

IMPACT OF DEER ON SECRETARY ISLAND, FIORDLAND, NEW ZEALAND

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SUMMARY: The first deer to invade an area of forest on Secretary Island show an almost exclusive preference for bark of *Pseudopanax colensoi* var. *ternatum*. Young shoots of *P. linearis* and juvenile *P. crassifolium* are also sought. Intensive browsing is begun in areas of *Asplenium bulbiferum* and continued where *Polystichum vestitum* and bushes of *Coprosma* spp. are plentiful. The foregoing are the main species being killed by deer but others are being taken in increasing quantity. Difficult access has made the island a mosaic of undamaged, selectively browsed and intensively browsed vegetation. The prospects of eliminating deer by poisoning are probably best while *P. colensoi* bark is available for bait.

INTRODUCTION

SECRETARY ISLAND has an area of about 80 km² and rises steeply to ridges that occasionally exceed the tree line at c. 900 m. It provides a varied sample of Fiordland vegetation which until 1967 was essentially unmodified by browsing mammals (Wardle, Mark & Baylis 1970), though there were localised signs of selective browsing, first reported along Thompson Sound in 1963 when the New Zealand Forest Service brought the Island under special surveillance (Evans 1974), and on the opposite coast at Grono Bay in 1967. By 1970, highly used trails behind Grono Bay suggested that small herds were remaining on the Island and thereafter some hinds and fawns have been included in kills (Fig. 1). When we examined the vegetation during a 5-day visit in February 1975 it showed distinct stages of deer use.

BROWSING PATTERNS IN FOREST

Selective browsing

The first indication of browsing deer in the forest is stripping of bark from trunks of *Pseudopanax colensoi* var. *ternatum* (3-finger) where it is present (below c. 500 m a.s.l.) (Fig. 2). Typically no other food is taken. The next choice is immature shoots of *Pseudopanax linearis*. The slender erect stems are common in light forest on ridges, and the taller are broken down 1.0-1.5 m above the ground (Fig. 3). Juvenile stems of *P. crassifolium* (lancewood) are treated similarly where it is present (below c. 350 m a.s.l.). The same level of preference is shown for

young foliage and twigs of *P. colensoi* var. *fiordense* (5-finger) (Fig. 4) and limited quantities of the shoots of *Coprosma lucida*, *C. foetidissima* and *Griselinia littoralis* (broadleaf). Bark may also be taken but not with the same avidity as from *P. colensoi* var. *ternatum*.

Selective browsing seems the work of single animals, or very small numbers, constantly on the move.

Intensive browsing

Intensive browsing appears to be the feeding of a herd of deer. The areas preferred are those with ground cover of *Asplenium bulbiferum* (Fig. 5). Though it is usually ignored in selective browsing, it now loses almost every leaf (Fig. 6). At the same time some fronds are taken from accessible crowns of *Dicksonia squarrosa* while undershrubs of *Coprosma foetidissima*, *C. astonii* and *C. colensoi* may be reduced to sticks.

Trunks of *Schefflera digitata* show teeth marks but the bark adheres and the trees survive. Some accessible foliage is taken from *S. digitata* and from the species listed below. The next species that is a focus of intensive browsing is *Polystichum vestitum* (scaly fern). Where its crowns are almost completely stripped (Fig. 7) there is substantial use of other foliage approximately in the following order of preference:—*Coprosma lucida*, *Griselinia littoralis*, *Coprosma foetidissima*, *Chionochloa conspicua*, *Fuchsia excorticata*, *Blechnum lanceolatum*, *Thelypteris pennigera*, *Uncinia uncinata*, *Pseudo-*

