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Monitoring of sal heartwood borer *Hoplocerambyx spinicornis* (Newman) infestation in Chhattisgarh

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Abstract

The sal heartwood borer, *Hoplocerambyx spinicornis* Newman (Coleoptera: Cerambycidae), commonly known as sal borer, is the most devastating insect pest responsible for catastrophic damage of sal forests of the country. Till date, over 21 epidemics of this borer have been recorded in sal forests of the country. To combat this major pest of sal, "Trap Tree Operation" is used for trapping the beetles. This is an environmentally sound and very effective non-toxic method of control, currently available. The present paper reports the emergence of sal heart wood borer, *H. spinicornis* and its infestation in sal trees at different forest divisions of Chhattisgarh, during the year 2020- 21. Out of the eight sal forests ranges, Viz., Rengaghar, Taregaon, Amabeda, Bade Rajpur, Kanker, Mainpur, Navagarh and Narayanpur. The sal borer incidence was recorded in eight ranges and there was borer affected trees recorded in amabeda range, were belong to type T1 (1 tree), T2 (2 trees), T4 (2 trees), T5 (3 trees) and T7 (1 tree). The girth class of borer affected trees were recorded 180 cm GBH. Trap tree operation was conducted during the adult emergence period (June-July) in different affected compartments of forest ranges, for its collection. A total number of borer beetles trapped were 27 during the year 2020-21, collected from eight forest ranges. The collection of borer beetles reduced its incidence which reflects the efficiency of tree trap operation in management of *H. spinicornis* in sal trees.

Keywords: forest, sal tree, borer beetle, trap tree operation

Introduction

Shorea robusta commonly called as Sal belong to the family Dipterocarpaceae; the genus comprised about 360 species. Sal tree is a semi deciduous, dicotyledon and multiyear tree. Sal is native to the Indian sub continental, the north east India is considered as homeland of sal. Sal tree is large and evergreen tree. Sal tree is usually found in hilly areas and densely forest. It is usually a very slow growing tree. The most special feature of sal is that it makes itself fit for many types of natural habitats (Anon, 1997)^[1]. The use of this tree is mainly in wood, which is famous for its strong and elasticity. Sal wood is hard, heavy, compulsive and brown in color. Sal is perhaps the second most important timber tree (after teak) in the Indian subcontinent. It is often the dominant tree in the forests where it occurs. Sal forests are well known to harbor maximum biodiversity and being semi-evergreen, they constitute an important ecosystem, which provides cool and calm environment. The sal tree is known also as sakhua in northern India. It is the state tree of two Indian states- Chhattisgarh and Jharkhand. The seeds of sal tree, which are ripe in the beginning of the rainy season, serve as food in many places, especially during the famine. Resin extracted from this tree is used as an incense and medicine. Sal forest in Madhya Pradesh and Chhattisgarh are found over an area of 25,703 sq. km. accounting 25% of the total sal forest of the country (Kulkarni, 1956)^[9].

Sal tree has been the sufferer of sal borer which causes huge damage. *H. spinicornis* (Coleoptera: Cerambycidae), commonly known as sal borer is the only known Indian representative of its genus and one of the most injurious pest of sal. The less vigorous, weak, unhealthy trees or those with reduced vitality are easily attacked or killed due to borer. Different abiotic and biotic factors have been the major cause for the reoccurring epidemics (Bhandari and Rawat 2001^[4]; Roychoudhury, 2013)^[18]. The borer kills trees of all age groups above the girth of 20 cm, the trees between the girth class 91-150 cm are the most preferred (Beeson, 1941). The heartwood borer was first discovered as a destructive pest of sal by Stebbing in 1897 from Singhbhoon division in Chota Nagpur, Bihar (Stebbing, 1906)^[20]. Sal borer is an oligophagous insect that feeds primarily on sal. Sal borer has yearlong life cycle divided in four stages viz. Egg (3-7 days in June -July), Larva (July to April), Pupa (April to May) and Adult (June -July). During last epidemic in rajnandgaon (1997-98) 205692

sal trees, bilaspur (1997-2000) 153856 sal trees and sarguja (1997-2000) 13163 sal trees affected by sal borer in chhattisgarh (Roychodhury, 2009 ^[15]; Roychodhury and Kulkarni, 2012) ^[17]. Present paper reports the occurrence of sal borer in eight forest range of Chhattisgarh.



