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New record of an amblyceran species, *Heterodoxus spiniger* (Enderlein, 1909) (Phthiraptera: Insecta) on the dogs, C*anis familiaris* Linnaeus, 1758 from Hayrana, India

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Abstract
The examination of street dogs, scientifically known as *Canis familiaris* Linnaeus, 1758, was carried out identify the occurrence of phthirapteran species in district Panchkula, Haryana during 2022-2024 and recorded only one phthirapteran species, *Heterodoxus spiniger* (Enderlein, 1909). The present report furnishes the first information of *H. spiniger* infestation on the dogs from Haryana, India.

Keywords: Amblyceran, phthiraptera, *Heterodoxus spiniger*, *Canis familiaris*, 1758

Introduction
The dogs, *Canis familiaris* Linnaeus, 1758 is harbor, two phthirapoteran species *i.e. Trichodectes canis* and *Heterodoxus spiniger* (Enderlein, 1909) all over the world (Jittapalapong *et al.*, 2008; Johnson & Calyton, 2003; Norhidayu *et al.*, 2012; Torres & Figueredo, 2007 and Troyo *et.al.*, 2012) [4, 5, 11, 20, 21]. Jittapalapong *et al.*, 2008) [4] given the spatial distribution of *H. spiniger* in South-East Asia and also workers *i.e.* Bermudez & Miranda, 2011; Gonzalez *et al.*, 2004; Torres & Figueredo, 2007 and Venzal *et al.*, 2012 [1, 3, 20, 23] documented in American continent. Lakshiminarayana, 1979 [8] had prepared a synoptic list of avian and mammals Phthiraptera of India and neighbouring countries. Morphology of *H. spiniger* have been provided by Tyagi *et al.*, 2009; Keller, 1971; Sultan and Khalafalla, 2014; Symmons, 1952; Yoshizawa and Johnson, 2006; Werneck, 1956 and Zlotorzycka *et al.*, 1995 [22, 6, 17, 18, 25, 24, 26]. Scrutiny of the literature revealed that the taxonomic study on street dogs was not reported in Haryana, India. This report provides findings concerning the morphological characteristics of *Heterodoxus spiniger* (Enderlein, 1909) in association with the Dogs, *Canis familiaris* Linnaeus, 1758, first time from Haryana, India.

Material and Methods
A total of 20 dogs, *Canis familiaris* Linnaeus, 1758, were examined from various locations around the Khol Hi-Raitan Wildlife Sanctuary, in the Panchkula district of Haryana, during the survey from 2022-2024. The examination of the street dogs was conducted using technique given by Lewis *et al.*, 1967 [9], focusing on different anatomical sites on the hosts with the assistance of a magnifying lens equipped with light sources. Lice obtained from different areas of the body were meticulously selected and transferred into glass vials filled with 70% ethanol, with a distinct vial designated for each individual host. Subsequently, the samples were categorized by species, sex, and developmental stage under a Stereozoom Trinocular Microscope. For light microscopic study, the specimens were macerated in Pottasium Hydroxide (10%), subsequently rinsed with distilled water, treated with acetic acid, dehydrated using different grades of ethyl alcohol, cleared in xylene, and ultimately mounted in Canada balsam.

Results and Discussion
***Heterodoxus spiniger* (Enderlein, 1909)**
Type host: Dog, *Canis familiaris* Linnaeus, 1758

a. Adult male (Plate I, Figs.1-6)
The head is triangular shape. On the ventral side of the head, there is a postpalpal process located behind the maxillary palp, a distinctive feature of the family Boopidae. The antennary fossa divided into two parts: the anterior and the larger posterior basin, which characterized a pronounced transverse groove. The latter section also contains several prominent protuberances. The thorax was observed to be longer than the head. The abdomen measured twice its width, exhibiting a slender and oval shape. Normal setae are present near the edges of each somatic pleurite, which can be discerned under light microscopy. The claws exhibit a rough texture characterized by thick, transverse, and undulating grooves. Additionally, the tips of the claws are curved. The male reproductive organs are located within segments IV through IX.

b. Adult female (Plate II, Figs.7-12):
The head of the female is also triangular and trapezoidal form. The mandibles are robustly chitinized, displaying a notched, sickle-like shape that ends in denticles and partially overlaps. An undulating suture separates the clypeus from the rest of the head. The thorax is elongated and narrower than the head. The pterothorax is slightly longer than the prothorax. Both the prosternum and metasternum are well-developed, with the prosternum featuring one seta and the metasternum having two setae. The first pair of legs is the shortest, while the tibiae and femora of the first and second pairs are particularly slender. The claws are short and delicate, and the legs are equipped with setae arranged in a comb-like pattern. The abdomen comprises nine segments, with the first segment containing four setae, while the tergites of the following segments show a high level of chitinization. The posterior section of the abdomen is hollow and lacks setae. The area around the spiracles in the abdominal region is consistently lighter than the rest of the body. The posterior end features a gonopore, which is also free of setae.
The genus *Heterodoxus* Le Souef and Bullen, 1902 comprises 24 species which are parasitic on marsupials (Price *et al.*, 2003) [15]. This louse is distinguished by its

swift and vigorous movement, usually found at the proximal end of the hair shaft, near the skin, especially in the postero-dorsal region of the host's body (Roberts and Janovy, 2000) [16]. The species *H. spiniger* is frequently observed on street dogs, but it has also been found on other members of the Canidae family. Researchers such as Keler (1971) [6] and Plomely (1939) [14] have documented its presence on two species of Wallaby: *Wallabia agilis* and *W. bicolor*, respectively. Emerson and Stojanovich, 1996, observed a new species of Phthiraptera from the water mongoose. Workers *i.e.* Timm and Price, 1994 [19] and Perez and Palma, 2001 [12] have also described the morphological features of the genus *Felicola* from a Costa Rican Jaguar, *Panthera onca* and *Iberian lynx* respectively.

