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FELLING AND DELIMBING HAZARDS

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Figure 1 - Faller using his visor to prevent eye injury from the hazard of flying debris

ABSTRACT

The purpose of this investigation was to measure the number and types of hazards nine experienced and five inexperienced fallers were exposed to during their normal working day. Results showed that inexperienced loggers (less than one year felling) were exposed to significantly more hazards than experienced loggers (more than five years felling) and many of these hazards were due to poor work technique.

INTRODUCTION

This study is the third part of a project to reduce felling and delimbing injuries. The first part of the project was to determine whether loggers were aware of the parts of a logging operation that were hazardous and the types of injuries and parts of the body that were most at risk (Tapp et al., 1990). The second part of the project asked loggers to rank nine felling and nine delimbing situations in terms of risk

Table 1 - Characteristics of loggers in the study

	Inexperienced (5 Loggers)		Experienced (9 Loggers)	
	Average	Range	Average	Range
Age (years)	21.2	18 to 30	33.4	26 to 40
Experience (years)	0.5	0.2 to 1	10.8	5 to 20
Productivity (trees/hour)	5.2	4 to 6.6	8.0	6.7 to 12.2

(Parker, 1991). Results showed that loggers recognised hazardous felling situations which were the common cause of fatalities and lost time accidents. However, delimbing hazards were more difficult to recognise.

Felling and delimbing are the most hazardous phases of the logging operation. From 1985 to 1991 they accounted for 27% and 28% respectively of all lost time injuries in New Zealand plantation logging (Gaskin and Parker, 1993). Personal characteristics of the logger such as skill and technique have been identified as contributing to forestry injuries (LIRA and Swedforest, 1980; Gaskin, 1990). This study will investigate the relationship between logger felling experience and the frequency and type of hazards experienced by the logger.

ACKNOWLEDGEMENTS

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STUDY METHOD

Experienced and inexperienced loggers (Table 1) were observed continuously throughout their normal working day. Most loggers (nine of 14) were observed for two complete working days. However, five loggers (two inexperienced, three experienced) were observed for only one day each. Each logger's activity was recorded at 30 second intervals by the SIFREQ frequency sampling programme on a Husky Hunter field computer. All loggers were clearfelling radiata pine on flat to medium slope terrain. To investigate a range of logging operation types, supervision, crew organisation and work environments, loggers in the study were selected from 12 different crews working for three forestry companies.

Hazardous felling and delimbing situations, derived from Ostberg (1980), were recorded. A situation was regarded as hazardous if an injury resulted or could have resulted had the logger been in a slightly different position relative to the hazard. This was a subjective assessment made at the time by researchers experienced in felling and delimbing. Hazards have been categorised into those occurring in either the felling phase or the delimbing phase of the logging operation.

Hazard Definitions

Felling

The felling phase was defined as commencing when the faller arrived at the butt of the next standing tree to fell. It included all preparation (for example, clearing escape path, removing lower limbs) and felling cuts and activities until the tree was resting on the ground.

Felling Hazards

Hazard	Definition
Flying debris	Flying debris dislodged by falling tree and falling near logger
Comeback	Tree falling backward off stump
Drop start	Starting chainsaw by illegal drop start method
Butt kick	Standing too close to butt of tree which kicks upward on falling
Wind/lean	Attempting to fell tree against a strong wind or severe lean
Eye	Having to put down the chainsaw because of dirt or wood chips in eye
Saw above	Using chainsaw above shoulder height (for example, to remove limbs at base of tree)
Into stand	Accidentally felling tree into standing trees (resulting in sailers above stem to be delimbed)
Overcut	Overcutting the back cut and tree falling sideways
Drive	Felling a tree by driving a second (or more) tree(s) on to it

Delimbing

Delimbing was defined as commencing when the logger began delimbing along the fallen tree, and included heading off and walking back up (or beside) the stem to fell the next tree.

