The impact of thinning of older wet sclerophyll regrowth on bird populations in south-eastern Tasmania

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Abstract

Thinning of young regrowth (20–30 years old) is being adopted as a mechanism to increase growth rates of individual trees in native forests. However, little is known of its environmental effects. This study compared bird populations in thinned and unthinned older regrowth wet sclerophyll forest (60–80 years old). In summer, total numbers of birds were greatest in the thinned area but species such as the Tasmanian thornbill which utilised the mid layer of the forest were more abundant in the unlogged area. In winter, birds were consistently more abundant in the unlogged forest. Numbers of species were similar in the logged and unlogged areas. The trial was not on an operational scale and edge effects may have reduced the negative impacts of logging because of the small size of the logged and unlogged areas. It is likely that the impacts of thinning of older regrowth would be more pronounced if conducted at an operational scale.

Introduction

The clearfell, burn and sow technique is the accepted silvicultural system for the logging and regeneration of wet sclerophyll forests (Gilbert and Cunningham 1972). In the last decade, there has been a trend towards the development and use of a more diverse range of silvicultural techniques for the logging of dry sclerophyll forests. However, due to the necessity of providing a competition-free surface to allow for the establishment of eucalypt seedlings, clearfelling has remained the dominant treatment applied to wet forests. Public disquiet with the appearance of recently clearfelled wet forests has led to research investigating the possibility of using alternative silvicultural techniques. The Silvicultural Systems Project (Squire 1990) in Victoria was a major investigation on this topic and other trials to test alternative silviculture in damp eucalypt forests have been set up in south-eastern Tasmania. One of the major techniques investigated was a thinning technique, in this case applied to a 60–80-year-old regrowth stand. Thinning is becoming a more commonly utilised technique in forest management in an effort to increase productivity of native forest stands (Brown 1992). However, normally this is applied to younger stands of regrowth (20–30 years old).

The effects of thinning of forests on fauna have not been investigated in Tasmania. Given the likely increase in the use of this technique, at least for young stands, such studies are warranted. This paper reports on the findings of a study comparing bird populations in thinned and unthinned stands in the silvicultural systems trial of Forestry Tasmania in south-eastern Tasmania. The work was undertaken as part of a larger study examining the effects of partial logging systems on birds in Tasmania (Taylor and Haseler 1995).

Methods

Study area

The study area was located on the Forestier Peninsula (42°57'S, 147°54'E) in south-eastern

Tasmania. A trial was set up by Forestry Tasmania to investigate the use of alternative silvicultural systems to clearfelling for the logging of wet sclerophyll forests. The forest was predominately even-aged *Eucalyptus regnans, E. obliqua* and *E. globulus* aged 60 to 80 years, with oldgrowth trees present in some areas that had been selectively logged about 40 years ago. One or two oldgrowth trees were present per hectare, with a canopy cover of less than 10%. A dense shrub layer of 2–4 m was present, dominated by *Pomaderris apetala, Bedfordia salicina* and *Olearia argophylla.* The geological substrate was dolerite. Various treatments were applied but only three were examined in this study. Two were basically thinning techniques applied in this situation to older rather than younger regrowth (20–30 years old) as is normally the case. The two treatments differed in the extent of the thinning, with either one in two or one in four eucalypt stems being retained. The third treatment was an overstorey removal applied to a small area containing a high density of regrowth poles. The logging was completed two years prior to the present study and was followed by a top disposal burn on parts of the area. The treatment areas were small (4–11 ha) and were interspersed amongst the unlogged control sites.

Census of birds

Field work was undertaken between 12–18 February and 11–19 June 1992. Two census methods were employed: area searches and transect counts. Area searches should provide an accurate assessment of density for relatively sedentary species occurring at higher densities and should detect inconspicuous species (Loyn 1986). However, they are probably of limited value for species which occur at low densities or which range widely in flocks, as is often the case in the non-breeding season. Transect counts provide a better census method for these latter species (Recher 1988).

