

## Research Article

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# First record of *Goniodes dissimilis* Denny, 1842 (Ischnocera: Philopteridae) recovered from fowls (Galliformes: Phasianidae) from Hyderabad Sindh, Pakistan

Farheen Shaikh<sup>1\*</sup>, Saima Naz<sup>1</sup> and Nadir Ali Birmani<sup>1</sup>

1. Department of Zoology, University of Sindh, Jamshoro-76080, Sindh, Pakistan

\*Corresponding author's email: [farheenshaikh1578@gmail.com](mailto:farheenshaikh1578@gmail.com)

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### Abstract

The chewing lice (Insecta: Phthiraptera) are parasitic insects of variety of birds which belongs to the family Phasianidae (Galliformes: Phasianidae) and are common on game birds. These are the parasites of both domestic and wild birds usually all over the world. The order Phthiraptera (Amblycera and Ischnocera) divided into two noticeable groups on the basis of their feeding habits, the chewing lice (Mallophaga) and the sucking lice (Anoplura). Chewing lice are the most important group with more than 3000 species identified and always causes great pathogenicity to its hosts. The chewing Lice (Order: Phthiraptera) wrap of three suborders, Amblycera, Ischnocera and Rhynchophthirina. The ectoparasites have great veterinary importance their taxonomical work which is reasonably priced in Pakistan as well as all over the world. The chewing louse *Goniodes dissimilis* Denny, 1842 (Ischnocera: Philopteridae) is usually found on fowls (Galliformes: Phasianidae) which includes practically Common pea fowl *Pavocristatus* Linnaeus, 1758, Domestic fowl *Gallus gallus domesticus* (Linnaeus, 1758) and Turkey fowl *Meleagris gallopavo* (Linnaeus, 1958). The louse is small size brownish yellow pigmented slow moving philopterid and most of the time was attached to furry and glossy feathers of hosts belly or abdomen. It causes aggravation, annoyance, irritation and nervousness in behaviors of hosts. This was first reported as new hosts and new locality records from the study area. The description of species was planned as taxonomically and genetically of both male and female specimens. The main purpose of the study was to check out the population density, collection, examination and investigation of variety of species of chewing lice and described systematically from urban and rural areas of Hyderabad Sindh, Pakistan.

**Keywords:** Genital studies; *Goniodes dissimilis*; Hyderabad; Ischnocera; New record; Philopteridae; Sindh; Taxonomy; Turkey fowl

### Introduction

The nation state Pakistan has incredible variety of resident and migratory birds which representing possibilities of a large

range of chewing lice population (Mallophaga: Insecta: Amblycera and Ischnocera). The data regarding the chewing lice fauna in Pakistan is insufficient and

deficient [1-11]. There are about 150 species of the genus *Goniodes* Nitzsch 1818 have been reported in the world which regularly parasitize galliform birds [12]. The chewing louse *Goniodes dissimilis* Denny, 1842 (Ischnocera: Philopteridae) causing infestation in Common pea fowl *Pavocristatus* Linnaeus, 1758 Domestic fowl *Gallus gallus domesticus* (Linnaeus, 1758) and Turkey fowl *Meleagris gallopavo* (Linnaeus, 1758) in Hyderabad Sindh, Pakistan. It was remaining untouched as taxonomically and genetically in the past far away from [13, 14], who contributed to our information of the genus *Goniodes* (Ischnocera: Philopteridae). The known species of chewing lice in the past was first time described from Punjab [1, 3, 15] which parasitize hosts Common pea fowl *Pavocristatus* Linnaeus, 1758 Domestic fowl *Gallus gallus domesticus* (Linnaeus, 1758) and Turkey fowl *Meleagris gallopavo* (Linnaeus, 1758). Most of the samples of chewing lice recovered during the present study, which are however to be recognized, may represent previously identified species, all of which would make up new records from Hyderabad, Sindh, Pakistan. The genus *Goniodes* Nitzsch, 1818 is greatly diversified in their morphology with different genera of subfamily Gonioidinae in having goniocephaloid head with broad anterior margin, occurrence of heteromorphic antennae, expansion of temporal margins, deviating pterothoracic lateral margins, extended oval and broad abdomen and which is bilobed, concave to convex terminal segment. But the genus *Goniodes* Nitzschis can be clearly differentiated from the same genera of the subfamily by having head size, carinae, cephalic sutures; anterior and posterior chaetotaxy of head region; shape and size of temples; shape and structure of antennal segment I and III, pterothoracic setae and posterior margin, posterior articulation of pterothorax, abdominal