Survey of literature reveals that the dog louse, *H. spiniger* is an intermediate host for helminthic ectoparasites and filarial worm, *Dipetalonema recondititum* (Nelson, 1962) [10]. It is also known to harbor the developmental stages of the tapeworm, *Diphylidium caninum* and the filarial worm *Dipetalonema recondititum*. The latter is an intestinal parasite that can infect dogs, foxes, cats, and occasionally humans (Kettle, 1984) [7]. Pennington and Phelps, 1969[13] reported that 23% of dogs surveyed in Okinawa, Ryukyu Island, were infected with *D. recondititum*, with most of these dogs also infested with *H. spiniger* and the flea, *Ctenocephalides canis*. Larvae of *D. reconditum* were found in both fleas and lice, although the infestation rate for fleas (70%) was notably higher than that for lice (40%).

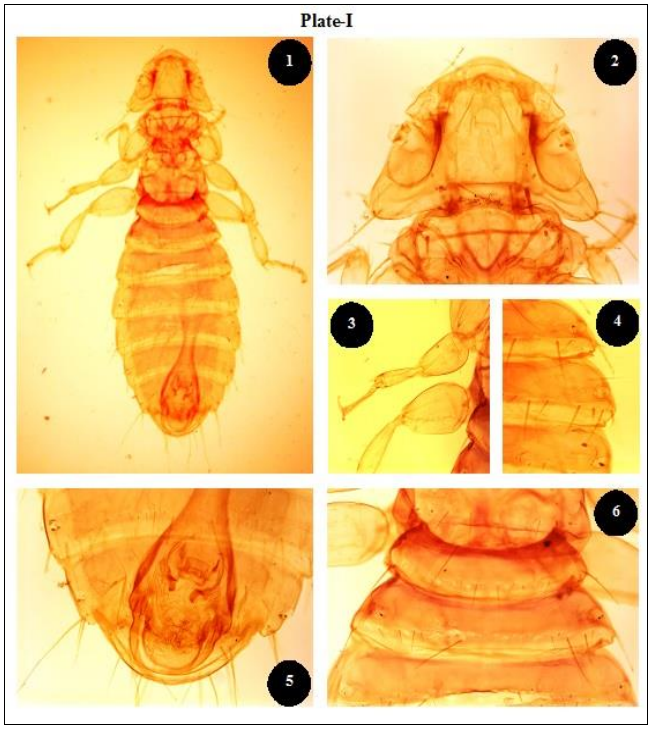

Plate I, Figs. 1-6: LM photographs of *H. spinger* (Male). 1. Adult male, **2.** Enlarged view of the head showing palpal process **3.** Enlarged view of the legs showing the claws **4.** Enlarge view of sternum showing spiracles.**5.** Enlarge view of the ventral showing genitalia **6.** Enlarge view of the thorax.

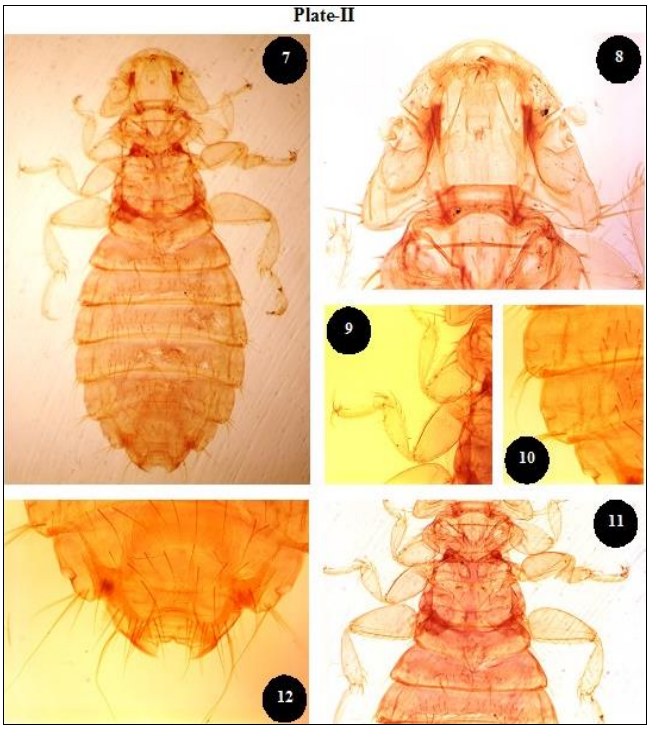

Plate II, Fig 2: 7-12: LM photographs of H. spinger (Female). 7. Adult male, 8. Enlarged view of the head showing palpal process 9. Enlarged view of the leg showing claws 10. Enlarge view of sternum showing spiracles.11. Enlarge view of the ventral showing genitalia 12. Enlarge view of the thorax.

Conclusion

Our initial survey reveals the preliminary findings concerning the infestation of street dogs by *H. spiniger* in Haryana, India. There is a notable deficiency of information regarding the morphological traits of *H. spiniger* that affect dogs, *Canis familiaris* Linnaeus, 1758, within the state of Haryana. Consequently, the present report offers valuable insights into the morphology of both male and female, amblyceran louse, *H. spiniger* on dog, *C. familiaris* employing Light Microscopy techniques in Haryana India.

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Competing interest

The authors have stated that they have no competing interests concerning this work.

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