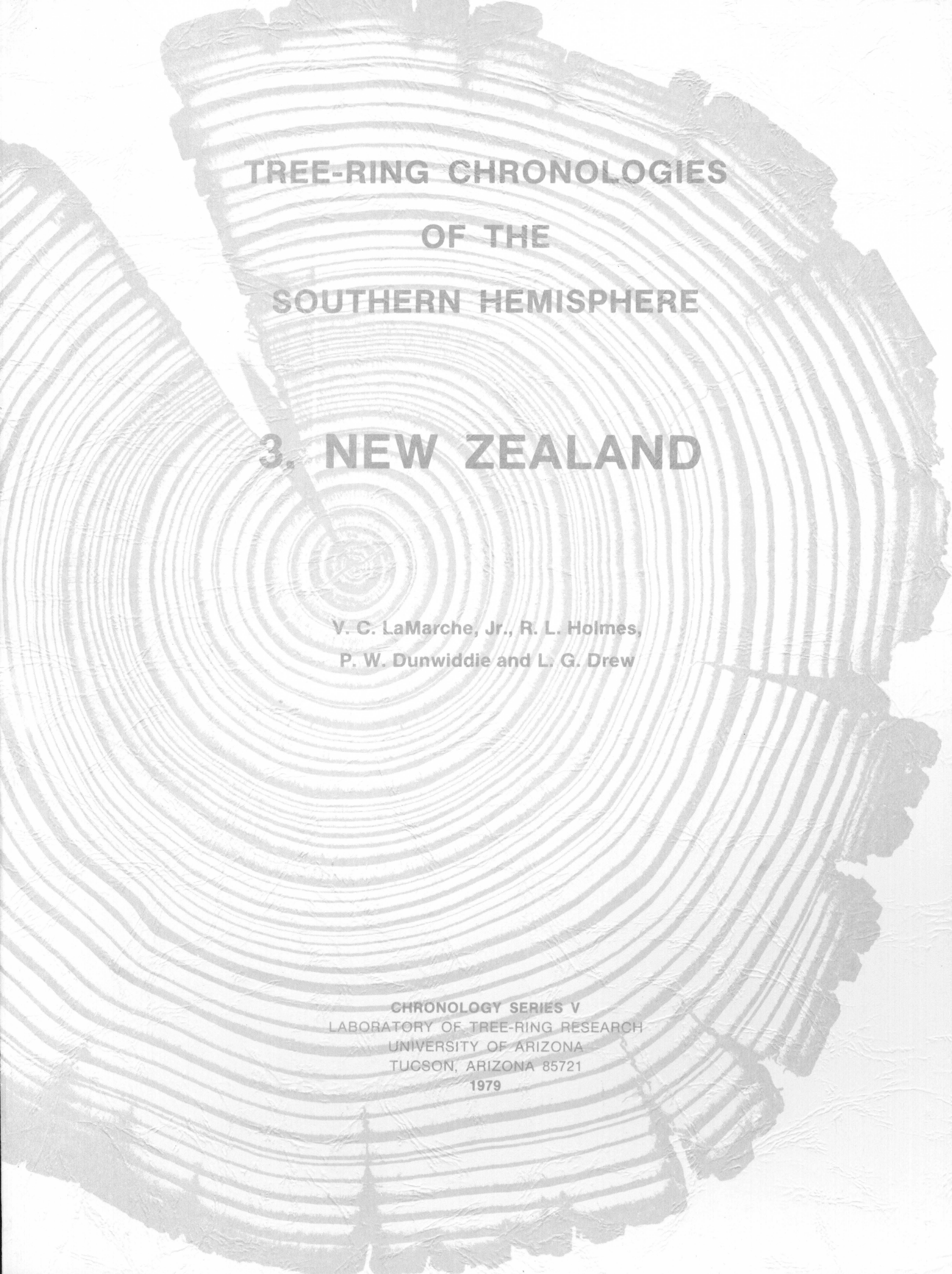

TREE-RING CHRONOLOGIES OF THE SOUTHERN HEMISPHERE

3. NEW ZEALAND

V. C. LaMarche, Jr., R. L. Holmes,
P. W. Dunwiddie and L. G. Drew

CHRONOLOGY SERIES V
LABORATORY OF TREE-RING RESEARCH
UNIVERSITY OF ARIZONA
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Volumes in Laboratory of Tree-Ring Research Chronology Series V:

1. Argentina
2. Chile
3. New Zealand
4. Australia
5. South Africa

PREFACE

This report is one of a series documenting dendrochronological studies in the Southern Hemisphere carried out by the Laboratory of Tree-Ring Research from 1973 to 1979 with the support of the U. S. National Science Foundation. Initial studies in Chile and Argentina in 1973-1974 were part of the International Biological Program, Origin and Structure of Ecosystems project, administered by the San Diego State University Foundation. Subsequent work there, and in Australia, New Zealand and South Africa was supported directly by grant GV 41450, from the Office of Polar Programs, and by grants ATM 75-15495, ATM 76-24267, and ATM-7823008, all from the Climate Dynamics Program, Division of Atmospheric Sciences.

The purpose of these investigations was to develop long, accurately dated, and climatically sensitive tree-ring records and to use them as a basis for inference about past climatic fluctuations. We have collected several thousand tree-ring samples from some 200 sites in temperate latitudes in South America, New Zealand, Australia and southern Africa. We have developed 71 ring-width index chronologies, each incorporating the growth records of a large number of trees. The longest approaches 1000 years in length. In these reports, we present these time series of average annual ring-width indices together with information on the sample size, the location and nature of the sample site, and statistics describing both the site chronology and its component series. Information is also presented on other sample collections where no index chronology was developed.

In order to make our Southern Hemisphere tree-ring records as widely available and as useful as possible, the data have also been entered in the International Tree-Ring Data Bank. Two types of data are available in machine-readable (punched-card or magnetic tape) form. First, we have entered the basic data in the form of all the measured radial ring-width series that were used in development of each site chronology. Second, we have also entered the derived site chronologies themselves, as published in this volume. For information on current holdings, cost, and formats, contact:

Manager
International Tree-Ring Data Bank
Laboratory of Tree-Ring Research
University of Arizona
Tucson, Arizona 85721

Although we had overall responsibility for site selection, sample collection, preparation, dating, ring-width measurement, and for data processing, evaluation and analysis, we received a great deal of help in this effort. Information, logistic and other support, and field assistance were generously provided by individuals, academic institutions and government agencies in each of the countries that we visited. They are acknowledged in the introduction to each volume. Dating of the samples was carried out mainly by R. L. Holmes, P. W. Dunwiddie and B. J. Richards,

assisted at times by J. Ambrose, P. Brown, H. L. Fleischauer, V. C. LaMarche, and D. A. Campbell. T. P. Harlan and J. B. Harsha dated the initial Chilean collections. Ring-width measurements and measurement checks were made by those listed above, and by S. D. Morton, B. L. Fine, M. R. Henry, J. B. Heider, P. Houghton and K. A. Black. M. S. Crebbs, M. A. Kempinski and J. G. Miller aided in sample preparation. Computer operations were managed by L. G. Drew, with assistance from D. J. Buecher, R. B. Minton, C. S. Carlson, K. L. Kreutzer, S. L. Ward and others in the Data Processing Section of the Laboratory. M. K. Cleaveland developed some of the computer software that was used, and also helped with processing. Typing of the manuscripts was ably handled by A. K. Allen.