Area searches were undertaken in eight permanently marked 50 m x 50 m plots (four in logged and four in unlogged forest), with each plot being searched twice. This plot size was smaller than would normally have been used due to the restricted nature of the unlogged forest. Area searches were undertaken in the morning, commencing when there was sufficient light. A maximum of four plots was searched per morning, with at least 20 minutes spent in each plot. Wherever possible, pairs of logged and unlogged plots were searched on the same morning to minimise the influence of weather on the comparison of treatments.

The transect counts were commenced immediately after the area searches were completed and continued until the end of the morning activity period. The path taken each day varied, with a record being kept of the distance travelled in each treatment type. The approximate distance of birds from the transect line and the total numbers seen or heard were recorded. A record was also kept of the sighting of bird species for each 10-minute time interval while undertaking the transects. The numbers of individuals seen were insufficient to enable detailed sightability curves to be plotted for species. Thus, calculation of densities was not possible for transects. Instead, the absolute counts were used. Examination of plots of numbers seen versus distance from the transect line gave no indication of a difference in sightability for birds in logged compared with unlogged forest.

Usage of common names of the birds follows that of Blakers *et al.* (1984).

Data analysis

Where numbers were sufficient, data for individual species were tested for any effects of logging. Logging tends to affect the structural attributes of a forest rather than the composition of its vascular flora (Duncan 1981). Bird species were thus grouped into three guilds based on the height at which most of their foraging was undertaken; that is, canopy; subcanopy and tall shrubs (referred to as 'mid layer'); and low shrubs and ground (referred to as 'ground'). The height guild

for each bird species is given in Appendix 2. Green rosellas were not included in these height guilds because of their high use of both ground and canopy habitats. Their numbers were often great enough to allow significance testing on their own. The numbers of birds in these guilds, along with total numbers and numbers of species, were also examined for any effects of logging.

For the data collected from area searches, differences between logged and unlogged forest were tested using the Wilcoxon matched-pairs signed-ranks test (Table 1). The plots were paired into logged and unlogged pairs sampled on days with similar weather patterns. Only species which occurred in at least half of the pairs of plots were included in the analysis. This was done to avoid bias resulting from chance situations such as a large flock being recorded from a single plot. For the transect counts, numbers seen in logged and unlogged forest were compared using chi-square tests (Table 2). Only species with greater than 10 individuals in at least one of the treatments and with expected frequencies greater than five were included in the analysis. Expected frequencies were calculated on the basis of the length of the transect walked in a treatment, with the numbers of birds in logged and unlogged forest assumed to be equal.

