

LONG HORNED BEETLES (Cerambycidae: Coleoptera) With New Records And Their ASSOCIATION WITH DIFFERENT WEED PLANTS IN SINDH, PAKISTAN**Kamran Ahmed Pathan¹, Waheed Ali Panhwar^{1,*}, Abdul Manan Shaikh¹, Safdar Ali Ujan¹, Javed Ahmed Ujan¹, Khadim Hussain Memon¹, Irfan Ahmed Pathan¹ and Shabana Mangi¹****DOI:** <https://doi.org/10.28941/pjwsr.v27i1.919>**ABSTRACT**

The longhorn beetles (Cerambycidae: Coleoptera) are present in almost all ecosystems, except the ocean and polar regions. They are most important biologically controlling agents into agro-ecosystems. Long horned beetles were gathered from different sites (agricultural fields and their surrounding vegetation) of Sindh Province with insect net (7.79 cm in diameter and 49.9 cm in length) and hand picking. A total of 234 specimens were captured from October 2018 to July 2019. The material was identified to seven species and six genera. The species *Batocera rubus* (Linnaeus, 1758), *Batocera rufomaculata* (De Geer, 1775), *Apriona cinerea* (Chevrolat, 1852), *Prionus corpulans* (Bates, 1878) and *Macrotoma crenata* (Fabricius, 1801), were recorded as new record from Sindh Province. While *Archopalus exoticus* (Sharp, 1905), *Dorysthenes hugelii* (Redtenbacher, 1848) were reported first time from Pakistan. Additionally, the association of various plants with the species is provided for the first time. This study will be a baseline for the future research associated with longhorn beetles.

Keywords: Biological control, Coleoptera, Long-horned beetle, New record, Pakistan, Plants.

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Introduction

The order Coleoptera includes beetles. The beetles (Coleoptera) are widespread in nearly all ecosystems, except the polar region and oceans, and are one of the important biologically controlling agents into agro-ecosystems (Vincent & Carde, 2009). The beetles eat extensive assortments of soil dwelling, tree dwelling insects in addition to maggots, caterpillars, aphids and ants (Liebman & Gallandt, 1997). Cerambycidae comprises long horned beetles, they are cosmopolitan in nature these beetles are named due to their long antennae that extends longer than their body length (Arnett et al. 2002). The name of family has been originated from Greek word *cerambis* which means horned beetle (Lawrence, 1982). The family Cerambycidae is considered as the largest family of order Coleoptera, containing 35000 species with 4000 genera and 11 subfamilies respectively (Svacha & Lawrence, 2014). Nearly, 396 species has been described from Indian sub- continent by Gahan (1906) i-e: *Grammoptera abdominalis* (Stephens, 1831), *Grammoptera ruficornis* (Fabricius, 1781), *Grammoptera ustulata* (Schaller, 1783), *Hylotrupes bajulus* (Linnaeus, 1758), *Judolia sexmaculata* (Linnaeus, 1758), *Lamia textor* (Linnaeus, 1758), *Leiopus nebulosus* (Linnaeus, 1758), *Leptura aurulenta* Fabricius, 1793, *Leptura quadrifasciata* Linnaeus, 1758, *Lepturobosca virens* (Linnaeus, 1758), *Mesosa nebulosa* (Fabricius, 1781), *Arhopalus fesus* (Mulsant, 1839), *Arhopalus rusticus* (Linnaeus, 1758), *Aromia moschata* (Linnaeus, 1758), *Asemum striatum* (Linnaeus, 1758), *Callidium violaceum* (Linnaeus, 1758), *Cerambyx cerdo* Linnaeus, 1758, *Cerambyx scopolii* Fuessly, 1775 were recorded for the first time, and of which 9 species were reported from Pakistan (Perveen, 2017). Sixteen species of Cerambycidae are reported from India (Sengupta & Sengupta, 1981).

The long-horned beetles grow in the timbers are effortlessly move under the side of the rudiments of the woods of trees, therefore expanded in various geographical ranges (Friedman et al. 2008). These beetles are characterized by long antenna the species of the beetles consume wide variety of trees, shrub and herbs. Mostly, they feed on the wood of broad-leaved trees causing severe damage by boring holes in the trees (Kumawat et al., 2015). The long-horned beetles prefer several fruits as a source of their nutrition (Nichols et al., 2006).

