Occurrence of pygmy possums, *Cercartetus lepidus* and *C. nanus*, and their nest sites in logged and unlogged dry and wet eucalypt forest in Tasmania

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Summary

Occurrence and nest site use by pygmy possums were investigated in dry and wet sclerophyll forest in Tasmania. There were four silvicultural treatments in the dry sclerophyll forest (a clearfelled coupe with 17-year-old regrowth, two partially logged coupes and old-growth forest) and four in the wet sclerophyll forest (4- and 20-year-old regrowth resulting from clearfelling, 80-year-old natural regrowth and old-growth forest). *Cercartetus lepidus* was captured in all ages of regrowth and in both partially logged and old-growth forest. *C. nanus* was captured only in 20- and 80-year-old regrowth in wet sclerophyll forest. Partially decayed logs were important nest sites for *C. lepidus*. Fissures in live trees associated with fire scars and hollows in stumps were also used as nests. All three nests of *C. nanus* were located in stumps. The amount of suitable nesting substrate did not appear to be a factor limiting populations in either the dry or wet sclerophyll forest.

Keywords: wild animals, *Cercartetus lepidus*, *Cercartetus nanus*, forest management, silviculture, sclerophyllous forests, breeding places, nests, Tasmania, Australia

Introduction

Arboreal mammals have long been identified as a group likely to be adversely affected by logging (Tyndale-Biscoe and Calaby 1975; McIlroy 1978; Recher et al. 1980) and there have been numerous studies on the larger species that nest only in tree hollows (Braithwaite 1983; Smith and Lindenmayer 1988; Lindenmayer *et al*. 1990). There is much less information available on the small mouse-sized arboreal species.

There are two species of pygmy possums in Tasmania, the eastern pygmy possum (*Cercartetus nanus*) and the little pygmy possum (*C. lepidus*). *C. nanus* is found in habitats varying from heath to rainforest. *C. lepidus* is also found in a variety of habitats, from heath to tall wet forests. Both are small nocturnal mammals (*C. nanus*:15-43 g, *C. lepidus:* 6-9 g: Strahan 1983) that eat insects and nectar; *C. nanus* eats mainly nectar and pollen and *C. lepidus*, mainly insects (Green 1983; Turner 1983). *C. nanus* is known to nest in hollows in trees and in shredded bark in the forks of trees (Turner 1983), while *C. lepidus* has been found in trees, stumps and logs (Green 1983). Both are agile climbers with prehensile tails. *C. nanus*, however, is thought to be more arboreal than *C. lepidus*.

Little is known about the effects of forest operations on pygmy possums. This study was undertaken to assess the occurrence and use of nest sites by pygmy possums in areas where both silvicultural regrowth and unlogged forest were present.

Study areas

Tooms

The study area at Tooms is at an altitude of 650 m in the coastal ranges in eastern Tasmania (42º09’S, 147º53’E). The geological substrate of the area is dolerite and the soils are shallow stony loams or clay-loams (Davies 1988). The area is an undulating plateau with rocky crests and occasional swampy areas.

Unlogged forest and three logged coupes were surveyed. Two of the coupes had been partially logged (a combination of advance growth and seed tree retention, Wilkinson 1994) while the third was clearfelled. One of the partially logged coupes was 306 ha and had been logged in 1991 with a follow-up fuel reduction burn; the other was 40 ha, had been logged in 1987 and was not burnt. After logging, these stands were composed of a mosaic of areas with seed trees, even-aged regrowth and unlogged patches. The clearfelled coupe of 305 ha had been artificially sown after a hot regeneration burn. The regeneration was 17 years old at the commencement of the study and varied in height from six to ten metres.

The vegetation of the area was mostly *Eucalyptus delegatensis* forest (20-25 m tall) with *E. amygdalina* and *E. viminalis* as minor species. Two major understorey types were present. One of these had a shrub layer (1-3 m) dominated by *Acacia dealbata* with *Lomatia tinctoria* prominent in the ground layer. The other had a shrub layer dominated by *Banksia marginata* (2-5 m) over a ground layer of *Lomandra longifolia*, *Cyathodes glauca* and *Pultenaea juniperina*. In areas of impeded drainage there was a dense understorey of *Leptospermum scoparium*, *Gahnia grandis* and *Lepidosperma concavum*.