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Plate 1. Old kauri *(Agathis australis)*, Waipoua, North Island.

INTRODUCTION

Background

New Zealand is potentially one of the most productive areas for dendroclimatic research in the Southern Hemisphere. Despite its relatively small size, it offers a fairly wide range of habitats, and its rich and distinctive flora includes a large number of dendrochronologically interesting species of both gymnosperms and angiosperms. A correspondingly large number of tree-ring based studies had been made or attempted prior to our initial work, some with very promising results. These are reviewed by Bell and Bell (1958) and most recently by Dunwiddie (in press). They include applications to archaeology, glacial geology, forest mensuration and age structure determination, and to the dating of landslides and volcanic eruptions. However, attempts to develop long, accurately cross-dated tree-ring chronologies based on large samples had not been notably successful. In only one case (Carter, 1971) were ring-width variations convincingly related to climate, based on a short, dated chronology for Nothofagus solandri var. cliffortoides.

Our initial strategy was based on previous results, on examination of tree-ring samples collected by C. W. Ferguson of this laboratory during his visit to New Zealand in 1973-74, and on experience gained elsewhere in the Southern Hemisphere. Libocedrus bidwillii was an obvious target, because it is closely related to Austrocedrus chilensis of southern South America and Calocedrus decurrens of western North America, both species that had been successfully utilized for dendroclimatic studies. Similarly, at least two of New Zealand's three species of Phyllocladus were expected to be valuable sources of tree-ring data because of their similarities in growth form and habitat to the Phyllocladus asplenifolius of Tasmania. However, samples from a large number of other species were examined in initial survey work, including logs from sawmills and wood from archaeological sites as well as increment cores. Sites for more thorough sampling were selected to provide a wide geographical and altitudinal distribution throughout New Zealand.

Sample Collection and Documentation

The tree-ring samples described in this volume are housed at the Laboratory of Tree-Ring Research, and were collected during 1977 and 1978 by members of the Laboratory working in cooperation with New Zealand scientists. The general procedure was to collect increment core samples from several radii of each of a number of trees on a geographically limited and ecologically homogeneous site. In a few cases it was also possible to collect discs (complete or partial transverse sections) from stumps or logs of recently felled trees. An embossed aluminum tag bearing an indentification number was attached to each tree sampled. A brief site description accompanies each chronology; a description and

pertinent collection information are also presented for those sites from which no index chronology was developed. Site location maps (Figures 2a and 2b) are keyed to an Index to Localities (Table 1) by use of a 3-letter site code.

Dating and Chronology Development

Each collection was evaluated, both in the field and upon return to the Laboratory, in terms of its dendrochronological potential. Criteria included clarity of ring structure, circuit uniformity, sensitivity, and the feasibility of cross-dating patterns of wide and narrow rings and of other features between different radii and between different trees in the site. Development of the dating chronology followed standard cross-dating procedures (Stokes and Smiley, 1968). We adopted Schulman's convention of assigning the date of the annual ring to the year in which ring growth begins. The annual rings in all suitable samples from each site were dated; others were rejected because of complacency, short length, poor wood quality, an unusually high frequency of locally absent rings, the presence of pronounced growth surges or suppression or for other reasons. One person normally had responsibility for evaluating and dating all the material from a particular site. The dating was then independently checked by another worker to ensure the accuracy of assignment of each annual ring in each sample to the correct calendar year.

After dating and checking were completed, the ring widths in each dated sample were measured to the nearest 0.01 mm using a Henson (Bannister model) measuring machine in conjunction with a Bausch and Lomb stereoscopic microscope with crosshairs, normally at 15X to 30X magnification. In the case of particularly difficult material measurements were made by a senior research assistant. In all cases, spot checks were made of the accuracy of ring-width measurements using a test based on the Chi-square statistic. The printed tapes produced by the measuring machine were checked for errors, and the ring widths transferred to punched cards by keypunch operators.

A standard procedure was followed in the processing and evaluation of the data. First, descriptive statistics were calculated for each ring-width series and the series was listed and plotted for visual inspection and an error check, using the Laboratory's RWLST and TRPLT programs. Some series were deleted from the data set at this stage because of poor statistical quality, or because the plots showed evidence of gross non-climatic growth surges or periods of extreme growth suppression.

The remaining ring-width series were then transformed to dimensionless ring-width indices using the Laboratory's program INDXA. The purpose of this transformation is to remove effects of non-climatic growth trends or fluctuations, as well as the effect of differences in average growth rate between different trees (Fritts, 1976). The curve-fitting option for each ring-width series was carefully selected, based on the general appearance of the plotted series, as well as our knowledge of the local

site history and general environmental conditions. In a majority of cases, a negative exponential or straight-line curve was fit, although the orthogonal polynomial option was occasionally used with considerable discretion.

Finally, the individual radial ring-width index series were combined by averaging to produce the site chronology, either as part of the INDXA run, or in a subsequent step using the SMSR or SUMAC programs. In addition to the site chronology, which normally includes all the good quality ring-width index series available for a site, we also produced a so-called "statistical" chronology, incorporating a selected sub-set of the available index series.

Descriptive Statistics

Two sets of statistics are presented for most of the sites for which a chronology was developed. These can be very useful in providing a quantitative basis for evaluating the dendroclimatic potential of a tree-ring chronology (Fritts, 1976).

The first set, designated "Sample Statistics", is based on analysis of the data sub-set incorporated in the statistical chronology. Most of the parameters provide measures of the relationships among the component radial ring-width index series, and are calculated for a period common to all the series, using a replicated sample in which, in most cases, at least two radii are available for each tree in the sub-set. The results of the analysis of variance show how the total variance in the chronology is partitioned among potential sources of variation. A high percentage of the variance retained by the mean chronology generally indicates that ring-width fluctuations are very similar in all the radii. However, differences between trees often account for a large percentage of the variance, particularly on more complacent sites or on those that have been disturbed. Other sources of variation may include differences between radius classifications, differences between groups of trees in different areas of the site, and other "unexplained" sources of variation that are not explicitly considered in the analysis. The estimated mean square of Y, as given here, is the estimated population value of the amount of variance in common among all series that is retained in the final chronology, and corresponds to the "Variance Component" used by Fritts in his Table 6.VII (1976, p. 288). The cross-correlation analysis duplicates the analysis of variance results to some extent, but also provides additional insights. The values given are the average linear cross-correlation coefficients between different sets of ring-width index series. The average correlation between radii within trees is always larger than the average correlation among radii from different trees, and reflects the tendency for growth records from individual radii of the same tree to be more similar than records from radii of different trees. Another measure of the similarities or differences between trees is provided by the average correlation between the tree mean chronologies, obtained by averaging the replicated records from the different radii of the same trees, and calculating correlation coefficients.

