

Research Article

Redescription of *Lipeurus tropicalis* Peters, 1931 (Phthiraptera: Ichnocera: Philopteridae) from Hyderabad district, Sindh, Pakistan with reference to its Morpho-taxonomical and genital studies

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Abstract

The dark pigmented large size common wing louse *Lipeurus tropicalis* Peters, 1931(Phthiraptera: Ichnocera: Philopteridae) was recorded new hosts and new locality records from Hyderabad district, Sindh, Pakista. The specimens were collected from *Meleagris gallopavo* (Linnaeus, 1758) Turkey fowland *Pavo cristatus* Linnaeus1758Pea fowl (Galliformes: Phasianidae) from urban and rural area of Hyderabad Sindh Pakistan. The species redescribed Morpho-taxonomically with special reference to its chaetotaxy and genitalia of both male and female sexes. The purpose of the present study is to compile the checklist of galliform chewing lice fauna and identify maximum number of species from Hyderabad, Sindh, region Pakistan.

Keywords: Hyderabad; *Lipeurus tropicalis*; Morpho-taxonomy; Pea fowl; Redescription; Sindh; Turkey fowl

Introduction

The study of chewing lice species (Phthiraptera: Insecta; Mallophaga) was started from 17th century. The ectoparasites of birds and mammals were first studied that have small and degenreated body with incomplete life cycle [1]. The word pediculus was used [2] for parasitic arthropods, like lice, fleas, Psocoptera and even for Hippoboscidae flies. The subfamily Lipeuidae Nitzsch, 1818 includes various chewing lice species. These are bilaterally symmetrical.

Obligatory, wingless ectoparasites with biting mouth parts [3] are closely related to genus *Oxylipaeus* Mjöberg, 1910 having similar anterior margin of head; preantennal region; arrangement of antenna and segmaentation; temples form; pterothoracic cavity and chaetotaxy; sclerotization of abdomen; evidence of genital pouch. The parasitic insect *Lipeurus tropicalis* Peters, 1931 (Phthiraptera: Ichnocera: Philopteridae) is common wing louse slow moving and most of the time is attached to

under soft and hairy feathers of host birds and cause frustration, irritation, anger and insanity behavior when there is high infestation. It is large sized and dark brown pigmented louse which is common in *meleagris gallopavo* (Linnaeus 1758) Turkey fowls and *Pavo cristatus* Linnaeus 1758 Pea fowls. It was provided the keys to the genera and their generic groups of family Menoponidae and Philopteridae [4-6] which are helpful in identification of chewing lice specimens. Different genera their generic groups, species their species groups of Amblycera and Ischnocera [7] and their reviews have been published throughout of the world. Key to the species of the genus *Lipeurus* [8, 9]. There are about 43 species of the genus *Lipeurus* Nitzsch, 1818 have been described. The genus mostly parasitized birds of the order Galliformes [10]. The species of *Lipeurus* preferred living on belly, wings and body feathers of host birds but especially found on abdominal region of the body and most of the time is remain attached to the body. The host bird Pea fowls *Pavo cristatus* Linnaeus 1758 commonly called forest bird. The males are recognized by squandering feathers having eye dotted tail. Male Pea fowls have metatarsal spurs on their legs that are used during intraspecific regional fight with other fellows of their same kind. The female of the similar species is called peahen [11]. The gallinaceous birds are omnivorous and regularly eat definite plant parts, like petals of flowers, seedcoat, insects of arthropods and other amphibians and reptiles [12]. Turkey fowls *Meleagris gallopavo* (Linnaeus, 1758) the males are larger in size than the females having scattering burnish shaped tails and thickset wattles called a snood that swing from the topmost of the beak. Their feathers are used for fine clothes, blankets and ceremonial purposes [13]. The chewing lice show host-specificity. They have effect of temperature and humidity in rate of

transmission on body. The increased temperature is the favourable medium for multiplication and development of lice population in domestic and wild birds [14].

