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Research Article

Analysis of the Crop Contents of Two Amblyceran Lice Infesting House Crow, *Corvus splendens* (Insecta: Phthiraptera: Amblycera)

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Abstract

The present report furnishes information regarding the analysis of crop contents of two amblyceran louse (*Menacanthus gonophaeus* and *Myrsidea bakttitar*) infesting house crow (*Corvus splendens*). The haematophagous nature of both the species has been recorded. On the basis of crop contents *M. gonophaeus* appeared to be a haematophagous louse, as 89% of the specimens contained red content compatible with host blood in their crops along with feather barbules. The percentage of blood in the crops of adults (94%) was comparatively higher than three nymphal instars stages (83%). On the other hand, *M. bakttitar* was found to be a non-haematophagous species as no red content (compatible with host blood) was not detected in the crops. LM (Light Microscopy) studies of both the louse were also performed. The ventral side of the head of *M. gonophaeus* bears a well developed post-palpal spine, which may be used for the accomplishment of blood requirement.

Keywords: Amblycera; Crow Lice; Haematophagy; *Menacanthus gonophaeus; Myrsidea bakttitar*; Phthiraptera

Introduction

Chewing Lice are obligatory parasitic insects belonging to the Order Phthiraptera (Class: Insecta). There are four recognized suborders: Anoplura, Amblycera, Ischnocera and Rhynchophthirina [1]. Members of Amblycera exhibit considerable diversity with respect to feeding habits. Some species are purely feather feeders, others consume the host blood occasionally and still others are exclusively haematophagous [2]. Due to active habits and haematophagous nature, the amblyceran lice are more injurious to host birds than ischnoceran lice (which are generally sluggish and feather feeders).

There are eight phthirapteran species have been listed [3] of chewing lice on the house crow (*Corvus splendens* Vieillot) throughout the world. Out of the eight species, six belong to the suborder Amblycera (e.g. *Menacanthus gonophaeus* Burmeister, *Menacanthus merisuoi* Eichler, *Myrsidea insolita* Kellogg and Paine, *Myrsidea splendenticola* Klockenhoff, *Myrsidea bakttitar* Ansari, and *Colpocephalum fregili* Denny) while the remaining two belong to the suborder ischnocera (e.g. *Brueelia saliemi* Ansari and *Philopterus lahorensis* Ansari). The occurrence of *Menacanthus gonophaeus* and *Myrsidea bakttitar* on Indian house crow has already been recorded [4].

Survey of literature indicates that the haematophagous amblyceran lice are more harmful because they may act as transmitter of bacteria and viruses and can also act as intermediate host of filarial

worms. Two poultry lice (*Menacanthus stramineus* and *Menopon gallinae*) have been convicted to transmit strains like *Pasteurella multocida*, *Salmonella gallinarum*, *Streptococcus equinus*, *Escherichia coli* and *Ornithosis bedsoniae* among the domestic fowls [5-8]. Moreover, certain amblyceran species like *Dennyus hirundinis*, *Pseudomenopon pilosum*, *Actornithophilus limosae*, *Trinoton anserinum*, *Pseudomenopon species* and *Austromenopon phaeopodis* (infesting African swift, American coot, Marbled godwit, Mute swan, Red-necked grebe and Whimbrel respectively) can transmit the filarial worms (*Filaria cypseli*, *Pelecitus fulicaeatrae*, *Eulimdana wongae*, *Sarconema eurycera* and *Eulimdana bainae*) among their respective hosts [9,10]. However, Crow lice have not been investigated from this point of view. The haematophagous lice affect the growth, haematology and the production of host birds [11,12]. Heavy infestation of haematophagous lice may causes RBC (Red Blood Cell) reduction and resulting in death of host bird due to Hyper Chromic Anaemia [11,13,14].

Present study provides information about the feeding habits of two menoponid amblyceran lice (*Menacanthus gonophaeus* and *Myrsidea bakttitar*) infesting house crow *Corvus splendens* in district Rampur (UP) India on the basis of the analyzing of crop content. Light Microscopy studies of the ventral side of the head of both lice have also been performed to record the nature and structure of mouth parts.

Materials and Methods

Specimen collection

Fresh specimens of Crow lice were collected from six host birds by a modified fumigation method [15]. In fumigation method we placed the bird in a large transparent polythene bag containing a ball of cotton wad soaked with chloroform; the legs were tied and the head protruded out to allow normal breathing; the bird took out after 15 minutes and fluffed the feathers manually on white plastic sheet to recover the louse load; examined the body feathers closely under Megnascope to remove the remaining louse load. The obtained louse load was separated species wise, sex wise, stage wise and stored in 70% alcohol. The term "louse load" refers to all kinds of lice found on host bird including one or more species.