Delimbing Hazards

Hazard	Definition
Saw above	Using chainsaw above shoulder height while delimbing
Loaded limb	Limb under tension hitting logger (normally on foot or lower leg) when cut
Kickback	Chainsaw kicking back violently
Unstable	Logger standing or walking on unstable log while delimbing
Sailer	Working under an apparently unstable broken branch suspended in a tree
Balance	Includes "slips", "stumbles", "trips" and falling over

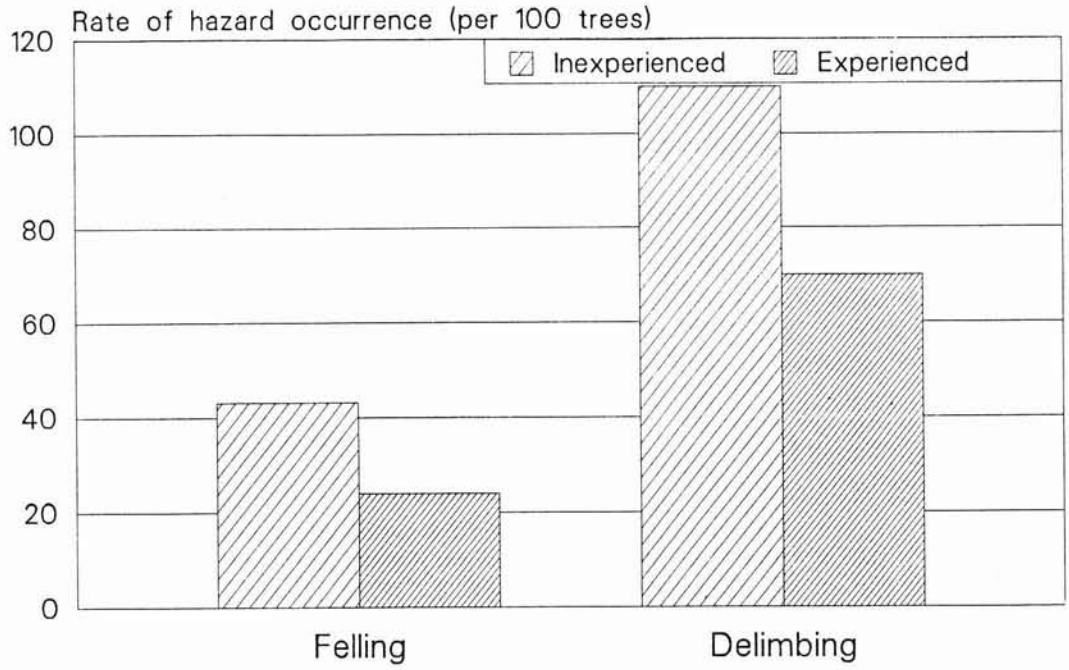

Figure 2 - Comparison of total number of hazards (per 100 trees) confronted by loggers during felling and delimbing

RESULTS AND DISCUSSION

The average rate of hazard occurrence (± standard error) while felling was 31.1 (± 3.9) hazards per 100 trees and for delimbing, 85.7 (± 10.3) hazards per 100 trees. Inexperienced loggers were exposed to significantly more hazards (Figure 2) than experienced loggers in both the felling and delimbing phases.

Felling Hazards

The hazard occurring most frequently during the felling phase was driving. Experienced and inexperienced loggers both drove on average eight trees per 100 felled. Driving was the third greatest cause of felling fatalities in the period 1968 to 1987 (Gaskin, 1988b) and is still a practice in common use.

The type and frequency of hazards confronted by the logger were related to the degree of experience in clearfell. Inexperienced fallers were exposed to hazards of their own making due to poor work technique, for example, "trees coming back off the stump", "drop starting" the chainsaw and "overcutting the back cut" to such an extent that the tree did not fall in the intended direction.

Inexperienced fallers had significantly more occasions where material (for example, wood chips or dirt) entered their eyes than experienced loggers. More experienced loggers may reduce the opportunity for material to enter their eyes by positioning themselves better during the felling cuts. Visors were used irregularly by all loggers. Greater use of visors during delimbing accounted for the very low rate of "eye" hazards during this phase; greater use during felling would reduce the incidence of eye injury in that phase.

Some hazards had no relationship with experience and were in response to the physical environment in which the logger was working, for example, using the chainsaw above the shoulder to remove limbs and undergrowth. However, standing too close to the falling tree and uncontrolled driving are hazards that can be eliminated.