Hastings

The study area at Hastings is at an altitude of 30 m on the coastal plain near Lune River in southern Tasmania (43º25’S, 146º51’E). The geological substrate is Parmeener Supergroup (Permian sandstone, mudstone and siltstone) and the soils are generally duplex with fine sandy loams over medium clays (Davies 1988).

Three logging coupes were surveyed. All had been clearfelled followed by an intense regeneration burn and artificial seeding.

Two of the coupes had four-year-old regeneration and the third, 20-year-old regeneration. All of the old-growth forest in the vicinity of the logged coupes had previously been subjected to light selective logging. An area of forest that regenerated after a fire about 80 years ago was also sampled. This was adjacent to one of the four-year-old coupes and part of it had been burnt when the regeneration burn escaped.

The vegetation in the old-growth forest was tall *E. obliqua* (>40 m) over a tall understorey (10-20 m) of *Acacia melanoxylon*, *Eucryphia lucida*, *Atherosperma moschatum* and *Nothofagus cunninghamii*. Underneath this was a tall shrub layer (2-5 m) of *Pomaderris apetala*, *Pittosporum bicolor*, *Phebalium squameum*, *Phyllocladus aspleniifolius* and occasional clumps of *Anopterus glandulosus*. Ferns (*Dicksonia antarctica*, *Histiopteris incisa*) were prominent in the ground layer, but shrubs such as *Trochocarpa cunninghamii*, *Pimelea drupacea*, *Acacia verticillata* and *Coprosma nitida* were also present, and *Gahnia grandis* formed dense patches along old logging tracks. Moss and litter were also a major part of the ground layer.

The 80-year-old regeneration consisted of tall *E. obliqua* (30-40 m) over a tall understorey (6-10 m) of *A. melanoxylon*, *Pomaderris apetala*, *Pittosporum bicolor*, *Phebalium squameum*, *Melaleuca squarrosa* and *Cyathodes glauca* and a shrub layer of *T. cunninghamii*, *C. nitida*, *A. verticillata*, *P. apetala* and the occasional *G. grandis* and *D. antarctica*. The ground layer was dominated by ferns (*Blechnum wattsii*), moss and litter and occasional *P. drupacea*, *C. nitida* and *Drymophila cyanocarpa*. Where the understorey had been burnt four years ago there was a dense shrub layer (1-5 m) of *P. apetala*, *A. verticillata* and ferns (*B. wattsii* and *H. incisa*) with clumps of *G. grandis* over a ground layer of deep litter. In part of the area the soil was waterlogged. Here there were fewer eucalypts over a dense stand mainly of *M. squarrosa* and *C. glauca* (6-10 m) with a ground layer of *B. wattsii*, water-logged moss and clumps of *G. grandis*.

The 20-year-old regeneration was composed of a dense stand of *E. obliqua* (10-12 m) with *P. apetala*, *A. melanoxylon* and *A. verticillata* forming a tall understorey (6-8 m). The ground layer was quite open, consisting of litter, ferns (*Pteridium esculentum*) and occasional shrubs such as *C. nitida*, *L. scoparium*, *P. bicolor*, *Pimelea drupacea* and vines (*Billardiera longiflora*, *Clematis aristata*). In gaps and along tracks there were dense thickets of *P. esculentum* and regeneration of *L. scoparium* and *P. apetala*.

The four-year-old regeneration consisted of dense *E. obliqua*, three to four metres tall. Underneath was a tangled shrub and ground layer of species such as *L. scoparium*, *A. verticillata*, *P. apetala*, *M. squarrosa*, *Phebalium squameum*, *Cassinia aculeata* and *B. longiflora*, with occasional patches of *G. grandis* and sedges (*Juncus* spp., *Schoenus* spp. and *Lepidosperma elatus*) occurring on tracks.

