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SUMMARY

A sawmilling trial assessed sawn graded recoveries from two grades of regrowth jarrah (*Eucalyptus marginata* Donn ex Sm.) and one grade of regrowth karri (*E diversicolor* F. Muell.) in four log size classes, with combinations of 15-19.9 cm or 20-30 cm small end diameter under bark (s.e.d.u.b.) and 2.4 m or 3.6 m length. These logs were substantially smaller than the mature logs currently supplied to industry. The regrowth logs were milled using sawing strategies which produced structural timber, boards, or a combination, and defects which required docking to upgrade the boards were assessed.

The results showed significant differences in sawn recoveries ($p < 0.001$) between grades and between log size classes. Sawing strategy was not significant. The major defects docked from the timber varied among the species and log grades, with rot in 2nd grade regrowth jarrah logs being most significant. The percentage of timber pieces affected by defects is also given.

INTRODUCTION

As harvesting of the log resource from mature forest in Western Australia is phased out, increasing volumes of regrowth jarrah and karri from forest thinnings are becoming available for commercial production.

There are limited data on the effects of log quality and dimensions (i.e. length and diameter) on sawn graded recovery from regrowth logs of these species. The effect on recovery by using different sawing patterns for cutting structural timber, boards, or a combination of boards and structural timber, required assessment. In addition, the effect of log grade on production had to be assessed. The Department of CALM is currently separating 1st and 2nd grades in mature logs sold to the W.A. timber industry.

This sawmilling trial assessed the sawn graded recoveries from 1st and 2nd grade regrowth jarrah logs, and 1st grade regrowth karri logs, harvested in two diameter classes (15-19.9 cm s.e.d.u.b. or 20-30 cm s.e.d.u.b.) and two length classes (2.4 m or 3.6 m). These logs were milled to produce either structural timber, boards, or a combination of boards and structural timber. The defects which required docking to upgrade the boards were assessed, and percentage recoveries green-off-saw and after docking and grading were determined.

METHODS

The regrowth mill logs used for this trial came from forest thinnings which would be supplied to industry as part of their annual log resource. The jarrah logs were harvested in Darrell Block in the Harris River Dam catchment area, in regeneration which grew after logging in the 1940s. The area was cut over for poles in 1975-76. The karri logs came from Big Brook in Pemberton District, in regeneration from the 1930/31 logging . There were no previous thinning operations.

CALM contractors harvested and delivered the two species in full length with bark-on to the Wood Utilisation Research Centre at Harvey. All log grading, barking and docking of logs to length was done by staff at W.U.R.C. The full lengths were docked into two length classes (2.4 or 3.6 m), and logs were then sorted into two diameter classes (15-19.9 or 20-30 cm).

The logs were graded as follows :

- Regrowth Grade 1 had a minimum amount of millable wood at the worst end of 50 per cent, and maximum sweep allowed in one direction is 30 mm in any 2.0 m length (if in two directions 15 mm) ;

- Regrowth Grade 2 had a minimum amount of millable wood at the worst end of 30 per cent (to be on only one side and the only defect evident), with the same requirements for sweep.

Each grade specified a minimum log length of 1.2 m and a minimum s.e.d.u.b. of 150 mm.

In comparison, the mature Grade 1 jarrah logs currently supplied to sawmillers have a minimum s.e.d.u.b. of 250 mm, while karri logs have a minimum s.e.d.u.b. of 300 mm. A medium grade regrowth karri sawlog would have a minimum s.e.d.u.b. of 200 mm.

After logs were docked to length and measured , sixteen were selected randomly for each treatment. The exception was second grade regrowth karri where the logs supplied did not produce sufficient of that grade, and the treatment was discarded. The logs were stockpiled under waterspray in size classes and grades until required for milling.

Logs were milled in their groups of sixteen of each size and grade class, and as each log was placed onto the infeed deck, the number, size class and species were recorded.

The milling was carried out using one of three different sawing strategies.

(i) Structural with board recovery (70, 95, 115, 140, 170 or 200 mm wide; 20, 30, 40 or 50 mm thick);

(ii) Boards;

(iii) Boards and structural.

Green-off-saw volume from each log, and the major defect which required docking for any board were recorded.

Minimum docked length for boards was 0.6 m and for structural 1.2 m with all length increments of 0.3 m. All structural material was graded green to AS2082 (Standards Association of Australia 1979), and boards were graded green to appearance grade 1 or 2 of AS2796 (Standards Association of Australia 1986). Production was organised to ensure an even distribution of products throughout the round log resource.

The experimental design for the regrowth study was therefore:

Treatment	**df**	
Species and log grade	2	Grades 1, 2 (jarrah), Grade 1 (karri)
Log size class	3	2.4 or 3.6 m; 15-19.9 or 20-30cm diameter
Sawing strategies	2	Structural, boards, or boards and structural
Replications	15	Sixteen logs
Error	553	
	575	

The recovery data were analysed using analysis of variance.