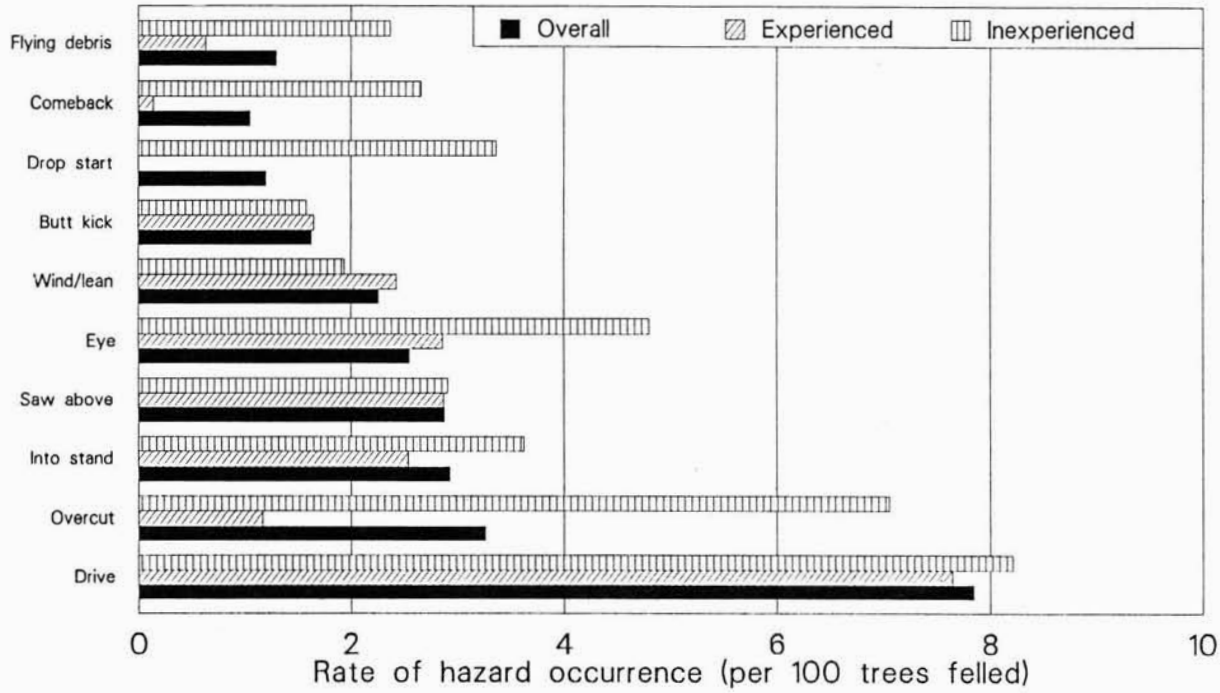

Figure 3 - Rate of occurrence of felling hazards (per 100 trees felled) for inexperienced and experienced loggers