sclerotization, size of abdominal segment, tergal and sternal chaetotaxy, genital segments, male and female genitalia have also peculiarities in structure of basal apodeme, mesosomal plate, endomere and penis. The family Phasianidae of galliform birds consist of large to small sized birds which cannot fly. These are terrestrial ground eating and have more weight which includes chickens, guinea fowl, turkey fowl, pea fowl, domestic fowl, Jungle fowl, pheasants. These birds are also called gallinaceous birds. The family Phasianidae is one of the largest family of birds which includes 185 species which are classified into 54 genera. Most of these birds are trained and beat predators by good running. The male birds of most of the species are more beautiful, gorgeous, attractive and colorful than the female. They are not migratory [16]. The bird Common pea fowl *Pavocristatus* Linnaeus 1758 (Galliformes: Phasianidae) is mostly kept in captivity the male is typically larger, powerful, weighty, with controlling legs and with small sized wings than female. The bill is small and thick. The male periodically show off its bright coloured plumage and facial ornaments like combs, wattles, and crests. The special characteristics of game birds is the presence of spur on each leg which is common in Pea fowl, jungle fowl, partridges, pheasants, turkeys and quails, and grouse. Domestic fowl *Gallus gallus domesticus* (Linnaeus, 1758) is resident bird the male has red and golden-yellow neck hackles. Female bird has black-streaked and rufous-brown underparts streaked with burnish. Turkey fowls *Meleagris gallopavo* (Linnaeus, 1758) was first introduced in Pakistan from turkey, the male fowl is larger in size than female bird. Tail is light brown and characteristically thick set wattle called snood which move back and forth from the uppermost of the beak and is cast off in courtship behavior [17, 18].

## Materials and Methods

The parasitic insect *Goniodes dissimilis* Denny, 1842 (Ischnocera: Philopteridae) was collected from fowls (Galliformes: Phasianidae). The variety of fowls included Common pea fowl *Pavo cristatus* Linnaeus, 1758, Domestic fowl *Gallus gallus domesticus* (Linnaeus, 1758) and Turkey fowl *Meleagris gallopavo* (Linnaeus, 1958). The study was conducted during 2018-2020. The chewing lice collected from fowls were immature and adult size with both sexes of male and female found on different areas of the body like belly, head and feathers. The powder Permethrin powder was used for paralyzing the ectoparasites. The fowls were kept on white large sheath for 25-30 minutes. Chewing lice were infested and fallen down on sheath. The parasitic insects were handled with fine brushes and needle. Preservation of specimens occurred in 80% ethyl alcohol in glass vials. The glass vials were labelled with date, time and location. The process of mounting of parasites was started the parasites. First step clearing chewing lice in 10% of solution of Potassium hydroxide (KOH) solution for overnight, next step neutralization in dilute acetic acid for 35-40 minutes, third step clean the specimen by pressing, next step was dehydration with alcohol series of 20% to 100%, final step permanent mounting in Canada balsam which was followed by xylene for 5 minutes for clearing. Examination of chewing lice under the compound microscope. Oculomicrometer was used for drawing. Photography was conducted with Nikon Japan camera. The slides of chewing lice were deposited in the museum of Advance Parasitology Laboratory (APL) department of Zoology, University of Sindh, Jamshoro. The literature on chewing lice was followed by collection followed by [19, 20].

## Results and Discussion

*Goniodes dissimilis* Denny, 1842: 57; Piaget, 1880: 269.

### Type Host

Domestic fowl *Gallus gallus domesticus* (Linnaeus, 1758).

### Size

Body length of male: 2.175 mm; female: 2.932 mm (Fig. 1A & B).