RESULTS AND DISCUSSION

Recoveries

The mean diameter under bark in each regrowth species and grade, length and diameter class is given with the ungraded and graded green sawn recoveries from the three different sawing strategies.

Table1

Recoveries from different sawing strategies for milling 1st and 2nd grade regrowth jarrah and 1st grade regrowth karri logs in different length and diameter classes

			1st GRADE JARRAH			2nd GRADE JARRAH			1st GRADE KARRI		
Sawing strategy	Log Length (m)	S.E.D. Class (cm)	Mean s.e.d.u.b... (cm)	Mean ungraded recovery (%)	Mean graded recovery (%)	Mean s.e.d.u.b. (cm)	Mean ungraded recovery (%)	Mean graded recovery (%)	Mean s.e.d.u.b. (cm)	Mean ungraded recovery (%)	Mean graded recovery (%)
Structural	2.4	15-19.9	20.0	28.6	25.1	18.7	16.7	0.0	17.4	19.8	1.5
Boards	2.4	15.19.9	19.7	31.2	28.4	17.7	13.5	4.5	17.8	23.0	16.2
Boards & Structural	2.4	15-19.9	19.7	28.9	24.6	18.7	17.1	8.9	18.6	16.1	5.6
Structural	2.4	20-30	25.4	35.7	30.4	26.0	19.6	6.5	25.4	34.4	23.2
Boards	2.4	20-30	25.5	42.9	35.7	26.6	22.4	10.7	27.5	45.3	41.9
Boards & Structural	2.4	20-30	23.0	35.5	27.2	23.0	24.0	12.6	26.1	36.8	29.3
Structural	3.6	15-19.9	20.0	22.8	14.3	18.4	13.5	0.0	18.1	17.0	13.4
Boards	3.6	15-19.9	19.9	21.9	13.9	18.8	13.4	0.6	18.2	17.4	10.8
Boards & Structural	3.6	15-19.9	18.3	15.6	10.1	19.1	13.1	1.6	18.8	19.3	13.7
Structural	3.6	20-30	25.6	33.4	26.7	25.4	18.5	5.5	26.3	32.5	24.0
Boards	3.6	20-30	24.8	34.4	22.1	24.5	15.8	2.1	27.5	27.8	14.6
Boards & Structural	3.6	20-30	26.9	35.1	22.5	26.5	19.4	5.1	27.0	35.6	26.1

Analysis of variance indicated significant differences ($p < 0.001$) in log species and grade and in log size class (Table 2). The interaction between species/grade and size class was significant at the same level. Sawing strategy effects were not significant, although the interaction between size class and sawing strategy was significant at $p < 0.05$.

Table 2

Analysis of variance of sawmilling trial relating regrowth jarrah and karri in different log size classes milled by different sawing strategies (16 replications).

Treatment	d.f	F - ratio	Prob
Species and grade	2	90.7	.000
Log size class	3	70.2	.000
Sawing strategy	2	1.0	.372
Species x size class	6	6.8	.000
Species x sawing strategy	4	2.0	.097
Size class x strategy	6	2.3	.032
Spp x size class x strategy	12	1.0	.474
Error	540		

The recoveries from 1st grade regrowth jarrah logs (Table 1) were satisfactory in 2.4 m lengths and 15-19.9 cm and 20-30 cm size classes, and in 3.6 m lengths in the larger diameter class. However, recoveries would be unacceptable in the 3.6 m/15-19.0 cm size class. Although the sample size was comparatively small (16 logs), the data indicated the likely recoveries from small 1st grade regrowth jarrah logs of these dimensions.

Milling 2nd grade regrowth jarrah sawlogs as graded using the specifications described in Methods resulted in low recoveries in each of the four dimension classes, irrespective of the production option (i.e. choice of cutting pattern). The best result achieved was 12.6 per cent recovery from cutting boards and structural timber in 2.4 m/20-30 cm size class, but ungraded recovery in this size class was 24.0 per cent. These dimension classes included smaller sawlogs than are currently supplied to sawmiller as stated previously.

The recoveries from 1st grade regrowth karri logs were poor in the 2.4 m/15-19.9 cm size class, because of the very small logs, but in the other three dimension classes tended to give similar results to those from 1st grade regrowth jarrah logs in those classes. The best overall graded result was 41.9 per cent from milling boards, after an ungraded recovery of 45.3 per cent.

The results of ungraded compared with graded recoveries suggested a need for production of some lower grade products (eg. pallets, cable drum boards, tile battens) to improve sawmill viability while milling logs less than 20 cm s.e.d.

Defects

The defects docked from boards milled from 1st grade jarrah, 2nd grade jarrah, and 1st grade karri regrowth logs are listed in Tables 3, 4, and 5 respectively. The percentages given are based on log volumes, and the total percentage defects for each dimension class are equivalent to the difference between ungraded and graded recoveries as shown in Table 1.

