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First Record of *Leucopholis lepidophora* Blanchard, 1850 (Scarabaeidae; Melolonthinae) from Western Himalayas along with a Checklist of the Genus *Leucopholis* from India

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ABSTRACT

Melolonthinae is a subfamily of June beetles and contains many species of agronomic importance in India. It holds major genera like *Brahmina* (Blanchard 1850), *Eotrichia* (Medvedev 1951), *Holotrichia* (Hope 1837) and *Sophrops* (Fairmaire 1887) in India. A survey based on light trap collection was conducted in the terai foot hills of the Western Himalaya in Uttarakhand to check for the presence of the species. During surveys in the years 2021-22 and 2022-23, various chafer beetles were collected to observe the distribution pattern and their hosts. Among these various species, one beetle species is here reported for the first time i.e., *Leucopholis lepidophora* Blanchard, 1850, from Uttarakhand, India. This also represents their first record for Western Himalaya. Their habitus and male genitalia are provided herein to aid in identification. A preliminary checklist of Indian *Leucopholis* is also provided.

Keywords: June Beetles, Light trap, Himalaya, *Leucopholis* sp. new record, range expansion

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INTRODUCTION

India is a biodiversity-rich nation that shares around 6.4% of the world fauna (Chandra et al, 2018). It has been divided into 27 biogeographic zones, of which the Indian Himalaya is classified into 2 biogeographic zones i.e., Trans Himalaya and Himalaya. Further, these two zones can be classified into seven biotic provinces, of which Uttarakhand comes under the Western Himalayas biotic province (Rodgers, Panwar, & Mathur, 2002). It represents the second highest faunal diversity (12022 species/subspecies) after central Himalayas (14183 species/subspecies), which is overall dominated by arthropods, accounting for approximately 86.9% of Indian Himalaya (Chandra & Sindhu, 2009).

Coleoptera is the largest and most diverse order of class Insecta exhibiting the finest diversity in the world (Kim, Park, Choi, & Park, 2017). In India, the Pleurosticti group is mainly divided into four subfamilies i.e., Melolonthinae, Rutelinae, Dynastinae and Cetoniinae. They commonly belonged to the genera *Holotrichia*, *Brahmina* and *Sophrops*, under the subfamily Melolonthinae (Sreedevi, Tyagi, & Sharma, 2014; Pathania, Chandel, Verma, & Mehta, 2015; Bajad, Dadmal, & Undirwade, 2017; Kumar, Sreedevi, & Singh, 2017).

Leucopholis is a genus under Melolonthinae, which was first erected by Dejean (1833) for the spp. *Melolontha alba* Weber, 1801; *Melolontha stigma* Fabricius, 1798; *Melolontha hypoleuca* Wiedemann, 1819; and *Melolontha rorida* Weber, 1801. *Leucopholis* is characterized by the presence of elytral scales, subdued pronotal serrations, and a prosternal process that is flattened, anteriorly ovoid to spindle-shaped, glabrous. At present, it is distributed mostly in the Oriental region with 56 reported species (Banki et al, 2023). In India, it has been reported from the states of Maharashtra, Karnataka, Kerala, Tamil Nadu, Assam, and Meghalaya as major pest species of areca nut, coconut, sugarcane etc., (Kumar, 1999; Adarash, 2014; Kalleshwaraswamy, Adarsha, Naveena, & Sharanabasappa, 2016; Bhawane & Bhanot 2017; Swamy, Ramasamy, Kalleshwaraswamy, & Adarash, 2019).

Until now, *Leucopholis* species have not been documented from many parts of India, which requires the frequent surveys and monitoring to document and record their species distribution in other parts as well. For the first time in the history of the species biodiversity in the Himalayas, we have recognized the single species of *leucopholis* from the Western Himalayas. Finally, a synopsis and Indian check list of *leucopholis* species are provided, along with images and specimens that are currently available.

MATERIALS AND METHODS

Study Area

Surveys were carried out in the summer of 2021–2023 in Uttarakhand, the Northern state of India, at the foothills of the Western Himalaya, with the goal of collecting adult beetles. Survey locations ranged from 30.06680 N to 79.01930 E (Fig. 1). When the adult beetles emerge from the soil at nightfall and settle on the surrounding trees to

feed and mate, from May to September of each year, a powerful 150 watt mercury vapour lamp light trap was placed in the aforementioned site between the evening hours of 7: 15 p.m. to 10:30 p.m.

Along with light trap collection, the beetles were also searched in their host plants with the help of a powerful torch light. As beetles were collected from light traps, and were brought into the laboratory, where they were killed with ethyl-acetate and finally labelled, pinned, and placed in an insect cabinet for further identification.