Crop content analysis

To conform the haematophagous nature, freshly collected specimens (adults and three nymphal instars) of both the louse species were directly (without processed) dissected in Insect Ringer's Solution under the Stereozoom Trinocular Microscope. The dissections were performed on a glass slide with the help of extremely sharp entomological pins. The crop of the specimens were taken out and teased to examine the gut contents closely because amblyceran lice exhibits diversified feeding habits i.e. feather feeders, partial blood feeders and exclusively blood feeders (haematophagous).

Light microscopy studies

To record the morphology and nature of mouth parts the permanent slides were prepared according to the technique proposed by Palma [16]. Selected specimens treated with 20% aqueous solution of potassium hydroxide (KOH) for whole night at room temperature. To wipe out the dissolved internal organs, KOH solution is replaced by water for 30 minutes. After that for neutralizing, the specimens treated with 10% aqueous solution of acetic acid for a period of about one hour. The neutralized specimens then stained with highly concentrated solution of acid fuchsin for some time. All stained specimens then gradually dehydrated by ethanol series of increasing concentration (i.e. 30%, 50%, 70%, 90% and 100%). In last, the mounting was done with diluted Canada balsam with xylene.

Image analysis

The permanent slides were visualized under the Trinocular Research Microscope and images were taken with the help of attached camera. The images were analyzed for study the nature of mouth parts.

Results

Menacanthus gonophaeus

During present studies 89% of 72 specimens of *M. gonophaeus* (Figure 1C) were found with red content (compatible to host blood) in their crops along with the feather barbules. A close examination of crop content shows that the percentage of blood in adult females was higher (100%; n = 18) than adult males (89%; n = 18; Table 1). Among the nymphal instars, percentage of blood carried by 3rd instar was higher (100%; n = 12) than 2nd instar nymph (83%; n = 12) and 1st instar nymph (67%; n = 12). The above data suggests that the adult stages are more involved (94%; n = 36) in haematophagy than nymphal stages (83%; n = 36). Hence, the data clearly shows that the amblyceran Crow louse, *M. gonophaeus* is haematophagous in nature.

Species	Stage	No. of lice examined	No. of lice found with red content in crop	Percentage of lice with red content in crop
Menacanthus gonophaeus	Adult Male	18	16	89%
	Adult Female	18	18	100%
	3rd Instar Nymph	12	12	100%
	2nd Instar Nymph	12	10	83%
	1st Instar Nymph	12	08	67%
Total		72	64	89%

Table 1: Showing the percentage of different life cycle stages of *Menacanthus gonophaeus* carrying red content compatible with host blood in their crops.

Light Microscopy examination of the head of louse, *Menacanthus gonophaeus* reveals that sharply pointed mandibles are located towards the frontal margin of the head (Figure 1A). The framework of both the mandibles is very sharp and chitinized and may be used for cutting the host skin and feathers barbules. A well developed labium almost touches the clypeal margin anteriorly. One pair maxillary palp (four segmented each) arises from either side of labium from the base of mandible. One pair antennae (four segmented each) with slightly expanded pedicel and undivided terminal segment, remains concealed beneath the head. Moreover, a spinous process called post-palpal spine arises from the base of maxillary palp. It might be presumably used to pierce the host skin to make blood pool.

Myrsidea bakttitar

Microscopic studies of different life cycle stages of *M. bakttitar* (Figure 1D) show that 3rd instar, 2nd instar and 1st instar nymph (30 each) were found with feather barbules in their crops. Likewise, the examination of crop contents of adult males and adult females (30 each) also shows the presence of feather barbules. The presence of epidermal debris was also detected in the crop of some lice. But any red content compatible to host blood was not found in the crops of any stage of life cycle of *M. bakttitar*. Hence, the data clearly indicates that the amblyceran Crow louse *M. bakttitar* is non-haematophagous in nature.

Light Microscopy of the head of *M. bakttitar* reveals that both the mandibles are roughly triangular and densely chitinized but not sharply pointed (Figure 1B). Hypopharynx is well developed and lies just below the mandibles. The pedicels of both the antennae are prominent with numerous tactile pegs at the tip. The four segmented maxillary palp arises from the base of mandible. The fourth segment of maxillary palp is comparatively longer than third and second segment. Close examination of the head of aforesaid louse does not indicate the presence of post-palpal spine as found in case of the *M. gonophaeus*.

