Continuation of wood increment in *Olearia ilicifolia* during the winter of 1984

Peter Haase

To cite this article: Peter Haase (1986) Continuation of wood increment in *Olearia ilicifolia* during the winter of 1984, New Zealand Journal of Botany, 24:1, 179-182, DOI: 10.1080/0028825X.1986.10409727

To link to this article: https://doi.org/10.1080/0028825X.1986.10409727

Published online: 05 Dec 2011.
Short communication

Continuation of wood increment in *Olearia ilicifolia* during the winter of 1984

PETER HAASE
Department of Plant and Microbial Sciences
University of Canterbury
Private Bag, Christchurch, New Zealand

Abstract Cambial activity of a subalpine population of *Olearia ilicifolia* continued throughout the mild winter of 1984 with a subsequent resting period from September to November. Radial growth ceased from June to October in older trees at another stand at similar altitude some 400 m distant. It is suggested that mild winter temperatures allowed the continuation of wood increment in the younger trees.

Keywords *Olearia ilicifolia*; wood increment; growth ring; temperature response; resting period; subalpine scrub

INTRODUCTION

It has been suggested that the initiation of the resting season in New Zealand trees is mainly controlled by falling autumn temperatures (Bussell 1968) whereas decreasing daylength is the prime factor inducing winter dormancy in trees of the northern temperate zone (e.g., Wareing 1956). The start of the growing season is controlled by rising spring temperatures in both temperate zones (Wareing 1956, Bussell 1968).

In a number of New Zealand evergreens, including *Olearia ilicifolia*, the cessation of leaf and shoot growth well before the onset of the cool season is not due to declining temperatures or photoperiod but is controlled autonomously as a result of a predetermined of the number of leaf primordia in the resting buds (Bussell 1968, Haase 1985). As radial growth may continue until late autumn to early winter in some New Zealand trees (e.g., Benecke & Havranek 1980; Norton 1982, 1984) and seems to be controlled by temperature alone, it seems possible that high winter temperatures may cause an extended season of wood increment.

MATERIAL AND METHODS

Two stands of the small tree *Olearia ilicifolia* Hook. f. (Compositae) growing at an altitude of 830–840 m a.s.l. at Pegleg Flat, Arthur’s Pass National Park (42°54'S, 171°34'E Fig. 1), were monitored for seasonal wood increment. The sample sites are on young river terraces supporting recent soils of the Tasman set (stand 1) which grade into high country podzolized yellow-brown earths of the Otria set (stand 2) (New Zealand Soil Bureau 1968).

The dendrometers used were similar to the model described by Liming (1957); they consisted of two aluminium strips with a millimetre grading and a vernier scale, giving a circumference resolution of 0.1 mm. The two strips were connected with a steel wire which encircled the trunk of the sample tree, and a coiled spring produced the necessary tension to hold the bands to the trees. Five sample trees in each stand with basal diameters between 25 and 53 cm were fitted with two dendrometers in September and October 1983. The dendrometers were placed at approximately 50 cm above ground level. Readings were taken fortnightly to monthly, usually during late morning, and the results expressed as radial growth.

Errors can be caused by thermal expansion of the dendrometers, and by swelling and shrinking of the stem due to changing moisture content. Both sources of errors, however, cause only temporary changes in tree girth which are normally reversible and unlikely to significantly affect the readings when taken at intervals of one week or more. Averaging of several sample trees reduces the effect of individual measurement errors (e.g., Daubenmire 1946, Müller 1982, Palmer 1982, Norton 1984).

The climate of the investigation area is superhumid, only very brief dry spells have been recorded during the time of observation, and the variation in temperature is comparatively small; both sources of errors were thus reduced to a minimum.
area at Arthur's Pass; the extent of the subalpine low forest is indicated.