Material and Methods

The present louse-species was collected, preserved and examined from *Meleagris gallopavo* (Linnaeus, 1758) Turkey fowl and *Pavo cristatus* Linnaeus 1758 Pea fowl (Galliformes: Phasianidae) from urban and rural area of Hyderabad, district, Sindh Pakistan. The host birds were brought to the Parasitological laboratory, Department of Zoology, University of Sindh, Jamshoro time to time and for some hosts we visited the houses for collection of parasites. The study was conducted from 2018-2020. The specimens included eggs, nymphal stages and adult males and females from various body parts of their hosts. The white and dry powdered pyrethroid (Coopex powder) was dusted on each body of the host. After 20-30 minutes the feathers of the bird was scrambled over a white paper sheath for collection of parasites. A large number of chewing lice were fallen down from the body of the hosts on white sheath. The specimens were collected with the help of fine brushes and preserved in 75% ethyl alcohol in small glass vials. The vials were labeled with time, date, locality and information of the hosts. First each specimen was cleared in KOH solution for 24 hours, then neutralize the specimen in dilute acetic acid 20-30 minutes, after that cleaned specimens by pressing, then dehydration is started by passing them from ascending series of alcohols till 100% of ethyl alcohol, then washed by xylol and finally put the specimen on the glass slide and mounted permanently with Canada balsam and with cover slips. The specimens were studied under the light compound microscope and drawing was made on thin tracing paper by microscope of drawing tube attachments, photographs were taken with the help of Nikon Japan camera. 5 mature specimens

were boiled in 10% KOH solution in water bath. The genitalia were dissected and removed from the body with the help of insect pins and fine sharp pointed forceps. The collection methods and techniques were followed by [15-17].

Results and Discussion

Lipeurus tropicalis Peters, 1931

Lipeurus tropicalis, Peters, 1931: 195.

Type host

Gallus gallus domesticus (Linnaeus, 1758)

Domestic fowl.

Size

Body length of male: 3.304 mm; female: 3.29 mm (Fig. 1A&B).

Coloration

Large size dark brown pigmented on latero-dorsal side and pale yellow on latero-ventral side (Fig. 1A&B).

General body shape

Body thin elongated cylindrical shape. Anterior region much broader than posterior region of the body (Fig. 2A&B).



Figure 1. *Lipeurus tropicalis* Peters, 1931, A Male B Female at 10x10

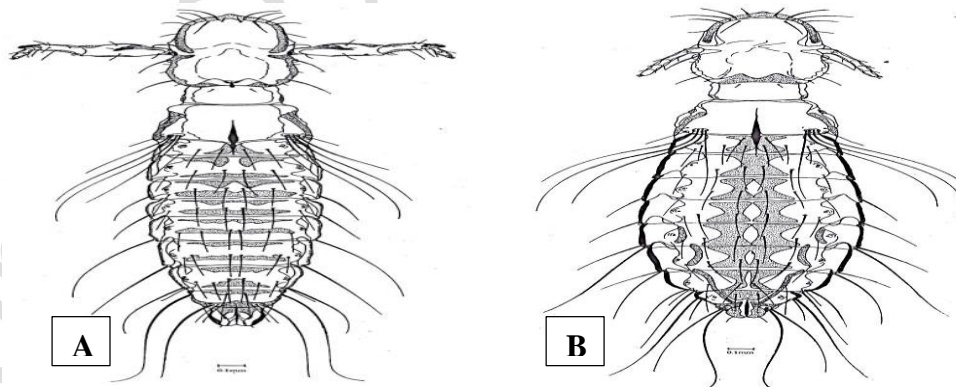


Figure 2. *Lipeurus tropicalis* Peters, 1931, A Male B Female

Head

Circumfasciate, evidence of narrow and smooth anterior margin, head is slightly longer than broad with the presence of in front pointed projections.

Pre-antennal region

Clypeal region is much reduced; hyaline margin is present; evidence of complete marginal carina; both premarginal carina and postmarginal carina continue with each other

and having six pairs of anterior setae; dorsal carina absent; around oral cavity ventral carina is complete band; transverse carina is not present; reduced or small preantennal nodus; preocular nodus is well developed; postocular nodus is present; trabeculae are distinct, small and triangular; torus is evident.

Antennal region

Antennae is filiform, heteromorphic and exposed; antennal socket is shallow; conus is smooth and blunt in both sexes; enlarged scape of male is having small horn-like process with two or three setae; conus is smaller than scape in male but in female is equal; flagellomeres and pedicel are divided; temporals are smooth and rounded, occipital margin is concave with black band on front to lateral margin continue on the temples; dorsal anterior plate is evident, undivided and complete; ventral anterior plate is not present; pulvinus is complete with large lobed and pulvinal band is clear and fused with ventral carina; male flagellomere I is curved bear short extension at apex.

