TRYPHOCARIA DAMAGE IN JARRAH APPEARANCE GRADE TIMBER

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SUMMARY

This pilot study involved a survey of damage caused by bullseye borer (*Tryphocaria sp.)* to regrowth jarrah (*Eucalyptus marginata* Donn ex Sm.) sawlogs, and the effect this damage has on appearance grade timber.

Seventeen logs were assessed for evidence of *Tryphocaria* attack. Each grub track had a gum vein or gum pocket associated with it. For every 2 lineal metres of board, there was an average of 1 grub track with 1.34 lineal metres of associated gum damage, mostly in the form of gum veins. Some brownwood and rot were also observed.

INTRODUCTION

The regrowth resource of karri (*E.diversicolor F . Muell.*) and jarrah in the south-west of Western Australia is providing an increasing proportion of the logs supplied to the State's timber industry.

The *Tryphocaria sp.* have been found in a high proportion of these regrowth forests attacking large numbers of trees. *Tryphocaria* feeds in a spiral pattern around the cambium layer. The grub has a long life span, approximately 18 months (Abbott pers comm.). The same grub may be responsible for damage in a number of sawn sections. Multiple attack over a number of years reduces the potential use of the tree from high value appearance structural grades to residues. The grub track in itself causes degrade. However the major problem is the tree's response to the wound caused by the grub, which typically is the formation of kino deposits or gum rings.

The damage caused by insect attack in the living tree has adverse effects on wood quality.

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The use of jarrah for value-added purposes such as furniture and joinery is increasing continually, and there is a need to quantify the effects of insect attack on graded recoveries of sawn timber.

The study included detailed assessment of insect damage such as number and length of gum veins and grub timber (or galleries), and related the sawn graded recovery of boards to those variables.

METHODS

The study commenced in September 1991, and was designed to estimate the extent of damage to jarrah logs caused by *Tryphocaria*. Regrowth logs from a current logging operation at Chalk block, Harvey District were assessed. The forest type is a Havel S type (Havel 1975) and is typical regrowth jarrah forest managed for timber production, with annual rainfall for the area about 1100 mm After felling trees were assessed for visual damage, then docked to 2.1 m log lengths. Diameter over bark ranged from 200 mm to 280 mm.

The visual damage was assessed and rated (McKenzie and Donnelly 1992) and was marked on the logs and recorded. The logs were then sent to the Wood Utilisation Research Centre at Harvey for debarking and milling.

The logs numbered 1 to 9 were sawn through and through on a 'Forestor' horizontal bandsaw into 7 mm thick slabs to display any insect damage clearly. It was subsequently decided that sawing 16 mm thick sections would be equally effective with considerable time savings, and the remainder of the logs were cut to this thickness. The log and slab numbers were recorded , as well as the log volume.

Assessment of Tryphocaria.

The slabs were placed on skids so that they could be easily separated for assessment.

The types of defect assessed were the actual evidence of the *Tryphocaria* grub in the wood including grub tracks or holes, pupation chambers, and bullseyes. The associated damage caused by the tree's response to the insect's activities (including gum veins, gum pockets, fungal staining, callus formation and overgrowth) was recorded.

Any *Tryphocaria* damage was measured along the length from the butt end. The external features and associated damage were recorded on the assessment sheet as a volume (mm^3) using the following system:

(i) Grub track: The volume in mm^3 extended from the diameter of the hole and the depth, which is the thickness of the slab.

(ii) Pupation chamber: The volume calculated by the width of the hole, (after 12 - 15 mm in diameter) multiplied by the length of the chamber.

(iii) Bullseyes: The area of bullseye included in the slab, calculated as for the pupation chamber.

(iv) Gum veins: The area affected by gum veins calculated by measuring length and depth of the veins and multiplying the volumes together to give mm^3 affected.

(v) Fungal staining: Recorded as associated damage, and not measured for area or volume. Staining occurred occasionally in association with grub tracks and more commonly in association with pupation chamber.

(vi) Callus or overgrowth: Recorded as associated damage, but not measured. The callus is caused as the tree responds to overgrow the galleries caused by the *Tryphocaria* larvae feeding in the cambium area.

