

Morphological features of three nymphal instars of *Companulotes bidentatus compar* (Phthiraptera: Ischnocera) infesting blue rock pigeon, *Columba livia*

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Abstract: Three nymphal instars of red *C.b. compar* differ from each other not only size, abdominal segmentation, chitinization but also in the number of setae occurring on head, thorax and abdomen. First instar carries only one marginal temporal setae which are two in second instar. Second instars bear only one long marginal setae on lateral margin of metanotum while third instars bear two such setae. First instar lacks abdominal segmentation, which is slightly marked in second instar and distinct in third instar.

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1. Introduction

In louse taxonomy, the morphological features of adults are generally used. Three instars of nymphs of Phthiraptera resemble to each other to a considerable extent and are difficult to differentiate. Thus, the identification of different nymphal instars of any phthirapteran species is a difficult task. Selected phthirapterologists have performed studies on the morphology of nymphs of few avian lice. Workers like, Agarwal (1967), Martin (1934), Wilson (1939), Conci (1956a, b), Arora and Chopra (1959), Modrejska and Zlotorzycza (1987), Saxena et al (1998), Smith (2000), Cichino and Castro (2002), Silke *et al.*, (2006) and Rajput *et al.*, (2010) have provided information about nymph morphology of few lice. Further studies in this regard was made by Keler (1952). Mey (1994) made detailed study on the external morphology of nymphal stages of Phthiraptera. Workers like Page *et al.*, (1995) and Price and Hellenthal (1996) have recognized the importance of nymphal morphology in elucidating the systematics and louse relationship.

Present report deals with the morphological features of three instars of nymphs of an ischnoceran pigeon louse, *Companulotes bidentatus compar*, in order to furnish information on their diagnostic characters.

2. Materials and Methods

The nymphal instars of *C.b. compar* were obtained by culturing the lice *in vitro* condition (Gupta *et al.*, 2007). For L.M. studies, nymphs were maceration with 20% KOH, washed with water, treated with 10% Acetic acid, stained, dehydrated, cleared and mounted. For SEM, nymphs were fixed in 0.2 M phosphate buffer, critically dried, arranged on

metal stub, covered with double sided cello tape, gold coated and examined under Mode Leo-435 VP- Scanning Electron Microscope.

3. Observations

First Instar Nymph:

The description of the first instar nymph is based on the characters of 4-5 days old specimens reared in the laboratory. It is elongated in shape and creamy white in colour (Plate I Fig. 1; Plate II Photo-2).

Head is longer than broad, narrow, triangular; forehead trapezoidal, rounded in front; preantennal region slightly narrower than the post-antennal and temporal regions; post antennal region is widest just behind the eyes; temples rounded with narrow, indistinct, yellowish marginal band and short seta disposed; eyes protruding, rounded, ocular blotch distinct: occipital margin with a small seta; antennae are filiform having five segments. Gular plate and other structures remain unpigmented and unsclerotized and therefore, are not clearly visible. The chaetotaxy of the head of the first instar nymph does not conform to the arrangement in the adult, nor does it show any variation in the two succeeding instars.

The prothorax is rectangular, small, lateral margins straight. The pterothorax is slightly longer than the prothorax and has a slightly concave posterior margin. The legs are well developed; first pair of legs is the shortest. The prothorax bears one long seta on either side at the posterolateral angle on its dorsal surface. The pterothorax bears dorsally one long seta.

The tergal chaetotaxy as follows- segment II bears 1 setae, segment III to VIII, 1 median seta and 1 seta at each postero-lateral angle. The sternal chaetotaxy is - one seta at each posterolateral angle on segments III- VIII.