Cerambycid beetles are wood-dependent and their larvae almost exclusively feed on living, dying or dead trees. Approximately 960 species alongwith subspecies of Cerambycidae have been recorded from Japan and 31% (257) species live within the administrative districts of Tokyo (Saito 1994). Long horned beetles have been originated from the Far East particularly China are most remarkable insects amongst Coleoptera order. They are considered as severe pest in East Asia, Europe, Korea, China, United Kingdom, and United States of America. The immature stage of these beetles feed upon the fresh leaves and fruits (Monne 2005).

Several authors have carried out significant work on the Cerambycidae from Indian sub-continent and adjoining countries (Noguera & Chemsak 1996, Shoda et al., 2003, Hegde, Holzschuh 2003, Makino et al., 2007, Loble & Smetana 2010, Agarwala & Bhattarcharjee 2012, Ali & Rapuzzi 2016, Perveen 2017). Parveen (2017) reported *Arhopalus fesus* (Mulsant, 1839), *Arhopalus rusticus* (Linnaeus, 1758), *Aromia moschata* (Linnaeus, 1758), *Asemum striatum* (Linnaeus, 1758), *Callidium violaceum* (Linnaeus, 1758), *Cerambyx cerdo* Linnaeus, 1758, *Cerambyx scopolii* Fuessly, 1775 from KPK, Pakistan. However, there has very negligible work been conducted on this family from the province of Sindh, including the proposed

study area. It was therefore found necessary to carry out the present study at the faunal level.

MATERIALS AND METHODS

Sampling Sites

The material used in the research included a total of 234 specimens long horned beetles that were collected from October 2018 till July 2019, from different crops and vegetative regions of the Sindh Province (26°21'N 68°51'E) with insect-capturing net. (Figure 1, Table.3). Sindh was one of the four original provinces of the modern state of Pakistan, also located in the southeast of the country, the Sindhis are the largest ethnic group is

located here. Sindh is the third-largest province of Pakistan and second-largest province by population size in terms of Pakistan after Punjab. Sindh is situated on the west by the province of the province of Balochistan and is bordered by the state of Punjab. the province of Sind is also bordered by the Indian states of Gujarat and Rajasthan to the east, and the Persian Sea to the south. the most of the land in Sindh is made up of alluvial plains that adjoin the Indus River, which is located in the far eastern part of the state, while the Kirthar mountain range, located in the western state, has extensive desert in its western regions.



Figure 1. Districts of Sindh Province

Sampling material, Killing and Preservation of samples

Long-horned beetles were gathered from different sites (agricultural fields and their surrounding vegetation) of district Sindh Province with insect net (7.79 cm in diameter and 49.9 cm in length) and with hands picking method. The collected specimens were taken to the Entomological Laboratory at Department of Zoology, Shah Abdul Latif University Khairpur Mir's and was killed into insect killing jar using Chloroform and KCN (Saito, 1994). The samples were pinned properly, and their body parts were stretched on the board, the dried insects were labeled with vicinity, species and collector names and were preserved in the insect boxes (Figure 2) (Saito, 1994).

Fixation and identification of samples

Long horned beetles were preserved by piercing the insect pins on the right side of the pronotum. Major taxonomic characteristics were recognized by removing dust with Zero size camel brush. The beetles were identified using the identification keys by Perveen 2017 and Svacha & Lawrence, 2014).

Morphometric study & Photography

With the help of scale divider fitted with microscope (Scale count was from 0.1mm- 1000mm) morphometric analysis of the specimens was carried out. The photography of species was carried out with Canon 20 MEGA PIXEL camera.



Figure. 2 Sampling material, Killing and Preservation of samples

RESULTS

The distribution and taxonomical study of family Cerambycidae was conducted from various localities/ districts of Sindh province. The species were recorded from October 2018 to July 2019. 234 species were collected and recognized in seven species of six genera belonging to the

family Cerambycidae. The identified species were *Batocera rubus* (Linnaeus, 1758), *Batocera rufomaculata* (De Geer, 1775), *Apriona cinerea* (Chevrolat, 1852), *Archopalus exoticus* (Sharp, 1905), *Macrotoma crenata* (Fabricius, 1801), *Prionus corpulatus* (Bates, 1878) and *Dorysthenes hugelii* (Redtenbacher, 1848)

(Table. 1; Figure 3). The association of long-horned beetles with various plants was noticed included *Citrus limon*, *Psidium guajava*, *Vitis vinifera*, *Moringa oleifera*,

Ziziphus mauritiana, weeds and cultivated fields showed that they are the pest of these plants at any stage of their life cycle (Table. 3).