The losses in recovery owing to defects in 1st grade regrowth jarrah logs were comparatively small, with the largest loss in milling structural timber being 4.2 per cent from rot and 2.8 per

cent from knots in the 3.6 m/15-19.9 cm size class (Table 3). When milling boards and structural, the largest loss was 7.1 per cent from knots. There was an irregular trend, but overall there was a higher percentage defect in the larger logs, and structural products had least defect docked.

Table 3

Defects docked from timber from small 1st grade regrowth jarrah logs (percentage of log volume)

Defects	Structural				Boards				Boards and Structural			
	A*	B	C	D	A	B	C	D	A	B	C	D
Under size	-	-	-	-	-	-	0.8	-	-	0.2	0.1	-
End splits	1.0	1.8	0.3	1.2	0.1	1.0	1.5	0.3	0.4	0.7	0.4	0.7
Shake	-	-	-	-	-	0.3	-	-	-	-	0.5	-
Cross grain	-	-	-	0.1	-	-	-	-	-	-	-	-
Heart	-	0.2	-	0.6	-	1.1	1.1	1.2	0.8	0.6	1.7	0.2
Sapwood	-	-	-	-	-	-	0.6	-	0.3	-	-	-
Wane	0.4	0.9	0.3	1.0	0.5	1.6	2.5	1,3	-	1.1	2.8	0.5
Gum veins	0.1	0.3	0.2	1.0	0.7	0.9	0.4	3.9	0.2	1.2	-	1.7
Gum pockets	0.1	-	0.2	1.0	0.3	0.9	0.2	1.1	0.4	0.7	-	1.2
Rot	-	0.8	4.2	-.	-	0.4	0.6	1.1	0.1	1.5	-	0.6
Stain	0.3	-	-	-	-	0.1	-	-	0.7	0.2	-	0.2
Knots	0.8	1.0	2.8	1.7	1.0	0.9	0.1	2.8	1.2	1.1	-	7.1
Epicormics	-	-	0.1	-	-	-	-	-	-	0.3	-	0.1
Insects	0.2	0.3	0.4	0.1	0.2	-	0.2	0.5	0.2	0.7	-	0.3
Bow	0.6	-	-	-	-	-	-	0.1	-	-	-	-
TOTAL	3.5	5.3	8.5	6.7	2.8	7.2	8.0	12.3	4.3	8.3	5.5	12.6

A* 2.4 m : 15-19.9 cm class
B 2.4 m : 20-30 cm class
C 3.6 m : 15-19.9 cm class
D 3.6 m : 20-30 cm class

With 2nd grade regrowth jarrah logs (Table 4) the major defect requiring docking was rot, with the maximum value of 15 per cent loss when milling structural timber from logs in the smallest size class (2.4 m/15-19.9 cm). The occurrence of other defects was similar to the results from milling the 1st grade regrowth jarrah logs. Overall, milling structural timber resulted in the highest percentage of defects requiring docking, but there was greater uniformity in percentages from different size classes than with the latter.

Table 4

Defects docked from timber from small 2nd grade regrowth jarrah logs (percentage of log volume)

Defects	Structural				Boards				Boards and Structural			
	A*	B	C	D	A	B	C	D	A	B	C	D
Under size	-	-	-	-	-	-	-	-	-	-	-	-
End splits	-	-	-	-	-	-	-	-	-	0.9	-	-
Shake	-	-	-	-	-	-	-	-	-	-	-	-
docked	-	-	-	-	-	-	-	-	-	-	-	-
Cross grain												
Heart	-	-	-	1.5	0.6	-	-	0.2	-	-	-	0.4
Sapwood	-	-	-	0.1	-	-	-	-	-	-	-	-
Wane	0.2	1.6	0.3	1.1	0.7	1.3	0.2	0.7	0.5	0.8	0.9	0.8
Gum veins	0.2	2.7	1.2	1.2	2.2	1.5	0.5	2.3	2.5	0.9	3.0	1.5
Gum	-	1.2	0.7	0.7	-	1.0	-	1.1	0.9	0.1	-	0.1
pockets												
Rot	15.0	7.0	10.5	8.0	4.0	5.8	11.7	9.1	3.3	6.0	6.6	10.1
Stain	-	0.2	-	-.	-	-	-	0.1	-	-	-	
Knots	1.0	0.3	0.2	0.4	1.1	1.6	-	-	0.8	1.2	0.7	0.6
Epicormics	-	-	-	-	-	-	-	-	-	0.2	-	-
Insects	0.2	0.1	0.6	-	0.4	0.2	-	0.2	-	0.7	0.3	0.4
Multiple**	0.1	-	-	-	-	0.3	0.4	-	0.2	0.6	-	0.4
TOTAL	16.7	13.1	13.5	13.0	9.0	11.7	12.8	13.7	8.2	11.4	11.5	14.3

A* 2.4 m : 15-19.9 cm class
B 2.4 m : 20-30 cm class
C 3.6 m : 15-19.9 cm class
D 3.6 m : 20-30 cm class
** Some species had two or three defects of equal importance, and the grader recorded this as 'multiple'.