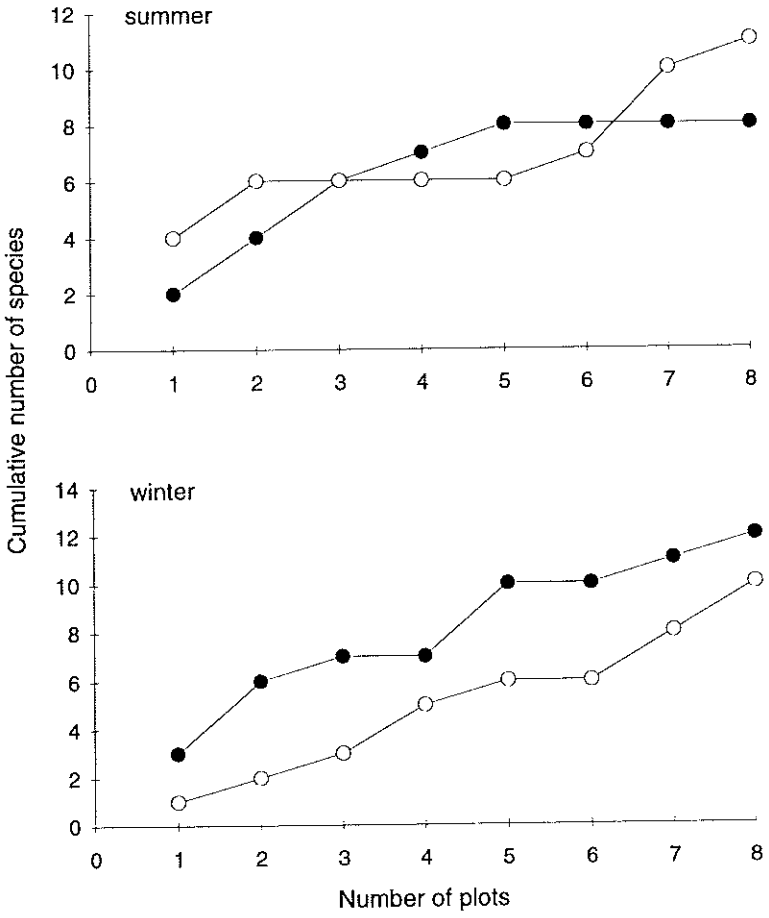

Figure 1. Cumulative number of bird species recorded from area searches for unlogged regrowth forest and thinned stands (o = thinned regrowth, ● = unlogged regrowth).

Table 1. Comparison of surveys of bird populations using area searches in thinned and unlogged regrowth forest with scattered oldgrowth trees. Only those species with sufficient numbers were included (see text). Abundance values are numbers per eight plots.

Season	Species (or category)	Abundance		Significance of difference
		Thinned	Unlogged	
Summer	Strong-billed honeyeater	19	5	N.S.
	Grey fantail	2	5	N.S.
	Brown thornbill	0	7	N.S.
	White-browed scrubwren	10	4	N.S.
	Canopy birds	19	5	N.S.
	Mid-layer birds	11	24	< 0.05
	Ground birds	13	8	N.S.
	Total numbers	54	37	N.S.
	No. of species/plot	3.1	2.6	N.S.
Winter	Grey fantail	6	1	N.S.
	Black-headed honeyeater	3	14	N.S.
	Crescent honeyeater	3	7	N.S.
	Canopy birds	27	19	N.S.
	Mid-layer birds	14	17	N.S.
	Total numbers	45	40	N.S.
	No. of species/plot	2.3	2.5	N.S.

Results

The three partial logging treatments examined (overstorey removal, thinning of one in four or one in two stems) were not separated in the analysis as the areas were intermingled and sampling of each treatment was not adequate to examine it individually. These three treatments are referred to as 'thinned' in the following discussion because this treatment predominated in the area sampled. The numbers of each bird species seen on plots and during transect counts are given in Appendices 1 and 2.

In summer, green rosellas were significantly more abundant in thinned regrowth as were canopy birds and total numbers (Table 2). Tasmanian thornbills were more abundant in unlogged regrowth forest. The numbers of species observed during the area searches was slightly greater in the thinned areas (Figure 1) and similar in the two treatments for the transects (Figure 2).

In winter, in contrast to summer, there was a general trend for species to be more abundant in the unlogged regrowth forest. Total numbers, canopy and mid-layer birds were also more abundant in unlogged forest (Table 2). Numbers of species were slightly greater in the unlogged regrowth for the area searches (Figure 1) and slightly greater in the thinned areas for the transects (Figure 2).

Overall, the numbers of species seen in unlogged regrowth forest and thinned areas were similar (Table 3). Seven species (White's thrush, 6 individuals seen; grey butcherbird, 1; noisy miner, 1; eastern spinebill, 1; silvereye, 2; grey currawong, 5; forest raven, 6) were seen only in unlogged forest and four species (scarlet robin, 3; olive whistler, 2; superb fairy-wren, 6; beautiful firetail, 6) were seen only in thinned areas.