Post-antennal region

Evidence of gular plate which is very thin, larger than wide and divided; present of temporal marginal carina which is thin and complete and slightly wide at postocular region; presence of temporal marginal setae which are subordinate; behind the lens, post temporal marginal setae are not present; on the lens, postocular setae normal microsetae; presence of ocular seta which is thorn like macroseta.

Thorax

Generally common structure and shape in all species of the genus *Lipeurus* Nitzsch, 1818.

Prothoracic region

Prothorax is narrow anteriorly and is widened posteriorly, quadrangular and trapezoidal with lateral irregular bands, anterior lateral margin is concave and posterior lateral margin is convex, evidence of anterior setae and on latero-posterior corner posterior setae

single pair, arrangement is 1+1; presence of rhombic sclerite between head and prothorax which is cup like.

Pterothoracic region

Pterothorax is narrow anteriorly and wide posteriorly and slightly curved with subparallel lateral margin; latero-posterior setae of pterothoracic region is four pairs very long macrosetae which are grouped together; pteronotum is undivided; from lateral margin mesothorax and metathorax union is noticeable; evidence of trichoid and thorn like setae; proepimerin is unfused, blunt and medially well developed; presence of meso-metasternal plate and second sternal plates but lackness of connection between both sternal plates are present; evidence of two pairs of meso-metasternal setae, arrangement is 1+1 as meso-sternal setae and arrangement is 1+1 as metasternal setae; no evidence of mesofurcal pit; both mesothoracic and metathoracic legs are sterno-pleuro-coxal in articulation.

Abdomen

Diamond shaped, ovate and darkly pigmented with subparallel lateral margin; tergites are fused with pleurites.

Abdomen of male

Abdomen of male is having transverse tergal plates of oblong shape; presence of enlarged and rectangular pregenital segments; abdominal segment II is shorter and divided; evidence of medial tergal division; occurrence of sub-median to median seta on tergites II to III: 2 pairs, IV to VII: 2 pairs; latero-posterior setae present on tergites II to IV: 0, 1 pair, VI to VIII: 2 pairs; evidence of intermediate sternal setae; abdominal spiracles bear small atria and six pairs are present.

Abdomen of female

Abdomen of female are modified into hourglass shaped plates and wider than male abdomen with median setae; limitation of pleural and tergal sclerotization to tergopleurites which are separated medially

with widegap; enlarged pleural abdominal ribs bear reduced pleural knots; developed and not divided sternites are evident which are sclerotized and darkly pigmented; on abdominal segment VIII lateral trichoid is present.

Terminalia of male

Abdominal terminal segment of male is small, smooth, rounded and anterior margin is convex, comprises of segment IX and X, which are very typical with highly dark pigmentation; slightly concave posterior margin bears two very small microsetae; anterior margin bearing two pairs of small and fine setae and one pair of large macrosetae; ventral margin bearing four to six microsetae and three pairs of lateral fine setae; subgenital plate is well developed.

Terminalia of female

Abdominal terminal segment of female is bilobed and uncomplicated; tergite IX is unfused medially bears anterior plate which

is fused and occurrence of separated posterior plate; three pairs of lateral marginal setae are very large; evidence of well-developed subgenital plate which is elongated, less sclerotized, and slightly concave posteriorly; existence of ventro-terminal genital opening; margin of vulva is furnished with limited microsetae (Fig. 3A).

Genitalia of male

Genitalia of male typically characteristics to species, largely elongated, complex and well developed. A genitalia was reached up to the abdominal segment IV of the body. Sclerotization occurs extensively; occurrence of large and stout basal apodeme which is bent anteriorly which stands dark pigmentation. Approximately parameres are straight with posteriorly pointed ends; existence of well-developed genital sac having comma shaped spicules; occurrence of developed mesosomal plate (Fig. 3B).