The second set of data, labelled "Chronology Statistics", describes the properties of the site chronology presented on the facing page. Each chronology is identified by a 6-character code. The three letters correspond to the site code given in Table 1 and used in Figure 2. The first two numbers constitute a two-digit species code, explained in Table 3, and the "9" in the last position of the code for most chronologies follows a Laboratory convention indicating that it is a site chronology, incorporating all available good-quality radial index series. Three statistics are given that describe time-series properties of the chronology (Fritts, 1976). Autocorrelation is the first-order autocorrelation coefficient - a measure of the tendency for high or low index values to persist from one year to the next. The standard deviation of the series is calculated in the usual way, and measures the total amount of variation at all frequencies. The mean sensitivity is a statistic developed for the description of tree-ring series, but corresponds to the mean average first difference. High mean sensitivity indicates that there are large differences in index value from one year to the next. The standard error measures the amount of dispersion of the index values in the sample about the mean value in each year; they are averaged for the entire series to produce the mean standard error given here. In general, the closer the individual values are to the mean value, and the larger the sample size, the smaller the standard error. The chronology statistics are summarized in Table 2.

Acknowledgments

Important contributions were made by many persons and organizations in New Zealand. These have been acknowledged in detail by Dunwiddie (1978), but some deserve special mention. M. R. Boase and D. A. Campbell proved invaluable as field assistants. Professor A. T. Wilson, then at the University of Waikato, and Dr. D. J. Cown of the Forest Research Institute, New Zealand Forest Service, provided a great deal of information, advice, logistic support and field assistance. We also thank the Park Boards and the rangers at all the National Parks for their cooperation and help.

TABLE 1. INDEX TO LOCALITIES

Site Code	Site Name	Species Codes	Lat.	Long.	Altitude, mts.	Site Chronology
AHA	Ahaura	DACO	42°23'S	171°48'E	244	AHA209
AHA	Ahaura	LIBI	42°23'S	171°48'E	244	AHA189
ANB	Alex Knob	LIBI	43°25'S	170°09'E	991	
ARM	Armstrong Reserve	LIBI	43°50'S	173°00'E	731	ARM189
CLT	Clinton Forks	PHAL	44°53'S	167°53'E	152	
CRG	Mount Cargill	LIBI	45°50'S	170°30'E	576	CRG189
CRG	Mount Cargill	NOME	45°50'S	170°30'E	576	
DEN	Denniston	DABI	41°44'S	171°48'E	457	
EMT	Mount Egmont	LIBI	39°15'S	174°05'E	1067	EMT188
EMT	Mount Egmont	POHA, LEER	39°15'S	174°05'E	1067	
FCB	Fish Creek Bridge	LIBI	44°07'S	169°21'E	472	
HAK	Hakarimata Reserve	PHTR, AGAU DACU, POFE	37°40'S	175°10'E	305	
HHT	Hihitahi	LIBI	39°32'S	175°44'E	976	
KON	Konini Forks	AGAU LIPL	37°04'S	175°08'E	400	KON239
LST	Lodestone Track	LIBI	41°11'S	172°44'E	1067	
MAM	Mamaku	PHTR, PHGL DACU, POFE	38°08'S	176°07'E	549	
MAP	Manapouri	DABI	45°32'S	166°49'E	305	MAP229
MGR	Maungaroa Valley Road	PHTR	37°45'S	177°44'E	229	
MIN	Minginui	POTO, BETA POSC, DACU	38°40'S	176°45'E	152	
MOP	Moa Park	LIBI	40°56'S	172°56'E	1037	
MTA	Maungataniwha	PHGL	38°55'S	176°52'E	640	
MTI	Maitai Valley (South Fork)	PHTR	41°19'S	173°22'E	183	
MWO	Mangawhero River Bridge	DACO	39°21'S	175°29'E	1000	MWO209
MWO	Mangawhero River Bridge	LIBI	39°21'S	175°29'E	1000	MWO189
NET	North Egmont	LIBI	39°17'S	174°06'E	991	NET189

TABLE 1. INDEX TO LOCALITIES (cont.)

Site Code	Site Name	Species Codes	Lat.	Long.	Altitude, mts.	Site Chronology
NHP	Ngahinapouri	PODA	37°54'S	175°12'E	122	
OKA	Owaka	LIBI	46°23'S	169°27'E	305	OKA189
OMA	Omoeroa Bridge	LIBI	43°25'S	170°06'E	274	
OMA	Omoeroa Bridge	PHAL	43°25'S	170°06'E	274	
OWI	Okiwi	PHTR	41°07'S	173°40'E	15	OWI179
PAP	Paparoa	PHTR	36°07'S	174°15'E	160	PAP178
PAP	Paparoa	AGAU	36°07'S	174°15'E	160	
PIR	Pirongia	LIBI	38°00'S	175°06'E	962	
PLC	Peg Leg Creek	PHAL	42°54'S	171°34'E	915	PLC259
PLC	Peg Leg Creek	LIBI, DABI	42°54'S	171°34'E	915	
PTA	Putara	DABI	40°40'S	175°31'E	650	
PTA	Putara	PHAL	40°40'S	175°31'E	650	
PUK	Puketi State Forest	PHTR	35°14'S	173°48'E	152	
RCH	Ruapehu Chateau	LIBI, PHAL	39°12'S	175°31'E	1080	
RSF	Russell State Forest	PHTR	35°25'S	174°18'E	274	
RUS	Rahu Saddle	LIBI	42°18'S	172°06'E	672	
SAB	St. Arnaud Bog	LIBI	41°47'S	172°55'E	710	
SAD	St. Arnaud Track	LIBI	41°48'S	172°52'E	671	
TEA	Te Anau Dam	NOFU, NOSO	45°26'S	167°42'E	152	
TEH	Te Aroha	PHGL	37°30'S	175°50'E	1000	TEH168
TEH	Te Aroha	LIBI, PHAL NOSO	37°30'S	175°50'E	1000	
TKP	Takapari	LIBI	40°05'S	176°00'E	838	TKP189
TMH	Te Moehau	LIBI	36°32'S	175°24'E	823	
UWR	Urewera	LIBI	38°41'S	177°12'E	854	UWR189
WIU	Waiau Falls	AGAU	36°45'S	175°30'E	100	
WKA	Waikoha Road	PHTR	37°52'S	175°07'E	122	
WKT	Lake Waikareiti	PHGL	38°42'S	177°12'E	853	WKT169
WMN	Waimanoa	PHGL	38°34'S	175°42'E	518	WMN169

TABLE 1. INDEX TO LOCALITIES (cont.)