Plate I

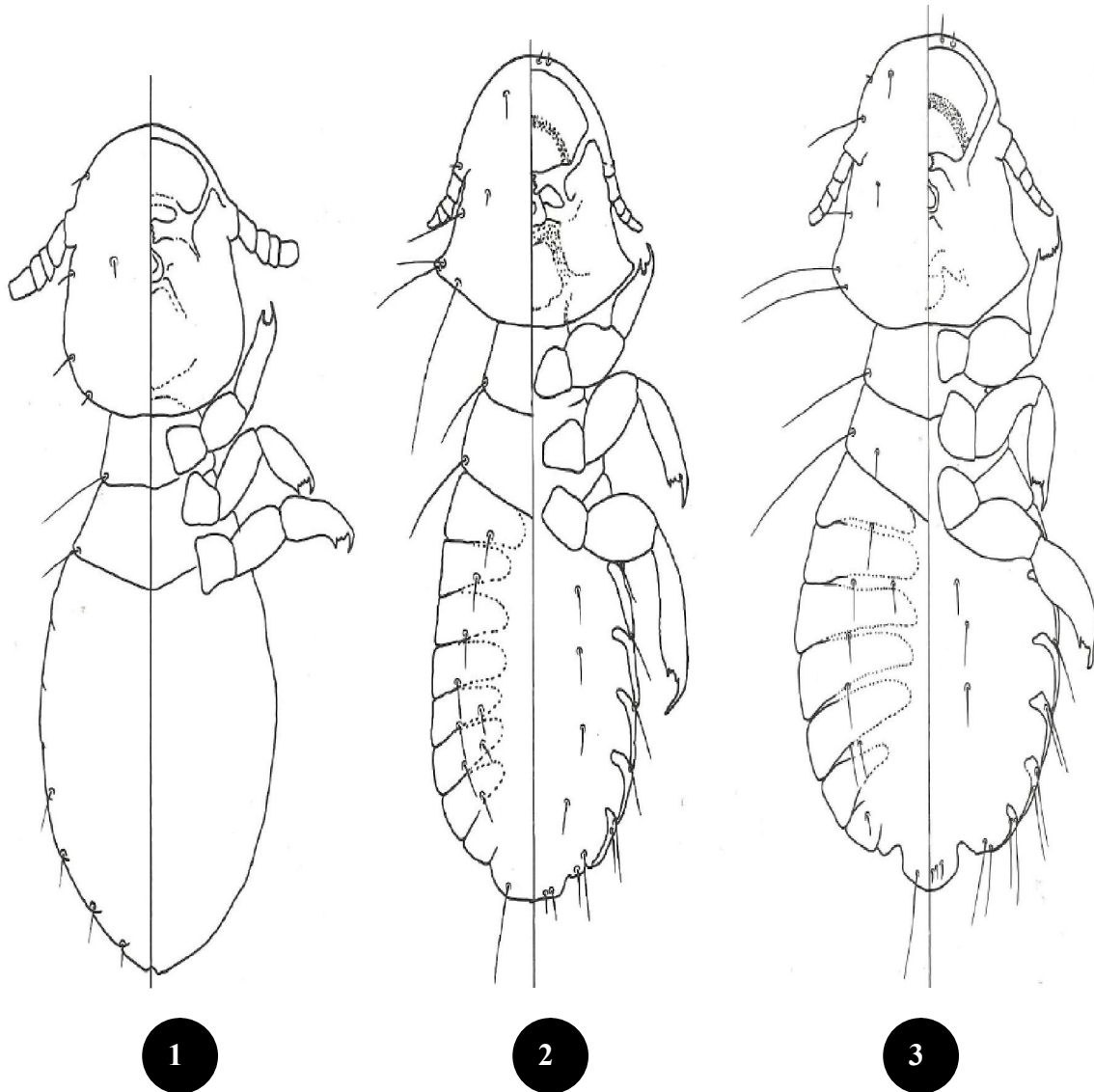


Plate-I (Figs 1-3): Diagrammatic sketch of three nymphal instars of *C. b. compar*.

Fig. 1. First instar nymph

Fig. 2. Second instar nymph

Fig. 3. Third instar nymph

Second Instar Nymph:

The second instar nymph resembles the first instar nymph in general characters and appearance but differs in size, chaetotaxy and pigmentation (Fig. 2; Plate I-Photo-2).

