

Mating behaviour of *Campanulotes bidentatus compar* (Burmeister, 1838) (Phthiraptera: Ischnocera)

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Abstract

Most of the phthirapteran ectoparasite reproduces sexually while some species show parthenogenetic reproduction. *Campanulotes bidentatus compar* exhibited sub-feminal mating behaviour (i.e. male is under the female) similar to certain other Mallophaga. The complete copulation process takes an average of 12.33 min.

Keywords: Behaviour, *Campanulotes bidentatus compar*, copulation, mating, phthiraptera and sub-feminal

Introduction

Generally, most of the phthirapteran ectoparasites reproduce sexually. Certain species involves mating between two individuals of the opposite sex (i.e. male and female). Further complexity of sexual reproduction might be associated with the structure of genitalia. However, parthenogenetic reproduction has been noted in some species of genus *Bovicola* e.g. cattle biting louse *Bovicola bovis* (Matthysse, 1946 and Mock, 1974) [8], deer louse, *B. longicornis* (Andrews, 1971) [2] and *B. tibialis* (Westrom *et al.* 1976) [15].

The literature on the mating behaviour of phthirapteran species has rarely appeared. However, selected workers have discussed mating posture and duration of mating in few species while investigating different aspects of their biology (Wilson, 1939; Schmutz, 1955; Arora and Chopra, 1957; Eichler, 1963; Agarwal, 1967 and Trivedi, 1991) [16, 11, 3, 4, 1, 14]. The present study deals with the mating behaviour of small pigeon louse, *Campanulotes bidentatus compar*.

Materials and Methods

Information regarding mating behaviour of *Campanulotes bidentatus compar* has been recorded through direct observation under a stereozoom trinocular microscope. Fresh adult lice (male and female) were placed in culture jar containing feathers of birds and kept over hot plate maintained at 35±1°C. During present investigation an attempt has been made to observe behaviour of both sex prior to pairing, the posture adopted during copulation, frequency of muscular contraction and jerk movement, duration of copulation (in case of unknown age adults collected from host as well as freshly emerged adults obtained from culture stock) and the impact of 48 hours separation on mating duration etc.

Observation

It has been observed that lice mate only after 72-80 hours of final moult after they have gone through complete hardening and darkening (Singh *et al.* 2010) [13]. In *C. bidentatus compar* normally copulation takes place during the late morning and an afternoon (11:00 a.m. to 3:00 p.m.). Male and females which are isolated from each other for a day or two promptly mate when placed together.

In the beginning stages of copulation, the male approaches behind the female and crawls beneath the abdomen of it. Then it draws dorsal surface of its head and thorax in such a way that it comes to lie under the sterna segment of posterior abdomen region of female and finally female comes to lie on top of male (Fig. 1). Thereafter, male rapidly directs its antennae upward and firmly grips the trochanter of third legs of a female by the hook-like process on the third antennal segment. This process is constricted against the trochanter of the third leg of its side of the female. Third and fourth segments of antennae remained free. While small projection on the dorsal side of the first antennal segment works as a support against the legs. Furthermore, female flexes its antennae downward and holds the feather below its legs and mandibles to ensure a firm grip. However in some cases, female holds the male by its last pair of legs. Subsequently, male draws its abdomen upwards and stretch it forward till the abdominal extremity is brought in contact with the ventro-terminal part of the female abdomen (i.e. female genital opening). At the same time, female raises its posterior portion of the abdomen to facilitate the male. Terminal upward portion of abdomen exhibits jerks lateral movements before the extrusion of aedeagus. Male jerks the abdominal extremity of female several times so that vulva gets opened and then finally extruded aedeagus (male genitalia) is inserted into the genital chamber of a female. Thus the process of mating starts.