Site Code	Site Name	Species Codes	Lat.	Long.	Altitude, mts.	Site Chronology
WMU	Waiomu	PHTR	37°02'S	175°32'E	61	WMU179
WPA	Waipoua	PHGL, PHTR	35°41'S	173°33'E	244	WPA179

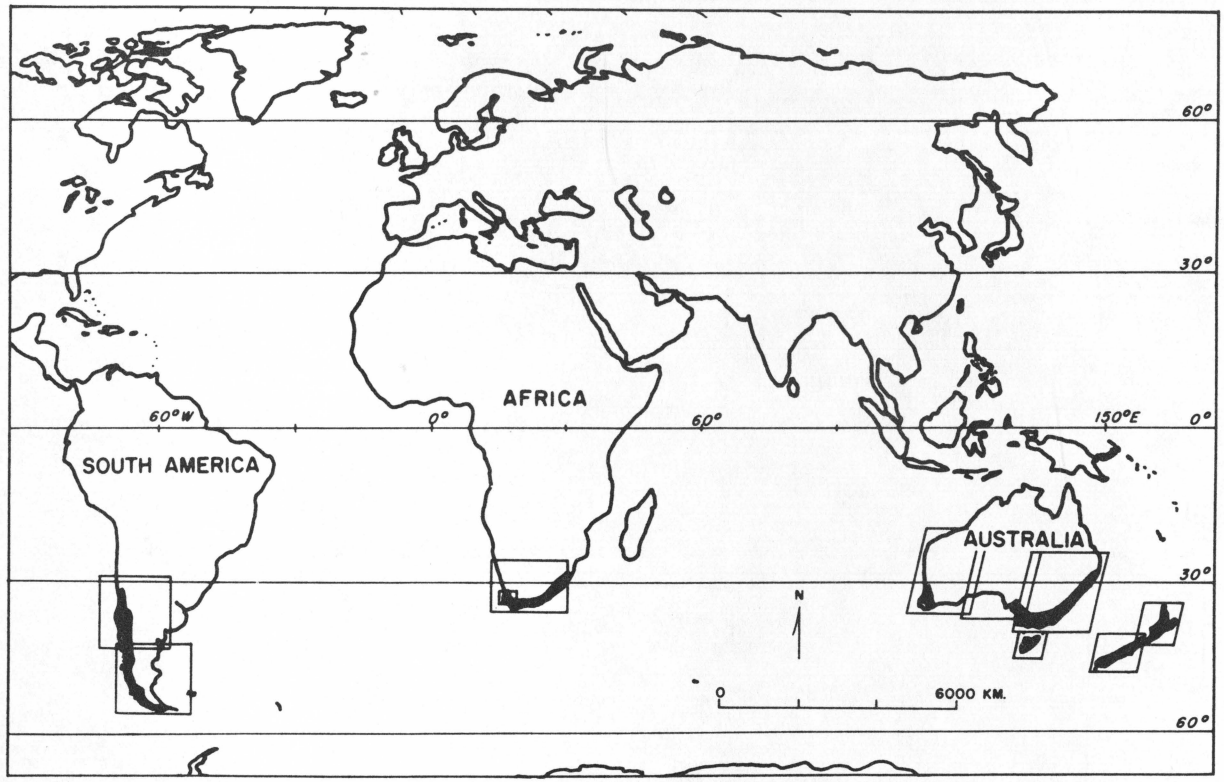
TABLE 2. CHRONOLOGY STATISTICS SUMMARY

Chronology Identification Code	Mean Sensitivity	Standard Deviation	Auto-Correlation	Mean Standard Error	Time Span A. D.
AHA209	0.13	0.20	0.69	0.08	1403-1976
AHA189	0.16	0.28	0.77	0.08	1525-1976
ARM189	0.16	0.24	0.62	0.07	1450-1958
CRG189	0.16	0.26	0.75	0.08	1492-1975
EMT188	0.16	0.19	0.50	0.06	1616-1975
KON239	0.21	0.18	0.00	0.08	1712-1976
MAP229	0.10	0.18	0.75	0.08	1567-1976
MWO209	0.12	0.17	0.54	0.07	1464-1976
MWO189	0.12	0.32	0.87	0.07	1662-1976
NET189	0.15	0.20	0.58	0.06	1625-1976
OKA189	0.12	0.18	0.66	0.05	1732-1976
OWI179	0.29	0.25	0.06	0.08	1724-1976
PAP178	0.22	0.22	0.26	0.07	1779-1975
PLC259	0.13	0.18	0.57	0.05	1717-1976
TEH168	0.53	0.36	-0.28	0.09	1779-1975
TKP189	0.14	0.28	0.79	0.09	1256-1976
UWR189	0.17	0.25	0.66	0.09	1346-1976
WKT169	0.44	0.31	-0.15	0.08	1535-1976
WMN169	0.34	0.26	-0.65	0.05	1745-1976
WMU179	0.24	0.23	0.15	0.08	1664-1976
WPA179	0.30	0.25	0.06	0.07	1585-1976

TABLE 3. SPECIES COLLECTED

Species	Alphabetic Species Code	Numerical Species Code	Number of Sites Collected
Agathis australis	AGAU	23	4
Beilschmiedia tawa	BETA		1
Dacrydium biforme	DABI	22	4
Dacrydium colensoi	DACO	20	2
Dacrydium cupressinum	DACU		3
Leptospermum ericoides	LEER		1
Libocedrus bidwillii	LIBI	18	23
Libocedrus plumosa	LIPL		1
Nothofagus fusca	NOFU		1
Nothofagus menziesii	NOME		1
Nothofagus solandri	NOSO		2
Phyllocladus alpinus	PHAL	25	6
Phyllocladus glaucus	PHGL	16	6
Phyllocladus trichomanoides	PHTR	17	11
Podocarpus dacrydioides	PODA		1
Podocarpus ferrugineus	POFE		2
Podocarpus hallii	POHA		1
Podocarpus spicatus	POSC		1
Podocarpus totara	POTO		1