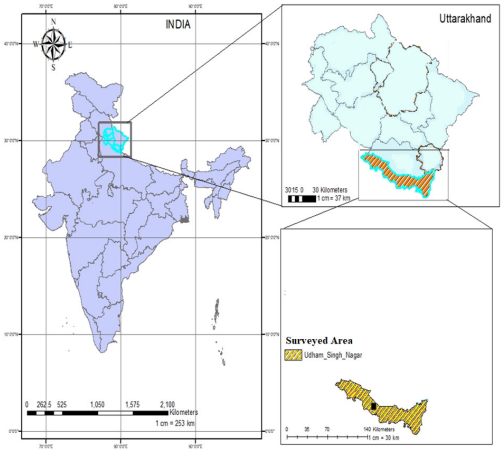

Figure 1. Location of *Leucopholis* sp. collection during 2021-2023.

Specimen Preparation and Microscopy

The *leucopholis* beetle specimens (2) were collected during 2021 to 2023 from the area of Pantnagar locality (29 02’ o 60.00” N to 79 30’59.99” E). Samples concerning the departmental museum of Entomology, College of Agriculture, Pantnagar were also examined for species confirmation using several referred papers (Swamy et al, 2019; Adarasha, Kalleshwaraswamy, & Shivanna, 2023). Later, the abdomen was removed with the help of a pointed needle from the specimen’s body. Genitalia and speculum gastrale were extracted carefully with forceps from the abdomen, and placed in cavity block under 10% KOH for muscle removal, and finally glued to a pointed card and pinned along with the adult male specimen and label. The external morphological characters of the genitalia of specimens were observed through a nikon SMZ745T stereo zoom microscope and adults’ images were obtained with a nikon D5600 digital camera while genitalia image was attached to the microscope using leica auto-montage software. The terminology follows the aedeagus structures by described D’Hotman & Scholtz (1990). Length measurements are from the anterior margin of the clypeus to the apices of the elytra. Data pertaining to *Leucopholis* species and their distribution were searched thoroughly for their documentation and distribution in India (Burmeister, 1855; Sharp, 1876; Brenske, 1892,Brenske, 1894; Barlow, 1899; Dalla Torre, 1912, Sabatinelli, 1993; Thurekar et al, 2012; Swami et al, 2019; Gosh et al, 2022; Adarasha, Kalleshwaraswamy, & Shivanna, 2023).

RESULTS

The present investigation was based on the morphological identification, and structure of male genitalia. The present findings record the first documentation of *Leucopholis lepidophora* Blanchard (1850) from the studied locality (Fig. 1). Results of the survey from sampling sites revealed its first record from the Western Himalaya of the northern part of India.

Leucopholis lepidophora Blanchard 1850 (Figs 2a-b)

Description: Male length 35.0 mm, width 17 mm; female length 36.0 mm, width 17 mm. Body elongate and ovoid; uniformly black or blackish brown. The clypeus anterior margin is wide and strongly convex mesally in males as compared to females without a median cleft, weakly indented and longer than the labrum (Fig. 3a). Labrum punctate with long, fine, stiff reddish orange setae. The mentum is smooth and punctate in the posterior margins. Ocular canthus with small white and large reddish-brown setae. Antennal club length is 2 mm and nearly as long as antennomeres II–VII. Anterior angle of the pronotum rounded and the posterior angle is obtuse and lobed in both sexes. Protibial spurs extend in front of the anterior angle in both sexes. Posterior metatibial end with 19-35 spicules. The prosternal process is dorsally pear-shaped without median depression. Metaventral process length 2.5 mm. Scutellum scales overlap at the anterior angle. Elytral scales are large, less dense (male), sub-ovate shape and off white in colour.

Figure 2. Adults of *L. lepidophora* viz.; a) male (collected specimen), b) female (Museum specimen).

Male: Genitalia length 9.5 mm. Phallobase (5 mm) larger than paramere, sclerotized dorsal anterior margin with horizontal straight mesally and connected with membranous

tissue. Paramere (4.5 mm) ventral inner posterior margin is inverted, elongate, and hook-shaped; parameres are parallel laterally, apically blunt, and basally pointed (Figs. 4a-c).

Female: Clypeus is weakly convex, weakly recurved, strongly indented laterally, and distinctly narrower than the labrum (Fig. 3b). Antennal club length 1.30 mm, shorter than antennomeres II-VII. Pronotum anterior angle obtuse and posterior angle at right angle. Meta ventral process length 2.3 mm. Posterior metatibia with 35 spicules.

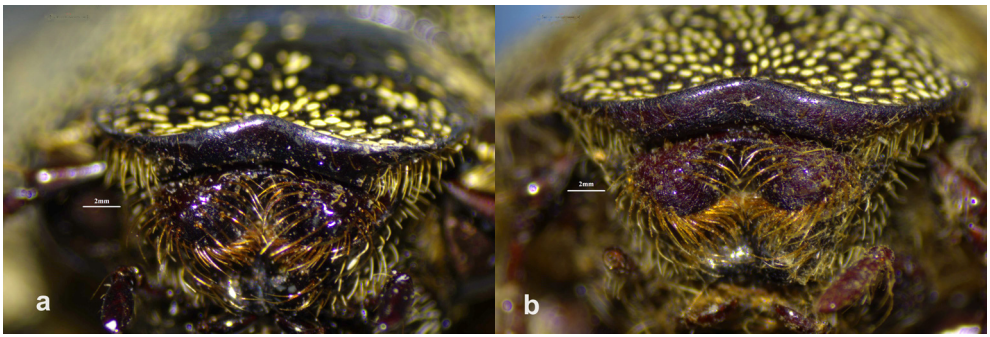

Figure 3. Clypeus of *L. lepidophora*; a) male, b) female.