The 1st grade regrowth karri logs in the smallest size class (2.4 m/15-19.9 cm) required 11.6 per cent docked because of heart and 5.3 per cent because of gum pockets (Table 5). An additional class 4 defect referred to as 'multiple' was used when grading because samples had two or three major defects of equal importance. Overall, milling boards resulted in the least amount of defects requiring docking, but the major problem was the small log size.

Percentage of timber pieces affected

The previous section referred to the overall percentage volume loss when defects required docking to upgrade them or enable them to make grade. It is also important to consider the percentage of pieces of timber affected, because sawmill productivity decreases as the percentage requiring docking increases.

Table 5

Defects docked from timber from small 1st grade regrowth karri logs (percentage of log volume)

Defects	Structural				Boards				Boards and Structural			
	A*	B	C	D	A	B	C	D	A	B	C	D
Under size	-	-	-	-	-	-	0.1	-	0.1	-	-	-
End splits	-	0.1	0.3	0.1	1.3	0.1	1.5	0.9	1.2	0.1	0.3	-
Shake	-	-	-	-	-	-	-	-	-	-	-	-
Cross grain	-	-	-	-	-	-	-	-	-	-	-	-
Heart	11.6	-	0.3	-	0.8	0.2	0.6	-	-	-	-	-
Sapwood	-	-	0.1	-	-	-	-	-	0.3	-	-	-
Wane	0.7	0.4	1.6	0.2	2.7	-	2.3	0.2	1.0	-	3.2	-
Gum veins	-	0.5	0.2	1.0	0.5	-	0.7	0.3	0.4	0.3	0.6	0.2
Gum pockets	5.3	0.8	-	0.9	0.1	0.1	-	2.4	-	0.1	-	1.1
Rot	-	-	0.5	0.9	-	-	-	0.7	0.6	0.9	0.4	0.1
Stain	-	-	-	0.1	-	0.1	-	-	-	-	-	-
Knots	0.7	1.5	0.1	1.5	0.4	0.2	1.0	3.9	0.8	2.8	0.4	2.9
Epicormics	-	0.8	-	-	-	0.6	-	1.2	-	-	-	0.1
Insects	-	1.2	0.5	3.1	0.7	2.0	0.3	3.2	0.9	2.6	0.4	3.9
Multiple**	-	5.9	-	0.7	0.3	0.1	0.1	0.4	5.2	0.7	0.3	1.2
TOTAL	18.5	11.2	3.6	8.5	6.8	3.4	6.6	13.2	10.5	7.5	5.6	9.5

A* 2.4 m : 15-19.9 cm class
B 2.4 m : 20-30 cm class
C 3.6 m : 15-19.9 cm class
D 3.6 m : 20-30 cm class
** Some species had two or three defects of equal importance, and the grades recorded this as 'multiple'.

Milling the 1st grade regrowth jarrah logs produced timber with considerable variation between treatments i.e. log size class and sawing pattern (Table 6). The major defect affecting recovery was wane with 41.9 per cent of pieces affected when milling boards and structural from long thin logs (3.6 m/15 - 19.9 cm), and 21.8 per cent milling boards from that size class. However, the number of boards affected in other treatments was as low as 3.8 per cent. The occurrence of knots was more consistent, except when milling boards in the above size class. Undersizing occurred in one size class (2.4 m/20 - 30 cm), which presumably would be a milling error. There was considerable end-splitting, with about 20 per cent of boards requiring docking in the smaller diameter logs in both 2.4 cm and 3.6 cm lengths. There was a consistent pattern throughout all sawing strategies with the percentage of pieces affected, but some variation between log size classes, particularly with structural and boards where the smaller diameter logs had higher percentages of defects.

Table 6

Percentage of timber affected by different defects after milling small 1st grade regrowth jarrah logs (by size class)

Defects	Structural				Boards				Boards and Structural			
	A*	B	C	D	A	B	C	D	A	B	C	D
Under size	-	2.2	-	-	-	-	10.3	-	-	4.8	4.7	0.8
End splits	19.2	21.7	3.5	12.5	1.6	7.6	9.0	4.3	5.1	6.7	4.7	1.5
Shake	-	-	-	-	-	0.8	-	-	-	-	2.3	-
Cross grain	-	-	-	1.0	-	-	-	-	-	-	-	-
Heart	-	3.3	-	5.2	-	5.1	7.7	4.3	5.1	1.9	16.3	0.8
Sapwood	-	-	-	-	-	-	2.6	-	1.7	-	-	-
Wane	5.8	10.9	5.3	6.3	4.7	8.5	21.8	6.8	-	6.7	41.9	3.8
Gum veins	-	-	-	-	-	-	-	-	-	-	-	-
Gum pockets	1.9	1.1	5.3	5.2	9.4	19.5	1.3	6.8	6.8	5.8	-	14.4
Rot	-	4.3	1.8	-	1.6	5.1	3.8	4.3	1.7	6.7	-	3.0
Stain	3.8	-	-	-	1.6	2.5	-	-	5.1	2.9	-	3.0
Knots	32.7	21.7	57.9	29.2	48.4	21.2	2.6	24.8	28.8	25.0	-	25.8
Epicormics	-	-	1.8	-	-	0.8	-	-	-	1.9	-	0.8
Insects	3.8	2.2	7.0	4.2	4.7	-	2.6	4.3	8.5	5.8	-	9.1
Bow	15.4	1.1	-	-	6.3	4.2	-	1.7	1.7	-	-	0.8
Spring	-	-	-	-	-	0.8	-	1.7	-	1.0	-	0.8