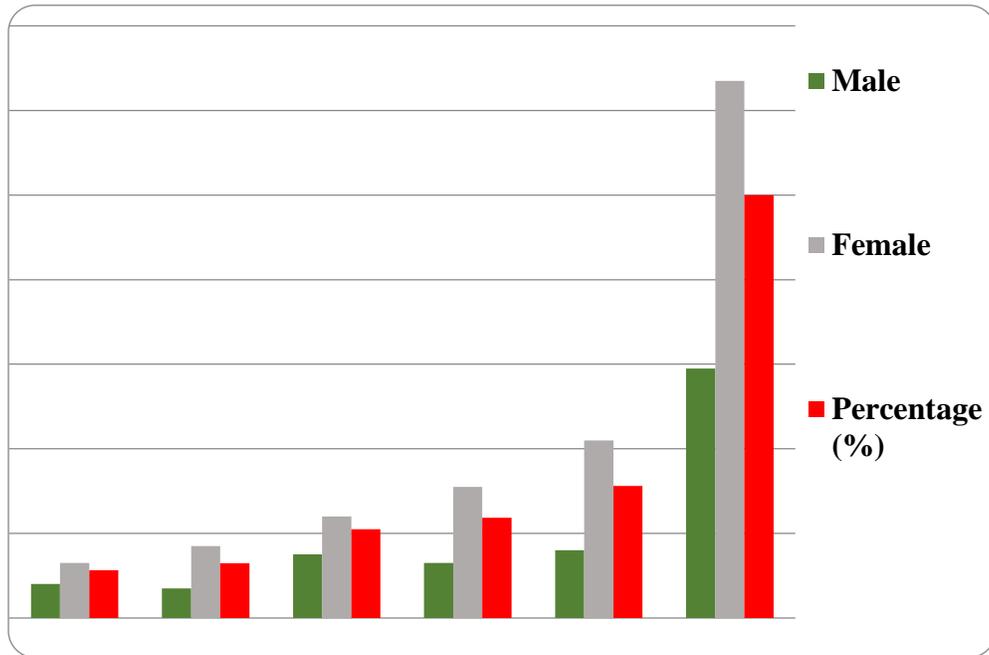


Figure. 3 The distribution of collected specimens of Cerambycidae of Districts of Sindh

Table. 1 New record of Cerambycidae from Sindh-Pakistan

Family	Species	Status
Cerambycidae	<i>Batocera rubus</i> (Linnaeus, 1758)	New Record Sindh
	<i>Batocera rufomaculata</i> (Charles De Geer, 1775)	New Record Sindh
	<i>Apriona cinerea</i> (Chevrolat, 1852)	New Record Sindh
	<i>Archopalus exoticus</i> (Sharp, 1905)	New Record Pakistan
	<i>Macrotoma crenata</i> (Fabricius, 1801)	New Record Pakistan
	<i>Prionus corpulantis</i> (Bates, 1878)	New Record Sindh
	<i>Dorysthenes hugelii</i> (Redtenbacher, 1848)	New Record Pakistan

Description of species

(Figure 4 A-G)

***Batocera rubus* (Linnaeus, 1758)**

Diagnostic feature:

Body lengthened, colour reddish brown to dark brownish, head small wider than longer, antennae as long as body length, their prothorax much broad than length, bispinose, convex anterior margin laterally, elytra dark red central disc with two semi-circular orange spots, more shiny of mid-dorsal part along sutral line, grey anteriorly, these are adorned with three yellow and four white spots, elytra highly notched .

***Batocera rufomaculata* (Charles De Geer, 1775)**

Diagnostic features:

Body dark brownish yellow colour with different patches and spots throughout dorsal side, with large eyes. Pronotum much broader than long with two bean-shaped semicircular yellowish orange spots. Scutellum white. Antennae 11 segmented. Elytra different numbers and shape with several orange spots v, a muddy white band extending along lateral side of body.