Plate 2. *Libocedrus bidwillii*, Takapari site, North Island.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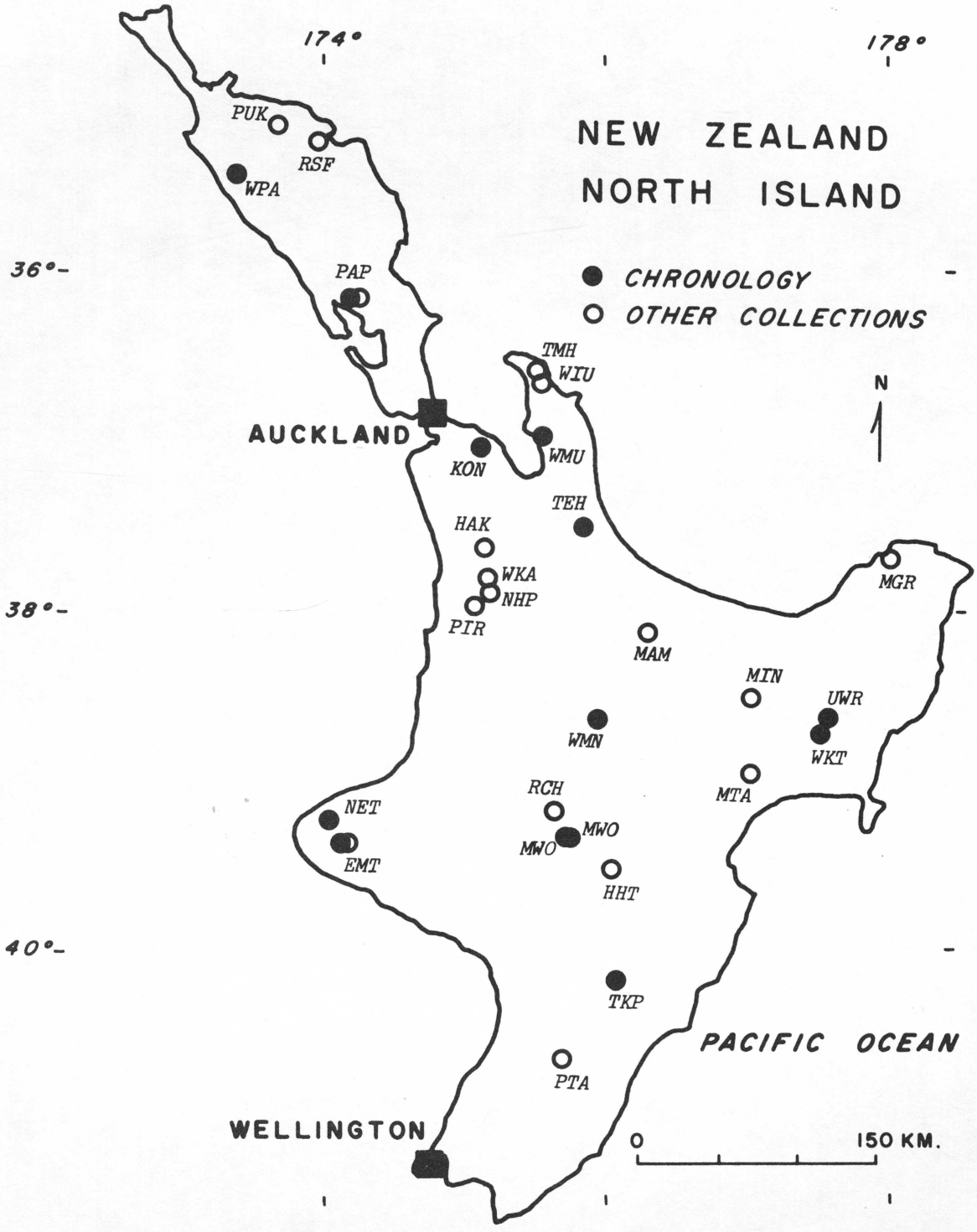
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TMH
WIU
AUCKLAND
KON
WMU
TEH
HAK
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MGR
MAM
MIN
UWR
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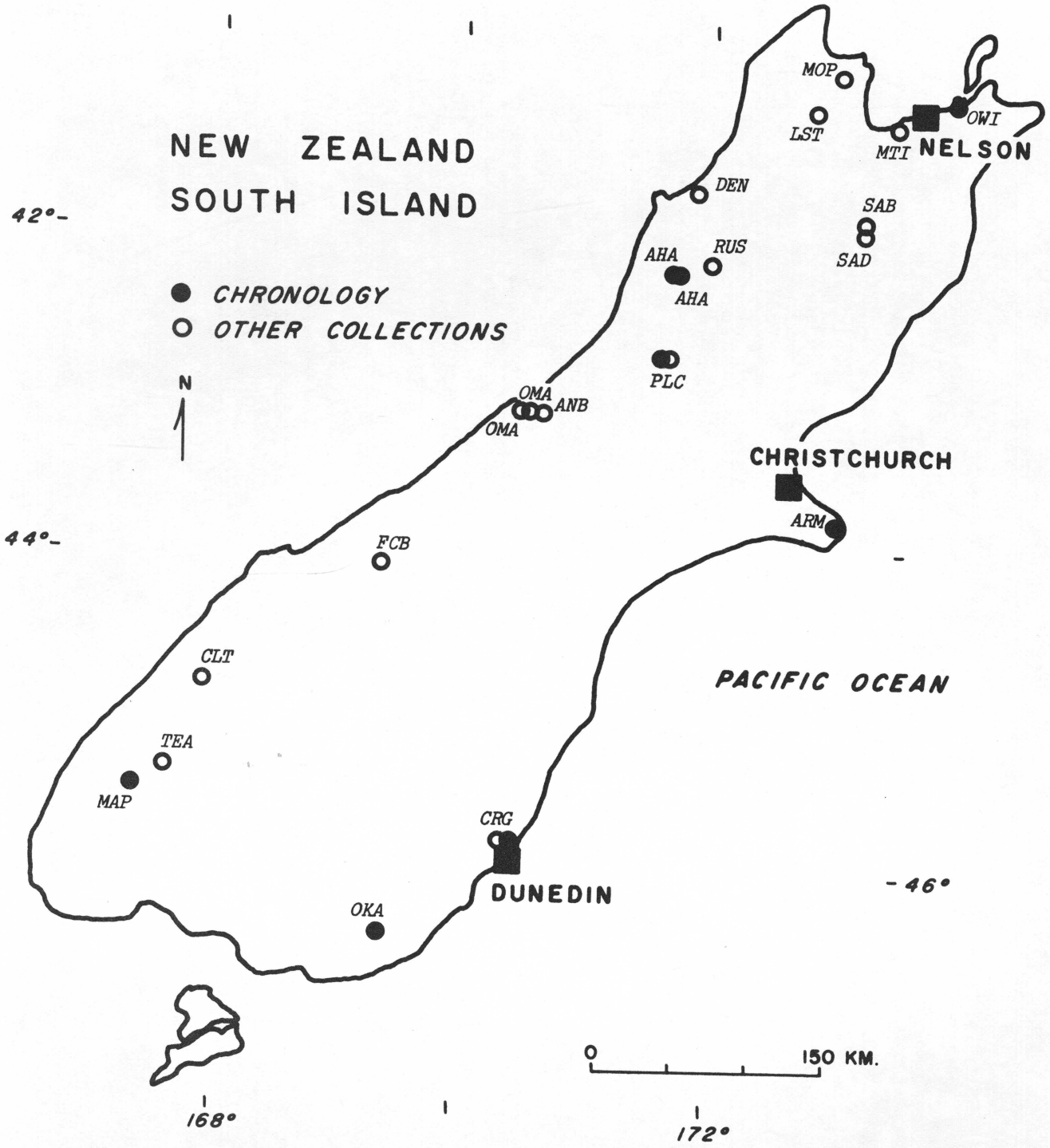
NEW ZEALAND
SOUTH ISLAND
CHRONOLOGY
OTHER COLLECTIONS
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CHRISTCHURCH
ARM
FCB
CLT
TEA
MAP
CRG
DUNEDIN
OKA
PACIFIC OCEAN
150 KM.