Fig 1: Sal heartwood borer *Hoplocerambyx spinicornis* (Male)

Materials and Methods

Surveys were carried out in sal forests of different 12 localities viz., range- rengakhar, taregaon (Kawardha forest division); range- amabeda (East Bhanupratappur forest division); range- baderajpur (Keshkal forest division); range- kanker (Kanker forest division) range- mainpur and navagarh (Gariyaband forest division) and range- narayanpur (Narayanpur forest division) of Chhattisgarh during the period of 2020-21, for monitoring of borer population and its incidence. Sample plots of 0.1 ha were laid in the each selected area to assess the borer attack in individual tree with girth more than 60 cm. The symptoms of borer attack were noted on all the trees in the sample plot. In the present study, categorization of affected trees were made as per the method given by Beeson (1941) based on the intensity of borer attack as Types-T1, T2, T3, T4, T5, T6, T7 and T8 (healthy tree) (Table 1). The enumeration of borer affected trees was done in all the selected sites where sal forests and borer occurred, based on the types/categorization and girth. Information on borer incidence was also collected from different related forest divisions. Tree traps experiments were carried out against sal borer beetles in selected sites of sal forests.

Table1: Types of representing different intensities of borer infestation in sal trees

Type	Tree characteristics
1	Crown dead and leafless, epicormics leafless, wood dust in large heap.
2	Crown dead and brown, epicormics dead and brown, wood dust in large heap.
3	Crown dead and brown, epicormics or bark dead in upper part, alive in lower part of trunk, wood dust in heap more than 3 inches deep or less abundant.
4	Crown entirely alive and green, epicormics green, wood dust in large heap.
5	Crown partly alive, green and partly dead or brown, epicormics green, wood dust scattered, less than 3 inches deep.
6	Stump with large heap of wood dust.
7	Crown entirely alive and green, epicormics green, resin abundant or absent, wood dust scattered or scanty

Source: Beeson (1941)



Fig 2: Survey and marking of sal forest, Compt. no. PF/2360, Beat- Khondagaon, Range – Narayanpur, Division- Narayanpur



Fig 3: Survey and monitoring of sal forest, Compt. no. PF/1034, Beat- Aamabeda, Range - Amabeda, Division- East Bhanupratappur.

Trap-tree operation: Trap-tree operation was conducted during the emergence period of sal borer beetles. Trap-tree operations in sal forests were conducted at 12 different selected sites of Range- Rengakhar, Range- Taregaon (Forest Division Kawardha), Range- Amabeda (Forest Division East Bhanupratappur), Range- Bade rajpur (Forest Division Keshkal), Range- Kanker (Forest Division Kanker), Range- Mainpur, Range- Navagarh (Forest Division Gariyaband) and Range- Narayanpur (Forest Division Narayanpur) Chhattisgarh. In this activity, an uninfected sal tree with girth of 60-90 cm is felled and cut into 2 to 3 m long logs. These logs are then beaten at the ends to exudes sap and provide shelter for the beetle. The beetles gets attracted to the smell of sap, gets inebriated after consuming it and become inactive, then collect them and killing easier. Beetles are collected from

traps every morning and evening. Trap tree operation were started on the onset of monsoon and that continued till the day

the insect catches are nil.