**Table 1.** Mean temperatures during the cool months at Pegleg Flat (°C).

<table>
<thead>
<tr>
<th>Year</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean*</td>
<td>5.2</td>
<td>3.0</td>
<td>2.4</td>
<td>3.4</td>
<td>5.1</td>
</tr>
<tr>
<td>1983</td>
<td>4.6</td>
<td>3.3</td>
<td>2.5</td>
<td>4.5</td>
<td>4.5</td>
</tr>
<tr>
<td>1984</td>
<td>5.1</td>
<td>5.4</td>
<td>4.3</td>
<td>5.2</td>
<td>5.5</td>
</tr>
</tbody>
</table>

*1974–83; extrapolation from Otira and Arthur’s Pass records.

In October 1984, cross sections of shoots of known age from both stands were studied under a binocular microscope (×10) in order to determine if the growth rings were annual.

Air temperature was recorded on a Casella thermohygrograph (weekly charts) mounted in a standard screen at 1.5 m above ground level. The records for 1984 are incomplete and mean monthly air temperatures were extrapolated from the Meteorological Station at Otira and Arthur’s Pass.

**RESULTS AND DISCUSSION**

The radial growth patterns registered by the individual dendrometers are shown in Fig. 2. The amount of radial growth between two successive readings sometimes differs considerably and during periods of stagnating growth a single faulty dendrometer, or an individual tree with an opportunist growth pattern, may account for a noticeable variation of the arithmetic mean (e.g., June increment, stand 1). In spite of this individual variation the radial growth patterns of the two sample stands show striking similarities during the 1983/84 growing season (Fig. 3). The previous winter of 1983 was a “normal” winter with mean temperatures close to the calculated ten year average means (Table 1) and cambial activity had ceased from June to October in both sample stands (Haase 1985). Radial growth resumed in late October to early November 1983. In June 1984, no further radial increment could be detected in the sample trees at stand 1; in stand 2, however, wood increment continued until August, apparently in response to a mild winter. Mean monthly temperatures at the investigation area were about 2°C above average from June to August (Table 1) and were, for most of the time, above mean September temperatures. Sectioning of sample shoots revealed that radial growth from spring 1983 to August 1984 was encompassed in a single growth ring, i.e., growth during winter did not result in a “false” annual ring.

The trees at stand 1 range in age from 150 to over 200 years (determined from increment cores; Haase 1985) whereas the stand 2 trees are 50–80 years old. The latter have shown the higher rates of leaf area, shoot, and wood increment (Haase 1985) and, as noted, their radial growth can extend over a longer period. In many species, younger trees have a more extended growing season than mature trees (e.g., Kozlowski 1971).

In addition, stand 1 receives less direct sunlight than stand 2 during the winter and appears more influenced by ponding of cold air.

The variation of the mean radius at stand 2 from September to November 1984 is insignificant and this time span is considered as a postponed cambial resting period.
The rates of radial growth during the early 1984/85 season differ considerably in the two stands; a phenomenon not observed in the previous year when both populations resumed cambial activity after a definite resting period during the 1983 winter. At stand 1, rapid radial growth was observed from November to February. Growth rates were markedly higher than during the previous year and can be related to the higher-than-average temperatures in the 1984/85 growing season. In stand 2, however, comparatively low initial increment rates were noted during December but seem to adjust to normal later on. This initially depressed radial growth may have occurred because the extended wood increment during the previous winter depleted stored carbohydrates.

CONCLUSIONS
It has been demonstrated that most New Zealand trees, even those in regions with a small annual temperature range, form annual growth rings in their wood and it has been assumed that they possess a definite resting season (e.g., Wardle 1963). Growth ring boundaries verify cessation of cambial
growth but the length or timing of the growth and rest periods can only be investigated by monitoring radial growth with appropriate devices. Such data have so far only been presented for a very limited number of indigenous tree species.

The winter of 1984, for which a continued cambial activity in a stand of *Olearia ilicifolia* has been demonstrated, had particularly mild temperatures but other years with above average winter temperatures may also prevent some woody species from becoming truly dormant. The investigated tree populations were situated close to the alpine timberline at the Main Divide and it may be assumed that winter wood increment could be more common at lower altitudes and in districts with mild winters.

**ACKNOWLEDGMENTS**

The field work for this study was carried out in the Arthur's Pass National Park and I would like to thank the Park Authorities for their support. The New Zealand Meteorological Service, Wellington, kindly supplied the climate data.

**REFERENCES**