A* 2.4 m : 15-19.9 cm class
B 2.4 m : 20-30 cm class
C 3.6 m : 15-19.9 cm class
D 3.6 m : 20-30 cm class

Gum veins and rot were the major defects in 2nd grade regrowth jarrah logs, as stated previously. In general, the comparatively larger diameter logs (20 - 30 cm s.e.d.u.b.) give a smaller percentage of timber pieces with defects (Table 7). The incidence of pieces with rot ranged from 34.1 per cent to 84.6 per cent, which includes the poor quality of the 2nd grade logs. Insect attack was a minor problem in the sample, although previous experience had indicated that insect galleries often had associated rot. Knots were the next major problem. Overall, the number of pieces affected by defect were similar over the three sawing strategies and four size classes.

The 1st grade regrowth karri logs produced a different distribution of defects - knots and insect attack were the major reasons for docking (Table 8). The data on insect galleries showed a greater incidence in the larger diameter classes, which indicates that more vigorous trees are more susceptible to insect attack (i.e. *Tryphocaria spp* and other). Knots similarly were more pronounced in the larger diameter overall. Sawing strategies had no effect on the percentage of pieces affected, over the combined size classes. The major effect was the high incidence of insect galleries in the larger diameter classes.

Table 7

Percentage of timber affected by different defects after milling small 2nd grade regrowth jarrah logs (by size)

Defects	Structural				Boards				Boards and Structural			
	A*	B	C	D	A	B	C	D	A	B	C	D
Under size	-	-	-	-	-	-	-	-	-	-	-	-
End splits	-	-	-	-	-	-	-	1.3	-	7.9	-	-
Shake	-	-	-	-	-	-	-	-	-	-	-	-
Cross grain	-	-	-	-	-	-	-	-	-	-	-	-
Heart	-	-	-	6.3	4.3	-	-	1.3	-	-	-	2.0
Sapwood	-	-	-	1.3	-	-	-	-	-	-	-	-
Wane	4.5	12.1	6.7	7.5	8.7	10.7	3.8	5.1	7.4	5.9	9.3	8.8
Gum veins	40.9	22.9	17.8	12.5	23.9	15.5	7.7	17.7	37.0	11.9	33.3	15.7
Gum pockets	-	8.4	4.4	3.8	-	7.8	-	10.1	7.4	2.0	-	2.0
Rot	34.1	47.0	66.7	57.5	45.7	40.8	84.6	63.3	38.9	37.6	51.9	52.9
Stain	-	1.2	-	1.3	-	-	-	1.3	1.9	-	-	-
Knots	18.2	4.8	4.4	5.0	17.4	15.5	-	-	9.3	11.9	5.6	7.8
Epicormics	-	-	-	-	-	-	-	-	-	1.0	-	-
Insects	2.3	1.2	4.4	-	4.3	4.9	-	1.3	-	7.9	3.7	2.9

A* 2.4 m : 15-19.9 cm class
B 2.4 m : 20-30 cm class
C 3.6 m : 15-19.9 cm class
D 3.6 m : 20-30 cm class

Board length variation

Figures 1 to 3 show the variation in lengths produced in each of the three species x grade log treatments (i.e. 1st grade jarrah, 2nd grade jarrah, 1st grade karri respectively). The results indicate a potential marketing problem with the large number of short length pieces of timber.

General

With the continuous increase in areas of regrowth eucalypt forests available for timber production, there is an increasing need to efficiently utilise the small thinnings resulting from silvicultural treatment. However, small diameter regrowth logs can only produce a viable result if the allowable levels of defect are less than those for large diameter logs. The technology is available to efficiently process regrowth sawlogs, with their inherent high level of growth stresses, into value-added products. The quality, and minimum diameter and length of logs which can be viably processed are affected by the type of milling equipment. Unfortunately the improved technology is not yet available in many sawmills.

