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ECONOMIC AND ECOLOGICAL STUDIES ON LONGHORN BEETLES OFSINDHUDURG DISTRICT (MS), INDIA

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Abstract:

Cerambycids are one of the most destructive wood boring insect pests on the planet Earth. Theyaffect wide range of garden plants, agricultural or food crops, forest trees and timber goods that cause yearly expenditures of millions of dollars. Despite their economic importance and ecological diversity, cerambycid beetles have yet to be studied in terms of ecology, behavior, and evolution. Considering this destructive nature of this group of beetles, this study aims to highlight ecological behaviour with respect to their host plants and emergence as well as degree of damage caused by these beetles by surveying wood material in the saw mills and furniture shops. Study recorded highly polyphagous species like Stromatium barbatum and few new host plants. The survey carried out led to document the valuable trees coming at saw mills and even practical ideas followed by workers to counterattack the pest problem to the stock of wood material. These beetles were studied during 2016 to 2021 in Northern Western Ghats of Sindhudurg district (MS), India.

Key words: *Cerambycid, Sindhudurg, Western Ghats, wood borer, polyphagous, long-horned beetles.*

Introduction:

Cerambycid prefer specific habitats. Their larvae usually depend on wood under various conditions, while adults are plant breeders and occasional pollinators. They have a highly positive response to herbs and understory trees and can be used in forest management and thus may serve as bioindicators (Maleque *et al*., 2009). Adult cerambycids eat a wide variety of foods; which includes flowers, roots, fruits, bark, foliage, cones and sap. These beetles also prefer to eat stem, leaf or even fungus and accordingly they have classified. Adults of *Monochamus clamator* help wood decompose by introducing yeasts, bacteria and decaying fungi that cause trees to rot and check into the wood. The long-horned beetles can potentially be used as an important forest biological monitoring tool. However, in order for this tool to work, accurate distribution data is required (McCorquodale and Bondrup-Nielsen, 2004). Cerambycids are one of the most destructive wood boring pest species on the planet. They affect wide range of garden plants, agricultural or food crops, forest trees and timber goods that cause yearly expenditures of millions of dollars.

Despite their economic importance and ecological diversity, cerambycid beetles have yet to be studied in terms of ecology, behaviour, and evolution. A greater knowledge of all of these variables would significantly aid endangered species conservation and the management of invasive species that may become pests in new nations and ecosystems (Nearns, 2013).

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Most longhorn beetles are polyphagous. (Vasanthi & Raviprasad, 2013),(Vasanthi & TN, 2015) and (Saikia et al., 2011) respectively studied biology of *Plocaederus Spp.* , *Batocera rufomaculata* and *Anoplophora versteegi* Rits. (Aland et al., 2014) listed economically important insect fauna from Amba Reserve Forest included in Western Ghats near the present stud region. (Evans et al., 2007) in further study of these beetle highlighted that secondary economic effects on naturally damaged or felled timber can be considerable. (Martínez-Hernández et al., 2019) emphasized the need of studying the seasonal response of these beetles, which is directly related to global climate change, in order to understand patterns of distribution and species richness. Keeping this nature of this group of beetle, the research was conducted.

Material and methods:

The beetles were collected using light traps from certain places of study region during 2016 to 2021.

They were identified using standard published literature.

Study Region:

Sindhudurg district is a coastal district located at 16.3492° N, 73.5594° E. The climate is typically damp and humid, with little difference in daytime temperature or seasonal temperature. The highest temperatures recorded are 33.8 °C, while the lowest recorded values are close to 16.3 °C. The months of June, July, August, and September receive rain.

In this region, there is typically between 2,300 mm and 3,205 mm of rainfall each year. Arabian Sea borders it on its west side, and the Western Ghats are not far away from it on its east. Several forest trees, including Teak, Jackfruit, Cashew, Mango, Coconut, and Betel nut trees, make up the tree landscape. Sindhudurg district has a total forest area of about 390 sq. km.

Results and discussion:

Ecological relevance of the study: (Saha and Raychaudhuri, 2017) stated that these group is highly polyphagous and it devours and damage trees which may results in disturbances in the existing ecosystem. As a result, preserving nature's biodiversity and natural resources is an urgent need of the day in order to ensure both ours as well as planet's survival.

The health of the environment that sustains and enhances human existence is reflected in the state and trends of biodiversity. Every living organism on the planet contributes to the health of the ecosystem. Therefore this study attempted to assess the presence of these beetles and their ecological behaviour with respect to their host plants and emergence in the Sindhudurg district.