Methods

Trapping

Three trapping techniques were used: pitfall lines with drift fences, pitfalls without a drift fence, and small mammal traps. At Tooms two pitfall lines with drift fences were established in each of the clearfelled, partially logged and old-growth forests. A further two lines were established on the interface between logged and unlogged areas. At Hastings two lines were placed in the old-growth stand, two in 20-year-old regrowth, one in four-year-old regrowth and one in 80-year-old regrowth. Because substantial digging was required to establish the pits it was difficult in some treatments to find a suitable spot and in most cases fencelines were established on old tracks. Each line consisted of six pitfalls (20-litre metal ice-cream tins) placed about five metres apart, with a fence of flywire stretched across the middle of each and to a distance of about two to three metres past the end of the line of tins. The flywire was buried in the ground between the tins. Where the flywire was directly over the tins, holes were cut to allow animals to pass through when the traps were closed. Holes were punched in the bottom of each tin to allow water to drain out and a small receptacle was placed in the bottom of each to provide shelter.

Pitfalls without fences were made of sections of PVC pipe 15 cm in diameter and 30 cm deep. Wire mesh was placed in the bottom to allow water to pass through, although some litter was placed on top of the mesh to provide shelter. A honey solution was sprayed in a one metre circle around the pitfall every second day or every day after rain to try to attract animals to the location. The PVC pitfalls were distributed across the study areas as follows: Tooms: 25 in old-growth, 15 in partially logged areas, 5 in the clearfell coupe and 15 in the interface of old-growth and partially logged forest; Hastings: 10 in each of 4-, 20-, 80-year-old regrowth and old-growth.

Initially three different types of small mammal traps were used: pygmy possum traps, Elliott traps and sugar glider traps (Mawbey 1989). The pygmy possum traps were a miniature version of the sugar glider trap, with a small entrance (4 cm diameter), designed to exclude rats. After the first trapping session at Tooms only the pygmy possum traps were used.

At Tooms, traps were placed in *Banksia marginata* trees in the vicinity of the pitfall lines with drift fences, about 20-30 m apart depending on the distribution of banksias. Nine traps were placed in old-growth and ten in each of partially logged and clearfelled areas. At Hastings, traps were placed on logs and stumps at about 20 m spacing. Six traps were placed in each of the 4- and 80-year-old regrowth and old-growth forests, and seven were placed in the 20-year-old regrowth.

All traps were baited with a peanut butter, honey and oats mixture. Where the trap was placed in a tree, the base of the tree and the bole length to the trap was sprayed with a weak honey solution every day. Where the trap was on a log, the log was sprayed for several metres along its length leading to the trap. Between trapping sessions the traps were left baited and wired open. The ears of captured animals were notched for identification.

Trapping took place over five sessions at each area. The Tooms and Hastings sites were trapped alternately, with trapping at each site every two months. The dates of the trapping sessions were:

- Tooms - 30 September to 7 October, 26 November to 2 December, 19-28 January, 23-30 March and 18-22 May.

- Hastings - 19-27 October, 15-22 December, 23-29 February, 20-27 April and 25-29 May.

Location of nests

Adult animals without pouch young were radio-tracked to locate their nests. Ultra-light single stage transmitters (Model LT1, Titley Electronics Pty Ltd), weighing 0.8 to 0.9 g and sprayed with an electronic waterproofing substance and partly coated with araldite, were used for tracking animals. The aerials were 15 cm long, giving a range of approximately 350 m. Maximum battery life achieved was three days. Transmitters were attached to animals using gel superglue. This was intended to stick on the animal for the duration of the tracking but eventually fall off if the animal was not recaptured. The transmitters were placed on the back of the neck of the possums with the aerial lying along the tail.

Attempts to locate nesting sites of animals with transmitters were carried out in daylight hours. Where possible, bearings of signals during the day and after dark were compared to confirm that the transmitter had moved and thus was attached to an animal. If a signal was lost after one or two days, or was not located at all, attempts to locate it were continued for several days. No attempt was made to retrieve the transmitter from the nest, thereby disturbing the animals.

Observations on the use of nest sites made by logging contractors and Forestry Tasmania field staff from various locations across Tasmania were also collated.

Nest description

When nests were located the following parameters were recorded: location (tree/stump/stag/log), surrounding vegetation, number of potential entrances and their size and location, dimensions and decay class if a log and type of stag/ tree species. The following decay classes (Brown and Nelson 1992) were used to classify logs: 1. intact with bark; 2. intact with no bark; 3. partly soft - embedded in the soil; 4. soft - can be kicked apart; and 5. composted - virtually flat. In March 1994 internal descriptions were obtained from four nests at Tooms that had been located in the previous year.