Fig 4: Log cutting and preparation for Tree trap operation in Compt. no. RF 797, Beat Pinjodi, Range- Amabeda, East Bhanupratappur Division and found sal borer insect

Results and Discussion

During last 02 year surveys and monitoring were conducted in different sal forests of Chhattisgarh, viz. Compt. no. RF/13, Beat- Kotnapani and Compt. no. PF/407, Beat- Dhanwahi, Range Taregaon (Forest Division Kawardha); Compt. no. RF/1865, Range Machkot (Forest Division Jagadalpur); Field near sarena Range- Sarona (Forest Division Kanker); Compt. no. RF/797, Beat- Pinjodi and Compt. no. PF/1034, Beat- Amabeda, Range- Amabeda, (Forest Division East Bhanupratappur); Compt. no. PF/1024, Madanpur, Range- Pasarkhet (Forest Division Korba); Compt. no. RF/134, Beat- Adwar, RF/353, RF/138, Beat- Supkhar, Range- Rengakhar, Compt. no. PF/403, Beat- Sajatola, Range- Taregaon (Forest Division- Kawardha); Compt. no. - PF/1034, Beat-

Aamabeda, Range- Amabeda, (Forest Division East Bhanupratappur); Compt. no. - RF/2848, Beat- Manikpur, Range- Bade rajpur (Forest Division Keshkal); Compt. no. - RF/65, Beat- Barkai, Range- Kanker (Forest Division Kanker); Compt. no. - RF/1003, Beat- Deharguda, Range- Mainpur, PF/666, Beat- Nayagarh, Range- Nayagarh (Forest Division Gariyaband); Compt. no. - PF/2360, Beat- Khodgaon, Range- Narayanpur (Forest Division Narayanpur), Chattisgahrh during the period 2020-2021, for monitoring of borer population. The enumerations of sal borer affected trees were done in all the selected sites based on the types/categorization as per the method given by Beeson (1941).



Fig 5: Visited with Forest officials at Compt. no. RF 797 Beat- Pinjodi, and Compt. no. PF-1034, Beat- Amabeda, Village- Suklupal, Range- Amabeda, East Bhanupratappur Division.

Sample plot laid in different 12 localities in Chhattisgarh. Each sample plot laid out of 0.1 ha quadrat in the selected areas to assess the borer attack in individual tree with girth more than 60 cm. The symptoms of borer attack were noted on all the trees in the sample plot. The categorization of borer affected sal trees were carried out as per classification. Some drying and semidrying trees were found in the areas, infected by insect borer and the accompanying forest officials were suggested to remove these trees at the earliest to prevent the spread of borer attack on other trees in the area. Maximum trees were falling in the category T8 (healthy tree) and were showing no symptoms of borer attack. Following areas were selected for laying quadrat sample plot.

▪ Compt. no. - RF/134, Beat- Adwar, Range- Rengakhar,

- Division- Kawardha
- Compt. no. - RF/353, Beat- Supkhar, Range- Rengakhar, Division- Kawardha
- Compt. no. - RF/138, Beat- Rengakhar, Range- Rengakhar, Division- Kawardha
- Compt. no. - PF/403/I, Beat- Sajatola, Range- Taregaon, Division- Kawardha
- Compt. no. - PF/403/II, Beat- Sajatola, Range- Taregaon, Division- Kawardha
- Compt. no. - PF/403/III, Beat- Sajatola, Range- Taregaon, Division- Kawardha
- Compt. no. - PF/1034, Beat- Aamabeda, Range- Amabeda, Division- East Bhanupratappur
- Compt. no. - RF/2848, Beat- Manikpur, Range- Bade

- rajpur, Division- Keshkal
- Compt. no. - RF/65, Beat- Barkai, Range- Kanker, Division- Kanker
- Compt. no. - RF/1003, Beat- Deharguda, Range- Mainpur, Division- Gariyaband
- Compt. no. - PF/666, Beat- Nayagarh, Range- Nayagarh, Division- Gariyaband
- Compt. no. - PF/2360, Beat- Khodgaon, Range- Narayanpur, Division- Narayanpur

Table 1: Data on salborer status during tree trap operation in different sites of sal forest in Chhattisgarh