They were caught at different study sites from and in the vicinity of host plants. This study revealed occurrence of key species such as *Stromatium barbatum, Aeolesthes holosericea, Neoplocaederus ferrugineus, Acanthophorus serraticornis, Cyrtonops punctipennis* and *Celostrena scrabator.*

Many of the individuals of species of beetles found in the study region feed on different types of plants that have food and ecological value (Table 1). *Stromatium barbatum* caught from a site where there was good vegetation. It is one of the common longhorns attracted towards the light. Most specimens were collected from light sources. Some were caught directly by their host plants.

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Aeolesthes holosericea was caught directly from *Mangifera indica* and *Terminalia elliptica* along with its larvae and gravid female. Probably this would be the first record of *Aeolesthes holosericea* infesting *Mangifera indica* at the study region.

Another longhorn beetle caught directly from the host plant is *Neoplocaederus ferrugineus.* A few specimens of this species were caught from *Anacardium occidentale,* but the interesting outcome of the work
is that this species was found feeding on *Strychnos nux-vomica.* This is also probably the first report of the host plant in the study region and Maharashtra or elsewhere. *Acanthophorus serraticornis* is the largest beetle caught in the study region.

By extensively injures the roots of the damaged host trees, the beetle causes significant harm to the host plants. It is well known that cerambycid beetles have seasonal preferences or periodically emerge. One of thebeetles at the study site displayed a specific emergence and appearance behaviour while being collected. For instance, *Acanthophoros seratticornis* was frequently caught in 2016 and 2017. Throughout the 2018 monsoon, *Stomatium barbatum* is more frequently encountered. In 2019's monsoon and post-monsoon seasons, more *Cyrtonops punctipennis* and *Celostrena scrabator* were caught. Similar to this, although *Aeolesthes holosericea* demonstrated consistent presence throughout the study period, more individuals were discovered between November 2020 and February 2021, post-monsoon.

Socio-economic relevance of the study:

Longhorn beetles prefer a wide variety of plants for their food. That means they seem to be adapted for such a diet cluster. If such usual food is scarce in their habitat, they may move to another food source. Sindhudurg district has a large variety of trees, naturally growing in forest and cultivated, such as *Acacia spp*. Looking at this scenario, they may extend their food source to their non-host plants in the future and present a high risk of devastation.

Reproduction and spread of the longhorn beetle are influenced by cultural and other control strategies that we generally follow in agriculture, horticulture and forest ecosystems. Again, the richness of longhorn beetle species seems directly proportional to the number of tree species, extensive cultivation of crops, replacing the natural forest canopy, e.g. *Oxidentalie anacardium*, combined with greenhouse effects and human-made activities, results in becoming longhorn beetles major pests in horticultural ecosystems like orchards (Kariyanna et al., 2017). This fact led to the interviewing of individuals that had direct contact with wood during the study.

Thus the approach for socio-economic relevance of the study was determined through analyzing the level of knowledge, awareness, and harm posed by these longhorn beetles. For this purpose, a specially designed questionnaire was made in the local language and using it, carpenters, wood mill workers etc.

were interviewed in the area selected for the study sites (Joshi, A., and Kushare, K., 1999). All interviewed respondent individuals were found to have more than ten years of professional experience. Of these, 17 were timber mills and 5 were timber

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merchants and carpenter shops. Along with the questionnaire, the workers were shown photos of beetles, their larvae and sometimes actual specimens. An analysis of this questionnaire led to the following conclusions.

1. *Mangifera indica, Terminalia arjuna, Terminalia paniculata, Tectona geandis, Acacia auriculiformis, Artocarpus integrifolia* etc. trees were common raw material bought to the work place of timber/ saw mills for further processing. All the interviewed respondents seem to know all kinds of these plants, found locally in different study sites.
2. Many responders agreed that all of these trees are locally grown and utilised for building and furniture. The most valuable woods are *Tectona grandis* and *Gmelina arborea*. Even though it's a very small proportion (less than 10%), these pests get into the wood at the workplace.
3. Commonly infested woods are *Mangifera indica*, *Artocarpus integrifolia, Terminalia paniculata, Terminalia bellirica and Terminalia tomentosa.* Insects infest the main stem and bark. More respondents mentioned that all kinds of trees get infested. Some observed that even the tender or young wood gets infested with these pests. Only one worker informed that the teak tree was rarely infested with pests. This proves that even the teak tree is infested with pests.
4. With a few exceptions, they all agreed that these pests existed, but some of them were unable to distinguish two or three specimens that were presented to them. According to what has been documented, the majority of the workers were unaware of the dangerous nature of these insects. When pests invade, holes develop on the trunk or bark, and wood dust escapes from them. The larvae can cause up to 10% of the wood to be damaged. The rainy season is when these insects are most prevalent. To keep the trees from becoming infected, several workers adopted the practice of removing the bark.