SITE CHRONOLOGIES

SITE AND COLLECTION INFORMATION

Site name *KONINI FORKS*
Country *NEW ZEALAND* **State or Province** *NORTH ISLAND*
Latitude *37°04'S* **Longitude** *175°08'E* **Altitude** *400 m*
Species collected *Agathis australis*
Date of collection *1 February 1978*
Collectors *P.W.Dunwiddie, M.R.Boase, A.Dakin, K.Buchan*
No. of trees sampled *11* **No. of cores** *33* **No. of discs** *0*

Site description:

The site is located above the confluence of Konini and Mangatangi streams in the Hunua Range, 11.5 km east of the town of Hunua. The Lilburne Road, east of Upper Mangatawhiri Dam, provided access within one km of the trees. A stand of nearly pure Agathis australis is growing on a north-facing 30° slope within the scarp delimiting an old land slip. A single large individual (131 cm dbh) just outside the slide area probably provided the seed source for these trees, which are 70 to 90 cm dbh, and 30 to 38 m tall. There is little understory growth beneath the trees, which form a fairly tight canopy. Six cores from two Libocedrus plumosa at the top of the slip were also collected.

SAMPLE STATISTICS

Interval analyzed (A.D.)	*1831 - 1976*
No. of trees *9* No. of radii per tree *2*	
Mean ring width (mm)	*1.80*
% locally absent rings	*0.68*
Analysis of variance:	
Estimated mean square of Y	*0.036*
Sources of variation, % variance	
Mean chronology	*23*
Differences between trees	*20*
Other	*57*
Cross-correlation analysis:	
Radii within trees	*0.46*
Radii among trees	*0.25*
Between tree means	*0.26*

CHRONOLOGY STATISTICS

Identification	*KON239*
Interval (A.D.)	*1712 - 1976*
No. of trees *11* Total no. of radii *33*	
Autocorrelation	*0.00*
Standard deviation	*0.18*
Mean sensitivity	*0.21*
Mean standard error	*0.08*

KON239
KONINI FORKS
AGATHIS AUSTRALIS

TREE RING INDICES

DATE	0	1	2	3	4	5	6	7	8	9
1712			99	72	80	98	81	115	115	79
1720	77	102	83	101	83	105	86	101	119	83
1730	102	68	97	112	99	95	87	93	88	103
1740	115	117	126	107	103	99	119	102	90	110
1750	106	100	81	115	102	87	106	62	124	87
1760	92	120	98	105	95	79	101	88	115	95
1770	107	93	63	84	95	82	92	76	107	83
1780	90	108	94	105	92	97	121	68	122	92
1790	112	97	101	95	130	97	121	135	109	116
1800	109	85	89	87	109	70	115	110	106	120
1810	99	111	118	107	115	107	100	93	98	99
1820	104	106	90	98	92	80	102	123	84	105
1830	99	123	97	136	105	124	100	92	103	63
1840	109	106	99	104	88	101	57	107	86	72
1850	90	81	103	108	90	111	84	97	71	118
1860	75	113	113	88	117	111	105	100	108	89
1870	107	103	111	101	123	76	127	96	107	100
1880	100	91	89	90	125	123	89	84	86	77
1890	79	128	107	155	123	123	132	108	129	79
1900	82	75	98	61	118	110	82	84	66	84
1910	88	108	76	142	115	87	76	105	106	144
1920	102	119	111	75	120	104	108	122	92	109
1930	95	134	92	115	67	74	107	75	113	68
1940	135	96	117	99	113	93	62	86	67	94
1950	80	137	105	91	96	92	72	90	109	101
1960	65	106	82	183	111	128	116	105	91	81
1970	85	114	99	63	98	73	108			

NUMBER OF SAMPLES

0	1	2	3	4	5	6	7	8	9
		3	3	3	3	3	3	3	3
4	4	4	4	5	5	5	5	5	5
5	5	5	6	6	6	7	7	7	7
8	8	8	9	9	9	9	9	9	9
9	9	9	9	9	9	9	9	9	9
9	9	9	9	9	9	10	10	11	11
12	12	12	12	12	12	12	12	12	13
13	14	14	14	14	14	14	14	14	14
14	14	14	14	14	13	13	13	14	14
16	16	16	16	16	18	19	20	20	21
21	21	22	22	22	24	25	25	25	25
26	27	27	27	27	28	28	28	28	28
28	30	30	30	30	30	30	30	30	30
31	31	31	31	31	31	31	31	32	32
32	32	32	32	32	32	32	32	32	32
32	32	32	32	32	32	33	33	33	33
33	33	33	33	33	33	33	33	33	33
33	33	33	33	33	33	32	32	32	32
32	32	32	32	32	32	32	32	32	32
32	32	32	32	32	32	32	32	32	32
32	32	32	32	32	32	32	32	32	32
32	32	32	32	32	32	32	32	32	32
32	32	32	32	32	32	32	32	32	32
32	30	30	30	30	30	29	29	29	29
28	28	28	28	28	28	28	28	28	28
27	27	27	27	27	27	27	27	27	27
27	27	27	27	27	27	27			

SITE AND COLLECTION INFORMATION

Site name *LAKE WAIKAREITI*
Country *NEW ZEALAND* State or Province *NORTH ISLAND*
Latitude *38° 42'S* Longitude *177° 12'E* Altitude *853 m*
Species collected *Phyllocladus glaucus*
Date of collection *27 January 1978*
Collectors *P.W.Dunwiddie, M.R.Boase, K.Buchan*
No. of trees sampled *12* No. of cores *47* No. of discs *0*

Site description:

A forest of mature Nothofagus menziesii, Nothofagus fusca, and Phyllocladus glaucus is found at the east end of Lake Waikareiti in Urewera National Park. Access to the Sandy Bay Hut, adjacent to the site, is made by a trail and rowboat from Waikaremoana. The 16 m tall P. glaucus share the canopy or may be somewhat overtopped by the Nothofagus. Major understory plants include Dracophyllum, Ixerba, and Griselinia. No disturbance was evident in the area, and the forest is quite dense. Trees were cored east of the hut in mostly level terrain along the lake. The stand appeared typical of the forest elsewhere around the lake, although P. glaucus of this size may be unusual.