S. N.	Locality	Total trees (above 60 cm)	Average girth (cm)	Salborer attack	Tree category	No. of dying trees	No of adults found on the tree trap
1.	Compt. no. RF/134, Beat- Adwar, Range- Rengakhar, Division- Kawardha	12	109.33	No	T8	-	-
2.	Compt. no. RF/353, Beat- Supkhar, Range- Rengakhar, Division- Kawardha	21	105.38	No	T8	-	-
3.	Compt. no. RF/138, Beat- Rengakhar, Range- Rengakhar, Division- Kawardha	25	92.96	No	T8	-	12
4.	Compt. no. PF/403/I, Beat- Sajatola, Range- Taregaon, Division- Kawardha	17	123.29	No	T8	-	-
5.	Compt. no. PF/403/II, Beat- Sajatola, Range- Taregaon, Division- Kawardha	22	95.54	No	T8	-	-
6.	Compt. no. PF/403/III, Beat- Sajatola, Range- Taregaon, Division- Kawardha	32	108.37	No	T8	01	10
7.	Compt. no. PF/1034, Beat- Amabeda, Range- Amabeda, Division- East Bhanupratappur	09	171.33	Yes	T1 (01) T2 (02) T4 (02) T5(03) T7 (01)	-	5
8.	Compt. no. RF/2848, Beat- Manikpur, Range- Bade Rajpur, Division- Keshkal	32	128.25	No	T8	-	-
9.	Compt. no. - RF/65, Beat- Barkai, Range- Kanker, Division- Kanker	12	207.08	No	T8	-	-
10.	Compt. no. - RF/1003, Beat- Deharguda, Range- Mainpur, Division- Gariyaband	14	128.21	No	T8	-	-
11.	Compt. no. PF/666, Beat- Navagarh, Range- Navagarh, Division- Gariyaband	12	135	No	T8	-	-
12.	Compt. no. PF/2360, Beat- Khondagaon, Range- Narayanpur, Division- Narayanpur	16	150.31	No	T8	01	5

From the above observation (Table-1) it is evident that there is very low population within on build up in four sites. Compt. no. RF/138, Beat- Rengakhar, Range-Rengakhar, Division- Kawardha; Compt. no. PF/2360, Beat- Khodgaon, Range-Narayanpur, Division- Narayanpur; Compt. no. PF/1034, Beat- Amabeda, Range- Amabeda, Division- East Bhanupratappur; and Compt. no. PF/403/II, Beat-Sajatola, Range-Taregaon, Division-Kawardha which needs to be monitored continuously to check the population growth of the borer. Effective management plan needs to be put in place in case the population of the Sal Borer increases further.

Out of eight selected site of sal forest ranges, the sal borer incidence was recorded in amabeda ranges (Table 1) three trees were recorded as borer affected due to the presence of holes and wood dust at the base of tree. As per the classification of Beeson (1948), the borer affected trees were belonging to type T1 (1 tree), T2 (2 trees), T4 (2 trees), T5 (3 trees) and T7 (1 tree). The sal borer is an occasional, chronic endemic pest, but the insect is always present in small numbers in sal areas, usually infesting fallen, unhealthy or drying trees. *H. spinicornis* cause extensive damage to sal trees both in standing as well as freshly felled timbers (Joshi *et al.*, 2004) [8]. Due to kairomonal activity of sal sap (Roychoudhury, 2009 [15]; Kulkarni *et al.*, 2004) [11]. The less vigorous, weak unhealthy trees or those with reduced vitality are easily attacked or killed due to borer (Beeson, 1941). The borer kills trees of all age groups above the girth of 20 cm (Bhandari and Rawat, 2001) [4]. Occurrence of sal heart wood

borer and its considerable damage has been reported in bastar forest division of Chhattisgarh. (Roychoudhury and Soni, 2009) [15].

Conclusion

Thus, regular surveys should be undertaken to monitor the sal borer incidence and periodical surveillance of sal forests of southern forests ranges of Chhattisgarh, should be carried out in order to determine the borer incidence of growing stock and subsequent management of sal borer through trap tree operation to save sal forests.

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References

1. Anon. Report of the Committee for Sal Borer Affected Areas of M.P. Submitted to Ministry of Environment and Forests, Govt. of India, New Delhi, 1997.
2. Beeson CFC. The trap tree method. Indian Forester.

