


## A note on the haematophagous nature of poultry shaft louse, *Menopon gallinae* (Amblycera: Phthiraptera)

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**Abstract** An analysis of the crop contents of the poultry shaft louse, *Menopon gallinae* indicates that 67 % of adult males and 72 % of the adult females examined carried red content compatible to host blood, along with feather barbules. The percentage of nymphal instars carrying red content in the crop was quite low. On the basis of crop contents the louse does not seem to harbor any tritulating agent and is also not involved in cannibalism or predation. SEM studies on the ventral side of head do not indicate the presence of any pointed structure which can be used to pierce the skin.

**Keywords** *Menopon gallinae* · Poultry shaft louse · Haematophagous louse · Amblycera · Phthiraptera

### Introduction

Avian Phthiraptera exhibit considerable diversity with respect to feeding habits. Some species are purely feather feeders; others consume the host blood occasionally while still others are habitually haematophagous. The degree of harmfulness of avian lice is generally determined by their feeding habits and also the population density. Haematophagous species do not only affect the vitality and productivity of their hosts and often act as reservoir and transmitter of the strains of infectious diseases among the hosts. Members of Menoponidae consume the host blood in

varying degree (Wilson 1933; Crutchfield and Hixson 1943). Kalamarz (1963) confirmed the blood feeding habits of two species by detecting hemoglobin with crystals Teichman method and by contact autoradiography, using Fe<sup>59</sup> isotope. Haematophagous nature of selected species e.g. *Menacanthus eurysternus*, infesting common Myna *Acridotheres tristis* (Agarwal et al. 1983), *Trinoton anserinum* occurring on swans (Seegar et al. 1976) *Trinoton querquedula* parasitizing *Anas c. crecca* (Saxena et al. 1985), *Heterodoxus spiniger* infesting dogs (Agarwal et al. 1982) has been reported by the workers. On the other hand, members of Gyropidae reportedly eat upon liquid secretions of eye (Rothschild and Clay 1952). The *Piagetiella* sp. lives in pauches of Pelecaniformes and visits feathers only to lay eggs, presumably feeding on blood, mucus and skin debris (Dubinin 1947). *Gyropus ovalis* and *Gliricicola* sp. Reportedly rely upon serum and secretions of their hosts (Marshall 1981).

The present report furnishes information on the degree of haematophagy of a poultry shaft louse, *Menopon gallinae* with respect to sex, stage and mouth parts.

### Materials and methods

Freshly collected live adults and different instars of nymphs of *M. gallinae* were collected from career hens and dissected in Insect Ringers Solution under Stereozoom Trinocular Microscope. The crop of the specimens was taken out and teased on glass slide to analyze the gut contents. For SEM studies, lice were fixed in 2.5 % gluteraldehyde, post fixed in 0.2 M phosphate butter, critically dried, arranged on aluminum stubs covered with double sided cello tape, gold coated and examined under Scanning Electron Microscope.

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## Results

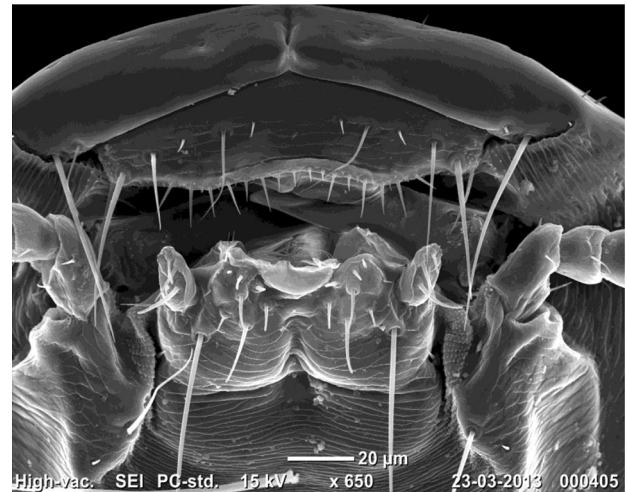
Microscopic examination revealed that 67 % of adult males had red content compatible with host blood in the crops (Table 1). Percentage of females having red content was marginally higher (72 %). Twenty-one percentage of IIIrd instar nymphs carried red content in the crops. Corresponding figure was lower in case of IIInd instar nymphs (13 %). Only 11 % of the first instars were found having red content. The crops of all the aforesaid lice were found packed with nearly equal sized feather barbules. The presence of anything like quartz, mica, sand, seed coat, fungal spores or any other chitinous structure was not detected in the crop of this louse (indicating that it does not harbor any triturating agent). Furthermore, the presence of egg cases, cast skins or any other part of lice or other insects was also not observed indicating that the louse is not involved in cannibalism or predation (as reported in case of one amblyceran louse infesting pigeons).