### Coloration

Small size, yellowish brown pigmented on dorso-lateral side and light yellow pigmented on ventro-lateral side (Fig. 1A & B).

### General body shape

Body small, broad yellowish brown pigmented and slightly thin toward the anterior end and thick and broad toward the posterior end. Male is smaller than female. The anterior end of male and female is smooth and rounded. Posterior end is slightly pointed (Fig. 2 & 3).

### Status

New hosts and new locality recorded.

### Present study host

Common pea fowl *Pavo cristatus* Linnaeus, 1758, Domestic fowl *Gallus gallus domesticus* (Linnaeus, 1758) and Turkey fowl *Meleagris gallopavo* (Linnaeus, 1958).

### Head

Typically circumfasciate; to some extent broader than elongated and reasonably robust, anterior margin is smooth and rounded, generally convex and subquadrate; not occurrence of hyaline margin; occurrence of solid anterior marginal carina; occurrence of broad and extensive pre antennal nodus; presence of heteromorphic or filiform antennae; temporal are in fact angulate externally projecting; occurrence of pointed and long conus of male head; evidence of membranous clavi; narrowing scape of antennae which are elongated; posterior progression on scape is not evident; present of deep antennal socket;

flagellomere I is posture short and lateral additional room; male temples expansion posture short temporal angles; female temples expansion posture extended temporal angles; occurrence of thick and broad temporal marginal carina; marginal temporal setae five, 2 and 3 prevailing, 1, 4 and 5 subsidiary; development of post ocular nodus.

### **Thorax**

It is short clear rhombic shape. It is classified into Prothorax, Pterothorax, Mesothorax and Metathorax.

#### **Prothoraxis**

Prothorax is small and thin with occurrence of setae; rhombic sclerite is evident between head and prothorax which is great cup like with particularly one pair of posterolateral setae, arrangement of setae is 1+1.

#### **Pterothorax**

Pterothorax is triangular or diamond shape with lateral margin is divergent and posterior margin is concave and V-shaped surrounded by abdominal segment II; Pteronotum is complete with posterior to lateral setae four arrangement is 2, 2 + 2, 2; no occurrence of trichoid setae; present of thorn like setae.

#### **Mesothorax**

It is mesothoracic spiracles stand short atrium are ventro-lateral in position; not present of meso-meta sternal plate and second sternal plate; complete absent of meso-metasternal setae; not evidence of mesofurcal pit.

#### **Metathorax**

It is development of proepimeron which is no complete and divided, and well developed towards posterior; meso thoracic and meta thoracic legs are equally sterno-coxal in expression.

#### **Abdomen of male and female**

Abdomen is bulky, oval to rectangle, rounded and smooth, diamond shaped with curved lateral margin; tergites are completed; tergopleurites are darkly pigmented; tergite I

and tergite II is merged with each other; Tergite II is not merged but separated; occurrence of median to submedian setae on tergite II: 2 pairs, III: 3 pairs, IV to V: 4 pairs, VI to VII: 3 pairs, VIII: 6 pairs, six pairs; occurrence of intermediate tergal setae; evidence of trichoid setae on segment VIII; sternal setae of median and submedian in individual row; control of abdominal sclerotization to tergo pleurites and division with extensive space medially; distended and prolonged pleural ribs stand large pleural heads; abdominal spiracles stand short atrium and six pairs are present; weakly sclerotization or decrease of sternal plates.

#### **Terminalia of male**

Abdominal terminal segment of male is short lobe like with smooth convex margin; abdominal dorsal plate on terminal segment is divided into fused tergites anteriorly IX and X; occurrence of slim and thin tergite XI; characteristically ventral chaetotaxy which is wide, thick and pointed; ventral of sternite VIII protruded process is present; genital opening is bilobed.

#### **Terminalia of female**

Female abdominal terminal segment is bifid; sub genital plate is well developed; highly sclerotized and V-shaped, provided with sharp pediculated spines, arrangement is 5+5 beside the vulval margin; occurrence of vulval opening in between segment X and XI; occurrence of cluster of spiky pointed microsetae at pleurosternal position; opening of anus is typically convex (Fig. 4A).

