and female abdominal setae which was with larger alveoli. Tergal sub median setae was present on termites III to VII with one pair. The number of tergal median setae on tergites were II, 4, III: 10, IV: 12, V: 12, VI: 10, VII: 6, VIII: 2. Presence of intermediate tergal setae. Six pair of minute spiracles were present with large atria. Trichoid setae were present on tergite VIII. Sternal plates were sclerotized weekly. The number pf sternal median setae on sternite were I: 0 to 2, II:2 to 4, III:8 to 9, IV:16 ,V: 16 to 18 ,VI: 16 to 18 ,VII: 4,VIII: 2/0 (Figure 2).

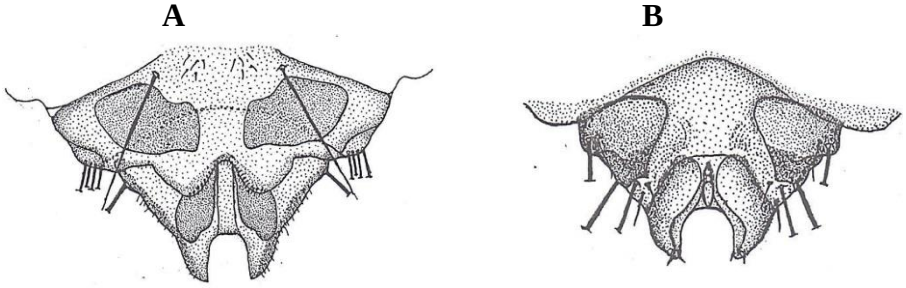


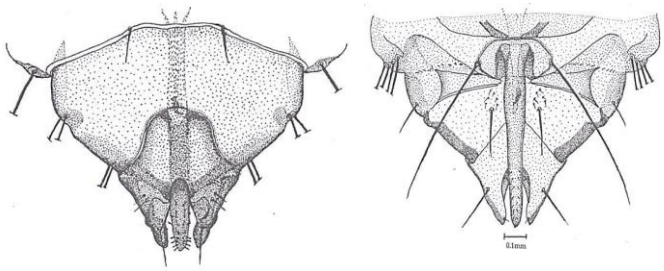
Figure 4: The chewing louse. *Chelopistes meleagridis* (Linnaeus, 1578) female terminalia. A. Ventral view. B. Dorsal view

Figure 5: The chewing louse *Chelopistes meleagridis* (Linnaeus, 1578) male genitalia.

Male Terminalia

Male abdominal terminal segment was short and triangular in shape. Presence of prominent and thick sub genital plate which was forming stylus. Presence of exposed reproductive organ below the stylus. Evidence of constrictive tapering last segment which forming pliers shape. Presence of

gonopophyses with segment XI (Figure 6).



A **B**

Figure 6: The chewing louse. *Chelopistes meleagridis* (Linnaeus, 1578) male male terminalia.
A. Dorsal view B. Ventral view

Female Terminalia

Terminal segment of female abdomen was bilobed. It was wing shaped and profoundly concave with improper posterior margin. It was bearing one line of microsetae. Dorsal plate was bifurcated into anterior fused tergites IX and X and posterior segment XI. Tergite XI was sharp posteriorly or pliers shaped. Genital opening was present on segment VIII from dorsal side. Presence of vulval margin which was curved (Figure 4).

Male Genitalia

Male genitalia are elongated reached up to the segment IX. It was wide and smooth anteriorly, and slightly tapering posteriorly. Reproductive region and reproductive organ was typical. It enclosed from inside a bag like parameres. Presence of complex aedeagus.

Male genitalia was small and having a horny structure at the anterior end of parameres. Presence of large and enclosed basal apodeme. Sternite VIII was prominat and lead to develop a stylus which was depressed, prolonged and constricting tube like. Presence of weak sclerotized basal apodeme. Not evidence of endomeres (Figure 5).

Discussion

The chewing lice (Psocodea: Insecta) are the major area of investigation in research of parasitology and have been reported on variety of hosts like birds and mammals. The biology, morphology and taxonomic studies of chewing lice have been described specifically by numerous taxonomists of the world in their periods [11]. Most of the taxonomists classified the lice on the basis of anatomy of head and physiology of mouth parts. The parasitic infestation and infection are prevailing in those fowls who are facing the natural environments and not found in captivity. The chewing lice physically and mechanically damaged the host body. The invasion of lice causes skin damage, skin lesions, irritation, loss of feathers, result reduced eggs production and also act as vector of many pathogens [12]. The chewing louse Chelopistes meleagridis (Linnaeus, 1758) is most prevalent to Turkey fowl Meleagris gallopavo (Linnaeus, 1758).

Conclusion

The chewing louse Chelopistes meleagridis (Linnaeus, 1758) is regular ectoparasites of Turkey fowl

Meleagris gallopavo (Linnaeus, 1758). It was large, soft and pigmented yellowish. It was Philopterid louse. It was rare occurring and less active or slow moving insect on the body of hosts. It causes penetrating and severe infestation to host birds turkey fowls. Sign of infestations were observed in infected birds were annoyance, weakness, exasperation, irritation and nervousness and loss of feathers. It was investigated through research work that increased rate of population of parasitic insects turn down the health of the hosts and in turn reduced the eggs and meat productions. It caused the great loss of poultry products and poultry industry. Increased burden of Chelopistes meleagridis (Linnaeus, 1758) on Turkey fowls increased life threatening illness.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

HUMAN AND ANIMAL RIGHTS

All experimental protocols were performed after the approval of Ethical Committee of Animal Care and Use of University of Karachi, Karachi, Pakistan.

CONSENT FOR PUBLICATION

Not applicable.

AVAILABILITY OF DATA AND MATERIALS

The datasets used and analyzed during the current study are available from the corresponding author upon reasonable request.

FUNDING

None.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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