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ESTIMATING THE DETERIORATION OF RAMIN LOGS CAUSED BY THE AMBROSIA BEETLE *PLATYPUS TREPANATUS* CHAP. (COLEOPTERA: PLATYPODIDAE)[1]

Pendugaan Kerusakan Dolok Ramin yang Diserang Kumbang Ambrosia Platypus trepanatus *Chap. (Coleoptera: Platypodidae)*[1]

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Ringkasan

Kerusakan dolok karena serangan kumbang ambrosia Platypus trepanatus *Chap. (Coleoptera: Platypodidae) termasuk masalah terpenting dalam usaha penebangan pohon ramin* (Gonystylus bancanus *Kurz.). Selama ini penentuan derajat kerusakan karena serangan kumbang penggerek tersebut hanya dihitung berdasarkan jumlah lubang gerek yang terdapat pada permukaan dolok, tanpa memperhatikan perkembangan serangan di dalamnya.*

Suatu metode penelitian dikembangkan untuk menentukan tingkat kerusakan kayu berdasarkan pola penembusan lubang gerek serangan kumbang di dalam dolok. Dalam penelitian ini dilakukan penghitungan jumlah lubang gerek yang menembus dolok pada berbagai tingkat kedalaman. Hasil analisis menunjukkan bahwa persamaan regresi :

$$Y = 97,91 + 26,53X - 10,51X^2 + 0,71X^3$$

dimana: Y = nisbah jumlah lubang gerek pada tiap tingkat kedalaman terhadap jumlah lubang pada permukaan dolok (%)
X = kedalaman bagian kayu dari permukaan dolok (cm)

dapat digunakan sebagai dasar perhitungan tingkat kerusakan atau rendemen dolok ramin yang diserang oleh kumbang penggerek tersebut.

I. INTRODUCTION

Ramin *(Gonystylus bancanus* Kurz.) is one of the most valuable tropical wood species naturally grow in Indonesia which has been exported by the country for the last two decades. This bright-colored wood species is very attractive used for furniture, molding, wall panel, veneers, toys, etc. However, this species is highly susceptible to various wood deteriorating agents after the tree is felled. Several ambrosia beetle species, especially *Platypus trepanatus* Chap. (Coleoptera: Platypodidae), cause considerable economic loss by boring logs in logging areas (Browne, 1961; Martawijaya and Abdurrohim 1978; Supriana *et al.* 1978). The immediate attacks and severe damage occuring within a few days after a tree is felled (Sukartana, 1986; 1987a; 1987b) need for special attention during log extraction in the forest.

Some studies of the biological habits of the ambrosia beetle *P. trepanatus* were recently conducted. It was shown that the beetle might initiate tunneling within a few hours after a tree was felled (Sukartana 1986; 1987a) at the rate of about 0.5 cm per day (Sukartana 1987b). More than 90% of the initial attacks were concentrated between the side and the uper parts of a log surface (Sukartana and Martawijaya 1987).

So far, from the previous information gained, the extent of log damage due to the infestation by the beetle is only determined superficially. The inner parts still remain untouched. This paper deals with the results of studies to determine the relationship between the external and internal damage of the infested logs.

II. MATERIALS AND METHODS

The studies were carried out in a logging area of ramin trees in Teluk Umpan, an area about one hour down-stream boating on the Kahayan River from Palangkaraya, Central Kalimantan Province.

A ramin tree, measuring about 25 cm in diameter at breast height, was felled. The felled tree was

1) This paper was formerly prepared for the 8th International Biodeterioration and Biodegradation Symposium, Windsor, Ontario, Canada, 26—31 August 1990.
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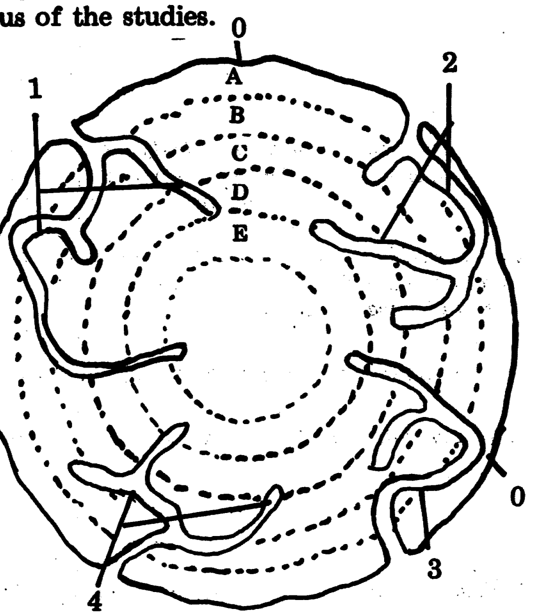
then left on felling site to attract the ambrosia beetle for infestations.