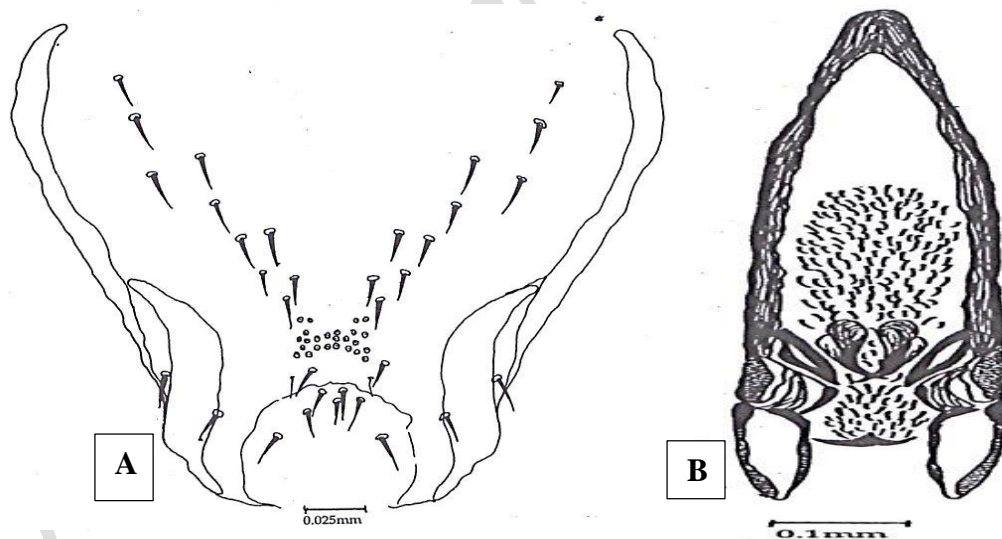


Figure 3. *Lipeurus tropicalis* Peters, 1931, A Female terminalia B Male genitalia

The species *Lipeurus tropicalis* Peters, 1931 is closely associated to *Lipeurus caponis* (Linnaeus, 1758) in having some similar structures; occurrence of similar structure of head; cephalic carina; and chaetotaxy; arrangement of antennal scape; existence of dark brown lateral margin and expanded body size;

proof of abdominal integrated plates; but the present species *Lipeurus tropicalis* Peters, 1931 can be easily separated from *Lipeurus caponis* (Linnaeus, 1758), by having some structures; occurrence of marginal setae on anterior head; width of head; hyaline medial bump; organization of head and its sclerotization;

construction of pterothoracic region; abdominal sclerotization; chaetotaxy; abdominal terminal segments are vary in both species. The genitalia of male parameres, basal apodeme and mesosomal plate are very different in structures and adaptations in *Lipeurus tropicalis* Peters, 1931 as experimental in good reason.

The chewing lice species *Lipeurus tropicalis* Peters, 1931 (Phthiraptera: Ichnocera: Philopteridae) is act as a pest of *Meleagris gallopavo* (Linnaeus 1758) Turkey fowl and *Pavo cristatus* Linnaeus 1758 Pea fowl in both the regions of Pakistan and India [18, 19] as well as also found in North American states like Mexico and Florida [20]. The species was reported from *Gallus gallus domesticus* (Linnaeus 1758) as a type host. It was recorded first time as new host and new locality record from *Meleagris gallopavo* (Linnaeus 1758) Turkey fowl and *Pavo cristatus* Linnaeus 1758 Pea fowl from Hyderabad District, Sindh Pakistan. The taxonomic study was carried out by [21] and he was the pioneer in the taxonomic history of (Phthiraptera). He worked on ectoparasites and detailed variety of species in 19th century [22]. He presented the clear the origin of all groups of lice and described the names of species [23]. He recommended the name Mallophaga to chewing lice and cleared differences between chewing lice and sucking lice. A comprehensive biology and morpho-taxonomy of chewing lice fauna have been described by many taxonomists in different periods of time [21, 24-33].

Conclusion

The chewing lice (Mallophaga: Phthiraptera) are obligatory parasitic insects of *Meleagris gallopavo* (Linnaeus, 1758) Turkey fowl and *Pavo cristatus* Linnaeus 1758 Pea fowl (Galliformes: Phasianidae) causes pathology directly or indirectly to host birds. The present study was carried out on domestic fowls (Galliformes: Phasianidae) which are poultry birds galliforme birds of family Phasianidae. The purpose of the study is to identify the male and the female species by line diagrams and described the species taxonomically with the special reference of their special genital frame work. The detailed morpho-taxonomy of lice explained the existance of particular species on host birds which is dark pigmented large size common wing

louse *Lipeurus tropicalis* Peters, 1931 (Phthiraptera: Ichnocera: Philopteridae) was collected and recorded as new hosts and new locality record from Hyderabad district, Sindh, Pakistan. The parasitic louse causes uneasiness, unhealthyness, less feather meat and eggs productions in birds.

Authors' contributions

Conceived and designed the experiments: F Shaikh & S Naz, Performed the experiments: S Naz & F Shaikh, Analyzed the data: NA Birmani Contributed materials/ analysis/ tools: F Shaikh & NA Birmani, Wrote the paper: F Shaikh.

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