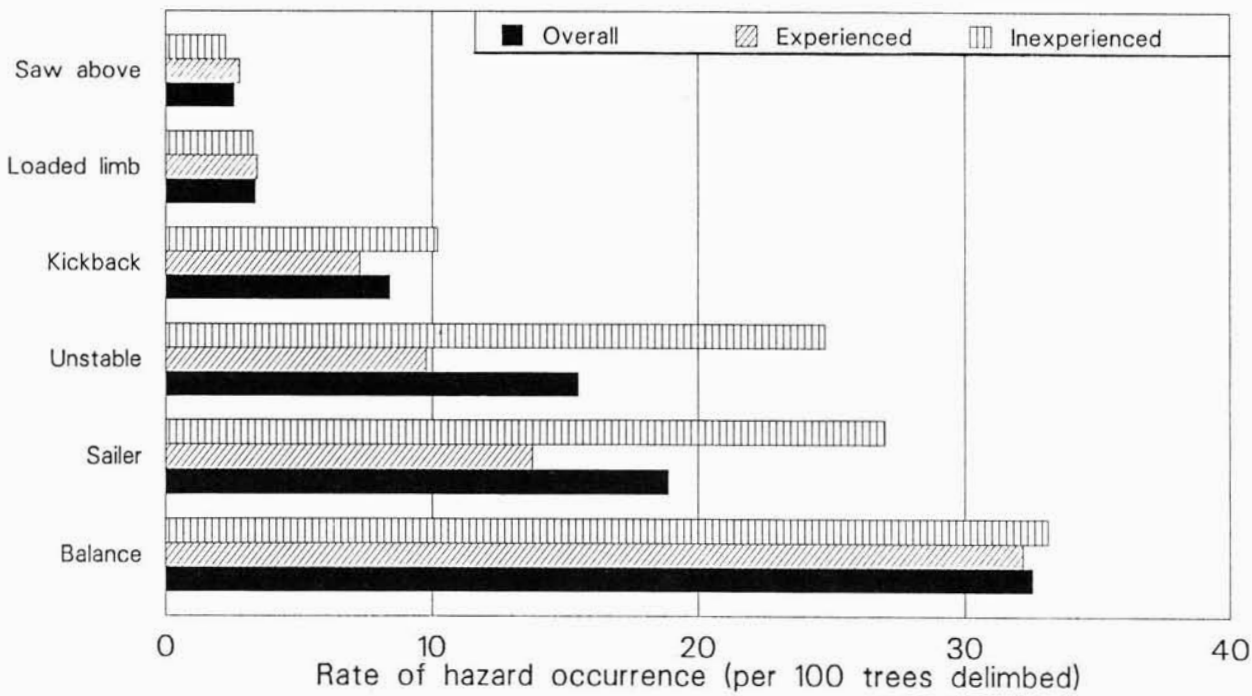

Figure 4 - Rate of occurrence of delimbing hazards (per 100 trees delimbed) for inexperienced and experienced loggers

Delimbing Hazards

The most common hazards when delimbing, for both inexperienced and experienced loggers, were "loss of balance" (slipping, tripping or falling over). These events occurred when walking on the stem or beside the stem on slash (severed branches) and undergrowth (for example, punga fronds). This result is confirmed by the high frequency of injuries recorded in the Logging Industry Accident Reporting Scheme resulting from "loss of balance". In the period 1985 to 1992, 18% of all felling and delimbing lost time injuries were due to falling over. All loggers in the current study wore conventional rubber-soled forestry boots which give less traction in the cutover. The use of spiked-soled forestry boots would dramatically reduce the frequency of slipping, tripping and falling over while delimbing (Kirk and Parker, 1992).

The greatest differences in hazard frequency between experienced and inexperienced loggers were exposure to sailers and working while standing on an unstable platform (Figure 4). Inexperienced loggers worked under significantly more sailers (that could have fallen and injured or killed them) than experienced loggers who, more frequently, identified the sailer as dangerous and left the limbs to be removed by the skid workers. In 1992, 11% of all lost time injuries (that is, the logger could not return to work that day) were the result of "being hit by a sailer". Delimbing hazards, which had no relationship with experience, were using the saw above the head to trim, being hit by loaded limbs and losing balance while delimbing.

The higher hazard exposure rate of inexperienced loggers in the current study confirms the findings of an investigation of Canadian loggers (Mason, 1977). The Canadian study demonstrated that inexperienced loggers (less than three months experience) had a significantly higher injury rate than experienced workers. In support of these findings, the injury rate among inexperienced loggers of less than one year's experience (Klen, 1988) or less than four years' experience (Gaskin, 1988a) was higher than experienced loggers.

The Canadian study also determined that the types of injuries sustained by experienced and inexperienced loggers were different. Inexperienced Canadian loggers had proportionately more "cut by chainsaw" injuries than experienced loggers. This finding is reflected in the higher rate of "drop starting", "kickback" and delimbing on an "unstable platform" hazards demonstrated by inexperienced loggers in the current study. Also the Canadian research identified injury due to "struck by falling tree" as more common among inexperienced loggers. The inexperienced New Zealand loggers were exposed to significantly more technique related hazards which could result in being struck by a falling tree or limb. These were "tree coming back off stump", "overcutting the back cut" and continuing to "work under unstable sailers".

The number of hazards loggers (particularly inexperienced) are exposed to could be reduced by eliminating some work practices (for example, drop starting, working under unstable sailers, working on unstable surfaces), by greater knowledge of good felling technique (for example, trees coming back off stump, overcutting the back cut) and all loggers could benefit by wearing spiked boots to reduce "loss of balance" hazards and subsequent injury, especially during delimbing.

CONCLUSIONS

The logger working in clearfell radiata is exposed to an average of 31 (SE 3.9) hazards per 100 trees during felling and 86 (SE 10.3) hazards per 100 trees during delimbing. The experienced logger is exposed to significantly less hazards per 100 trees than the inexperienced logger.

The number of hazards loggers are exposed to could be reduced by eliminating some work practices, by greater knowledge of correct work technique and by wearing spiked-soled boots.

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