Discussion

In winter, the effects of thinning on bird populations in the present study area were similar to those obtained for other partial logging systems applied at an operational scale in dry and moist sclerophyll forests

Table 2. Comparison of surveys of bird populations from transect counts in thinned and unlogged regrowth forest with scattered oldgrowth trees. Abundance values are numbers/km. Transect length in summer was 3.15 km for thinned and 4.9 km for unlogged forest and, for winter, 6.6 km for thinned and 5.75 km for unlogged forest.

Season	Species (or category)	Abundance		Significance of difference
		Thinned	Unlogged	
Summer	Grey shrike-thrush	4.8	3.3	N.S.
	Grey fantail	3.8	3.1	N.S.
	Green rosella	13.7	5.5	< 0.001
	Superb fairy-wren	4.4	3.1	N.S.
	White-browed scrubwren	4.1	3.9	N.S.
	Brown thornbill	5.7	5.3	N.S.
	Tasmanian thornbill	1.0	4.3	< 0.01
	Strong-billed honeyeater	12.7	9.4	N.S.
	Silvereye	6.0	5.5	N.S.
	Black currawong	1.3	2.0	N.S.
	Canopy birds	17.5	11.2	< 0.05
	Mid-layer birds	30.5	24.5	N.S.
	Ground birds	14.9	13.9	N.S.
	Total number	76.5	55.1	< 0.001
Winter	Yellow wattlebird	0.6	1.7	N.S.
	Green rosella	1.2	9.2	< 0.001
	Grey shrike-thrush	1.4	4.3	< 0.01
	Grey fantail	2.3	7.8	< 0.001
	White-browed scrubwren	1.7	3.5	< 0.05
	Brown thornbill	1.7	3.7	< 0.05
	Tasmanian thornbill	2.1	1.0	N.S.
	Spotted pardalote	0.8	1.9	N.S.
	Black-headed honeyeater	3.5	10.1	< 0.001
	Strong-billed honeyeater	3.9	18.4	< 0.001
	Yellow-throated honeyeater	1.1	2.1	N.S.
	Crescent honeyeater	1.8	12.0	< 0.001
	Silvereye	0	3.8	< 0.001
	Canopy birds	8.8	32.4	< 0.001
	Mid-layer birds	14.2	44.5	< 0.001
	Ground birds	5.8	7.0	N.S.
	Total number	30.0	93.0	< 0.001

elsewhere in Tasmania (Taylor and Haseler 1995); that is, similar numbers of species but reduced densities of birds in logged areas compared with unlogged forest. The results obtained for summer, however, did not show a consistent trend for greater numbers in the unlogged forest, in contrast to the results of Taylor and Haseler (1995) for other partially logged areas. The abundance of birds was, in fact, greatest in the logged areas. The green rosella and the strong-billed honeyeater were the two species contributing most to the greater numbers of birds in the thinned areas.

Green rosellas feed on the ground and in low shrubs as well as in the canopy and thus may have taken advantage of the more open conditions in the thinned area. Strong-billed honeyeaters spend most of their time foraging in trees. However, Thomas (1980) notes that they can feed opportunistically as well and has observed them taking caterpillars from the ground. The Tasmanian thornbill was the only species that was significantly more abundant in unlogged areas in summer. This is probably related to their use of mid-layer shrubs as a foraging substrate which was

reduced and fragmented by the falling of trees in logged areas. Total numbers of mid-layer birds were also significantly greater in summer in unlogged areas for the area searches, due mainly to differences in numbers of brown thornbills between treatments.

None of the species that were seen only in the unlogged or only in the logged areas was common and hence it was not possible to definitely conclude that they were restricted to one of the treatments. However, it is possible that with greater sampling effort this could have been found to be the case for some of the species. For instance, superb fairy-wrens were seen only in the logged areas. This species utilises areas where dense undergrowth and open ground are interspersed. The creation of open areas amongst the dense undergrowth as a result of logging could well have favoured this species. It has been found to be favoured by partial logging in other areas (Taylor and Haseler 1995).