Observations were designed to figure out the performance of full grown beetle making tunnels which was indicated by the changing of frass types ejected from their tunnels, i.e. coarse forms at the first and fine ones at the latter. These studies were conducted four weeks after initial infestations to insure all observed tunnels had been fully excavated by the beetles (Sukartana 1987b). The number and penetration of the beetle tunnels became the focus of the studies.



1 — 4 : Gallery models *(Model lubang gerek)*
0 : Surface of log *(Permukaan dolok)*
A—E : Line of peeling areas *(Bidang pengupasan)*

Figure 1. Cross section of the log; peeling patterns and imaginary schemes of ambrosia beetle gallery systems (Redrawn from Sukartana 1989, improved 1990)
Gambar 1. Penampang melintang dolok; pola pengupasan dolok dan bentuk rekaan sistem lubang gerek kumbang ambrosia (Digambar ulang dari Sukartana 1989, diperbaiki 1990).

The trunk of the tree was then cut into some drum-shaped samples of 20 cm in length. Six samples free from growing defect were chosen for the studies. Some consecutive circular lines corresponding to shape of the log surface, each with the space of one centimeter from one another, were graphed on each cutting area as previously introduced by Sukartana in 1990 (Figure 1). The samples were then barked and disected following the lines. The number of tunnels appearing on the barked samples and on each disected area were counted.

Regression analysis, based upon the ratio of the number of tunnels on each disected area to those on the surface, were applied to determine the development of the beetle tunnels. The intensity of the beetle attacks on each open area was also measured for further estimation of the degree of deterioration inside the logs.

III. RESULTS AND DISCUSIONS

It was shown that a particular curve pattern could be graphed following the number of tunnels found on the observed areas. The number of tunnels formerly increased but after the peeling of about four centimeters in depth, they gradually decreased. There, finally, was no tunnel any more as observed at the depth of 11 centimeters (Table 1).

Table 1. Number of tunnels on each disecting area
Tabel 1. Jumlah lubang gerek pada tiap bidang kupasan

Depth *(Kedalaman)* cm	Number of tunnels *(Jumlah lubang gerek)* $\bar{X} \pm SD$	
	Per sample *(Tiap contoh)*	Per sq. meter *(Tiap m2)*
0	84.17 ± 13.44	522,29 ± 45.19
1	87.00 ± 9.57	605.20 ± 130.38
2	92.83 ± 10.91	715.95 ± 178.24
3	95.00 ± 8.57	810.04 ± 149.34
4	74.17 ± 13.04	698.57 ± 46.21
5	33.16 ± 9.70	354.35 ± 50.85
6	9.83 ± 3.71	125.40 ± 43.93
7	4.33 ± 2.34	71.12 ± 46.21
8	2.00 ± 1.79	43.96 ± 43.42
9.	0.67 ± 1.21	22.22 ± 40.37
10	0.17 ± 0.41	9.80 ± 24.01
11.	0	0

Remark *(Keterangan)*:
$\bar{X} \pm SD$ = Mean ± Standard Deviation *(Rata-rata ± Simpangan Baku)*

Analysis of variance for the data, calculated as the ratio between the number of tunnels appeared on each observed area and those on the surface, showed that a third degree polynomial was satisfactory fit for the relation between the depth and that ratio (Table 2). Meanwhile, regression equation:

$$Y = 97.91 + 26.53X - 10.51X^2 + 0.71X^3$$

where: Y = ratio of number of tunnels found on each observed area to those on the surface surface, in %.
X = depth of observed area inside the sample sample, in cm.

was the result of further computation and mathematic expression for the data (Figure 2).

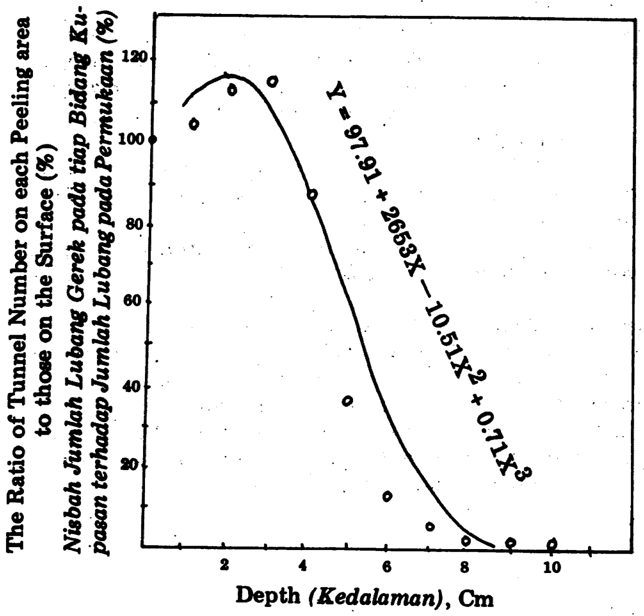


Figure 2. The pattern of graph showing the number of ambrosia beetle *P. trepanatus* at various depth of inside ramin logs.