Conclusion:

Cerambycids are one of the most destructive types of wood-boring pests on the earth planet. They cause serious damage to variety of plants, crops, forest trees, and wood products, which result in economic loss as well as ecological imbalance. This approach was attempted by studying occurrence of these beetles and surveying carpenter's shop as well as saw mills in the study region i.e. Sindhudurg district. *Stromatium barbatum, Aeolesthes holosericea, Neoplocaederus ferrugineus, Acanthophorus serraticornis, Cyrtonops punctipennis,* and *Celostrena scrabator* were among the important recorded species during the study from different locations and from different hosts along with their emergence. Few new hosts for these beetles werediscovered.

The socioeconomic study was done by analyzing the degree of knowledge, awareness, and knowledge about danger posed by these longhorn beetles of the stakeholders working in the wood related market. *Mangifera indica,Terminalia arjuna, Terminalia paniculata, Tectona geandis, Acacia auriculiformis, Artocarpus integrifolia,Tectona grandis*, *Gmelina arborea* etc are the important valuable trees used for making furniture which get infested (10%) by these pests. Most

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of the workers were not aware of these damaging insects.

Some key observations made by these workers such as holes after infestation appear on the trunk, and wood dust flows out of them. These insects are especially numerous during the rainy season. Interestingly, workers peel the bark from the trees to prevent infestation of these pests.

Table 1 Some major economically, ecologically important host plants found in Study region and their longhorn beetles pests

Sr. No.	Host plants	Cerambycid Species
1	*Mangifera indica*	*Batocera numitor Batocera rufomaculata Acanthophorus Serraticornis Aeolesthes holosericea Batocera rubus Celosterna scrabator*
2	*Strychnos nux- vomica*	*Neoplocaederus Ferrugineus*
3	*Ficus bengalensis*	*Aeolesthes holosericea*
4	*Moringa spp.*	*Batocera rufomaculata Plocaederus Ferrugineus*
5	*Anacardium Occidentale*	*Neoplocaederus Ferrugineus Prionomma atratum Batocera rufomaculata Plocaederus Ferrugineus*
6	*Psidium guajava*	*Aeolesthes holosericea*
7	*Terminalia elliptica*	*Aeolesthes holosericea*
8	*Artocarpus integrifolia*	*Batocera rufomaculata Batocera rubus*
9	*Bamboosa arundensia*	*Dorysthenes walker Stromatium barbatum Chlorophorus annularis*
10	*Tectona grandis*	*Aegosoma costipens Stomatium longicorne Gelonaetha hirta Stromatium barbatum Acalolepta (Dihammus) Celosterna scabrator Aeolesthes holosericea*
11	*Ficus spp.*	*Deroplia troberti Batocera rubus Batocera rufomaculata*
12	*Eucalyptus spp.*	*Celosterna scabrator*
13	*Acacia spp.*	*Celosterna scabrator*

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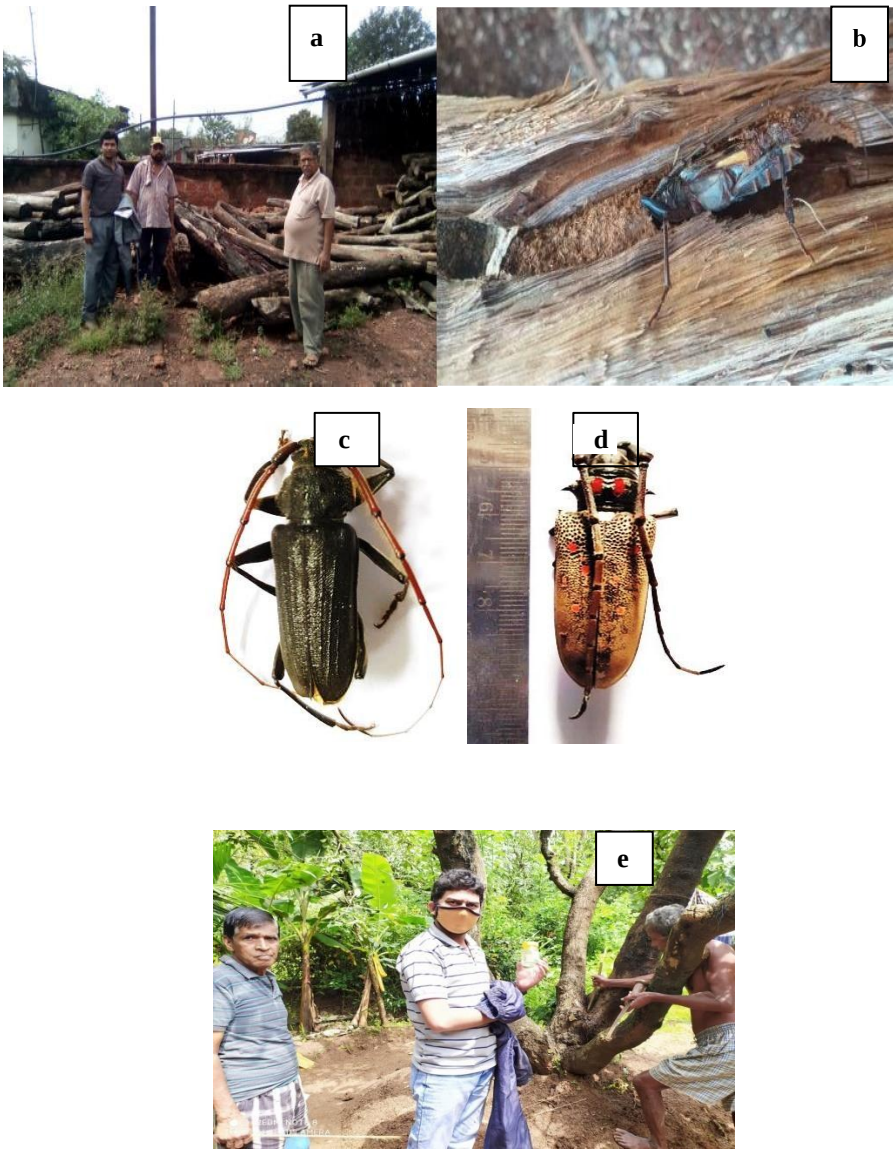

