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Cover: Nilgiri Large Burrowing Spider *Haploclastus nilgirinus*. Acrylic on canvas. © Aakanksha Komanduri.

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SHORT COMMUNICATION

First record of *Hycleus marcipoli* Pan & Bologna, 2014 (Coleoptera: Meloidae) as a pest of Common Beans in Kashmir Himalaya, India

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Abstract: Blister beetles are recognized as pests of agricultural crops due to their phytophagous habits and they produce cantharidin, a toxic compound that causes significant crop damage and poses health hazards. This study reports the first occurrence of *Hycleus marcipoli* (Coleoptera: Meloidae), an important member of the blister beetles feeding on Common Bean, *Phaseolus vulgaris* L. in the Kashmir Himalaya (India). The species was originally described in 2014 from China, Laos, and Thailand. This report represents a significant extension of its geographical range, emphasizing the need for further entomological surveys and taxonomic studies in the region. The species significantly impairs the reproductive potential of *P. vulgaris* resulting in reduced pod formation and overall yield decline. The present study provides a comprehensive taxonomic description of the species along with a detailed observation of the nature and extent of crop damage to *P. vulgaris*.

Keywords: Blister beetles, cantharidin, crop, ecology, inflorescence, legumes, new record, phytophagy, taxonomy, yield loss.

Blister beetles belonging to the family Meloidae are known to produce cantharidin, a toxic compound that induces irritation and formation of blisters in animals including humans, and hence named Blister Beetles (Ruiz-Torres et al. 2021). The family Meloidae consists of about 125 genera including around 3,000 described species (Bologna et al. 2008). They inhabit diverse ecosystems across the world with mostly phytophagous nature, primarily feeding on leaves and flowers (Bologna & Di Giulio 2011). Adult blister beetles are polyphagous pests preferably feeding on Cucurbitaceae, Leguminosae, Solanaceae, and Malvaceae families exhibiting gregarious behaviour and variable size. Blister beetles are commonly found in Pigeon Pea crops across Asia, leading to substantial damage through their feeding behaviour (Lawrence & Newton 1982). They feed on buds, flowers, tender pods, and leaves either individually or in groups leading to a reduction in the yield (Anand 1978). Different species of blister beetles including *Moloe rugosus*, *Mylabris phalerata*, and *Mylabris indica* have been reported to inflict damage to various crops across different regions of the world (Dutta & Singh 1991; Vivekananthan & Mathivannan 2010; El-Sheikh 2020). The previous work reveals that blister beetles are of utmost importance concerning damage inflicted on different types of crops especially leguminous crops. Among the diverse genera of blister beetles, the genus *Hycleus* Latreille, 1817 is recognised for its vast species diversity with about 500 identified species distributed across the Old World (Riccieri et al. 2020). *Hycleus* spp. are widely distributed in the Palaearctic, Oriental, and the Afrotropical Region excluding Madagascar (Bologna

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& Pinto 2002). During the flowering stage, leguminous crops are particularly vulnerable to damage from various species of *Hycleus*, which significantly impacts the seed-setting process (Lebesa et al. 2012).

In 2014, a new species, *Hycleus marcipoli* was identified, exhibiting a close phylogenetic association with *H. phaleratus* & *H. cichorii* (Pan et al. 2014; Wu et al. 2018). This species is documented for the first time in India as well as introduces a new host plant, i.e., *Phaseolus vulgaris* L.

Given the critical role of Blister Beetles in agroecosystems, *H. marcipoli* was observed during a routine field survey. The paper provides a detailed taxonomic description of the species along with the nature and extent of damage caused by it.

Materials and Methods

Surveys were conducted fortnightly at eight selected sites: Uri, Arin, Dragmula, Gutlibagh, Dara, Kular, Sopat, and Hermain (Table 1) throughout the Valley of Kashmir. The pest was observed at one site, Uri (34.066 ^{0}N & 74.093 ^{0}E), Baramulla, J&K, India. The beetles were collected from common bean fields with the help of a sweep net from blooming crops during the morning hours from 0800 h to 1100 h. Freshly collected specimens were immediately killed using ethyl acetate followed by dry preservation for identification (Nezhad-Ghaderi et al. 2021). The incidence of the pest was obtained by randomly selecting 10 plants from each selected field during each survey and then expressed as the percentage of plants infested with this pest over the total number of plants sampled. Photographs in the field were taken using a Canon EOS 7D SLR digital camera and Xiaomi- 11 Lite NE smartphone. Digital images of specimens and their body parts were captured using a Leica M205A stereo zoom microscope equipped with a Leica DFC295 camera and the imaging process was facilitated by Leica Automontage Software (Version 4.10). Map of the study sites (Figure 1) was generated by using ArcGIS Package Version 10.2.2. Photoshop 7.0 was used for organizing the images. The specimens are deposited in the museum of the Department of Zoology, University of Kashmir.