#### **Genitalia of male**

Genitalia of male is complicated structure, distended and reaching up to the abdominal segment III or IV; evidence of bilobed genital opening, presence of basal apodeme which is narrow and slender like, smooth and elongated; well development of parameres and mesosomal plate; both paramere and endomere are merged with each other; occurrence of short and merged penis (Fig. 4B).

The present species *Goniodes dissimilis*, Denny 1842, is closely correlated with *Goniodes costatus* (Kélér, 1939) in having gonocephaloid head, anterior head margin; sutures and cephalic carinae; structure and expression of antennae; male chewing louse head margin posteriorly; prothorax arrangement; pterothorax lateral margin; sclerotization of abdomen, form of abdomen and female abdominal terminal segments very comparable in postmargin, but it could be differentiated from the same species in having elongated basal apodeme, parabolic bears thin struts; curved paramere posteriorly, tapering outwards slightly; weak development of mesosomal plate; no evidence telomere; short penis, almost not sclerotized and precisely thick; female chaetotaxis thick; expansion of latero-ventral conical process; occurrence of little subgenital plate bearing fine thick diagonally arranged hyaline setae and lateral tuft fine setae, while in *Goniodes costatus* (Kélér, 1939), the female abdominal terminal segment bearing thin and fine light setae only as lateral tuft; occurrence of longer subgenital plate which bears eight to nine little hyaline setae; occurrence of small latero-ventral conical process, genitalia of male chewing

louse basal apodeme is wide and little; parameres are piercing posteriorly; well development of mesosomal plate; penis is highly sclerotized.

There many taxonomist and biologist classified the chewing lice into orders, suborders, families and subfamilies and provided keys and checklists for identification of species on host's birds [12]. The chewing louse *Goniodes dissimilis* Denny was first time acknowledge as new host record [21] infesting the Indian Pea fowl (*Pavo cristatus*) along with other chewing lice species like *Menacanthus stramineus* (Nitzsch, 1818). In past Turkey fowl (*Meleagris gallopavo*) was investigated and examined for the population density of chewing lice, mites and ticks and it was proved by the study that these ectoparasites causes direct and indirect infestation and even fatalness to hosts. In nation state Pakistan work on the chewing lice of galliform birds which belongs to family Phasianidae were studied less especially in Sindh and Balochistan Provinces as compared to other Province like Punjab [22].

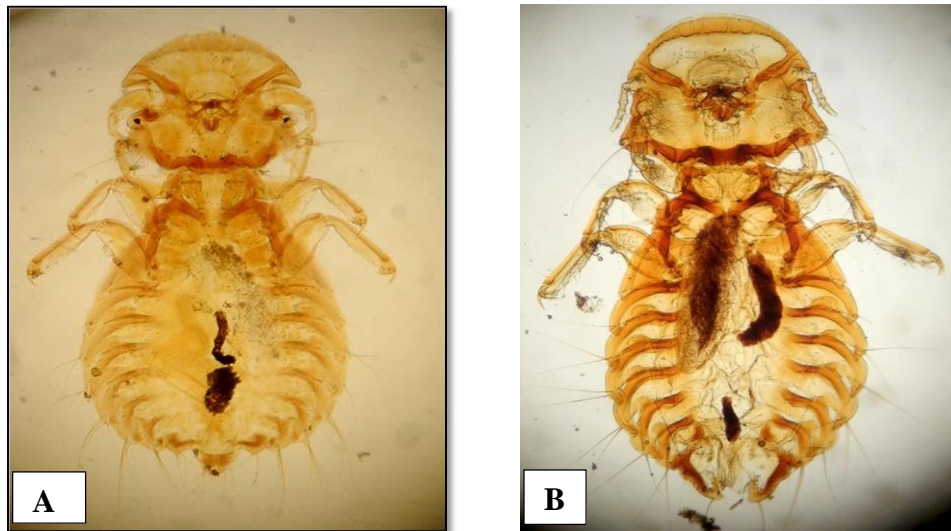


Figure 1. Chewing louse *Goniodes dissimilis* Denny, 1842, A Male B Female at 10x10