***Apriona cinerea* (Chevrolat, 1852)**

Diagnostic features:

The beetle is elongate in length rather narrow. Their body elongate with under surface golden. Head fused with mouth contains power mandibles. In both male and female antenna is larger than their body length. The first part of antenna swollen and second very short and third part is the longest. The adult coated with Elytra. At the side of shoulders Elytra are bispinose.

***Archopalus exoticus* (Sharp, 1905)**

Diagnostic features:

The body is brownish black with short pubescence. Head fused Labrum contains three bunches of setae. They possess large eyes which do not contain long hairs, the lower lobe narrow and upper lobe much broad than the lower. The antennae short and reach at the center of the elytra. Each elytra has two slightly observable dorsally costae and one laterally short costae.

***Macrotoma crenata* (Fabricious, 1801)**

Diagnostic features:

The body is Dark brownish colour, the body surface lighter brown but darker at base. Antennae reached at the third of body length, but in female antennae shorter than center of the body. Their thorax is broader than head, Pronotal disc slightly depressed, and shining area in anterior. The elytra is more rough towards base, especially near suture.

***Prionus corpulantis* (Bates, 1878)**

Diagnostic feature:

The body is light brown in colour. Their head closely fused. They have bulk eyes, their upper lobe separated from the lower. The antennae in female are longer than. The pronotum much wider than long, spines at each side. Their elytra are more two times as long as wide.

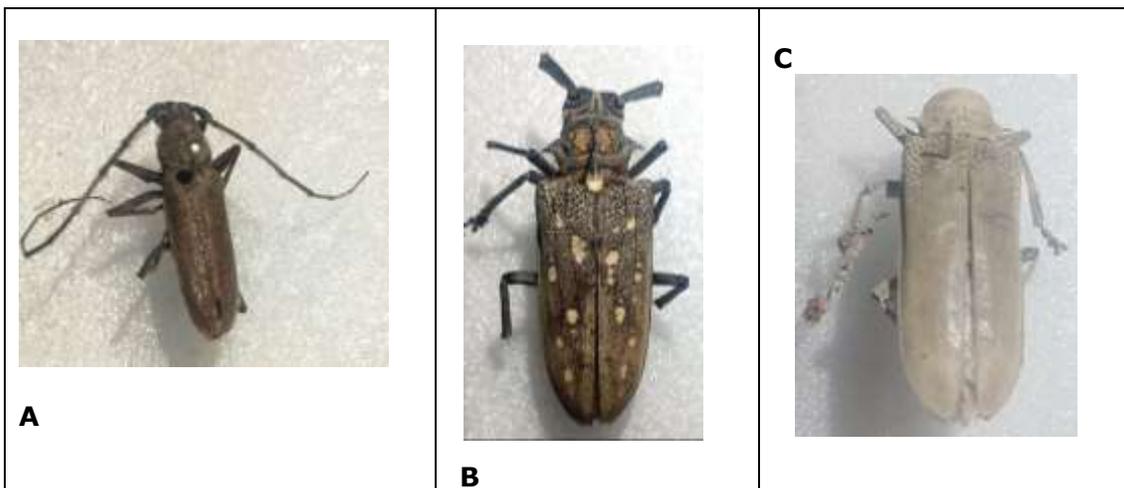
***Dorysthenes hugelii* (Redtenbacher, 1848)**

Diagnostic feature:

The reddish body color. Their head and prothorax are much darker than elytra. Their pronotum with anterior and posterior sides blacks. The head strongly fused. They have large eyes. Their Antennae are slightly shorter than body length. Pronotum finely fused in front and along each side of the central line. Their elytra finely punctured.

Table. 3 Morphometry of long-horn beetles

S.NO	SPECIES	BODY LENGTH	BODY WIDTH
1	<i>Batocera rubus</i>	46-47mm	17-18mm
2	<i>Batocera rufomaculata</i>	35-47mm	13-19mm
3	<i>Apriona cinerea</i>	41-43mm	15-16mm
4	<i>Archopalus exoticus</i>	19-21mm	13-14mm
5	<i>Macrotoma crenata</i>	47-52mm	17-20mm
6	<i>Prionus corpulantis</i>	40-55mm	17-19mm
7	<i>Dorysthenes hugelii</i>	44-45mm	17-18mm