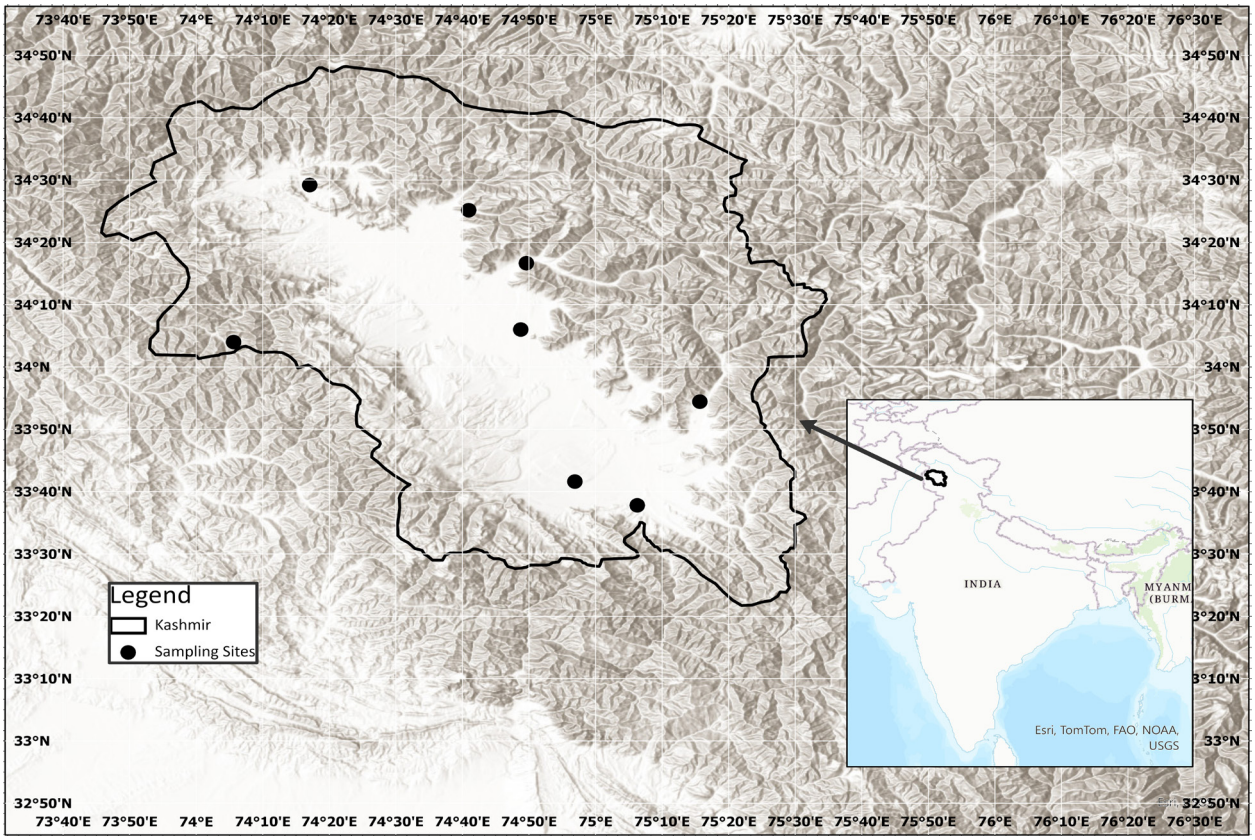

Figure 1. Map highlighting the study sites of Kashmir Himalaya, India.

Taxonomy

***Hycleus marcipoli* Pan & Bologna, 2014**

- *Hycleus marcipoli* Pan & Bologna, 2014 (11–19)

Material examined: 4 female & 2 male, India: Jammu and Kashmir: Baramulla: Uri: Nambla, 34.066 ^{0}N & 74.093 ^{0}E, alt. 1,746 m, coll. Farhana Shafi.

Diagnosis: Adults ranging 26–38 mm in size (Figure 2A–D). Belongs to the Mesoscutatus type lineage, categorized under the phaleratus group. Phenotypically resembles *H. phaleratus*.