Table 8

Percentage of timber affected by different defects after milling small 1st grade regrowth karri logs (by size class)

Defects	Structural				Boards				Boards and Structural			
	A*	B	C	D	A	B	C	D	A	B	C	D
Under size	-	1.2	-	-	1.9	-	1.5	-	2.2	-	-	0.9
End splits	-	1.2	6.3	2.2	11.3	1.8	11.8	2.8	15.6	1.2	6.7	-
Shake	-	-	-	-	-	-	-	-	-	-	-	-
Cross grain	-	-	-	-	-	-	-	-	-	-	-	-
Heart	16.0	-	3.1	-	5.7	0.9	4.4	-	2.2	-	-	-
Sapwood	-	-	3.1	-	-	-	-	-	2.2	-	-	-
Wane	16.0	4.9	18.8	2.2	22.6	-	14.7	0.9	13.3	-	21.7	-
Gum veins	-	13.4	3.1	11.8	1.9	-	4.4	9.3	4.4	11.9	6.7	7.6
Gum pockets	4.0	7.3	-	10.8	1.9	4.5	-	13.0	-	6.0	-	11.9
Rot	-	-	6.3	3.2	-	-	-	2.8	6.7	3.6	5.0	0.8
Stain	-	1.2	-	1.1	-	0.9	-	-	-	-	-	-
Knots	8.0	36.6	3.1	25.8	7.5	12.6	11.8	28.7	8.9	47.6	3.3	28.0
Epicormics	-	9.8	-	-	-	12.6	-	5.6	-	-	-	1.7
Insects	-	19.5	6.3	28.0	6.7	63.1	2.9	27.8	11.1	25.0	3.3	39.0

A* 2.4 m: 15-19.9 cm class
B 2.4 m: 20-30 cm class
C 3.6 m: 15-19.9 cm class
D 3.6 m: 20-30 cm class

The graded recoveries in the present trial indicated that logs of less than 20 cm s.e.d.u.b. must be part only of the total log intake for the sawmill to be viable. The 2nd grade regrowth jarrah logs similarly produced much lower graded recoveries than achieved from 1st grade regrowth jarrah and 1st grade regrowth karri. These results indicated that specifications for regrowth eucalypt sawlogs must be defined cautiously, because milling logs with small visible defects (e.g. 2nd grade) can result in low recoveries. The current 2nd grade specification of a minimum 30 per cent of millable wood at the worst end (to be only on one side and a single defect evident), with maximum allowable sweep in one direction of 30 mm in any 2.0 m length (in two directions 15 mm) would be acceptable if larger diameter logs are provided. Rot was the major defect affecting the sawn timber from 2nd grade jarrah logs .

Milling logs of good form with little or no visible defects resulted in commercially viable recoveries, and obviously 1st grade regrowth logs will be favoured by sawmillers. However, for efficient utilisation of the regrowth resource, lower grade logs must be included in processing operations. Further research is required to more accurately assess the relationship between occurrence of defects, log diameter and length, and sawn graded recoveries from Western Australian grown regrowth eucalypts.

Figure 1. Sawn recoveries by length from milling 1st grade regrowth jarrah logs in four size classes, using different sawing strategies.

