

# Egg laying site and oviposition pattern of ischnoceran louse, *Penenirmus pici* Fabricius, 1798 (Insecta: Phthiraptera) parasitizing black-rumped flameback, *Dinopium benghalense* (Linnaeus, 1758) (Aves: Picidae)

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**Abstract:** The present report furnishes information on the egg laying site and the oviposition pattern of ischnoceran louse, *Penenirmus pici* Fabricius, 1798 parasitizing black-rumped flameback, *Dinopium benghalense* (Linnaeus, 1758). The louse, *P. pici* exhibited a wide spread oviposition sites on the host body. The eggs of *P. pici* are miniature rice grain like pearly white structures in appearance are laid on lateral plumulaceous portion of the vane near the rachis. The eggs remained enclined at 40-45° with respect to the rachis, and a maximum of four eggs were noted on a single feather.

**Keywords:** *Penenirmus pici*, Ischnocera, Lice, Phthiraptera, Oviposition, SEM.

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## 1. INTRODUCTION

Phthirapteran ectoparasites are oviparous insects and are exhibit variations with respect to egg laying pattern and oviposition sites on the host body. The eggs are laid by the female louse on the host's hair or feathers and the sites of oviposition are often protected from removal of eggs by preening by host [1]. Prior to the oviposition, female slithers on the plumes, chooses a location of the feather, cuts the barbules with the help of mandibles and bends down the tips of its abdomen touching the surface of the feathers, at the points where the barbules were cut. Now it exudes a thick sticky secretion from its genital pore by which the eggs are cemented to the feathers [2]. The eggs are laid separately or in bunch onto hair or quills and require warmth of the host's body for development. Hatched eggs remain permanently glued to the feathers/hair of host throughout lifetime. Specific studies on the oviposition sites and pattern of egg laying of phthirapterans have rarely been made but information on the subject on selected avian hosts *i.e.* cattle egret, *Bubulcus ibis* [3]; domestic fowl, *Gallus gallus domesticus* [4], [5]; domestic pigeon, *Columba livia* [6], [7]; mallard duck, *Anas platyrhynchos* [8]; orange crowned warbler, *Vermivora ocelata* [9]; red avadavat, *Amandava amandava* [10] and red whiskered bulbul, *Pycnonotus jocosus* [11] have been provided by aforesaid workers from time to time. The oviposition behavior of some mammalian species *i.e.* sheep louse-*Bovicola ovis*, *Linognathus stenopsis*, cattle louse-*Haematopinus eurysternus*, horse louse-*B. equi*, *H. asini* have been investigated by [12]. During present studies, an attempt has been made to observe the egg laying pattern and oviposition sites on the host of ischnoceran louse, *Penenirmus pici* Fabricius, 1798 parasitizing black-rumped flameback, *Dinopium benghalense* (Linnaeus, 1758).

## 2. MATERIAL AND METHODS

Black-rumped flameback, *Dinopium benghalense* (Linnaeus, 1758) was examined under the magnascope with six inches diameter lens, fitted with circular light to record the egg laying sites. The specimen of bird Black-rumped flameback, *Dinopium benghalense* (Linnaeus, 1758) was found an accidentally dead condition on the nature trails of the Northern Regional Centre, Zoological Survey of India, Dehradun, Uttarakhand, at the time of trekking the nature trails during the cleanliness activities of the mission life campaign. The body of bird was arbitrarily divided into nine regions; the number of egg laid by species on different parts of the body was recorded by direct observation under the stereo zoom binocular microscope. The percentage of eggs in each region was recorded as lines adopted by [4]. Few feathers bearing eggs were gently removed from the host body for better result through scanning electron microscopy. For SEM studies, feather bearing eggs were arranged on aluminum stubs (covered with double-sided cello tape), and gold coated with gold palladium in the Neo Coater 100-240 V and observed under SEM (Model-Carl Zeiss EV018).



Figure 1: SEM photograph showing egg laying pattern of *Penenirmus pici* Fabricius, 1798



Figure 2-3: LM photograph of the feather bearing eggs of *Penenirmus pici* Fabricius, 1798

## 3. RESULTS

The eggs of *Penenirmus pici* Fabricius, 1798, are miniature rice grain-like, pearly white structures in appearance and exhibit restricted oviposition sites on the host body. The eggs are placed on the lateral plumulaceous part of the vane close to the rachis, and the rear end of the egg remains near the rachis while the operculum end faces away (Figure 2-3). There

were up to four eggs on a single feather, and the eggs stayed enclined at 40-45° angles with regard to the rachis (Figure 1). There were seen to be up to 27.3% of eggs on abdomen feathers, 23.58% on breast feathers, and 17.33% on back feathers. Consequently, 68.2% of the eggs were contained in these three regions of the host body. There were approximately 12.78% of eggs on the neck feathers, 10.80% on the wing feathers, and 8.24% on the head. The number of eggs on the tail, neck, and leg feathers continued to be very small.