Grading

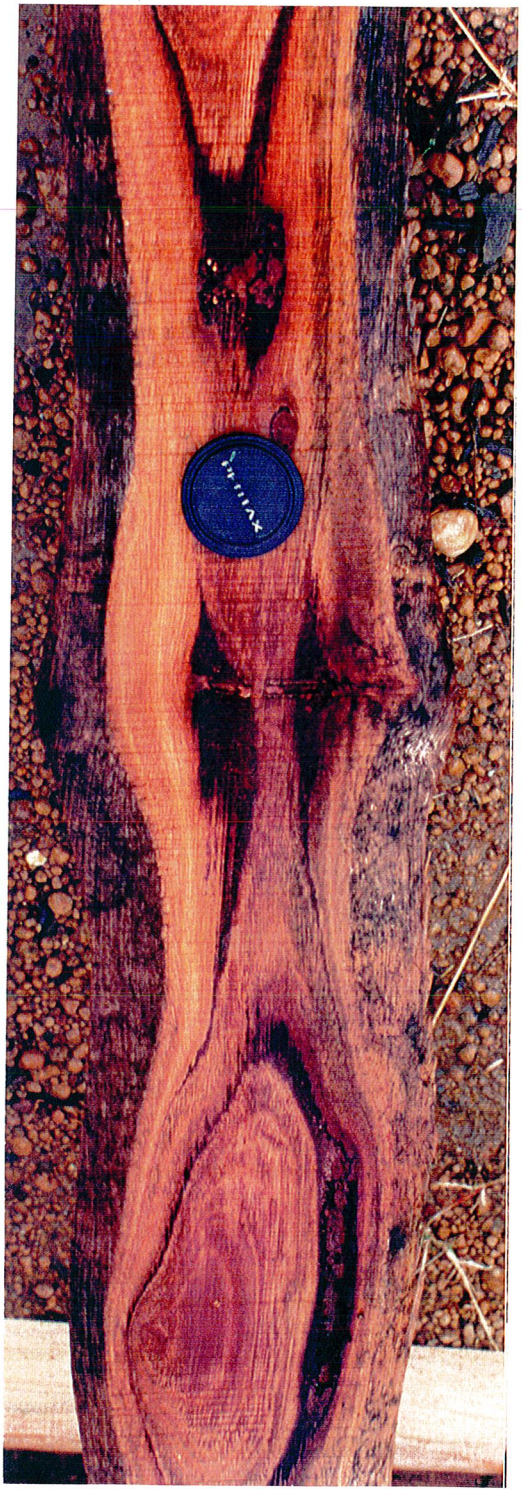
The total available sawn recovery and graded sawn recovery were estimated using the 'Draft Industry Standard for Seasoned, Sawn and Skip-dressed WA Hardwoods' (Draft 6). The Standard was released in July 1992 (FIF(WA) 1992). The following method was used:

(i) Measure the volume of board recoverable from each slab (length and available sawn width and thickness).

(ii) Mark and measure the available board graded to feature grade (now prime grade) on the best face. Graded volume is calculated from this measurement.

(iii) Use the nominal sawn board size and the actual graded board size to arrive at a recovery for each product. (The difference between the two recoveries represents the loss in recovery due to *Tryphocaria* attack and associated damage).

Sawn regrowth slab showing pupation chamber of Tryphocaria and associated gum damage.



Slab sawn from regrowth Jarrah log showing gum associated with Tryphocaria grub track. Gum pockets and gum rings are commonly associated with this form of stem damage.

RESULTS AND DISCUSSION

The results of the assessment of *Tryphocaria* damage are given in Table 1, and the effects of the damage on graded recovery of boards in Table 2.

Table 1

Assessment of *Tryphocaria* damage in regrowth jarrah logs

Log No. *-	Total length of slabs per log (m)	Total length of gum veins per log measured on 1 face of each slab (m)	Total no. of grub track damage/log recorded on 1 face of each slab	Gum veins per lineal metre	Mean length of gum/grub track damage per lineal metre of slab	No. of grub tracks per lineal metre
1	22.44	5.78	28	0.26	0.21	0.80
2	20.40	4.66	25	0.23	0.19	0.81
3	18.48	8.86	19	0.48	0.46	0.97
4	23.04	16.55	46	0.72	0.36	0.50
7	14.28	15.21	89	0.86	0.17	0.16
8	24.36	24.30	32	0.99	0.76	0.76
9	30.00	6.68	25	0.22	0.27	1.20
10	23.65	9.16	43	0.38	0.21	0.55
13	20.00	33.31	93	1.66	0.36	0.21
14	22.00	29.90	87	1.35	0.34	0.25
15	15.00	30.15	75	2.01	0.40	0.20
16	16.80	0.80	5	0.05	0.16	0.29
17	22.20	Nil	Nil	Nil	-	-
18	24.12	3.29	10	0.13	0.33	2.41
19	21.78	7.12	28	0.33	0.27	0.77
20	24.24	25.52	61	1.05	0.42	0.39
21	18.27	12.98	55	0.71	0.24	0.33
Mean	21.23	13.78	42.41*	0.67	0.30	0.62

Mean length of gum vein => 13.78

Mean grub tracks per log 42.41

=> 0.325 M/grub track

N.B. Log numbers are not numbered consecutively due to some being damaged while processing.