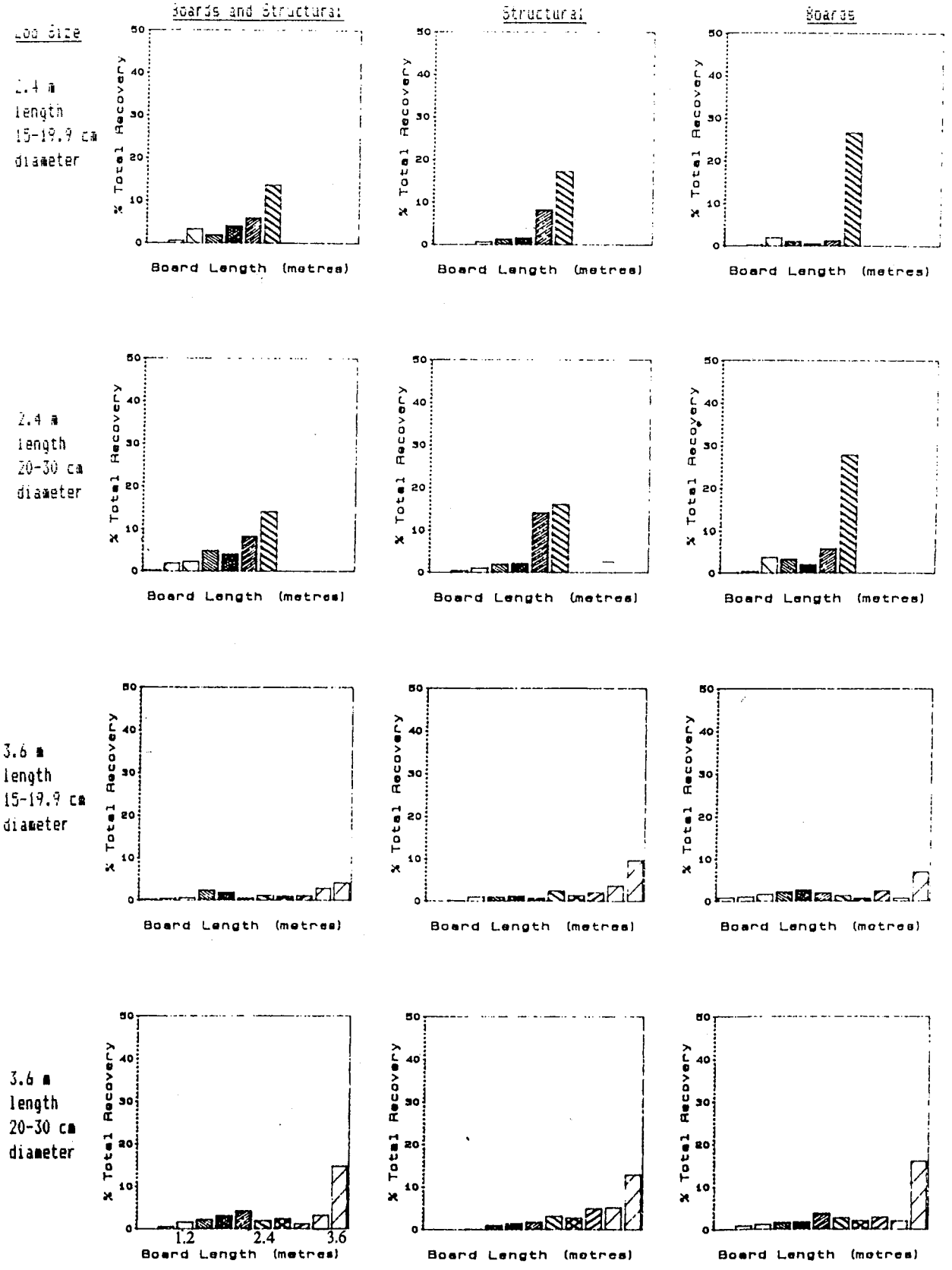


Figure 2. Sawn recoveries by length from milling 2nd grade regrowth jarrah logs in four size classes, using different sawing strategies.