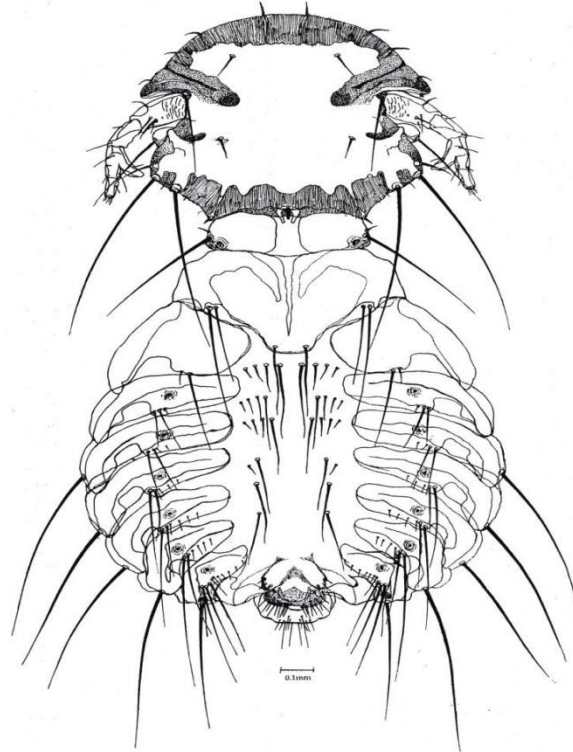


Figure2. Chewing louse *Goniodes dissimilis* Denny, 1842, Male

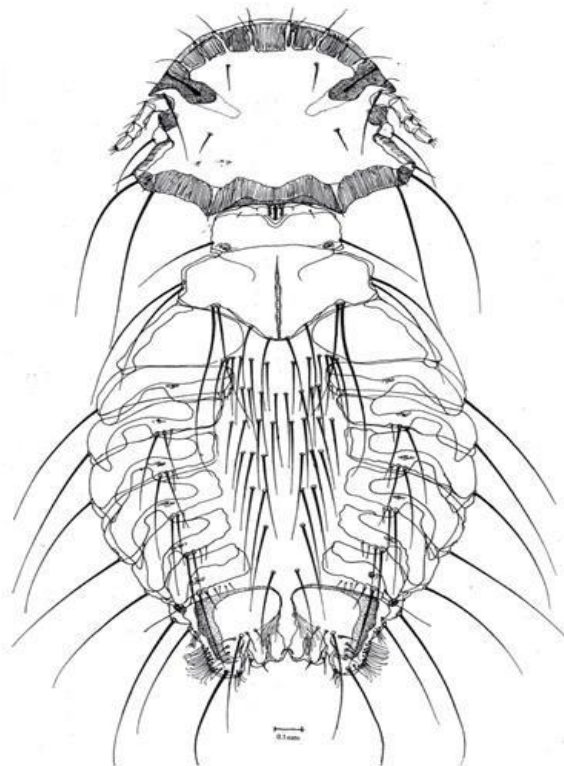
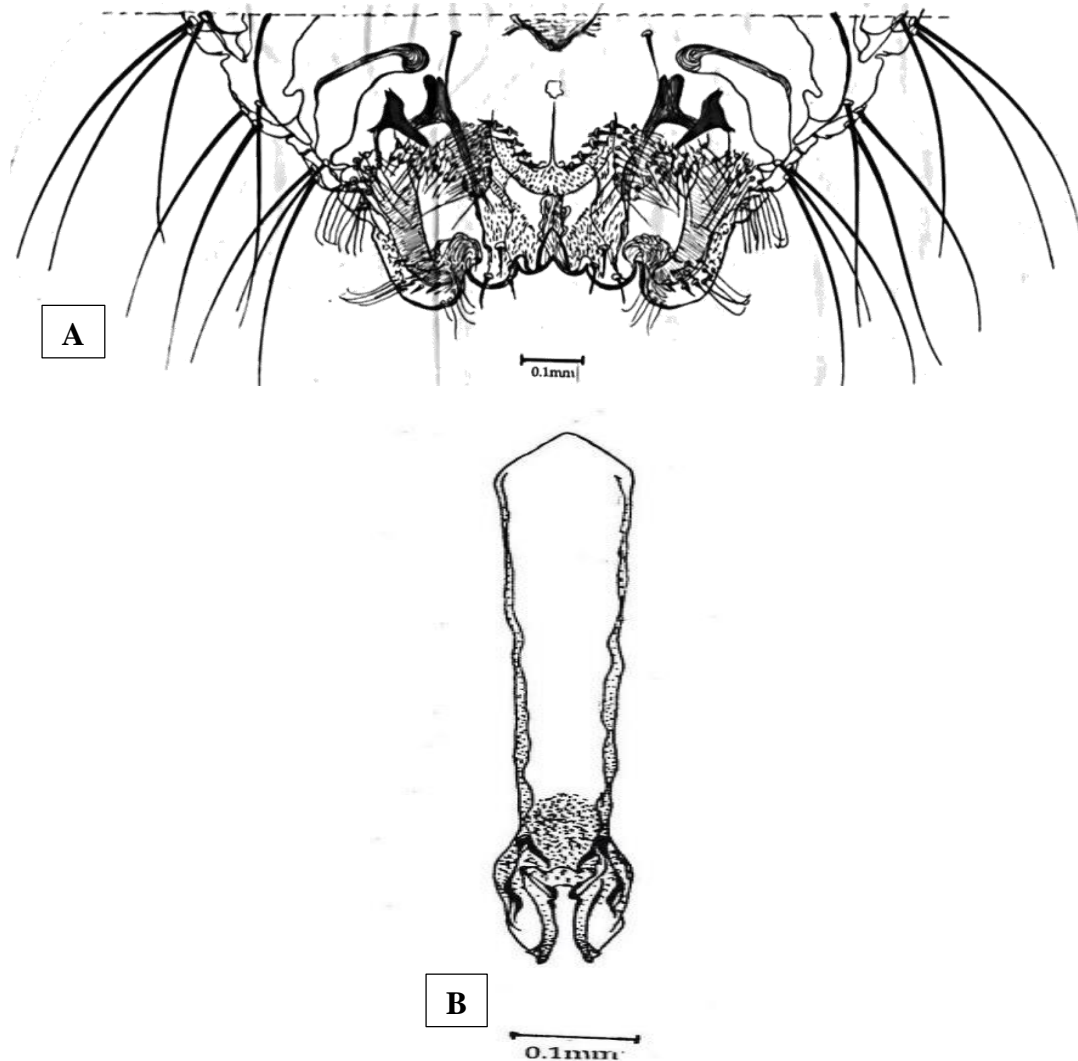


Figure 3. Chewing louse *Goniodes dissimilis* Denny, 1842, Female



**Figure 4. Chewing louse *Goniodes dissimilis* Denny, 1842, A Female terminalia B Male genitalia**

### Conclusion

The chewing louse *Goniodes dissimilis* Denny, 1842 is regularly found on fowls (Galliformes: Phasianidae) which include spractically Common pea fowl *Pavo cristatus* Linnaeus, 1758, Domestic fowl *Gallus gallus domesticus* (Linnaeus, 1758) and Turkey fowl *Meleagris gallopavo* (Linnaeus, 1958). The louse is not common parasite. It is small size dark yellowish brown pigmented. It belongs to the family Philopteridae. It was mostly attached to feathers, belly and head regions of the hosts. It causes acute to chroninc

infestation in fowls. The sign and symptoms included weakness, loss of feathers, aggravation, annoyance, irritation and nervousness in behaviors of hosts. It was reported from the urban and rural areas of Hyderabad, Sindh Pakistanas as new host and locality record. It was investigated through research work the increase rate of population of parasitic insects decline the health of the hosts and in turn decreases the eggs and meat prodiction. It causes the great economic loss of poultry birds. Increased burden of lice on fowls increases life threatening illnesses like diminution of

vigilance, defence of territory feeding and sleeping activity of life.

#### Authors' contributions

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

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