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# First record of *Xylocopa valga* GERSTAECKER, 1872 from the cold and arid conditions of Ladakh in India (Hymenoptera: Apidae: Xylocopini)

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**Abstract**
The presence of *Xylocopa valga* is reported for the first time from the high altitudes of Union Territory of Ladakh (more than 3,000 m above sea level), India. Several bees were observed in the area from May 2019 to September 2020, where it is considered to be a pest because of its aptness for making nests in residential and commercial buildings. The species has likely expanded its geographical area due to environmental changes. It is important to disseminate knowledge among Ladakh people about this bee to ensure the preservation of its populations.

**Keywords** | Asia • carpenter bee • conservation • environmental management

**Premier signalement de *Xylocopa valga* GERSTAECKER, 1972 dans les conditions froides et arides du Ladakh en Inde (Hymenoptera : Apidae : Xylocopini)**

**Résumé**
La présence de *Xylocopa valga* est reportée pour la première fois dans les territoires du Ladakh en Inde (plus de 3000 m d'altitude). Plusieurs individus ont été observés sur ce territoire entre mai 2019 et septembre 2020. L'espèce y est considérée comme nuisible par la population à cause de sa capacité à faire des nids dans les bâtiments commerciaux et résidentiels. Cette espèce a probablement étendu son aire de répartition à cause des changements environnementaux. Il apparaît important de communiquer autour de cette espèce auprès de la population de Ladakh pour préserver ses populations.

**Mots-clés** | Asie • abeille charpentière • conservation • gestion environnementale

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## INTRODUCTION

*Xylocalpa valga* is very widely distributed in the Palearctic and reported here for the first time from the Ladakh-region in India. Its presence is known from Europe (Albania, Austria, Bulgaria, Corsica, Crete, the Czech Republic, Estonia, France, Hungary, Italy, Lithuania, Poland, Portugal, Romania, Sicily, Slovenia, Spain, Switzerland and West-Russia), Asia (China, Georgia, Kazakhstan, Kyrgyzstan, Macedonia, Mongolia, Tajikistan, Turkmenistan, Ukraine and Uzbekistan), the Middle East (Armenia, Iran, Israel, Pakistan and Turkey) and North-Africa (Algeria and Morocco) (MICHENER, 2007; WU, 1982; MA, 1938; HURD, 1955, 1978; EARDLEY, 1983). It was also reported in India from other localities, notably Kashmir (ARA *et al.*, 2019). Ladakh is a newly created union territory of India located in the northernmost side of Jammu and Kashmir, India between 32°15' to 36°N and 75°15' to 80°15'E. It covers an area of approximately 98,000 km$^2$ (AKHTAR & WILLIAM, 2019). Regarding the mellitofauna, many studies in North-western Himalayas have been conducted in different agro-ecological areas where different (solitary) bees were reported.

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Worldwide, there are approximately 995 species and 15 genera within the subfamily Xylocopinae, of which 59 species have been reported from India. 19 Of those are situated in the genus *Xylocopa* (ASCHER et al., 2008). The species of *Xylocopa* (Hymenoptera: Apoidea: Apidae: Xylocopinae) recorded so far in temperate conditions are *Xylocopa valga* GERSTÄCKER, 1872 and *Xylocopa violacea* (LINNAEUS, 1758) (RAJU & PURNACHANDRA MATTU, 2014; ARA *et al.*, 2019), while, in sub-tropical conditions, *Xylocopa collaris* LEPELETIER, 1841, *Xylocopa fenestrate* (FABRICIUS, 1758), *Xylocopa latipes* (DRURY, 1773) and *Xylocopa pubescence* SPINOLA, 1838 (ABROL *et al.*, 2012; TARA *et al.*, 2014) were reported. However, no systematic work has been done in the cold and semi-arid conditions of Union Territory of Ladakh (UT Ladakh hereafter) in India, for *Xylocopa*.

In order to formulate conservation policies for any species, one needs information regarding its ecology and habitat. This study was intended to generate baseline data regarding species of *Xylocopa* by documenting diversity across different landscapes which in turn may help understanding their pollination services in various agro-ecosystems across the area.

## MATERIALS AND METHODS

### Study area and sampling design

The samplings were conducted in various localities/villages/cities of Kargil to assess the presence of *Xylocopa* species on different agricultural, horticultural and ornamental plants from April 2019 to September 2020. Locations were chosen on the basis of the abovementioned vegetation which could be typified as dominant (and typical) for certain ecotypes in the region of Ladakh, *e. g.* pulses, buckwheat, ornamental flours, fruit trees, etc. (see also table I). For practical reasons (the distance which had to be travelled), locations were only visited once each year.

### Insect collection and killing

Specimens were collected with a sweep net of nylon cloth and killed with ethyl acetate in a jar.