SAMPLE STATISTICS

Interval analyzed (A.D.)	*1776 - 1913*
No. of trees *9* No. of radii per tree *2*	
Mean ring width (mm)	*0.66*
% locally absent rings	*0.72*
Analysis of variance:	
Estimated mean square of Y	*0.091*
Sources of variation, % variance	
Mean chronology	*38*
Differences between trees	*24*
Other	*38*
Cross-correlation analysis:	
Radii within trees	*0.62*
Radii among trees	*0.39*
Between tree means	*0.41*

CHRONOLOGY STATISTICS

Identification	*WKT169*
Interval (A.D.)	*1535 - 1976*
No. of trees *11* Total no. of radii *37*	
Autocorrelation	*-0.15*
Standard deviation	*0.31*
Mean sensitivity	*0.44*
Mean standard error	*0.08*

WKT169
LAKE WAIKAREITI
PHYLLOCLADUS GLAUCUS

	TREE RING INDICES										NUMBER OF SAMPLES									
DATE	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
1535						102	148	90	68	113						2	2	2	2	3
1540	100	82	130	79	143	89	89	59	86	75	3	3	4	5	6	6	6	6	6	6
1550	61	106	47	132	120	88	53	149	107	102	6	7	8	8	8	8	8	8	8	8
1560	101	142	136	65	128	109	68	53	58	65	8	8	8	8	8	8	8	8	8	8
1570	94	82	90	148	121	61	133	106	137	77	9	9	9	10	11	11	11	11	11	11
1580	162	131	93	134	116	109	125	80	138	83	11	11	11	11	11	11	11	11	11	11
1590	143	111	86	96	63	125	119	103	59	95	11	11	11	11	11	11	11	11	11	11
1600	107	103	27	65	72	70	39	106	60	94	11	11	11	11	11	11	11	11	11	11
1610	55	108	83	120	112	124	70	137	122	106	11	11	11	11	11	11	11	11	11	11
1620	70	70	45	126	108	53	134	163	71	157	11	11	11	11	12	12	12	12	12	12
1630	109	121	49	89	101	49	115	82	115	75	12	12	12	12	13	13	13	13	13	13
1640	104	67	129	67	125	80	119	95	106	70	13	13	13	14	14	15	15	16	16	16
1650	134	113	110	129	73	133	150	93	164	128	16	17	17	17	17	17	17	18	19	19
1660	119	66	111	86	131	80	132	77	136	134	19	19	19	19	20	20	20	20	23	23
1670	79	139	132	111	120	45	114	85	131	139	23	23	23	24	24	24	24	24	25	25
1680	101	156	97	155	81	114	110	43	89	72	25	25	25	25	25	25	25	25	25	25
1690	117	68	145	84	160	144	85	81	126	52	25	26	26	26	26	26	27	27	27	27
1700	121	100	115	71	140	115	160	89	134	70	27	27	27	27	27	27	27	27	27	27
1710	103	93	104	43	114	82	121	102	42	112	27	27	27	27	28	28	28	28	28	28
1720	90	108	42	114	59	95	101	61	96	114	28	28	28	28	28	28	28	28	29	30
1730	143	52	115	131	120	33	103	109	69	99	30	30	30	30	30	31	31	31	31	31
1740	83	76	139	60	123	142	79	129	80	155	31	31	31	31	31	31	31	31	31	31
1750	84	127	48	132	124	105	43	139	126	132	32	32	32	32	33	33	33	33	33	33
1760	77	145	120	117	71	105	137	27	78	58	34	34	34	34	34	34	34	30	30	30
1770	96	31	90	37	137	130	46	95	60	119	30	30	30	30	30	30	31	31	31	31
1780	81	119	120	82	138	136	103	117	88	109	31	31	32	32	32	32	32	32	32	32
1790	65	100	88	108	46	124	60	127	97	55	32	33	33	33	33	33	33	33	33	33
1800	122	107	153	134	58	110	145	163	57	135	33	33	33	33	33	33	33	33	33	33
1810	118	45	132	92	118	95	106	65	102	28	33	33	33	33	33	33	33	33	33	33
1820	90	87	85	69	161	145	148	101	130	101	33	33	33	33	33	33	33	33	33	33
1830	63	112	62	119	55	83	94	37	122	106	33	33	33	33	33	33	33	33	33	33
1840	94	112	125	110	63	110	77	62	125	45	33	33	33	33	33	33	33	33	33	33
1850	126	76	122	91	96	106	71	141	138	98	33	31	31	31	31	31	31	31	31	31
1860	115	111	145	79	127	79	133	61	135	117	30	30	30	30	30	30	30	30	30	30
1870	70	125	35	94	58	124	113	139	100	150	30	30	30	30	30	30	30	30	30	30
1880	123	159	84	105	99	40	90	54	117	70	30	30	30	30	30	29	29	29	29	29
1890	124	73	140	101	142	112	114	161	122	153	29	28	28	28	28	28	28	28	28	28
1900	105	156	90	127	66	116	76	81	95	137	28	28	28	28	28	28	27	27	27	27
1910	46	117	110	37	92	56	115	130	99	84	27	27	27	26	25	25	25	25	25	25
1920	74	110	127	75	136	138	73	97	60	98	25	25	25	25	25	25	25	25	25	25
1930	76	70	64	82	102	37	91	64	82	123	25	25	25	25	25	24	24	24	24	24
1940	79	105	147	61	150	134	89	130	47	84	24	24	24	24	24	24	24	24	24	24
1950	71	106	62	124	51	74	78	94	75	83	24	22	22	22	22	22	22	22	22	22
1960	83	143	69	133	127	103	89	145	66	120	22	22	22	22	22	22	22	22	22	22
1970	45	97	127	43	123	72	117				22	22	21	21	20	20	20			

SITE AND COLLECTION INFORMATION

Site name *MANGAWHERO RIVER BRIDGE*
Country *NEW ZEALAND* **State or Province** *NORTH ISLAND*
Latitude *39°21'S* **Longitude** *175°29'E* **Altitude** *1000 m*
Species collected *Dacrydium colensoi*
Date of collection *15 January 1978*
Collectors *P.W.Durwiddie, M.R.Boase*
No. of trees sampled *12* **No. of cores** *46* **No. of discs** *1*

Site description:

On the southwest slopes of Mt. Ruapehu in Tongariro National Park approximately 9 km north of Ohakune, the Ohakune Mountain Road crosses to the west side of the Mangawhero River. Subsite I is located just west of the road above the bridge on a 15° southeast facing slope. Mature Libocedrus bidwillii up to 13 m tall are emergent from an 8 m tall forest of Nothofagus solandri var cliffortioides. Drainage is poor in the site, which is boggy in places. Coprosma, Myrsine, Griselinia, small Phyllocladus alpinus, and some young L. bidwillii are also present.