Habitat description

The number of trees, logs, stumps and stags with hollows, and the proportion of logs of different sizes and decay classes were assessed along transects. These data were used, along with knowledge of nest sites utilised, to estimate the quantity of substrate currently suitable for nesting in each treatment, as well as the quantity of nest sites potentially available in the future. A transect was run at 90º from the midpoint of each pitfall line with a drift fence. Transects were sampled in each understorey type in each silvicultural treatment. At Tooms 16 transects were sampled, all 50 m in length. At Hastings three of the eight transects sampled were less than 50 m (17, 42 and 44 m) and data for these were corrected to equate to a 50 m length. Along each transect, and within one metre either side of the transect line, every log with a diameter greater than 10 cm was measured (length and diameter) and its decay class, evidence of burning and the presence of hollows were recorded. The diameter at breast height (dbh) of eucalypt trees, stags and stumps within five metres, and non-eucalypt trees within two metres of the transect line (with a dbh greater than 10 cm) was measured. Evidence of the tree having been burnt and the presence/absence of apparent hollows was also recorded.

Data analysis

Analysis of variance and least significant differences were used to compare the occurrence of suitable and potentially suitable nesting substrate between silvicultural treatments.

Results

Trapping

Capture rates of *C. lepidus* did not differ greatly for the different trap types (Tables 1 and 2). This species was captured in all four silvicultural treatments at Tooms and all ages of forest at Hastings. At Tooms three female and one male *C. lepidus* were recaptured, all in the old-growth forest with a banksia understorey. Two of these were caught in the same pitfall the night they were released. The distances between recapture sites for females were 0, 27, 30, 42, 42 and 52 m. The male was caught in traps 30 and 77 m apart. At Hastings *C. lepidus* was caught in all ages of regrowth as well as old-growth forest. Recaptures occurred only in 20-year-old regrowth and old-growth forest. In the 20-year-old regrowth a male *C. lepidus* was caught as a juvenile in February and then again as an adult in April in a trap 128 m from the first trap site, and a female was caught in April 25 m from its trap site in February. In the old-growth forest a male was caught twice in February and three times in April, the maximum distance between trap sites being 33 m.

C. nanus were caught only at Hastings in the pitfalls with fences. Only two *C. nanus* were caught in each of 20- and 80-year-old regrowth stands.

Table 1. Captures of *Cercartetus lepidus* at Tooms

Trap type	Treatment	Trap nights	Captures	No./100 trap nights
Pitfall fence*	All	1829	10	0.55
PVC pitfall	All	1338	4	0.30
Traps	All	1060	7	0.66
All methods	Old-growth	1319	10	0.76
	Partial logging	1189	7	0.59
	Clearfelled (17-year-old)	1160	2	0.17
	Boundary of old-growth and partial logging	812	2	0.25
	All	4227	21	0.50

* No. of traps per pitfall fence = 6

Table 2. Captures of *Cercartetus lepidus* and *C. nanus* at Hastings

Trap type	Treatment	Trap nights	*C. lepidus*		*C. nanus*	
			Captures	No./100 trap nights	Captures	No./100 trap nights
Pitfall fence*	All	1292	8	0.62	4	0.31
PVC pitfall	All	973	8	0.82	0	0
Traps	All	1094	7	0.64	0	0
All methods	4-yr-old	700	5	0.71	0	0
	20-yr-old	939	9	0.96	2	0.21
	80-yr-old	734	1	0.14	2	0.27
	Old-growth	986	8	0.81	0	0
	All	3359	23	0.68	4	0.12

*Number of trap nights per pitfall fence = 6

Nest location

Tooms

Of ten possums fitted with transmitters, five were successfully located in nests. In the other cases the signal could not be picked up. The five animals were located in eight different nests and a further nest was located during the habitat assessment transects. The only animal successfully tracked in a logged area (partially logged) also nested in this forest. The animals located in different nests were 20, 28 and 65 m apart. Two animals were recorded in the same nest on three successive days. Distances from capture sites to nest sites were 28, 35, 45, 65 and 84 m.