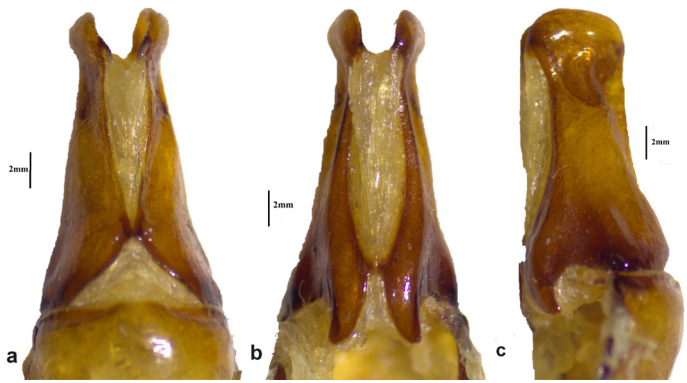

Figure 4. Male genitalia of *L. lepidophora*. Parameres; a) dorsal, b) ventral, c) lateral.

Material examined: India; Uttarakhand, U.S. Nagar, Pantnagar (29 02' o 60.00" N to 79 30'59.99" E), 243m 02.08.2023, 2♂,1♀. U.S. Nagar, Pantnagar, 243m October.1971, 1♀ (Department Museum specimen).

Distribution India: Maharashtra, Karnataka, Kerela, Tamil Nadu, Uttarakhand (New record)

CONCLUSION AND DISCUSSION

The present study of *Leucopholis lepidophora* from the lower foot hills of Western Himalaya recorded its first documentation from the same.

In India, *Leucopholis* species has gained the status of pest in many economical crops like arecanut, sugarcane, cocounut etc (Kumar, 1999; Adarasha, 2014; Kalleshwaraswamy et al, 2016). Usually, *Leucopholis* genus has its three economic important species in India. In those three, *Leucopholis lepidophora* is found in hilly and high-rainfall areas, while *L. coneophora* and *L. burmeisteri* are confined to coastal areas (Swamy et al, 2019). Out of these three species, *L. lepidophora* and *L. burmeisteri* takes two years for completion of life cycles, whereas *L. coneophora* take one year to complete its life cycle (Kumar, 1999). Several studies concerning to their behavioural aspect were also studied which found that *Leucopholis lepidophora* and *L. burmeisteri* did not attract light while *L. coneophora* attract to the light (Veeresh, Vijayendra, Reddy, Rajanna, & Rai, 1982; Jeevan, 2014). At present, due to the unavailability of literature, it demands more studies on the behavioural aspect of *Leucopholis* beetles at various light sources. Another species i.e., *L. crassa* was only documented from the evergreen forest of Brahmaputra, Assam and subtropical pine forest of Meghalaya from north eastern parts of India (Ghosh et al*,* 2022).

In our present findings, we recorded this species from a terai area of Uttarakhand that comes under broad leaf deciduous forest (Sati & Bandooni, 2018). The table 1 gives an account to current species and their distribution in India. However, at present, their presence is not recorded in many states like Uttar Pradesh, Haryana and Bihar which also contain some portions of the same type of forest. However, Madhya Predesh, Chhattisgarh and Rajasthan are required to conduct frequent monitoring and surveillance in their agriculture, forest, and conserved areas for the presence of this species. In present findings, its new record from the localities cannot be ignored due to its pest status in other parts of India on many economical crops. Further studies concerning the life cycle would definitely be helpful for documentation of its real impact on crops and other Himalayan states of India.

Table 1: Checklist of *Leucopholis* species from India.

Sl. No.	Species	Distribution	References
1	*Leucopholis aberrans* Sharp, 1876	India	Sharp, 1876; Dalla Torre, 1912.
2	*Leucopholis burmeisteri* Brenske, 1894	Karnataka	Burmeister, 1855; Brenske, 1894; Dalla Torre, 1912; Swamy, 2019
3	*Leucopholis coenophora* Burmeister, 1855	Kerala	Burmeister, 1855; Dalla Torre, 1912; Swamy, 2019
4	*Leucopholis crassa* Brenske, 1892	Assam, Meghalaya	Brenske, 1892; Dalla Torre, 1912; Sabatinelli, 1992; Gosh et al, 2022.
5	*Leucopholis lepidophora* Blanchard, 1850	Maharashtra, Karnataka, Kerela, Tamil Nadu, Uttarakhand, (New record)	Blanchard, E. 1850; Dalla Torre 1912; Thurekar et. al. 2012; Swami et. al. 2019; Adarsha, et. al. 2023
6	*Leucopholis tetaranus* Brenske,1896	Deccan	Barlow, 1899

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