### Processing of specimens

The collected specimens were sorted, spread and pinned using insect pins (size No. 1, 2 and 3). Tongue, mandibles, antennae, legs and wings were stretched properly. The processed specimens were permanently labelled giving details of locality, date of collection, host plants and collector name. Specimens examined were deposited in the Division of Entomology, FoA, Wadura, SKUAST-K, India.

### Diagnostics of *Xylocopa valga*

The tribe Xylocopini comprises only one single genus, *Xylocopa*, which consists of large and robust bees (13 to 30 mm long). Their general appearance greatly differs from other tribes of the subfamily Xylocopinae. Principal characters of the genus are the loss of the stigma, the very long prestigma and marginal cell (DANFORTH, 1989). The head is transverse, and the ocelli form a triangle just below the vertex. The antennae are geniculate, the scape sometimes dilated or incrassate. The distal parts of the wings are strongly papillate, while the forewing has an elongated radial cell, acute at apex, and three cubital cells: the third longest, the second subtriangular (MICHENER, 2007).

Next to the specific size (more than 22 mm), colouration, punctuation (sparse on the head), pubescence (brownish-black hair) are important structural characters to separate *X. valga* from other species in the (sub)genus which have entirely black antenna and the hind tibia with 5 to 6 longitudinal series of denticles (AMIET *et al.*, 2007; MICHENER, 2007).

Males and females of *X. valga* are similar in morphology (figure 1). Females are black (figure 1a), larger than males (figure 1b) (28–30 mm *vs*. 22–28 mm) and their wings display a purple iridescence. The mandible contains two teeth. On the outer apex of the hind tibia two spines account for two-third of the tibial length and scopa are found on the hind leg (basitarsus) to collect pollen. The male is also black, with larger eyes, which is also typical for other *Xylocopa* species. The head is smaller (figure 1d) than that of the females (figure 1c) and the wings are brownish-purple. There is no scopa on the hind leg of the males (figure 1b). Apart from a small amount of black hair on the anterior surface of the head, the body is covered with brownish-black hair.

## RESULTS

The study revealed the occurrence of *Xylocopa valga* for the first time in UT Ladakh. Overall, 42 specimens of *X. valga* were collected in eight locations located between 2,630 and 3,345 m above sea level, foraging on 25 wild and grown plant taxa belonging to several plant families. 78.6 % of the collected specimens were females (see Table I).

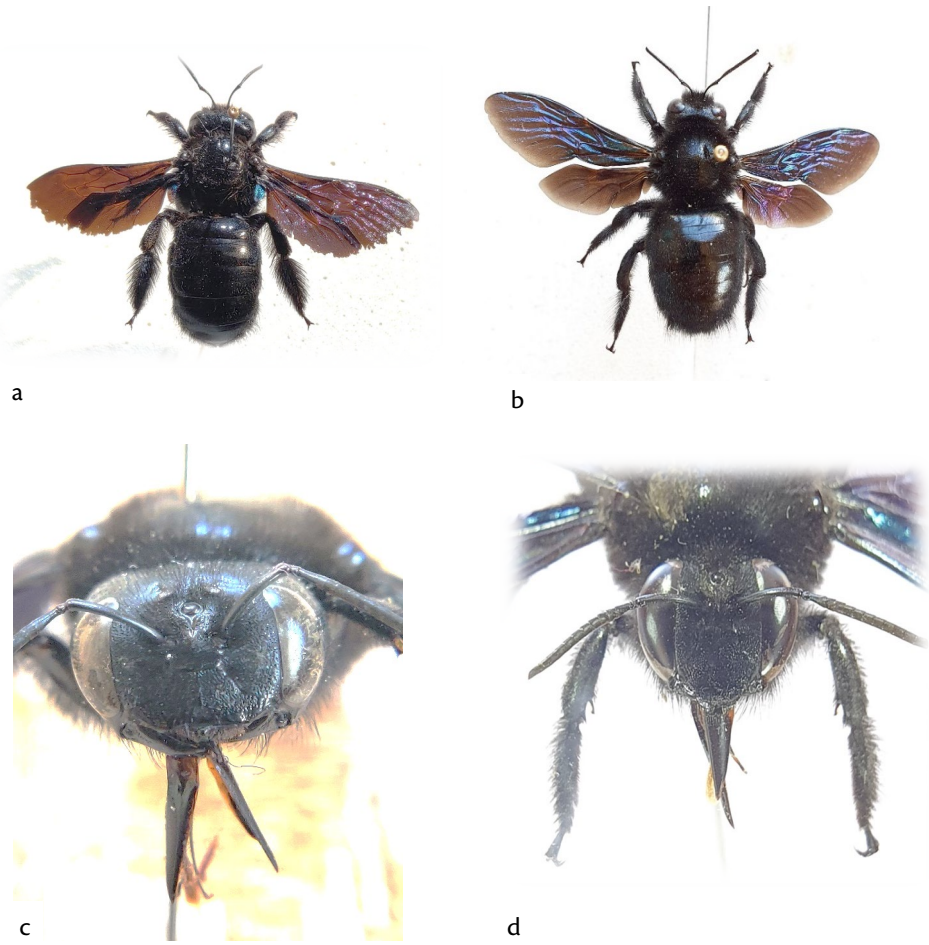


**Figure 1.** *Xylocopa valga* **a.** Female of *X. valga*. **b.** *Male of X. valga*. **c.** Head of female. **d**. Head of male.