**Table 1** Percentage of *M. gallinae* with red content compatible with host blood

Stage	Nos. of lice examined	Nos. of lice with red content	Percentage of lice with red content (%)
Adult male	100	67	67
Adult female	100	72	72
IIIrd instar nymph	100	21	21
IIInd instar nymph	100	13	13
Ist instar nymph	100	11	11



**Fig. 1** SEM photograph of the ventral side of the head of *M. gallinae*



**Fig. 2** Enlarged view of the anterior portion of the ventral side of the head of *M. gallinae*

SEM study on ventral side of head of *M. gallinae* (Figs. 1, 2) indicates that terminal margins of clypeus bear large seta. The sub marginal areas of labrum bears 4 small, 6 medium and 2 large sized setae. The inner margins of labrum have 8 small and 8 medium sized setae. The mandibles are roughly triangular and bear 2 apices which are not pointed (rather blunt). Single jointed labial palp bears 5 setae. The galae do not appear to be serrated. The premantum is clearly bilobed and bears 3 small, 1 medium sized and one large seta. The postmentum is characterized by wavy folds. Four jointed maxillary palp arises from stipes of maxilla. However, a small rod like structure (comparable to card) also appears to be present on inner side of maxillary base (which bears large seta). Thus, apparently the mouth parts of *M. gallinae* do not seem to bear any structure which can be used to pierce the host skin.

## Discussion

Survey of literature indicates that haematophagous nature of avian lice seems to be an important requisite for their pathogenic involvement. The ability of two poultry lice, *M. stramineus* and *M. gallinae* to transmit pathogenic strains of *Pasteurella multocida*, *Salmonella gallinarum*, *Escherichia coli* and *Streptococcus* sp. among the poultry birds has already been demonstrated (Derylo 1969, 1970, 1972; Derylo and Jarosz 1972). Moreover, certain phthirapteran species are able to act as intermediate host of filarial worms. For instance, swift louse, *Dennyssus hirudinis* reportedly harbors *Filaria cypseli* (Dutton 1905). *Heterodoxus spiniger* harbors *Dipetalonema reconditum* (Nelson 1962, Pennington and Phelps 1969) and Swan louse,

*Trinoton anserinum* acts as intermediate host of *Sarconema eurycerca* (Seegar et al. 1976). Furthermore, haematophagous species are more harmful in causing loss of productivity and vitality of host birds. Derylo (1974a, b) have indicated that haematophagous poultry lice are able to cause more reduction in number of eggs laid than the non-haematophagous species. Moreover, very heavy infestation of haematophagous species may cause more extensive skin injuries and ultimately death of the host. The death of a Lammergeier due to heavy infestation of *Laemobothrion vulturis danecki* has been reported by Zlotorzycza (1969). Likewise, cases of ulcerative stomatitis leading to death of host (white pelican) due to heavy infestation of *Piagetiella* sp. have also been shown by Wobeser et al. (1974). The lesions caused by haematophagous species may provide a potential site for the entry of other pathogens. The present studies indicate that *M. gallinae* does not exhibit sex related differences with respect to feeding habits. However, stage related differences appear to exist, as the nymphal instars of *M. gallinae* have been found less haematophagous. The mouth parts of avian lice are of biting type and modification from chewing to piercing have taken place in few species e.g. *Trichodectes canis* (Clay 1949). Bouvier (1945) has made attempt to correlate the presence of blood in gut to with the nature of mandibles (especially in *T. canis*). The mandibles of *M. gallinae* are not pointed (rather blunt). Avian lice are Telmophages (Lavoipierre 1965) and are unable to canulate the small blood vessels of skin. Thus, *M. gallinae* appears to obtain the host blood by gnawing through the epidermis or puncturing the quills of young feathers. Otherwise, they may obtain it through exudations/abrasions of skin.