Five nests were located in logs of decay class three or four (0.13, 0.15, 0.2, 0.6 and 0.9 m diameter); two were in the lower bole of live trees (*E. delegatensis* 2.9 m dbh and *Banksia marginata* 0.12 m dbh), associated with fire scars; and one was in/on the ground under a large decaying log (0.6 m diameter), although there was some doubt whether this was a pygmy possum nest (see below). The nest found during the habitat assessment contained a skeleton and was located between the bark and the wood (associated with a fire scar) on a stump (0.7 m dbh, 0.8m high).

Inspection of five of the nests was carried out 12 months after the radio tracking was completed. In four of the five cases the nesting material was shredded eucalypt bark in a small oval clump (10 x 5 cm), with an internal spherical space 3 cm in diameter. In one case there was doubt whether a nest was that of a pygmy possum - the nesting material appeared to be leaves and grass and the dimensions were slightly larger than those for other nests. It is possible that the actual nest located by radio-tracking was somewhere inside the log rather than underneath it.

Hastings

Of eight attempts to track possums (two in each of the four treatments) only three were successful (in 80-year-old regrowth and old-growth forest). Attenuation of signals in the dense 20-year-old regrowth made this habitat unsuitable for tracking. Signal location was also a problem in the old-growth forest. Six nests were located in the 80-year-old regrowth, three for an adult male *C. nanus* and three for an adult female *C. lepidus*. Distances from capture sites to nest sites were 23, 106 and 134 m for *C. lepidus* and 25, 88 and 108 m for *C. nanus*. The distance between nest sites of the same individual varied from 25 to 133 m for *C. nanus*, and 25 to 88 m for *C. lepidus*. One nest was located in the old-growth forest. However, this may have been only a temporary shelter: the animal was released with a transmitter in the morning and in the afternoon it was found five metres away in the root mound of the log it had been released onto.

All the *C. nanus* nests were in burnt stumps (0.25, 1.3, and 1.5 m dbh), while three *C. lepidus* nests were in logs (0.2, 0.54 and 4 m diameter, decay class three or four) and the other in a stump (4.2 m dbh, 2 m high).

Nesting habitat

Located nests indicated that *C. lepidus* used logs of decay class three and four, as well as the lower bole of trees with fire scars and stumps with hollows. However, they may also use trees and stags with hollows. Nest substrate was separated into two types, (1) logs and (2) trees, stags and stumps. For logs, those in decay class three or four, or those that had hollows present were considered currently suitable for nesting, while those potentially available in the future were estimated from the total number of logs in decay classes one to four. Similarly, trees, stags and stumps with hollows, and trees with fire scars were considered currently suitable for nesting, while all trees, stags and stumps were considered potentially suitable in the future.

The frequency of suitable nest substrates or potential nesting substrates was not significantly different between silvicultural treatments at Tooms (partial logging, clearfelling) (Fig. 1). If the two silvicultural treatments are combined, a significantly greater number of potential shelters are seen to be in logged areas than in unlogged areas ($F_{(1,14)}$=3.2, P<0.05). For the wet sclerophyll forest at Hasting there was a significant difference in the number of substrates with suitable nest sites between silvicultural treatments (clearfelling, regrowth varying from 4 to 80 years, and old growth) ($F_{(3,4)}$=11.5, P<0.05, Fig. 1), with four-year-old regrowth significantly different from all other treatments (all <0.05). There was no significant difference between the number of potential nesting substrates present in the different treatments at Hastings, but the same trend of lower numbers in the four-year-old treatment was evident (Fig. 1).