**Table I.** Materials examined from Kargil (UT of Ladakh, India).

| Site of sampling | Date of collection | Specimens Females (♀♀) | Specimens Males (♂♂) | Altitude (m) | Geographical coordinates | Name of the collector | Host plants |
|---|---|---|---|---|---|---|---|
| Baroo | 14-VII-2019, 08-VI-2020 | 3 | 1 | 2654 | 34°32'42"N 76° 08'34"E | Umer Bin Farook | *Trifolium pratense* L., *Trifolium repens* L. |
| Drass | 11-V-2019, 13-VIII-2020 | 5 | 0 | 3265 | 34°25'59"N 75° 45'37"E | Umer Bin Farook | *Phaseoulus vulgaris* L., *Cucumis melo* L., *Trifolium repens* L., *Trifolium pratense* L. |
| KVK Kargil | 28-VIII-2019, 5-IX-2020 | 6 | 2 | 2670 | 34°31'13"N 76° 08'35"E | Umer Bin Farook | *Solanum tuberosum* L., *Tegetes* spp. L., *Malus domestica* Borkh, *Pyrus* spp. L., *Zinnia* spp. |
| Minjee | 24-VI-2019, 17-VIII-2020 | 4 | 1 | 2676 | 34°29'10"N 76° 06'06"E | Abdul Majeed & Umer Bin Farook | *Phaseoulus vulgaris* L., *Cucumis melo* L., *Trifolium repens* L., *Trifolium pratense* L. |
| Sankoo | 08-VII-2019, 21-VIII-2020 | 2 | 1 | 2630 | 34°17'31"N 75° 57'39"E | Umer Bin Farook | *Zinnia* spp., *Dahlia* spp., *Taraxacum officinale* Weber, *Trifolium repens* L., *Trifolium pratense* L. |
| Trespoon | 6-VII-2019, 11-VIII-2020 | 7 | 2 | 2650 | 34°25'20"N 76°03'00"E | Umer Bin Farook | *Solanum tuberosum* L., *Phaseoulus vulgaris* L., *Cucumis melo* L., *Zinnia* spp., *Dahlia* spp., *Taraxacum officinale* Weber, *Trifolium repens* L., *Trifolium pratense* L. |
| Batalik | 27-VI-2019, 01-VIII-2020 | 0 | 0 | 3345 | 34°39'23"N 76° 20'23"E | – | – |
| Research station Kargil | 10-VIII-2019 03-IX-2020 | 10 | 3 | 2700 | 34°32'19"N 76° 09'04"E | Umer Bin Farook | *Tegetes* spp. L., *Malus domestica* Borkh, *Pyrus* spp. L., & *Zinnia* spp., *Trifolium repens* L., *Trifolium pratense* L. |

## DISCUSSION

The discovery of *X. valga* in the high altitudes of Ladakh shows that the range of this species has been expanding, possibly owing to the changing thermal conditions within the region. Although references are scarce in literature from neighbouring countries, there are at least some indications the species has been expanding only recently, notably in China where it has been reported from Inner Mongolia to Tibet and northwestern regions with higher altitudes (He & Zhu, 2020). It is very likely that the environment and habitat is getting more suitable for *X. valga*. On the one hand, there is an abundance of several agri- and horticultural vegetation as well as ornamental plants cultivated in neighbouring villages and town settlements that are used for feeding and to collect pollen. On the other hand, there is a surplus of

wood material that can be used for nesting (He & Zhu, 2020). In our case, females were observed nesting in poplar (*Populus* spp.) and occasionally in willow wood (*Salix* spp.). Both feeding and nesting facilities are key factors in stabilizing the population of *X. valga*. The response of the local people towards *X. valga* has been rather negative in spite of its ecological importance (Raju & Purnachandra Rao, 2006; Keasar, 2010). This is primarily because of its potential to damage local, commercial and cultural property besides being physically intimidating. Therefore, a proper knowledge of the carpenter bees' use and beauty will have to result in a broader awareness to base consequent actions upon (*i. e.* damage control for certain buildings; see Gao *et al*., 2020 for an example).

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**Conflict of interests**
The authors declare that they have no conflict of interest.

**Data availability statement**
The data that support the findings of this study are available from the corresponding author upon reasonable request.

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