- 1928;54(6):595-599.
3. Beeson CFC, Chatterjee NC. The economic importance and control of sal heartwood borer, *Hoplocerambyx spinicornis* New. Indian Forest Record (Ent. Ser.). 1925;11(8):47.
 4. Bhandari RS, Rawat JK. Sal heartwood borer, *Hoplocerambyx spinicornis* Newn. (Coleoptera: Cerambycidae) and its management. Indian Forester. 2001;127(12):1387-1393.
 5. Chaturvedi AN, Khanna LS. Forest Mensuration. International Book Distributors, Dehra Dun, 406 pp.
 6. Joshi KC. Biology, life history of sal heartwood borer, factors responsible for outbreak and its management – an updated information. Envis Forest Bulletin. 2009;9(1):1-8.
 7. Joshi KC, Chandra S, Homkar U. Sal borer epidemics and management. Vaniki Sandesh. 2013;4(2):16-22.
 8. Joshi KC, Kulkarni N, Roychoudhury N, Yousuf M, Sambath S. Population dynamics and behaviour of sal heartwood borer and its control measures. Implementation Completion Report, Project ID no. TFR-97/Ento-06. 2002.
 9. Kulkarni DH. Comparative distributional characteristics of sal and teak in Madhya Pradesh. Proceedings IX Silvicultural Conference, Dehra Dun, 1956.
 10. Kulkarni N, Tripathi S, Joshi KC. Kairomonal activity of compounds isolated from bark of sal (*Shorea robusta* Gaert. f.) for attracting the sal heartwood borer, *Hoplocerambyx spinicornis* Newman (Coleoptera: Cerambycidae). Indian Journal of Forestry. 2004;27(3):321-325.
 11. Mathur RN. Sal heartwood borer, *Hoplocerambyx spinicornis* and its control by trap tree method. Indian Forest Bulletin. 1962;238:13.
 12. Prakasam U, Dwivedi AP, Oberoi A. Heartwood borer epidemics in central India: A threat to *Shorea robusta* forest ecosystem, 2000. <http://www.fao.org/docrep/ARTICLE/WFC/XII/0739-B1.HTM>
 13. Roonwal ML. The biology, ecology and control of the sal heartwood borer, *Hoplocerambyx spinicornis*: A review of recent work. Indian Journal of Forestry. 1978;1(1):21-34.
 14. Roychoudhury N, Soni KK. Sal heartwood borer, *Hoplocerambyx spinicornis* Newman, in Bastar Forest Division, Chhattisgarh. Vaniki Sandesh. 2009;33(3):1-4.
 15. Roychoudhury N, Sambath S, Joshi KC. Girth class of sal trees prone to the attack of heartwood borer, *Hoplocerambyx spinicornis* Newman (Coleoptera: Cerambycidae). Indian Forester. 2004;130(12):1403-1409.
 16. Roychoudhury N, Kulkarni N. Sal borer menace in India with special reference to Madhya Pradesh and Chhattisgarh. National Conference on Biodiversity & Biotechnology: Biological Resources Conservation Management and Sustainable Uses, March 13-14, 2012, Govt. M. S. Golwalker College, Rewa (M.P.), (abstract of invited paper), 2012, 11p.
 17. Roychoudhury N, Kulkarni, Das AK. Sal heartwood borer and its epidemics in India with special reference to Madhya Pradesh and Chhattisgarh. VIIIth National Conference on “Biotechnology, Biodiversity & Environment”, 19-20 April, 2013, New Science College, Rewa (M.P.), (abstract). 2013, 12-13.
 18. Roychoudhury N. Emergence of sal heartwood borer, *Hoplocerambyx spinicornis* Newman (Coleoptera: Cerambycidae) in Satpura Tiger Reserve, Madhya Pradesh. My Forest. 2015;51(1&2):33-42.
 19. Sen-Sarma PK, Thakur ML. Pests of Dipterocarpaceae and their management. In: Forest Entomology (Eds. L.K. Jha and P.K. Sen-Sarma), Ashish Publishibg House, New Delhi, 1994, 165-186.
 20. Stebbing EP. A note on the Life History of *Hoplocerambyx spinicornis* (Singhbbhum Sal Borer). Forest Bulletin, No. 1906;8:1-11.