Brown *et al.* (1991) investigated the effects on bird populations of thinning of 19–36-year-old regrowth dry sclerophyll forest in East Gippsland. The size of areas thinned in their study ranged from 4.1–32.5 ha. They found that thinning generally caused a reduction in numbers and species diversity of birds.

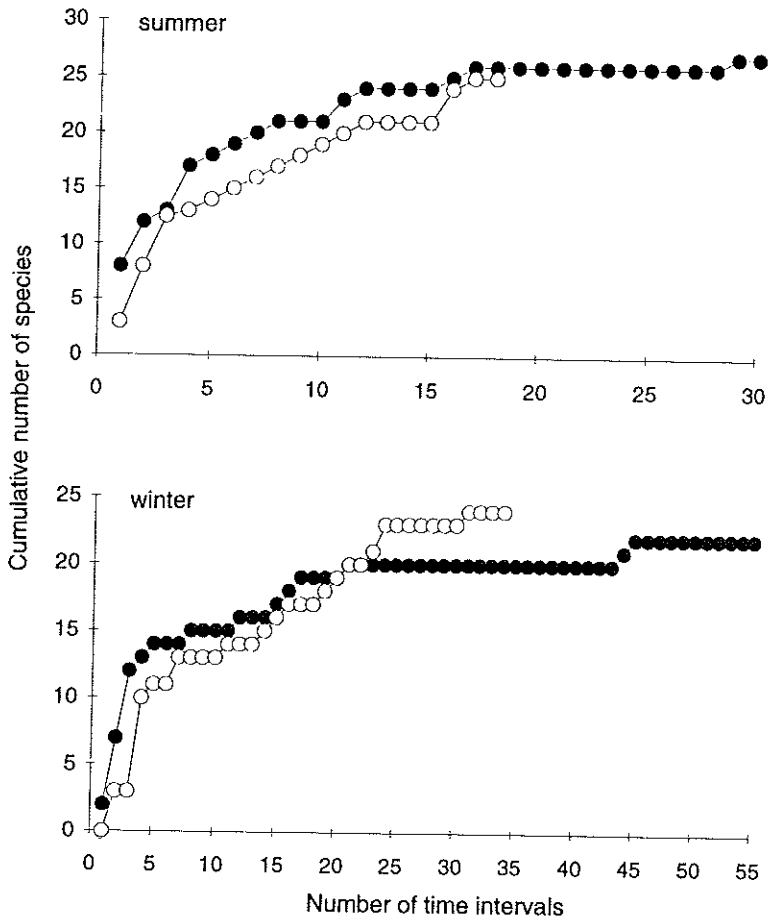

Figure 2. Cumulative number of bird species recorded from transects for unlogged regrowth forest and thinned stands (o = thinned regrowth, ● = unlogged regrowth).

Table 3. Number of all species and common species (greater than five individuals sighted) in thinned and unlogged regrowth forest using area searches and transect counts.

	Area searches		Transects	
	Thinned	Unlogged	Thinned	Unlogged
All species	14	15	30	31
Common species	13	14	24	24

However, the effects were related to the size and shape of the thinned area. In the smallest thinned area (4.1 ha), densities were over double those of the unlogged regrowth, whereas in the largest area, densities were three times greater in the unlogged regrowth. Logging in the present study area was on a small, experimental scale. The small size of both the thinned area and the unlogged control site may have led to similar edge effects. Thus, the results may not be an accurate picture of the likely impacts of thinning of older regrowth if conducted at an operational scale.

The logging in the study area was undertaken to examine alternative silvicultural systems to clearfelling. The minor differences recorded between logged and unlogged areas is in marked contrast to the effects of clearfelling where numbers of species and densities dramatically decline after logging and many decades are required before numbers of species approach that of mature forest (Loyn *et al.* 1980; Pattemore 1980; Loyn 1985). Thus, a change away from clearfelling to alternative logging systems would most likely benefit bird populations. However, clearfelling is still the recommended silvicultural practice for logging of older regrowth and mature wet forests in Tasmania. If any changes to this policy were to occur for wet forests, it would be likely that both group selection and thinning techniques would be utilised depending upon the structure of the forest (G. Wilkinson, pers. comm.).