#### 4. DISCUSSION

Certain avian lice are known to have defensive characteristics during oviposition and to favour laying their eggs in body parts that are relatively challenging for the host to preen [1]. Different species occurring on the same host often exhibit differences in egg laying sites, *i.e.*, pigeon lice (*Columbicola columbae*) and *Colpocephalum turbinatum* prefer to lay eggs on the wing and tail feathers; *Companulotes bidentatus* exhibits widespread oviposition sites; and *Hohorstiella lata* lays the egg on the forepart of the body [6]; munia lice *Myrsidea amandava* oviposite on the breast, back, and abdominal regions; *Brueelia* sp. exhibits widespread oviposition sites, as the eggs are found on feathers belonging to most parts of the body [10]; red-whiskered Bulbul lice *Brueelia guldum* prefers to lay eggs upon the feathers of the back, neck, and breast regions; *Menacanthus eurysternus* lays its eggs on the forepart of the host body [11]. In the case of the black-rumped flameback *Penenirmus pici* Fabricius, 1798 also exhibits widespread oviposition sites, and eggs were found in the abdomen, breast, back, neck, wing, and head region.

Some avian lice shows the site specificity on the fathers in respect of egg laying pattern *i.e.* *Columbicola columbae*, *Colpocephalum turbinatum*, *Anaticola crassicornis* places its eggs inside the furrows between the feather barbules [6], [8]; *Menacanthus stramineus* glue the eggs to the proximal end of rachis in regular pattern [6]; *Menopon gallinae* and *Goniodes dissimilis* lay the eggs on the proximal portion of rachis, under the shaft [5]; *Goniocotes gallinae*, *Lipeurus heterographus* lay the eggs on different portion of vane [5] and *Actornithophilus patellatus*, prefer to lay its eggs inside the shafts of primary or secondary feathers [1]. In the case of *Penenirmus pici* Fabricius (1798 parasitizing black-rumped flameback *Dinopium benghalense* (Linnaeus, 1758), prefer to lay its eggs on the lateral plumulaceous part of the vane, close to the rachis.

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#### REFERENCES

- [1] Marshall AG (1981) The ecology of ectoparasitic insects. Academic Press, London. 417 p
- [2] Saxena AK and Agarwal GP (1980) On the protuberences present on the lateral oviducts of poultry lice *Lipeurus tropicalis* Peters (Phthiraptera: Ischnocera). Ent. News 91:29-30.
- [3] Ahmad A, Khan V, Badola S, Arya G, Bansal N, and Saxena AK (2010) Population Characteristics and the nature of egg shells of two phthirapteran species parasitizing Indian cattle Egrets. J. Insect. Sci. 10:1-7.
- [4] Kumar S, Gupta N. and Saxena AK (2006) Egg laying patterns of phthirapteran ectoparasites infesting domestic hen, *Gallus gallus domesticus*. J. Parasit. Appl. Anim. Biol 15 (1 & 2): 11- 15.
- [5] Surman, Singh SK, Saxena AK and Kumar A (1998) Aspects of Oviposition in the poultry shaft louse, *Menopon gallinae* (Phthiraptera: Amblycera). Rivistadi. Parasitol. 25 (59):212-218
- [6] Nelson BC and Murray MD (1971) The distribution of Mallophaga on the domestic pigeon (*Columba livia*). Int. J. Parasitol. 1: 21-29.
- [7] Saxena AK, Singh SK, Surman, Kumar A and Badola S (2000) SEM studies on the microtopography of eggs of four pigeon lice (Phthiraptera, Insecta). Rivistadi. Parasitol. 17(61): 351-358.

- [8] Kumar S, Badola S, Singh SK, Gupta N and Saxena AK (2003) Aspects of oviposition in duck louse, *Anaticola crassicornis* (Insecta, Ischnocera: Phthiraptera). Par. Dis. 111-117.
- [9] Foster MS (1969) The egg shell of three species of Mallophaga and their significance in ecological studies. J. Parasitol. 55 (2): 453-446
- [10] Gupta N, Kumar S, Saxena AK and Bisht KL (2004) Aspects of oviposition of an ischnoceran (*Brueelia* sp.) and amblyceran (*Myrsidea amandava*) lice (Phthiraptera). National Seminar on Zoology and Human Welfare. Dr. Shyama Prasad Mukherjee Government Degree College, Phaphamau, Allahabad, 204-210
- [11] Saxena AK, Arya G and Bansal N (2012) Egg laying site and oviposition pattern of two phthirapteran species parasitizing red whiskered Bulbul (*Pycnonotus jocosus*). Turkish. J. Parasitol. 36(3): 166-168. DOI: 10.5152/tpd.2012.39
- [12] Murray MD (1957) The distribution of eggs of mammalian lice on their hosts. I. Description of oviposition behaviour. Aust. J. Zool. 5:13-18.