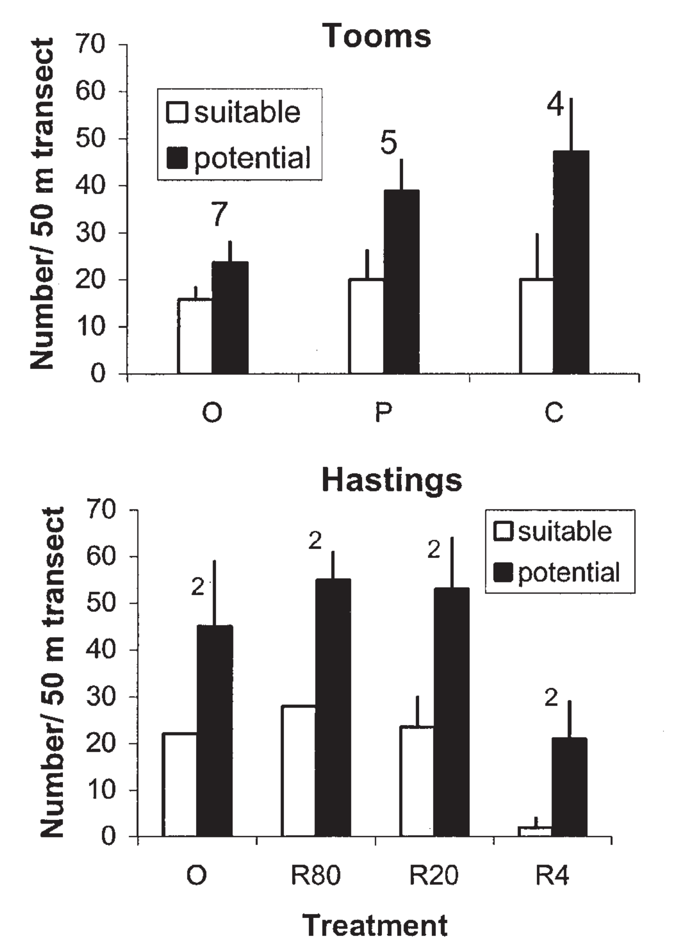

Figure 1. Frequency of substrates (logs, trees, stags and stumps) per 50 m transect containing suitable nesting sites now and potentially suitable in the future in each logging treatment at Tooms (treatment codes: O = old-growth, P = partially logged, C = 17-year-old regrowth after clearfelling); and at Hastings (treatment codes: R4 = 4-year-old regrowth, R20 = 20-year-old regrowth, R80 = 80-year-old regrowth, O = old-growth forest). Lines above the bars indicate standard errors and numbers indicate sample size.

Observations of pygmy possum nests from other areas

Ten reports of locations of pygmy possums were received from field staff. Eight of these were from wet sclerophyll eucalypt regrowth of various ages (undetermined, 27, 28, 28, 30, 30, 45 and 70 years old). In one of the 30-year-old regrowth sites, numerous nests were reported from natural clumps of bark where a branch joined the bole of the tree. Subsequent trapping in an area close to the site from which they had been reported was unsuccessful (32 traps for seven nights on platforms, one to two metres up the tree bole). Other nests in regrowth were from logs, with one in a small stag (10 cm dbh). The nests in old-growth forest were located in a log and in a living eucalypt (110 cm dbh) associated with a fire scar.

Discussion

Trapping success

Overall capture rates of pygmy possums in this study (Tables 1 and 2) were lower than that achieved in other studies. Turner (1985), in a study of *C. nanus* in banksia woodland, had capture rates of 2 to 2.3 per hundred trap nights using Elliott traps. Ward (1992) captured less than one *C. lepidus* per hundred trap nights in north-western Victoria when using pitfalls with drift fences. He caught 4 per hundred trap nights in pitfalls with no fences, which had been placed in the vicinity of fenced pitfalls with good capture rates. Cockburn *et al*. (1979) caught only 2 *C. lepidus* in 224 trap nights using a drift-fence pitfall system.

There was some evidence that resident animals may become accustomed to pitfalls with a drift fence and learn to avoid these structures. The first night after the pitfall line and fence were constructed at Tooms, in the old-growth forest over a banksia understorey, four *C. lepidus* were caught (these were not included in the results). However, after that only one individual, a juvenile, was ever caught, yet animals were caught in traps in banksias all around the fence.

Movements

Both *C. nanus* (Turner 1985) and *C. lepidus* (Ward 1992) are thought to be relatively mobile, capable of moving more than a hundred metres between trapping sessions, the largest distance moved in one night being 120 m (Turner 1985). Ward (1990) found home ranges for *C. nanus* of 0.7 ha for males and 0.35 ha for females that were overlapping. The recapture data within and between trapping sessions and the distance between nests located in this study are consistent with this scale of movement.