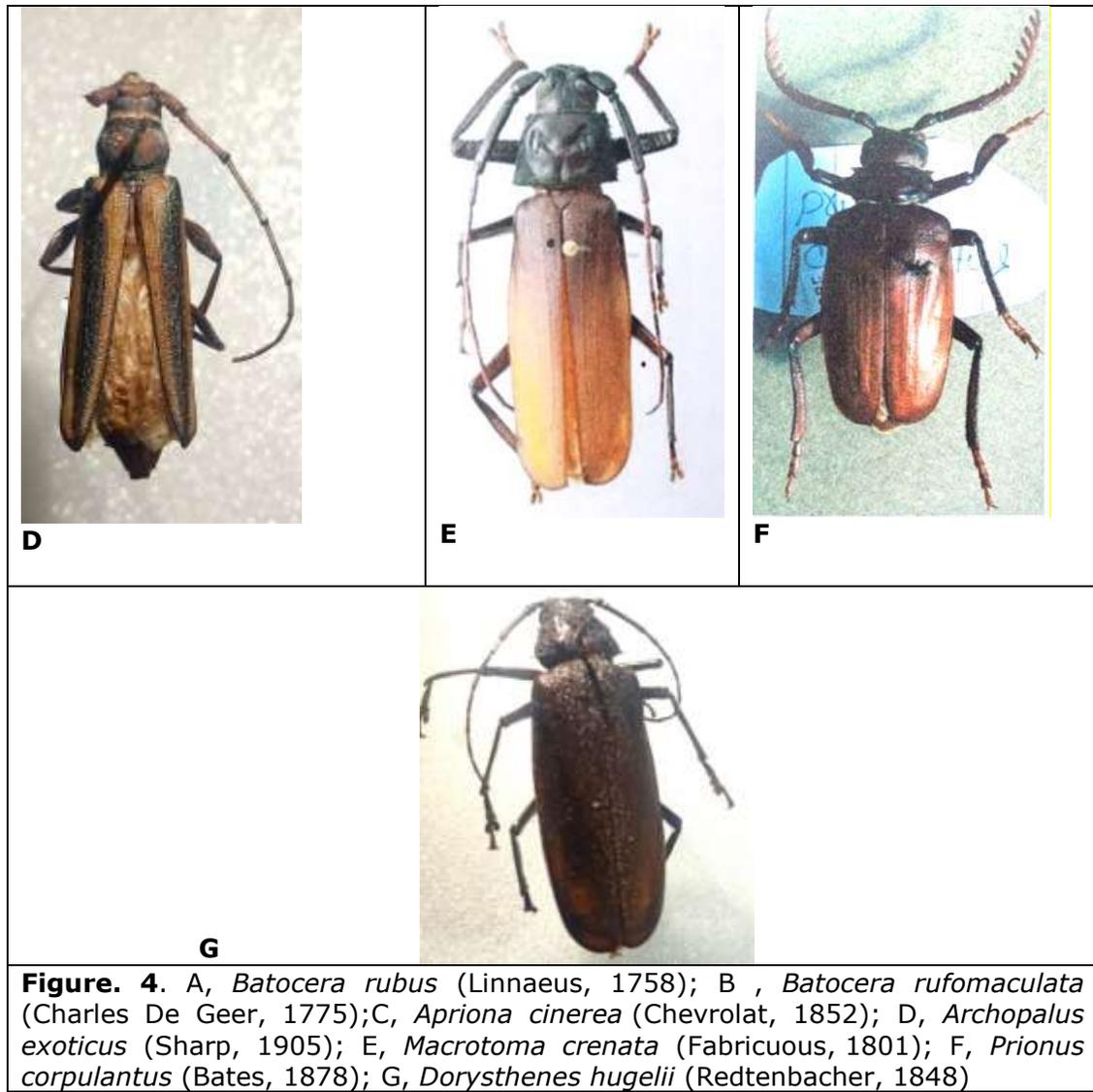


Table. 3 Association of longhorn beetles with plant species

S.NO	SPECIES	PLANT ASSOCIATED	
		SCIENTIFIC NAME	COMMON NAME
1	<i>Batocera rubus</i>	Weeds <i>Citrus limon</i>	Farm fields, gardens, lawns, and parks Lemon