The description of the second instar nymph is based on characters of 4 days old specimens reared in the laboratory.

The head of the second instar nymph is slightly larger than that of first instar. It shows browning at some places, specially near the incisures, mandibles and other structures indicating hardening of these structure. The gular plate is weak. The lateral margins of pro-and pterothorax and the dorso-lateral margins of the legs also become brownish and represent the first visible indication of sclerotization in

the thoracic region. Three long setae of the dorsal side of the pterothorax, on each side.

The abdomen of the second instar nymph is longer than that of the first instar nymph and the segmentation becomes more evident. There is a marked increase in the number of tergal setae, II- 1

median; III- 1 median, 1 lateral; IV- 1 median, 2 lateral; V-2 median, 2 lateral, VI- 2 median, 2 lateral, VII- 2 median, 2 lateral, VIII- 1 median, 1 lateral. The number of sternal setae from segment III- V- 1, VI- VIII- 2, IX- 1.

Plate II



1

2

3

Plate-II (Photos 1-3): SEM Photograph of three nymphal instars of *C.b.compar*
 Photo.1: First instar
 Photo.2: Second instar
 Photo.3: Third instar

Third Instar Nymph:

The third instar nymph resembles the second instar nymph in general characters. Characters in which the third instar differs from the second instar and approach the adult are increase in size, enlargement of the pigmented areas on the head, thorax and legs and abdomen, and increase in the number of setae (Fig. 3; Plate I Photo-3).

The head shows greater browning of the mandibles, incassations and others structure becomes distinct (showing further hardening). The pro and pterothorax of the third instar nymph resemble to those of the second instar nymph in shape and chaetotaxy, but the pigmented areas on the pterothorax become increased as pigmentation of the lateral margins is now evident. The legs are almost like those of the second instar nymph but show further hardening.

The number of tergal setae in each row on segments II- VIII shows an increase in third instar (II-2 median, III- 2 median, 1 lateral, IV- 2 median, 2 lateral; V- 2 median, 2 lateral; VI- 2 median, 3 lateral; VII- 2 median, 3 lateral; VIII- 2 median, 2 lateral). The number of sternal setae from segment III to V- 1, VI- 2, VII- 3, VIII- 3 and IX- 2.

4. Discussion

Biting and sucking lice are hemimetabous insects and newly hatched nymphs resemble to adults in several respect. Hence, the three nymphal instars are difficult to differentiate (specially within one or related genera). Nymphal instars of some species can be differentiated owing to the presence of peculiar setae. For example, in *Laemobothrion cubense*, in successive nymphal instars, number of setae transform into thick thorns (Eichler, 1963). In case of pigeon louse, *Columbicola columbae*, clypeal setae develop only in third nymphal instar (Mey, 1994). Lonc and Modrzeweka (1987) found that the head width is the best discriminator and can be safely used for the identification of the nymphal instar and in the separation within the species. Mey (1994) indicated that abdominal plates of first stage nymph are rarely delimited and never sclerotized. Survey of literature revealed that apart from evident differences in body size, relative size of abdomen and the rising chitinization of cuticle, the nymphal stages can also be distinguished on the basis of presence or absence of spiracles. Furthermore, the number and forms of setae are always specific to particular stage and during development, the number of setae increases. Present studies clearly indicate that three nymphal instars of *C.b.compar* can be differentiated on account of certain diagnostic characters of abdominal segments. The disposition of setae on pterothorax and different abdominal segments increases in successive instars.

For instance first instar can be differentiated from second instar on the basis on number of marginal temporal sites which is one in first instar nymph and two into in second instar nymphs. Likewise, second instar can be separated from third instar nymph on the basis of long marginal setae on lateral margins of metanotum. It is only one is second instar and two in third larval instar. First instar nymph lacks abdominal segmentation, which is slightly marked in second and distinct in third instar nymphs.

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