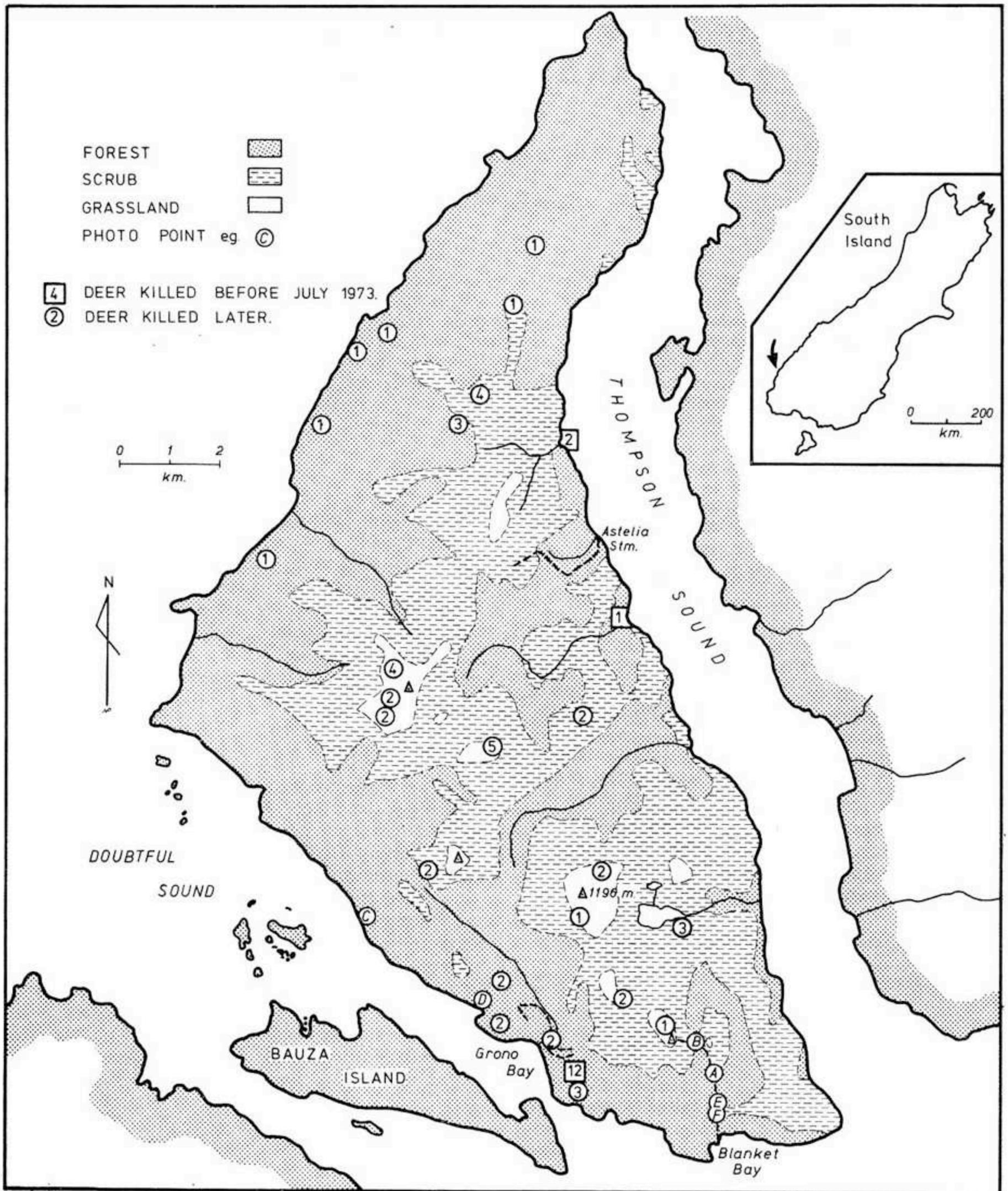


FIGURE 1. Map of Secretary Island based on Lands and Survey Department's N.Z.M.S. 1 Sheet S139, showing vegetation pattern (adapted from Wardle et. al. 1970), location and numbers of deer killed prior to 1975 and approximate locations of photographs (Figs. 3-8). Dashed lines show routes traversed.



FIGURE 2. Trunk of *Pseudopanax colensoi* var. *ternatum*, d.b.h. 40 cm, recently ring-barked by deer in lowland forest at Poison Bay, Fiordland. February 1974. The crown was still intact.

panax simplex, *Blechnum capense*, *B. minus*, *Hoheria glabrata*, *Astelia nervosa*, *Todea superba*, *Dracophyllum fiordense*, *Senecio bennettii*, *Pittosporum colensoi*, *Myrsine divaricata* and *Phormium cookianum*.

Some aromatic species not otherwise attractive can be fatally damaged by rubbing of antlers. *Phyllocladus alpinus* is most sought but *Pseudowintera colorata*, *Dacrydium intermedium* and *Podocarpus ferrugineus* may suffer in this way. Foliage that is clearly unpalatable includes *Blechnum discolor*, *Cyathea smithii*, *Microlaena avenacea*,



FIGURE 3. Typical damage to two forest interior stems of *Pseudopanax linearis*. Both have been broken at c. 1.2 m, sharply reflexed, and had their leading shoots removed. Remaining leaves are still green and intact, and the plants otherwise undamaged. Location "A" on Figure 1.

Astelia nivicola var. *moriceae*, *Neomyrtus pedunculata* and *Pseudowintera colorata*.

SNOW TUSSOCK-HERBFIELD

Poor weather limited our observations above tree line. The tops are now obviously tracked, but apparently little used for feed. Only occasional tussocks of *Chionochloa flavescens* and *C. crassiuscula* are heavily grazed while *C. acicularis* is untouched. A low proportion of the abundant *Anisotome haastii*, *Astelia petriei*, *Gentiana montana* and *Ourisia macrophylla* var. *lactea* are damaged.



FIGURE 4. Subalpine silver beech forest at c. 880 m showing the predominant small-tree species, *Pseudopanax colensoi* var. *fiordense* killed through ring-barking by deer. Most of the stems are still standing but leaves have fallen. A single *Dracophyllum fiordense* stem (centre) and the herb layer of *Astelia nivicola* var. *moriceae* are undamaged. Location "B" on Figure 1.