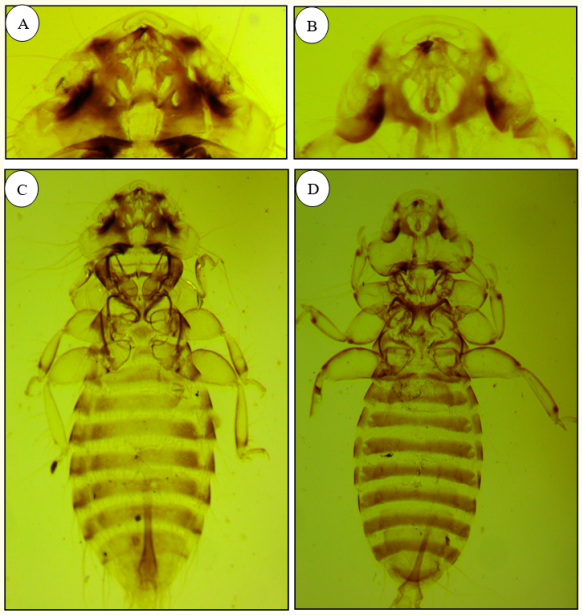

Figure 1: Showing the LM (Light Microscopy) photographs of both the Crow lice.

A. Enlarged view of head of *Menacanthus gonophaeus* showing the post-palpal spine.
B. Enlarged view of head of *Myrsidea bakttitar* showing the nature of mandibles.
C. Whole body of *Menacanthus gonophaeus* male.
D. Whole body of *Myrsidea bakttitar* male.

Discussion

Lakshminarayana [4] listed thirteen phthiraperan species on *Corvus splendens* (07 ischnoceran and 06 amblyceran species).

Out of six amblyceran, 04 belong to genus *Myrsidea* (*M. bakttitar*, *M. cornicis*, *M. nigra* and *M. splendens*), 01 to genus *Menacanthus* (*M. masudi*) and 01 to genus *Colpocephalum* (*C. fregili*). However, only eight phthirapteran species were recognized on house crow [3] including 06 amblyceran species (*Menacanthus gonophaeus*, *Menacanthus merisuoi*, *Myrsidea insolita*, *Myrsidea splendenticola*, *Myrsidea bakttitar* and *Colpocephalum fregili*). The morphological characterstics of specimens of amblyceran lice collected during present investigation conform to *Menacanthus gonophaeus* and *Myrsidea bakttitar*.

A review on available literature shows that the haematophagous nature of three species of *Menacanthus* (*M. eurysternus*, *M. abdominalis* and *M. kalatitar* infesting common mynah, common quail and black partridge, respectively) have already been studied [17-19]. Apart from this, few more amblyceran menoponids such as *Menopon gallinae*, *Hohorstiella lata* and *Ciconiphilus decimfasciatus* have also been found to be habitual blood feeders [20-22]. However, Contrary to the general belief that all the amblyceran species consume the host blood in varying degree, a common mynah louse *Myrsidea invadens* and a pigeon louse *Colpocephalum turbinatum* have been found to be feather feeders [23,24].

Generally, avian lice do not bear any mouthparts which can be used to pierce the host blood vessel (to draw the blood for feeding) and hence called "telmophages" [25]. Avian Amblycera bear biting type of mouthparts but modification from chewing to piercing have taken place in few species e.g. *Trichodectes canis* [26]. In *Trichodectes canis* an attempt has made to correlate the presence of blood in gut with the nature of mandibles [27]. Close examination of the crop contents reveal that both the species (*Menacanthus gonophaeus* and *Myrsidea bakttitar*) do not bear any triturating structure (like sand, grain, mica, quartz etc.) for grinding the feather barbules. The presence of pieces of egg shells, skin debris and any body part of lice and other insects were also not detected in the crop which shows that the aforesaid both species are not involved in cannibalism or predation at least *in vivo* condition. However, *Colpocephalum turbinatum* (a pigeon louse) has been reported to be involved in cannibalism [28].

Conclusion

The present study shows that the *Menacanthus gonophaeus* is strongly involved in haematophagy. The percentage of blood carrying females was higher than males but the overall differences were not found significant. However, the overall percentage of blood carrying adults was comparatively higher than that of nymphal instars. Among the nymphal instars, third instar nymph exhibited greater degree of haematophagy than second instar and the minimum percentage of haematophagy was exhibited by first instar nymphs. In other words sex related difference in haematophagy of *M. gonophaeus* was not found significant but stage related differences remained clearly marked. In *Menacanthus gonophaeus* the post-palpal spine might be used to puncture the host skin to make small blood pool. On the other hand, another Crow louse *Myrsidea bakttitar* does not appears to be haematophagous in nature on the basis of crop contents. The mandibles of *M. bakttitar* are comparatively blunt and post-palpal spine was not detected. Close examination reveal that the presence of pieces of egg shells, skin debris and any body part of lice and other insects not detected in the crop which shows that the aforesaid both species (*Menacanthus gonophaeus* and *Myrsidea bakttitar*) were not involved in cannibalism or predation.

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