* Many of these grub holes or tracks may have been made by one grub.

*- Only 17 jarrah logs were included in the trial. Marri were not included.

Table 2

Effect of *Tryphocaria* attack on sawn appearance grade timber milled from regrowth jarrah logs.

Log no.	Volume round	% Sawn volume	Volume resawn excluding insect damage		% Loss due to insect damage	Recovery to F.G.D.6.		% Loss to F.G. due to insect damage
			M^3	%		M^3	%	
1	0.083	56.0	0.022	26.8	29.2	0.022	26.5	29.5
2	0.067	51.1	0.011	16.2	34.8	0.011	16.2	34.8
3	0.053	67.4	0.031	58.3	8.7	0.018	34.9	32.1
4	0.079	60.0	0.031	40.0	20.0	0.024	30.5	29.5
7	0.049	40.0	0.007	15.9	24.7	0	0	40.0
8	0.092	59.1	0.048	51.6	7.4	0.041	44.6	14.5
9	0.118	49.8	0.044	37.0	24.3	0.044	37.1	12.7
10	0.077	61.6	0.038	49.3	12.2	0.030	39.2	22.4
13	0.065	70.0	0.039	59.3	10.6	0.008	12.2	57.8
14	0.076	77.8	0.043	56.9	20.8	0.015	19.8	58.0
15	0.059	61.0	0.027	45.3	15.6	0.014	23.9	37.1
16	0.067	58.6	0.035	52.0	16.4	o.020	49.4	9.2
17	0.082	60.8	0.049	59.7	1.0	0.049	59.7	1.1
18	0.102	76.7	0.067	65.4	10.0	0.044	43.3	33.4
19	0.082	78.6	0.045	55.1	23.5	0.029	36.6	42.0
20	0.097	68.5	0.053	55.1	13.3	0.036	37.2	31.3
21	0.063	61.0	0.023	36.4	24.6	0.015	23.5	37.5
Mean	0.077	62.2	0.036	48.5*	17.5	0.024	31.4	30.7

Although this recovery appears high the actual boards recovered were narrow and short and included heartwood.

All logs had damage resulting from *Tryphocaria*, attack except for log number 17. which on cutting open was found to be completely free of gum veins.

The mean length of gum veins measured on one face of each slab from the 17 logs in the survey was 13.78 lineal metres, which was equivalent to 0.67 gum veins per lineal metre. The mean number of grub tracks was 0.62 per metre in the slabs, and the mean length of gum veins or grub track damage was 0.30 per metre.

The number of gum veins that were caused by factors other than *Tryphocaria* was negligible.

The effect of *Tryphocaria* attack on graded recovery of appearance timber (Table 2) was a mean loss of 17.5 per cent of the initial log volume. When graded to the Draft Industry Standard No.6, the loss was 30.7 per cent. The incidence of insect attack and associated gum also has a significant effect on small section structural timbers.

The results of this study indicated a strong link between *Tryphocaria* damage and the the incidence of gum pockets and rings, with significant effects on wood quality in regrowth jarrah. This results in a significant reduction in graded recovery.

It is strongly recommended that this pilot study be followed up with a detailed research project to assess biological aspects of *Tryphocaria* and possible methods of control, because the timber industry requires gum-free timber and control of the insect is a priority.

REFERENCES

CLARKE, J. (1989). Log faults. A glossary of defects and other characteristics of trees and logs in the South West of Western Australia. Department of Conservation and Land Management.

FIF(WA) (1992). Industry Standard for Seasoned, Sawn and Skip-dressed WA hardwoods. July 1992.

McKENZIE, J. W. and DONNELLY, D.J. (1993). *Tryphocaria* attack in regrowth jarrah. Pilot Study. Department of Conservation and Land Management W.U.R.C. Internal Report (Limited distribution).

APPENDIX

Selected definitions of log defects (based on Clarke 1989)

Bullseye borer (*Tryphocaria sp*).

The larva of an insect that feeds on young living tees and tunnels mainly in between the sapwood and bark. The larva eats in a spiral fashion up the tree and gradually works into the sapwood.

Gum veins

A gum vein is a deposition of gum between growth rings.

Gum pockets

A gum pocket is the accumulation of gum within and around grub galleries.
Tryphocaria attack is the main cause of gum veins in regrowth jarrah. For each grub track found in the sapwood a gum vein would be present, both above and below the grub track.

Grub track or Hole

A grub track is the hole (usually 5 to 10 mm in diameter) that is caused by the larva of the borer as it feeds in a spiral pattern around the bole of a tree. It is this larva stage of the insects life cycle that is causing most damage in regrowth jarrah eucalypts.

Fungal Stain and decay

Fungal stain and decay was found to be associated with pupal chambers and occasionally with grub tracks.