Gambar 2. Pola grafik yang menunjukkan jumlah lubang gerek kumbang ambrosia P. trepanatus *pada berbagai tingkat kedalaman di dalam dolok ramin.*

The increase in number of tunnels around 2—4 cm in depth of the disected areas is presumably caused by the formation of branch tunnel(s) instead of the tunnel curving. This happen because such tunnel curving is not formed yet by the beetle until around four centimeters in depth of the beetle boring (Sukartana 1987b). A certain short tunnel branch of the beetle gallery, that was termed as false surface gallery (Browne 1987), was probabbably excavated by the beetle.

The deepest penetration of the beetle boring, as indicated by the created tunnels, was approximately 8—10 cm. Assuming that the distribution of the beetle infestations scatters on the entire surface parts of a log, the intact log might consequently reduce by 16—20 cm in diameter. This of course, should be further proven as the beetle attacks only initiate on certain parts, i.e. between the side and the upper parts of the log surface (Sukartana and Martawijaya 1987).

The value of X ± SD, especially for the data of the last four disecting areas, indicated the possibility of considerable errors. Consequently, the calculated deterioration rate of the infested logs by applying the regression formula might have some deviations from those of the observed data. This equation, however, may be useful to judge the expected yields of such infested logs.

Table 2. Analysis of variance for the ratio of number of tunnels appeared on various peeling areas to those on the surface of logs

Tabel 2. Uji keragaman untuk nisbah jumlah lubang gerek yang ditemukan pada berbagai bidang kupasan terhadap jumlah lubang pada permukaan dolok.

Source	Degree of Freedom	Sum of Squares	Mean Square	F
Total	10	26032.96		
Reduction to linear	1	21814.71		
Deviation from linear	9	4218.25	468.69	46.54 **
Reduction to quadratic	1	0.17		
Deviation from quadratic	8	4218.08	527.26	< 1.00 NS
Reduction to cubic	1	3151.64		
Deviation from cubic	7	1066.44	252.35	20.69 **
Reduction to quartic	1	184.95		
Deviation to quartic	6	881.49	146.92	1.26 NS
Reduction to quintic	1	592.76		
Deviation from quintic	5	288.73	57.75	10.26 **

** Higly significant *(Sangat nyata)*, $P < 0.01$
NS Not significant *(Tidak nyata)*

IV. CONCLUSION AND SUGGESTIONS

The studies may improve the determination methods of estimating the deterioration effects caused by ambrosia beetle *P. trepanatus* on ramin logs. A regression equation resulted in the studies is proposed for estimating the inner defects of ramin logs infested by the beetle species.

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REFERENCES

Browne, F.G. 1961. The Biology of Malayan Scolytidae and Platypodidae, Malay, For. Records. No. 22.

Martawijaya, A. and S. Abdurrohim. 1978. Protection of ramin logs against ambrosia beetle infestations. For. Prod. Res. Dev. Center, Bogor, Report No. 117.

Snedecor, G.W. and W.G. Cohran. 1978. Statistical Methods. Sixth ed. The Iowa State University Press Ames. Iowa.

Sukartana, P. 1986. Initial attack of ambrosia beetle *Platypus trepanatus* on ramin logs. For. Prod. Res. J. 3(2) : 25—27.

Sukartana, P. 1987a. Serangan kumbang ambrosia *Platypus trepanatus* pada dolok ramin yang diumpan dengan ethanol (The infestations of ambrosia beetle *Platypus trepanatus* on ramin logs baited with ethanol). Abst. Ent. Congr. III. Jakarta.

Sukartana, P. 1987b. The tunneling and breeding habits of ambrosia beetle Platypus *trepanatus* on ramin logs. For. Prod. Res. J. 4(2) : 30—35.

Sukartana, P. 1990. Ambrosia beetle infestation on sungkai wood *(Peronema canescens)*. For. Prod. Res. J. 7(2) : 71—75.

Sukartana, P. and A. Martawijaya. 1987. The distribution pattern of initial attacks of ambrosia beetle *Platypus trepanatus* on ramin logs. For. Prod. Res. J. 4(4): 1—3.

Supriana, N., R.C. Tarumingkeng, S. Wardojo, and A. Turngadi. 1978. Intensity and rate of ambrosia beetle infestations on ramin *(Gonstylus bancanus)*. Forum SPS. Institut Pertanian Bogor, 1(2): 1—18.