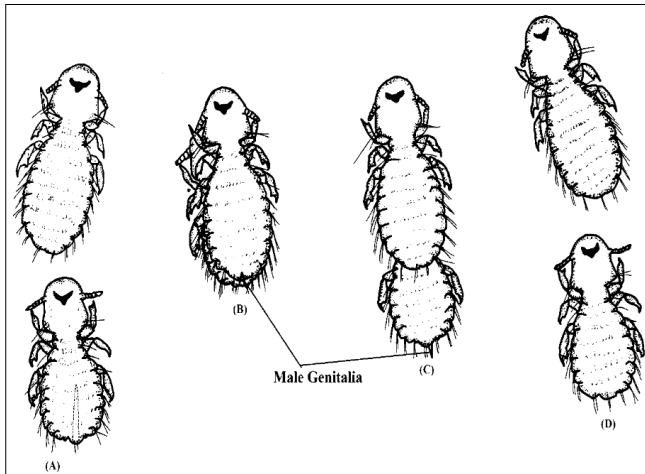


Fig 1: Diagrammatic Representation of Different Stages of Mating of *Campanulotes bidentatus compar*

During the process of copulation, male exhibits regular movement of contraction in an upturned posterior portion of the abdomen (3-7 times have been observed per minute). Jerk movements are more frequent during the first few movements (7-10/ min.) then later period. However, the female show contractions at a rate of 1/min. in earlier stages and up to 1 per 5 minutes in the later part. Aedeagus (genitalia) of males come out of the female genital chamber during the copulation process. But quickly it is pushed back. This happens 3-5 times during the copulation process.

An attempt has also been made to record the duration of the mating process. The data related to the duration of copulation in case of 3 pairs of unknown age has been noted (Table. 1). The copulation process takes an average of 12.33 minute. Mating usually lasts from a few minutes to 10 hours but in some instance, it continued even longer. Females copulate several times during its lifetime and are ready for mating as early as an hour after egg laying.

Table 1: Showings the Duration of Mating Process in *Campanulotes bidentatus compar*

Pair Number	Duration of Copulation (in minutes)
	Adult Male and Female of Unknown Age
1.	9
2.	13
3.	15
Average Time	12.33

Discussion

Certain workers like Arora and Chopra (1957) [3], Eichler (1963) [4], Agarwal (1967) [1] reported that prior to paring males of some lice species vibrate antennae in an excited state while receptive females respond by jerk movement of their body and antennae. In case of anopluran species, *Haematopinus suis*, male exhibited shacking movement of a head at the beginning of mating (Florence, 1921) [5] while *Gonides dissimilis* do not show such phenomenon related to courtship (Sharma, 1995) [12].

Phthirapterans exhibited high variation in the duration of copulation. It may fluctuate between a few minutes to 2 days. For instance, *Ibidoecus plataleae* takes 34-40 hour (Pfleger, 1929) [10]. Schmutz (1955) [11] reported 10-15 seconds in *Bovicola caprae*, 10-15 minute in *Trimenopon hispidium*, 2½ minutes in *Columbicola columbae* whereas mating time of has been noted as 10-75 minutes by Martin

(1934). However, in case of *Falcolipeurus frater*, mating lasts for 10-40 hours (Agarwal, 1967) [1], *Ibidoecus* species remain in copulation position for 40 minutes whereas *Lipeurus tropicalis* mating lasts for 47-51 minutes (Arora and Chopra, 1957) [3]. Species which takes very short duration for copulation seems to exhibit rapid ejaculation of semen as a result of the powerful ejaculation pump.

Mallophagans exhibited peculiar mating posture. Prior to mating, *C. columbae* males comes below female, firmly clasping her with the help of feelers while male of *T. hispidium* lies on the back of the female and holds fast with its tibia spines (subgenital position). Schmutz (1955) [11] describes them as "variant of supra-feminal copulation". *Zoxylpeurus* male adopts similar copulation position as in *Columbicola* (Oniki, 1999) [9]. However, *Neocolpociphalum* species copulates with the tips of dorsum together but head turned away while in case of *Cuculicella letirostris*, both lice lie side by side in form of V shape and male pushes the end of its dorsum below that of the female. Workers like Arora and Chopra (1957) [3], Agarwal (1967) [1] and Sharma (1995) [12] recorded the similar sub-feminal posture of lice during copulation as described by Schmutz (1955) [11] on some phthirapteran species such as *L. tropicalis*, *F. frater* and *G. dissimilis*. In present study also, *C. bidentatus compar* show similar (sub-feminal) posture during mating.

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We also declare that this manuscript does not violate any copyright or other personal proprietary right of any person or entity and it contains no abusive, defamatory, obscene or fraudulent statements or any other statements that are unlawful in any way.

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