2	<i>Batocera rufomaculata</i>	<i>Psidium guajava</i> <i>Vitis vinifera</i>	Guava Grapevine
3	<i>Apriona cinerea</i>	<i>Moringa oleifera</i> <i>Ziziphus mauritiana</i>	Moringa, drumstick tree, horseradish tree, and ben oil tree or benzolive tree Jujube
4	<i>Archopalus exoticus</i>	<i>Citrus limon</i> <i>Psidium guajava</i>	Lemon Guava
5	<i>Macrotoma crenata</i>	<i>Ziziphus mauritiana</i>	Jujube
6	<i>Prionus corpulatus</i>	<i>Malus domestica</i> Weeds	Apple tree Farm fields, gardens, lawns, and parks
7	<i>Dorysthenes hugelii</i>	<i>Citrus limon</i> <i>Malus domestica</i> <i>Psidium guajava</i>	Lemon Apple tree Guava

DISCUSSION

The long-horned beetles belong to family Cerambycidae. All longhorn beetles feed on plants. Larvae can be found in bushes, herbaceous plants, and conifer, deciduous, and fruit trees. They are xylophagous borers that eat living, decaying, and dead wood. Small twigs, roots, and fruit endocarps are also bore by some species. They usually have a long larval development period, with some species capable of developing in woody material long after the tree has died. As a result, they are easily transported with wood products, making their emergence and establishment easier. A total of 234 specimens long horned beetles that were collected from October 2018 till July 2019,

from different crops and vegetative regions of the Sindh. The material was identified to seven species and six genera. The species *Batocera rubus* (Linnaeus, 1758), *Batocera rufomaculata* (De Geer, 1775), *Apriona cinerea* (Chevrolat, 1852), *Prionus corpulatus* (Bates, 1878) and *Macrotoma crenata* (Fabricius, 1801), were recorded as new record from Sindh Province. While, *Archopalus exoticus* (Sharp, 1905), *Dorysthenes hugelii* (Redtenbacher, 1848) were reported first time from Pakistan. Seven (07) species of Cerambycidae containing 5 genera were first time reported from KPK (Pakistan) *Cerambyx Scopoli* Fuessly, (1775), *Arhopalus ferus* Mulsant, (1839), *Aromia moschata* Linnaeus, (1758), *Arhopalus rusticus* Linnaeus, (1758), *Aseum*

striatum Linnaeus, (1758), *Callidium violaceum* Linnaeus, (1758), *Cerambyx cerdo* Linnaeus, (1758) (Parveen, 2017).

Majumder *et al.*, (2015), reported 8 species of long horned beetle of which four species were first time recorded out of these two species are mentioned here *Nepiodes sulcipennis* White, (1853) and *Chlorophorus annularis* Fabricius, (1787) from the state of West Bengal. Doychev and Georgiev (2004), found 27 new and uncommon longhorn beetles (Coleoptera: Cerambycidae) collected during the 1997-2003 from Bulgaria. 2 species *Semanotus ruscicus* Fabricius, (1776) and *Glaphyra marmottani* Brisout, (1863) were first time reported from Bulgaria. Another species, *Acanthocinu sreticulatus* Razoumowsky, (1789) was documented for the maiden time in the Bulgarian. 10 Cerambycidae were captured from stems and old branches of trees.

Friedman *et al.*, (2008), reported 5 invasive species of longhorn beetles, these were first time reported from Israel and all known as pest: *Xystrocera globosa* Olivier (1795) and *Phoracanth recurva* Newman (1840) were reported in nature; *Rhagium inquisitor* (Linnaeus), *Chlorophorus annularis* (Fabricius) and *Neoplocaederus basalis* (Gahan) were nourished from timber and other woody plants.

Meng *et al.*, (2013), documented longhorn beetles (Cerambycidae), they selected area which were high biodiversity, vegetation and cultivated landscapes of tropical area. The species were reported in the Yunnan (China), which were rainforest region until 32 year ago, but it was by the time changed into commercial rubber only one type of plantation since that time. The objective of this study was reported longhorn beetles (Cerambycidae) biodiversity and dispersal in different landscapes and examine to effects of longhorn beetles in the growth of rubber plantations. The results of tree species were displayed total 181 species and the biodiversity of Cerambycidae total 220 species were closely related. There was a very important positive value of

Cerambycidae and tree species, respectively. The individual numbers of Cerambycidae and tree species were also positive related at the specimen site. Natural forest sites were higher species than any other type of vegetation. The young rubber plantation was tolerating the highest variety of longhorn beetles and they could not deliver long lasting habitats for most species of longhorn beetles, because they developed into closed shelter plants. Therefore, large cultivation of rubber plantations was proceeding at the forest regions, the territory situation for longhorn beetle's population in this region might less in future.