Figures a) Author with a owner of Saw mill at study region **b)** Female of *Aeolesthes holosericea* in the gallery of *Terminalia eliptica* **c)** *Stomatium barbatum* **d)** *Batocera rufomaculata* **e)** A farmer showing mango tree infestations in his farm at study region.

References:

1. **Aland, S. R., Mamlayya, A. B., & Bhawane, G. P. (2014).** Economically important insect fauna of Amba reserve. Avishkar-Solapur University Research Journal, 3.
2. **Evans, H. F., Moraal, L. G., & Pajares, J. A. (2007).** Biology, Ecology and Economic Importance of Buprestidae and Cerambycidae. Bark and Wood Boring Insects in Living Trees in Europe, a Synthesis, 447–474. https://doi.org/10.1007/978-1-4020-2241-8_20
3. **Joshi, A., and Kushare, K. (1999).** Research Guide Series Part Seven Research Questionnaire Application (first). Dr. Prakash Atkare Registrar Yashwantrao Chavan Maharashtra Open University Nashik 422 222.
4. **Kariyanna, B., Mohan, M., Das, U., Biradar, R., & A, A. H. (2017).** Important longhorn beetles (Coleoptera : Cerambycidae) of horticulture crops. Journal of

ISBN:978-93-94819-06-1
Pub. Date: 30 Aug. 2022
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Entomology and Zoology Studies, 5(5), 1450–1455.

5. **Maleque, M. A., Maeto, K., and Ishii, H. T. (2009).** Arthropods as bioindicators of sustainable forest
6. management, with a focus on plantation forests. 44(1), 1–11. https://doi.org/10.1303/aez.2009.1
7. **McCorquodale, D. B., and Bondrup-Nielsen, S. (2004).** Do we know beetles? Lessons from new records of Cerambycidae (Coleoptera) for Nova Scotia Proceedings of the Nova Scotian Institute of Science (NSIS) https://doi.org/10.15273/pnsis.v42i2.3601
8. **Martínez-Hernández, J. G., Corona-López, A. M., Flores-Palacios, A., Rös, M., & Toledo-Hernández,**
9. **V. H. (2019).** Seasonal diversity of Cerambycidae (Coleoptera) is more complex than thought: Evidence from a tropical dry forest of Mexico. PeerJ, Martínez-H. https://doi.org/10.7717/peerj.7866
10. **Nearns, Eugenio Hernán.**
11. **(2013).** Systematics of longhorned beetles (Insecta: Coleoptera: Cerambycidae). (2013).121.https://digitalrepository.unm.edu/biol_etds/86
12. **Saha, S., and Raychaudhuri, D. (2017).** Round-headed borers (Coleoptera: Cerambycidae) of Dooars, West Bengal – A compendium (Vol. 68).
13. **Saikia, K., Thakur, N. S. A., & Ao, A. (2011).** Biology of citrus trunk borer (Anoplophora versteegi Rits.) (Coleoptera: Cerambycidae) under laboratory conditions. Indian Journal of Hill Farming, 24(2), 19–24.
14. **Vasanthi, P., & Raviprasad, T. N. (2013).** Biology and Morphometrics of Cashew Stem and Root on Cashew Bark. International Journal of Scientific and Research Publications, 3(1), 1–7.
15. **Vasanthi, P., & TN, R. (2015).** Incidence of Batocera rufomaculata De Geer (Coleoptera : Cerambycidae) on cashew. 3(6), 174–177.