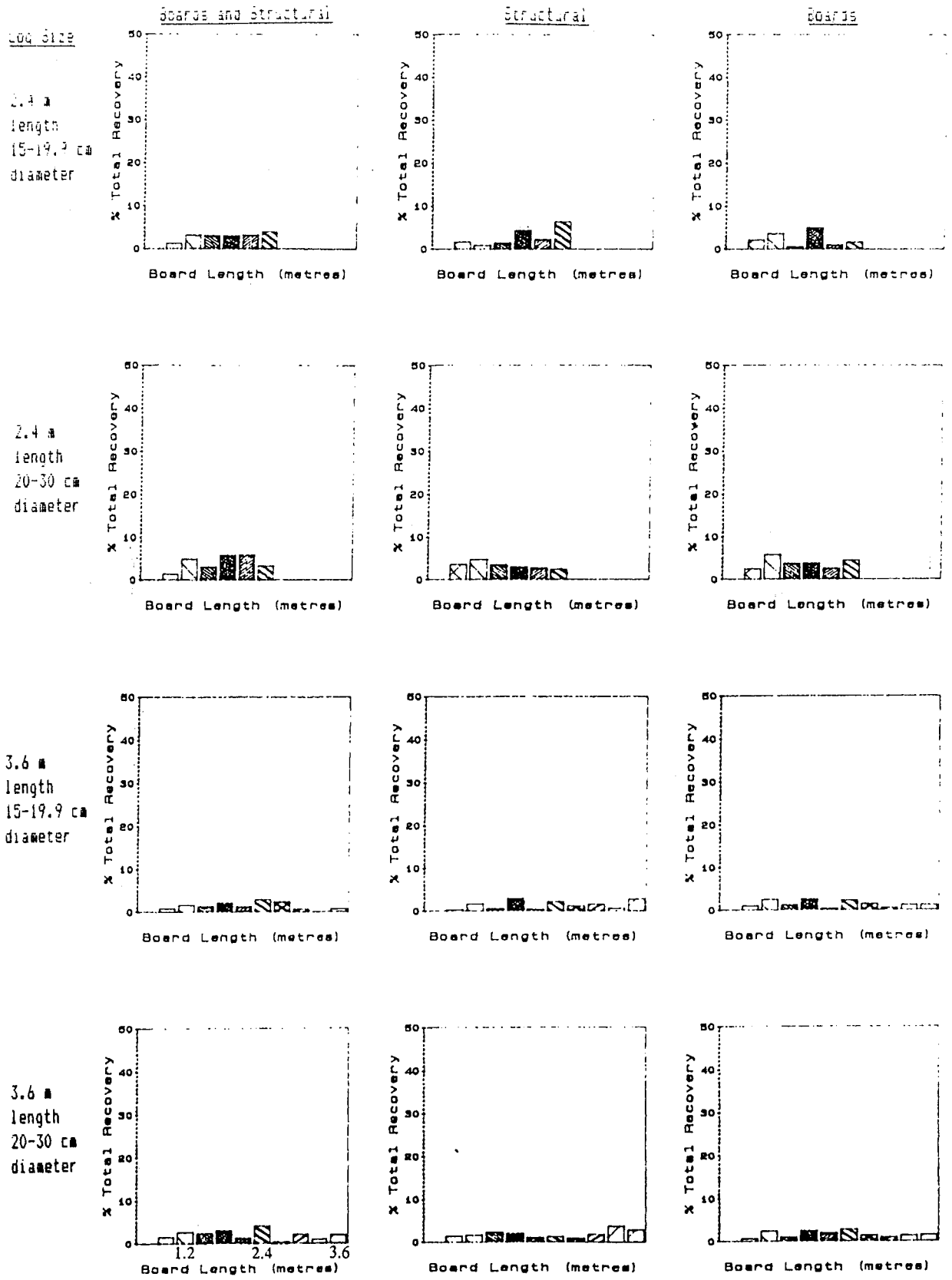
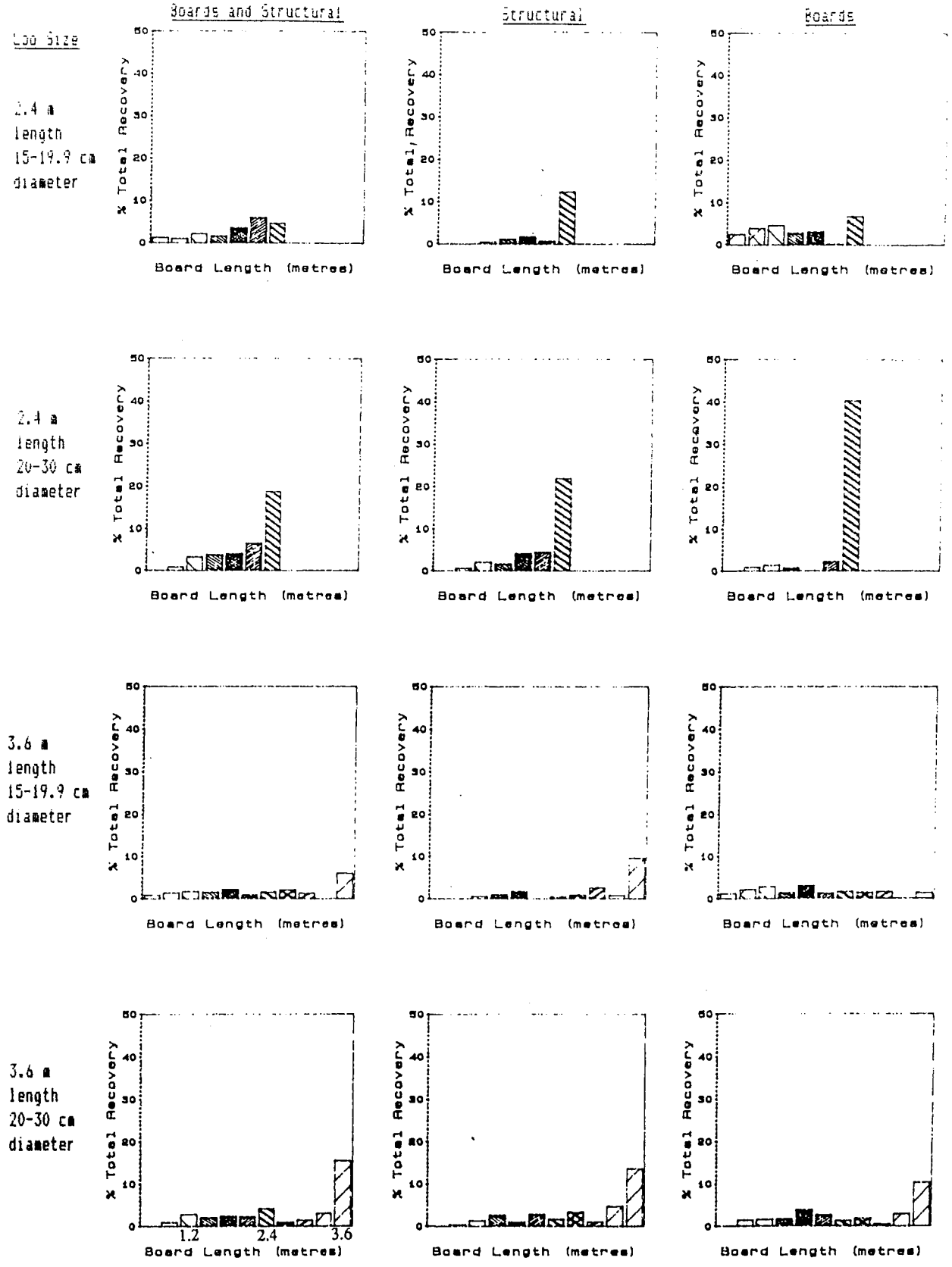


Figure 3 . Sawn recoveries by length from milling 1st grade regrowth karri logs in four size classes, using different sawing strategies.



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