Kariyanna *et al.*, (2017), stated that longhorn beetles (Coleoptera: Cerambycidae) were one of the economically important and these were regarded as wood boring insects. Longhorn beetles involved and caused damages to herbs, shrubs, forest products, trees, nut trees and fruit, vegetable, vegetation and crops, orchids, seeds, and flowers and help in the ecological control of insect's populations they mostly eat tree dwelling, soil dwelling insects, and also eat caterpillars, maggots, wasp, ants and aphids. The larvae of most species of longhorn beetles developed for about one year or more in the tree stem and main branches either as heart wood or sap wood feeder. Larva of some species developed in rotten wood, while others developed in roots or herbaceous plants. They were recycled the organic material of rotten woods which have a main economic. Their adults were short lived; they fed on fungal spores, nectar of flowers, or pollen grains and were moved to trees in which sap flown. With the help of ovipositor, they were usually placed their eggs under crack trunk, old trees or in bark in the wood. The larvae were a very strong, segmented, elongated, legless when fully develop, and were usually yellowish white, white, or light orange in color. Grubs have strong mandibles which help in the tunneling the heartwood. The pupa often placed entirely in the pupal chamber

which is located at the back of the Grub tunnel. The small ventilation of tree trunks, shelter and its branches were played a very significance factor for this pest for normal growth and development. Vance *et al.*, (2003) in their study reported Forest canopy insects are not very well known, particularly in temperate North American forests. During the month of June and August, we used canopy and understory flight-intercepted-trapping to collect nine sites in the south-central Ontario area with a paired and individual traps to sample Cerambycidae. These heights were computed using a simple ground-based bow-and-line method that got their overall average to be approximately 24.5 m at pine locations and 20.5 m at maple sites. In total, 297 species from 26 different taxa were trapped and collected over a period of six weeks. almost three-four-quarters of all the people on the planet, depending on how one defines individuals Species density was higher on pine trees than on maple trees, but the expected number of individuals was significantly lower. There were ten species that were present only in pine forests, six of which occurred in mixed forests as well, and 12 of which were exclusive to it. In contrast to the two trap heights, both the understory and the canopy traps had an observed richness that was higher than expected. The understory population also was significantly greater than the canopy population. Only eleven species were found in the canopy and understory, but six occurred in both two zones. When the heights were compared with either on their own or together, the species' growth was at a greater rate. anophidia acuminata, which had not been studied before, was encountered on branches at ground level; the species was rather common in the canopy but only infrequently observed in other studies

When more bottles were collected from the ground, it, the number of different types of minerals observed in the upper layer was like the lower layer, but the variation in minerals was greater. Several species had strong associations with either high- or low- or no-opening bottle cap-finding activity. There appears to be an increased abundance of species accumulation in this study. In other studies, the presence of fauna seems to be more important than abundance. This study agrees with Vance *et al.*, (2003). Finding of the present study will contribute to the field of entomological science.

CONCLUSION

Present study recorded 06 genera and 07 species of the family Cerambycidae, included *Batocera rubus* (Linnaeus, 1758), *Batocera rufomaculata* (Charles De Geer, 1775), *Apriona cinerea* (Chevrolat, 1852), *Archopalus exoticus* (Sharp, 1905), *Macrotoma crenata* (Fabricious, 1801), *Prionus corpulatus* (Bates, 1878) and *Dorysthenes hugelii* (Redtenbacher, 1848). Additionally, the distributions of species indicated their presence in the study area.

AUTHOR'S CONTRIBUTION. Kamran Ahmed Pathan wrote the paper, Waheed Ali Panhwar and Abdul Manan Shaikh analyzed the data and finalized the paper, Safdar Ali Ujan, Javed Ahmed Ujan and Khadim Hussain Memon have analyzed the data statistically and took measurements and prepared graph, Irfan Ahmed Pathan and Shabana Mangi supported the laboratory work in the sampling.

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