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## References

- Agarwal GP, Chandra S, Saxena AK (1982) Feeding habits of dog louse, *Heterodoxus spiniger* (End.) (Mallophaga, Amblycera). *Z ang Ent* 94(2):134–137
- Agarwal GP, Saxena AK, Chandra S (1983) Haematophagous behaviour of *Menacanthus eurysternus* (Mallophaga, Amblycera). *Angew Parasitol* 24(1):55–59
- Bouvier G (1945) De l'hémophagie de quelques mallophages des animaux domestiques. *Schweiz Arch Tierheilk* 87:429–434
- Clay T (1949) Piercing mouth-parts in the biting lice (Mallophaga). *Nature* 164:617
- Crutchfield CM, Hixson H (1943) Food habits of several species of poultry lice with special reference to blood consumption. *Florida Entomol* 26(4):63–66
- Derylo A (1969) Mallophaga as a vector of *Pasteurella multocida*. *Ann. Univ. Mariae Curie-Sklodowska. Sect C Biol* 24:355–366
- Derylo A (1970) Mallophaga as a reservoir of *Pasteurella multocida*. *Acta Parasitol Polon* 17(35):301–313
- Derylo A (1972) Present status of studies of the epizootiological importance of the chewing lice (Mallophaga). *Wiad Parazytol* 18(4):531–533
- Derylo A (1974a) Studies on the economic harmfulness of biting lice (Mallophaga). III. The influence of biting lice infestation on a decrease of body weight in hens. *Medycyna Wet* 30(6):544–547
- Derylo A (1974b) Studies on the economic harmfulness of biting lice (Mallophaga). II. The influence of biting lice infestation on egg laying and hatching in hens. *Medycyna Wet* 30(6):406–410
- Derylo A, Jarosz J (1972) Intestinal microflora in some species of hematophagous Mallophaga. *Wiad Parazytol* 18(1):113–119
- Dubinin VB (1947) Studies on the adaptation of ectoparasites: ecological adaptation of the mallophagans and feather ticks. *Parazitol Sborn* 9:191–222
- Dutton JE (1905) The intermediary host of *Filaria cypseli* (Annett, Dutton, Elliot), the filaria of the African swift, *Cypselus affinis*. *J Trop Med* 8:108
- Kalamarz E (1963) Badania i biologia Mallophaga I. The use of  $Fe^{59}$  isotope in studies on food consumption of mallophaga existing on hens (*Gallusdomesticus* L.). *Zeszyty Nauk Wyzsz Szkoly Roln W Olszt* 15:247–251
- Lavoipierre MMJ (1965) Feeding mechanism of blood-sucking Arthropods. *Nature* 208:202–203
- Marshall AG (1981) The ecology of ectoparasitic insects. Academic Press, London
- Nelson GS (1962) *Dipetalonema reconditum* (Grassi, 1889) from the dog with a note on its development in the flea, *Ctenocephalides felis* and the louse, *Heterodoxus spiniger*. *J Helminthol* 36:297–308
- Pennington NE, Phelps CA (1969) Canine filariasis on Okinawa, Ryukyu Islands. *J Med Entomol* 6:59–67
- Rothschild M, Clay T (1952) Fleas, flukes & cuckoos. A study of bird ectoparasites. Collins Son and Co Ltd, London
- Saxena AK, Agarwal GP, Chandras S, Singh OP (1985) Haematophagous nature of *Trinoton querquedulae* (Phthiraptera: Amblycera). *Angew Parasitol* 26:205–208
- Seegar WS, Schiller EL, Sladen WJL, Trpis M (1976) A Mallophaga, *Trinoton anserinum*, as a cyclodevelopmental vector for a heartworm parasite of waterfowl. *Science* 194:739–741
- Wilson FH (1933) A louse feeding on the blood of its host. *Science* 77(2003):490
- Wobeser G, Johnson GR, Acompanado G (1974) Stomatitis in a juvenile white pelican due to *Piagetiella peralis* (Mallophaga: Menoponidae). *J Wildl Dis* 10(2):135–138
- Zlotorzycza J (1969) Studien uber Raubvogelfederlinge (Mallophaga). VI. *Laemobothrion vulturis daneckii* subsp. nov. (Laemobothriidae) vom Bartgeier—*Gypaetus barbatus* (L.) (Falconiformes, Aegypiinae). *Polskie Pismo Entomologiczne* 39(1):123–128