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Appendix 1. Abundance values (number/eight plots) for bird species determined from area searches in thinned and unlogged regrowth. Eight plots were searched for both treatments.

Species	Summer		Winter	
	Thinned	Unlogged	Thinned	Unlogged
Green rosella	11	-	2	2
White's thrush	-	4	-	-
Scarlet robin	1	-	-	-
Dusky robin	1	-	-	-
Golden whistler	-	-	-	2
Grey shrike-thrush	3	1	1	1
Grey fantail	2	5	6	1
White-browed scrubwren	10	4	2	-
Brown thornbill	-	7	2	2
Tasmanian thornbill	2	4	1	1
Unidentified thornbill	-	3	1	-
Yellow wattlebird	-	-	-	5
Strong-billed honeyeater	19	5	22	-
Black-headed honeyeater	-	-	3	14
Crescent honeyeater	-	-	3	7
Eastern spinebill	2	4	-	1
Spotted pardalote	-	-	2	-
Silvereye	2	-	-	2
Beautiful firetail	1	-	-	-
Black currawong	-	-	-	2

Appendix 2. Abundance values (number/km) for bird species from transect counts in thinned and unlogged regrowth. Letters in brackets after the species names refer to their height guild: C = canopy, M = mid-layer, G = ground. The green rosella was not included in a height guild (see text).

Species	Summer		Winter	
	Thinned	Unlogged	Thinned	Unlogged
Brush bronzewing (G)	1.3	0.8	0.3	0.7
Yellow-tailed black-cockatoo (M)	-	0.6	0.5	1.0
Green rosella	13.7	5.5	1.2	9.2
Fan-tailed cuckoo (G)	1.3	0.2	-	-
Shining bronze-cuckoo (C)	0.3	-	-	-
Laughing kookaburra (G)	-	0.2	0.3	-
Black-faced cuckoo-shrike (C)	0.6	0.8	-	-
White's thrush (G)	-	0.2	-	-
Flame robin (G)	0.6	0.6	-	-
Scarlet robin (G)	-	-	0.3	-
Dusky robin (G)	1.6	1.8	0.6	0.2
Olive whistler (M)	0.3	0.4	0.8	-
Golden whistler (M)	1.3	0.2	0.3	1.6
Grey shrike-thrush (M)	4.8	3.3	1.4	4.3
Grey fantail (M)	3.8	3.1	2.3	7.8
Superb fairy-wren (G)	4.4	3.1	0.9	-
White-browed scrubwren (G)	4.1	3.9	1.7	3.5
Brown thornbill (M)	5.7	5.3	1.7	3.7
Tasmanian thornbill(M)	1.0	4.3	2.1	1.0
Unidentified thornbill (M)	1.3	-	1.7	6.6
Yellow wattlebird (C)	2.2	1.0	0.6	1.7
Noisy miner (C)	-	-	-	0.2
Strong-billed honeyeater (C)	12.7	9.4	3.9	18.4
Black-headed honeyeater (C)	1.6	-	3.5	10.1
Yellow-throated honeyeater (M)	1.0	0.2	1.1	2.1
Crescent honeyeater (M)	1.9	0.2	1.8	12.0
New Holland honeyeater (M)	1.6	-	0.8	0.5
Eastern spinebill (M)	1.9	1.4	-	-
Spotted pardalote (C)	-	-	0.8	1.9
Silvereye (M)	6.0	5.5	-	3.8
Beautiful firetail (G)	0.3	-	0.8	-
Grey butcher bird (G)	-	0.2	-	-
Black currawong (G)	1.3	2.0	0.8	1.4
Grey currawong (G)	-	0.4	0.2	0.5
Forest raven (G)	-	0.4	-	0.7