

## White Grub Diversity Explored from Various Biodiversity Rich Areas of Almora, Uttarakhand

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### ABSTRACT

*This study was mainly conducted to assess the diversity of white grubs and insect- host association of these scarabaeid beetles found at the different elevations of Almora, Uttarakhand, India during the month of May to August in the year of 2016 and 2017. Scarabaeid adults of 13 genera and 24 species belonging to subfamilies Rutelinae, Melolonthinae, Cetoniinae, Dynastinae, Scarabaeinae were collected from various areas of Almora. The predominant species reported were *Anomala dimidiata* and *Holotrichia longipennis*. It was found that the Scarabaeid beetles are serious pests of many crops. Loss in biodiversity and degradation of natural habitats due to climate change and human interference in natural ecosystem has necessitated the need to have an inventory of species richness in this area. It is imperative to understand the current species distribution in different regions so as a strategy for the management of these beetles in wild habitats could be planned to maintain the ecological balance.*

**Keywords:** White grubs, Scarabaeidae, Almora, Beetles diversity, *Anomala dimidiata*

### INTRODUCTION

In Coleoptera, the Scarabaeoidea is one of the largest superfamilies and comprises of approximately 31,000 species worldwide of which the family Scarabaeidae is composed of about 91% of all the scarabaeoids and includes about 27,800 species worldwide (Fincher, 1989; Jameson et al., 2001). Maximum numbers occur in the tropical areas of the world, particularly in the African and Oriental regions. The family Scarabaeidae represents about 2,500 species from the Indian sub-

continent to which the majority of the phytophagous scarabs belong to and the economically most important sub families include Melolonthinae, Rutelinae, Dynastinae and Cetoniinae (Ali, 2001).

The scarabaeid beetles and their larvae cause extensive damage to both cultivated and forest plants. The adult beetles become active during May-June and feed on the foliage of different fruit and forest trees (Mehta et al., 2008).

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The larvae of scarabaeids commonly known as white grubs cause extensive damage to the roots of cereals, legumes, small fruit plants, shrubs and trees in many parts of the world. In India, white grubs are pests of national importance and cause extensive damage to field crops and fruit trees (Mehta et al., 2010).

This investigation was conducted to assess diversity of white grubs and insect-host association of these beetles. A subfamily level key for these scarabaeid beetles is also prepared.

## MATERIALS AND METHODS

### Study Site

Scarabaeid beetles were collected through handpicking and light trap installed at many locations of Almora, Uttarakhand (India). Almora is located at 29°37'N 79°40'E / 29.62°N 79.67°E. It is 1,638 meters above mean sea level.

### Collection of the adult beetles

The light traps were installed for the collection of the adult (beetles) of white grubs from the various locations of district Almora as most of these scarabaeid beetles are positively phototactic and hence attracted towards light source. These traps were operated between 7:00pm- 10:30pm. Species belonging to family Cetoniinae are diurnal in habit and did not show attraction for light were collected by handpicking directly from field. Collected Beetles were preserved in the research laboratory and then identified with the help of taxonomic key, other literature and direct comparison of the specimens with the reference collection of scarabaeids available at VPKAS, Almora.

## RESULT AND DISCUSSION

### Study on white grubs species diversity found at the selected site

Field surveys to record the diversity of these beetles on various fruit trees, forest trees, shrubs, grasses, field crops and flowering plants were conducted during 2016 and 2017. During present study, 24 species of beetles belonging to 13 genera distributed in 5 subfamilies were identified (Plate1). Arya and Joshi (2014) studied the Beetles (Insecta:

Coleoptera) in the Nanda Devi Biosphere Reserve, Western Himalayas, Uttarakhand, India and this study found *Anomala dimidiata* as most populous species.

The highest numbers of beetles were collected from the subfamily Rutelinae (11 species) followed by Melolonthinae (8 species), Cetoniinae (3 species), Dynastinae (1 species) and scarabainae (1 species). Genus *Anomala* was represented by the most species (7 species) followed by Genus *Holotrichia* (4 species), Genus *Brahmina* and Genus *Melolontha* (2 species each) and Genus *Mimela*, Genus *Sophrops*, Genus *Clinteria*, Genus *Protaetia*, Genus *Oxycetonia*, Genus *Lepidiota*, Genus *Xylotrupes*, Genus *Onitis*, Genus *Maladera* (1 species each).