Nesting habitat

Pygmy possums have been recorded nesting in a wide range of situations: knotholes, burrows, empty birds nests, accumulations of leaves and twigs in branches, in the dead skirt of grass trees (*Xanthorrhoea spp*.), tree hollows, between the wood and bark of eucalypts, stumps, logs, the decaying centre of a green tree, beneath overturned turf on ploughed ground, in the cavity in an exposed root of a fallen tree and in a cavity in a fallen branch (W. Laidlaw *pers. comm*.; Hickman and Hickman 1960; Green 1983; Smith 1983; Turner 1983; Slater 1987; Ward 1990; Dickman 1991). Ward (1990) suggested that *C. nanus* was an opportunist and would use any available shelter. This may also apply to *C. lepidus*. While pygmy possums may be opportunistic, it is still possible that different environments may provide different quantities of suitable substrate and affect population density in this way. Smith and Lindenmayer (1988) demonstrated such an effect for Leadbeater's possum (*Gymnobelidus leadbeateri*). In our study there was no indication that the amount of suitable nesting substrate was limiting density of pygmy possums. At both sites in all treatments, bar one, there was a far greater number of suitable shelter sites recorded just on the transects than numbers of animals captured. The numbers captured also bore no relationship to the numbers of suitable nesting substrates recorded in the different treatments.

Ward (1990) found that *C. nanus* in woodland in Victoria changed nests frequently. One male in his study used nine nests in 0.5 ha over five months. Females used more substantial nests and returned daily over an extended period. In our study, the maximum number of nests located for one animal was three (a male *C. nanus* and a female *C. lepidus*). However, animals were tracked only for short periods of time. Hence the numbers of nests used by pygmy possums in Tasmanian forests is likely to be greater than indicated by these results

Effects of logging

It appears that *C. lepidus* and *C. nanus* inhabit logged areas, as *C. lepidus* was captured in all treatments and *C. nanus* was captured in 20-year-old regrowth. *C. lepidus* was also recaptured and recorded nesting in a logged area in our study and was recorded by forest workers from silvicultural regrowth in other areas. At both sites, however, the rates of capture of pygmy possums were too low to compare populations in the different treatments, and a change in population density in such areas cannot be ruled out.

It is unlikely that availability of insect food would limit the population of *C. lepidus* in the older regrowth. Loyn *et al*. (1980), for example, found that insects were more abundant in young dry sclerophyll forest regrowth (10-15 years old). Studies have indicated that insect diversity is related to the diversity and complexity of the vegetative substrate (Janzen 1973). In clearfelled areas the greater density of stems in regeneration may provide a greater volume of foraging habitat than is present in old-growth forest. On the other hand, in the partially logged forest the logging had opened up the understorey, thus possibly, at least in the short term, reducing the volume of foraging habitat.

Logging did not appear to have an impact on the amount of nesting substrate present at the dry sclerophyll forest site. It appears that trees removed by logging are compensated for by logging slash and stumps produced by the operation. This effect is unlikely to be just short term as the amount of substrate potentially available in the future (via decay or fire impact) is large. At the wet sclerophyll forest site there was an impact of logging on nesting substrate in the four-year-old regrowth but not in the 20-year-old site. This is likely to have resulted from an unusually high off-take of wood from the four-year-old coupe. There was a higher level of wood utilisation for a period of around five years during the time when this coupe was logged (C. Barry, *pers. comm*.). This explanation is supported by the finding of Meggs (1996) that there was no difference in the amount or decay stages of logs in logged or unlogged stands of wet sclerophyll forest in Tasmania. Lindenmayer *et al*. (1999) also found no differences in log volumes between logged and unlogged *E.regnans* forest in Victoria although log diameter was reduced in regrowth forest This study was not able to compare densities of pygmy possums in different silvicultural treatments. However, it is clear that pygmy possums utilise, and are probably resident in, all silvicultural treatments and ages of regrowth examined. Suitable nest sites are also present in logged areas and are likely to be present over the length of the rotation, unless the level of utilisation during the logging operation is particularly high.

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