FIGURE 5. Moderately steep bouldery talus slope at c. 50 m altitude near the southwest coast showing as yet unmodified but highly vulnerable vegetation, in particular a dense herb layer dominated by *Asplenium bulbiferum*. Location "C" on Figure 1.

EFFECTS OF BROWSING

Ringbarking normally causes a tree to die slowly without re-shooting from the base. This is the effect on *Pseudopanax colensoi* var. *ternatum*, a year or more elapsing before the crown yellows. Where the trunk cannot be completely girdled, fungi decay exposed wood so rapidly that collapse of the tree is probably scarcely delayed (Fig. 8). Already at Grono Bay, wherever foliage of *P. colensoi* var. *ternatum* can be seen, the trunk proves either to be perched inaccessibly or to carry exceptional bryophyte cover. Skeletons of many of the original population are now in the last stages of collapse.

Loss of *P. colensoi* var. *ternatum* scarcely modifies the forest structure, but on ridges above c. 500 m, *P. colensoi* var. *fiordense* is a major component of the forest subcanopy and its killing involves substantial loss of cover in this layer (Fig. 4).

As Tustin (1974) observed, none of the forest species that are extensively defoliated make any sustained recovery through sprouting from the base. Small fronds do appear on the defoliated bases of *Asplenium bulbiferum* but they grow slowly. *P. vestitum* responds more rapidly but not repeatedly.

Beneath *A. bulbiferum* there are rocks and boulders but *P. vestitum* grows on soil mantled with bryophytes. This is cut up by trampling, water is

channelled, and loss of soil begins. These changes in drainage pattern are likely to threaten the stability downslope where the vegetation has not been damaged directly.

DISCUSSION

Holloway (1950), in a study of the forests of Western Southland, established that deer browse selectively. He gives a list of species in order of preference, preceding *Pseudopanax* (*Nothopanax*) *colensoi* with *Coprosma lucida* and *Schefflera digitata*. He does not mention stripping of bark from *P. colensoi* but records the survival of isolated large trees of *Pseudopanax* (*Nothopanax*) spp. in forest that has been overpopulated by deer. It is likely that Secretary Island is illustrating a stage in the early infiltration of deer that had largely passed by the time Holloway made his observations in Western Southland. No tree of *P. colensoi* var. *ternatum* is so large that its bark is unpalatable unless it is masked by exceptionally thick bryophyte cover. A tree of d.b.h. 40 cm was stripped, not on Secretary Island but at Poison Bay (Fig. 2). However, the bark of other species of *Pseudopanax* is not stripped, and these could provide the old surviving trees that Holloway recorded. Holloway suggests that his list might omit some highly preferred species that had disappeared and *Asplenium bulbiferum* now seems a case in point.

Wardle *et al.*, (1971) give *P. colensoi* only a



FIGURE 6. Plant community similar to that shown in Figure 5 with the *Asplenium* herb layer almost completely cropped—fronds showing are mostly regrowth 15-20 cm long. Location close to forest edge in small unnamed bay 1 km northwest of Grono Bay; site "D" on Figure 1.

moderate rating (1.16) for susceptibility to browsing by deer in Northern Fiordland. But this presumably is for forest in which it has been reduced to seedlings and slender stems lacking the well developed bark which is so attractive to deer. The sampling method and rating system used was not designed to take account of a situation where mature trees of a species may already have been selectively eliminated by deer. *A. bulbiferum* heads the Northern Fiordland list of susceptible herbs but *Todea superba* precedes *Polystichum vestitum*. Wardle (1961) records that *P. vestitum* is sometimes left unbrowsed.

Wardle *et al.* (1970) state that "with the knowledge of these matters [habitat requirements, seasonal movements, food preferences] that we now possess, hunting from the air as well as the ground, and the newer toxicological techniques, a near approach to extermination could be made today". The Fiords are helpful barriers behind which to test this on Secretary Island, and the bark of *P. colensoi* var. *ternatum* offers a bait which is keenly sought by deer at the colonising stage, yet quite unattractive to native animals. For a few years after deer arrive it can be obtained in plenty by felling ringed trees that have not yet died. At least a year appears to elapse before their crowns collapse.

The Forest Service now has sufficient well established exclosures in Fiordland to show that this effort would be justified, for even species as hard hit as *A. bulbiferum* have recovered in a spectacular



FIGURE 7. Heavy selective grazing of *Polystichum vestitum* at c. 480 m with accessible fronds of *Cyathea smithii* (back centre) and *Todea superba* (between *Cyathea* and figure), both undamaged. The bryophyte cover has been eliminated along the trail (left foreground). Location "E" on Figure 1.

manner.

At present, Secretary Island is a mosaic of areas still undamaged, and those showing different degrees of deer use. Strong food preferences will counteract the difficulties of access responsible for this present pattern. To restore the value of the Island as a Special Area, for the preservation of indigenous plant and animal life in Fiordland National Park, the deer should be eliminated and re-invasion prevented.



FIGURE 8. A tree of *Pseudopanax colensoi* var. *ternatum* that was only partially ring-barked because of its angle of growth, but collapsed when the bared wood decayed. Location "F" on Figure 1.

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