### Study on Insect- host association of identified species of Scarabaeid beetles

The host preference study was conducted for the predominant species of white grubs shows that these beetles feed more preferably following 25 plants:

1-Bhimal (*Grewia optiva*) 2- Utis (*Alnus nepalensis*) 3- Oak (*Quercus leucotrichophora*) 4- Poplar (*Populus* sp.) 5- Kharik (*Celtis australis*) 6- Tun (*Toona ciliata*) 7- Quairal (*Bauhinia* sp.) 8- Siris (*Lagestromea* sp.) 9- Batain (*Melia azadirach*) 10- Pecannut (*Caryailinoensis*) 11- Chestnut (*Castaneam ollissima*) 12- Walnut (*Juglans rigia*) 13- Peach (*Prunus persica*) 14- Plum (*Pyrus domestica*) 15- Pear (*Pyrus communis*) 16- Pomegranate (*Punica granatum*) 17- Hisalu (*Rubus elipticus*) 18- Guava (*Psidium guajawa*) 19- Apple (*Psidium guajawa*) 20- Mulberry (*Morus alba*) 21- Maize (*Zea mays*) 22- French bean (*Phaseolus vulgaris*) 23- Rose (*Rosa* sp.) 24- Dahlia (*Dahlia* sp) 29- Zennia (*Zennia elegans*).

The study done against adults of *A. dimidiata*, *H. seticolis*, *M. indica* and *X. gideon* revealed that different species of white grubs preferred the hosts differently (Sushil, et. al. 2006). The most preferred host for *A. dimidiata* was walnut followed by Utis, Siris and French bean. *H. seticolis* was found to prefer eight hosts out of which rose was found the most preferred. *M. indica* was found to prefer four hosts only, out of which utis, was

the most preferred host. The emerging predominant species *X. gideon* was recorded to prefer eight hosts, out of which quairal was the most preferred. Except for *H. seticolis*; utis, was the most preferred host for all the species tested.

**Subfamily level key for Scarabaeid beetles**

A dichotomous key for the identification of major subfamilies of Scarabaeidae (Anonymous, 2008; Ahrens, 2007) is mentioned below.

1. Pygidium completely covered by apex of elytra.....**Aphodiinae**  
 Pygidium exposed.....**2**
2. Antennal insertion visible from above.....**Cetoniinae**  
 Antennal insertion not visible from above.....**3**
3. Abdominal sternites distinctly narrowed at midline.....**Scarabaeinae**  
 Abdominal sternites normal, not narrowed at midline.....**4**
4. Claws of both middle and posterior tarsi unequal in length and independently movable.....**Rutelinae**  
 Claws of both middle and posterior tarsi equal in length and not independently movable.....**5**
5. Claws of middle and posterior tarsi cleft and toothed, Mandibles hidden in dorsal view.....**Melolonthinae**  
 Claws of middle and posterior tarsi simple, mandibles exposed in dorsal view.....**6**
6. Metatibial spines adjacent.....**Dynastinae**  
 Metatibial spines widely separated.....**Orphninae**

**PLATE 1: Diversity of scarabaeids at Almora, Uttarakhand**

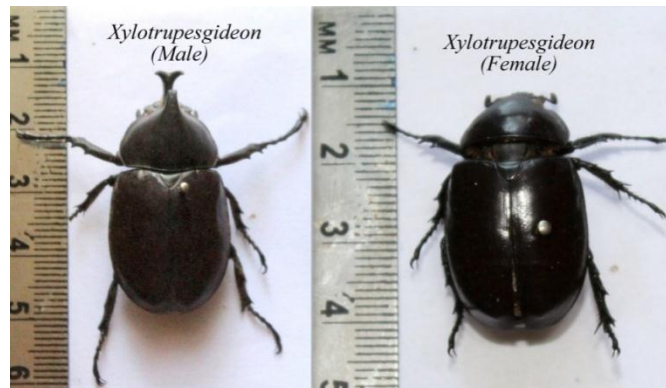
**Subfamily: Rutelinae**



**Subfamily: Melolonthinae**



**Subfamily: Dynastinae**



**Sub family: Cetoniinae**





### CONCLUSION

The white grub or 'kurmula' – as it is commonly known in Kumaun region is the most destructive pest of the agro-horticultural crops. The grubs are subterranean and feed actively on the living roots, while the beetles congregate on many host trees and plants and consume their leaves, flowers and in some cases, even the young fruits, thereby causing economic loss. In the present study, an attempt has been made to assess species diversity of the scarab beetles in a few different localities of district Almora. As a result, the inventory of the beetles incorporates 24 species belonging to 13 genera under 5 subfamilies. The maximum number of species were recorded from the subfamily Rutelinae followed by Melolonthinae, Cetoniinae, Dynastinae and Scarabainae. The field observations and sampling revealed prevalence of *A. dimidiata*. *H. Longipennis* constituted the second largest grub population; the other species *Brahmina*, *Melolontha*, *Mimela*, *Sophrops*, *Clinteria*, *Protaetia*, *Oxycetonia*, *Lepidiota*, *Xylotrupes*, *Onitis*, *Maladera* appeared to be sporadically important.

Studies on food plant spectrum of beetles have indicated that *A. dimidiata* has the widest host range feeding diurnally on the the

foliage of many fruit trees, forage and forest trees; ornamental and flowering plants and wild shrubs and field crops.

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