Body: Body black except for elytra. Elytra with four distinct testaceous (yellow-brown) markings (Figure 2E,F).

1. Two testaceous front spots: one near the axillary region and another near the scutellum.

2. Two testaceous fasciae: one medial and another subapical

Dorsum and venter with black setae except for elytral axillary spot, inner side of protibiae, and protarsal pads which have mixed yellow and black setae (Figure 2G,H)

Antennae: Clubbed structure with 11 segments. Antennomeres I–V glossy, VI–XI dull. Antennomere I, approximately as long as II & III combined. Antennomere III longer than IV. Antennomeres V–VIII, are similar in length. Antennomeres V–IX, gradually increase in width, except a slightly shorter X (Figure 2I).

Mesosternum: Exhibits the Mesoscutatus type. Fore margins of mesepisterna form a central groove, with nearly contacting margins.

Legs: Slender legs and tibial spurs. Protibiae: two spurs. Male protibiae external side with scattered longer setae, and apical setae longer extending to tarsomere I while, the inner side of both sexes is covered with dense golden setae. Protarsi in both sexes with distinct golden ventral pads. Protarsomeres slightly widen apically with dense long apical setae (Figure 2J).

Aedeagus: With two slender hooks: The proximal dorsal hook, is far from the distal one (Figure 2K).

Distribution: China (SE Gansu, Taiwan), Laos, Thailand (Pan et al. 2014), India (Uri, Kashmir).

Host plants: *Phaseolus vulgaris* L. (Specimens collected in the present study).

Nature and extent of damage

The insect was recorded to damage the *P. vulgaris* crops in the Uri Region of J&K. The beetles pestered the host plants from June to September with a peak intensity in August. The incidence began with the onset of inflorescence in the budding flowers. With the progress of crops towards full bloom the population of insects gradually increased, reaching its peak as the crop fully blossomed. A maximum of nine individuals were found to damage the flowers of a single plant. Adults were observed in loose groups displaying voracious behaviour targeting young flowers and buds with their biting and chewing mouthparts. Their feeding habits resulted in reducing the plant's reproductive potential. The insect damaged flowers and buds thereby hindering the process of pod formation. During mid-August, the insect exhibited its highest mean percent incidence of about 73.33 ± 6.66 accompanied by the highest mean number of 8.33 ± 0.88 individuals per plant. In cases of severe infestation, all the flowers of the plants were affected resulting in complete loss of inflorescence. Consequently, the crop suffered from reduced fruit setting and a decline in the overall yield highlighting the detrimental impact of this insect.

Table 1. Coordinates of the study sites.

Districts	Study sites	Latitude	Longitude
Baramulla	Uri	34.066	74.093
Bandipora	Arin	34.419	74.682
Kupwara	Dragmula	34.486	74.284
Ganderbal	Gutlibagh	34.277	74.827
Srinagar	Dara	34.100	74.822
Anantnag	Kular	33.907	75.261
Kulgam	Sopat	33.630	75.104
Shopian	Hermain	33.693	74.948

Discussion

Hycleus marcipoli first identified and described in China, Laos & Thailand is now recorded in the Kashmir Himalaya, India. This study presents the first record of *H. marcipoli* infesting *P. vulgaris* crops in the hilly regions of the Kashmir Valley. The common bean holds substantial economic importance in the region. The cultivation of Common Beans is highly significant for the rural communities residing in the Himalayan mountain region (Nasar et al. 2023). As a primary legume crop, it is vital for the local population and widely cultivated in northwestern Himalayan state of Jammu & Kashmir, India (Choudhary et al. 2018). This pest severely inflicts damage to the host crop and its potential to spread and establish raises a significant concern. The genus *Hycleus* is recognized for its vast diversity. Despite being a diverse group, it has received limited attention in terms of studies conducted in India. Although a few species within this genus including *H. pustulatus, H. orientalis, H. phalerata,* & *H. thunbergii* have been identified as infesting pigeon peas in India, there is limited

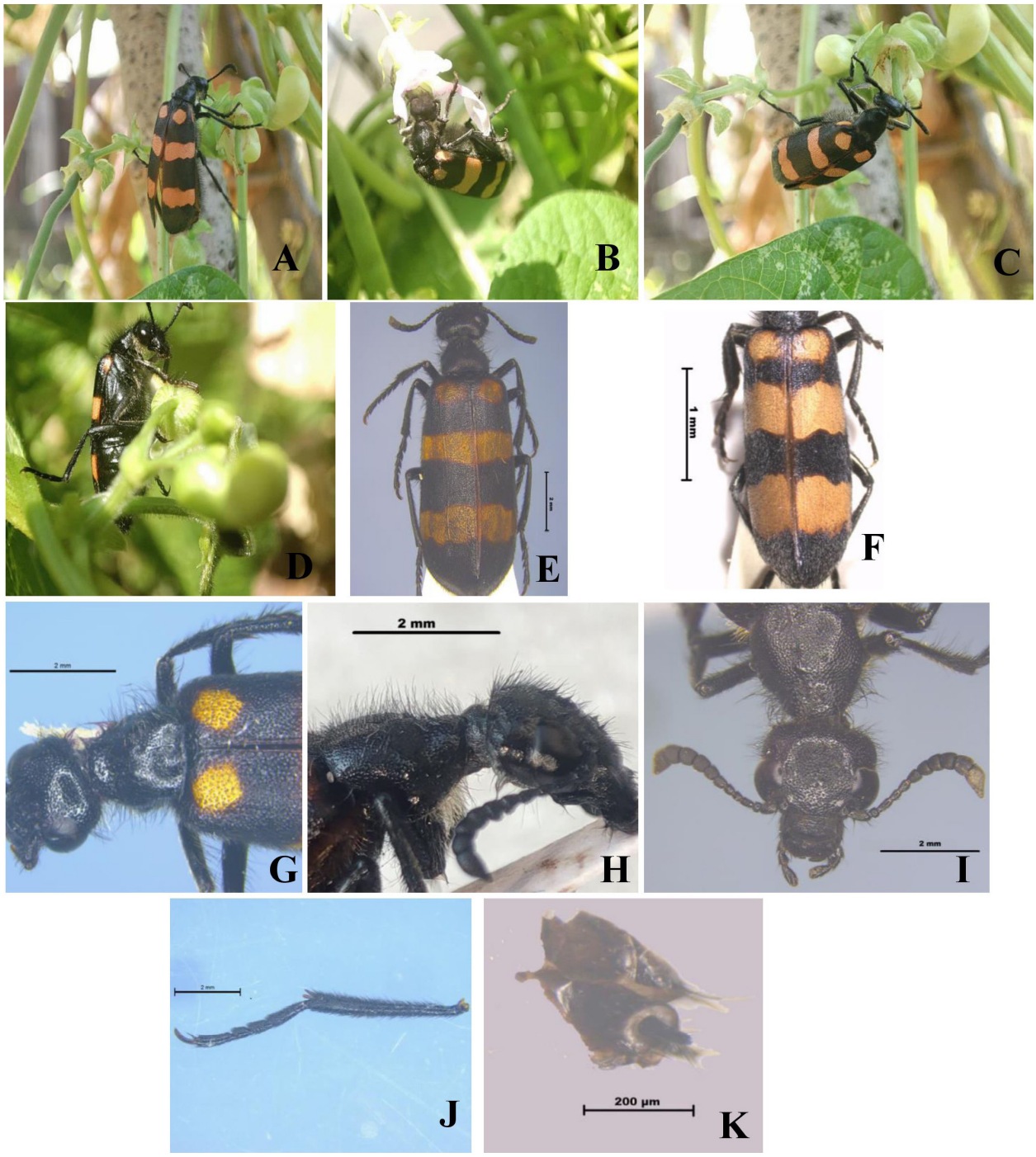

Image 1. A—*Hycleus marcipoli* | B&C—habitus | D—lateral view | E—dorsal view | F—elytra | G—black setae | H—yellow setae | I—antennae | J—leg | K—aedeagus. © Farhana Shafi.

information specifically on blister beetles of this group in the region. Another species identified as *H. polymorphus* was also documented in 2022 in India (Wankhade et al. 2022). Recognizing the importance of this group the current findings will contribute valuable insights to enhance the understanding of these insects. Further, the restricted presence of this species in the Uri Region is likely influenced by the area's distinct subtropical climate and ecotone system which differs from the temperate climate of other parts of Kashmir Valley. Moreover, the region's unique ecotone ecosystem, situated at the interface of distinct climatic zones, may play a critical role in supporting the presence of *H. marcipoli*. The transitional zone offers diverse habitats

and microclimates conducive to the species' survival and restricted distribution. Thus, exploring the agricultural crops more extensively might reveal additional species within the genus. Identification of this species expands the number of *Hycleus* species in India, important for the diversity of insects especially in the oriental region, and for taxonomic studies as well. Additionally, it also holds the potential to unveil and record the presence of this species in other countries.

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