Subsite II is 0.7 km farther up the road, in a nearly level area immediately west of the road. The forest has an open canopy of 11 m tall Dacrydium colensoi with L. bidwillii, N. solandri var cliffortioides, and P. alpinus with a moderate understory of shrubs and ferns. Drainage is poor, with Sphagnum found in the boggy places. The subalpine forest at both subsites is well-developed, with little of the stunting or deformation characteristic of the trees at timberline several km higher. Substrate is predominantly volcanic ash. Recent disturbance appeared to be negligible. A single P. alpinus was also cored.

SAMPLE STATISTICS

Interval analyzed (A.D.)	*1677 - 1875*
No. of trees *10* No. of radii per tree *2*	
Mean ring width (mm)	*0.45*
% locally absent rings	*0.10*
Analysis of variance:	
Estimated mean square of Y	*0.020*
Sources of variation, % variance	
Mean chronology	*18*
Differences between trees	*25*
Other	*57*
Cross-correlation analysis:	
Radii within trees	*0.44*
Radii among trees	*0.19*
Between tree means	*0.20*

CHRONOLOGY STATISTICS

Identification	*MWO209*
Interval (A.D.)	*1464 - 1976*
No. of trees *10* Total no. of radii *36*	
Autocorrelation	*0.54*
Standard deviation	*0.17*
Mean sensitivity	*0.12*
Mean standard error	*0.07*

MW0209
MANGAWHERO RIVER BRIDGE
DACRYDIUM COLENSOI

DATE	TREE RING INDICES										NUMBER OF SAMPLES									
	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
1464					105	133	128	143	108	89					1	1	1	1	2	2
1470	83	101	93	91	91	76	78	82	102	107	2	2	2	2	2	3	3	3	5	5
1480	72	79	70	76	73	68	71	79	64	67	6	6	6	6	6	6	6	6	6	6
1490	75	90	71	90	82	95	85	86	96	91	6	6	6	8	8	8	8	8	8	9
1500	100	99	94	102	96	115	98	85	110	109	9	9	9	9	9	9	9	9	9	10
1510	110	121	120	122	96	97	86	81	83	100	10	10	10	10	10	10	10	11	11	11
1520	102	94	96	110	91	80	98	97	102	101	11	11	12	12	12	12	12	12	12	12
1530	112	120	117	99	93	81	102	99	95	80	12	12	12	12	12	12	12	13	13	13
1540	95	85	96	85	83	105	100	106	105	107	13	13	13	13	13	13	13	14	14	14
1550	103	116	90	90	89	101	104	87	85	93	14	14	16	16	16	16	16	16	16	16
1560	93	81	97	74	81	98	94	78	96	98	17	17	17	18	18	18	18	18	18	18
1570	107	118	96	107	107	130	117	86	129	130	18	18	19	19	19	19	19	19	19	19
1580	124	122	115	121	147	125	128	134	142	111	19	19	19	19	19	19	19	19	19	19
1590	109	89	119	123	108	121	104	87	101	121	19	19	19	19	19	20	20	20	20	20
1600	119	134	107	126	108	113	97	105	114	95	20	20	20	20	20	20	20	21	21	21
1610	126	122	100	104	100	115	100	117	97	91	21	21	21	21	21	22	22	22	22	22
1620	98	112	87	79	87	86	85	101	88	89	22	22	22	22	22	22	22	22	23	23
1630	105	99	125	71	70	81	102	93	88	75	23	23	23	23	23	24	24	24	24	24
1640	86	99	88	104	72	90	70	77	82	70	24	24	24	25	25	25	26	27	27	27
1650	79	83	60	75	75	81	95	90	107	82	29	29	29	30	30	30	30	30	30	30
1660	64	79	85	80	79	72	75	57	74	76	31	31	31	31	31	31	31	31	31	31
1670	68	88	99	105	103	96	87	106	75	78	31	31	31	31	31	31	31	32	32	32
1680	71	89	78	95	93	92	77	99	100	110	32	32	32	32	32	32	32	33	33	33
1690	103	94	86	100	97	113	89	94	98	82	33	33	33	33	33	33	33	33	33	33
1700	82	86	96	114	112	93	110	96	87	99	33	33	33	33	33	33	33	33	33	33
1710	75	87	124	119	96	99	102	87	65	99	33	33	33	34	34	34	34	34	34	34
1720	96	100	79	95	113	82	95	99	108	86	34	34	34	34	34	34	34	34	34	34
1730	118	88	93	102	94	112	90	93	103	116	34	34	34	34	34	34	34	34	34	34
1740	122	111	123	114	91	112	91	98	117	126	34	34	34	34	34	34	34	34	34	34
1750	102	123	107	100	101	114	127	123	94	95	34	34	34	34	34	34	34	34	34	34
1760	100	115	110	103	115	87	129	91	93	108	34	34	34	34	34	34	34	34	34	34
1770	94	112	128	125	112	113	100	117	126	117	34	34	34	34	34	34	34	34	34	34
1780	143	110	99	109	92	110	123	115	88	92	34	34	34	34	34	34	34	34	34	34
1790	80	76	67	82	101	104	108	120	96	113	34	34	34	34	34	34	34	34	34	34
1800	128	127	109	104	103	117	98	96	121	96	34	34	34	34	34	34	34	34	34	34
1810	92	89	97	93	94	91	85	98	113	118	34	34	34	34	34	34	34	34	34	34
1820	112	112	112	108	112	133	87	105	94	102	34	34	34	34	34	34	34	34	34	34
1830	125	113	74	74	136	96	93	91	84	94	34	34	34	34	34	34	34	34	34	34
1840	91	98	93	95	97	93	107	92	113	112	34	34	34	34	34	34	34	34	34	34
1850	119	116	98	115	108	90	91	95	96	111	34	34	34	34	34	34	34	34	34	34
1860	102	100	100	88	96	91	107	76	85	93	34	34	34	34	34	34	34	34	34	34
1870	92	97	64	90	89	84	85	89	93	124	34	34	34	33	33	33	32	32	32	32
1880	75	100	101	73	83	90	105	82	92	119	32	32	32	32	32	32	32	32	32	32
1890	107	136	147	148	144	107	117	99	106	104	32	32	32	32	32	32	32	32	32	32
1900	111	125	100	115	120	95	123	121	110	128	32	31	31	31	31	31	31	31	31	31
1910	104	81	80	89	92	97	94	107	74	90	31	31	31	31	31	31	31	30	30	30
1920	95	111	91	92	86	86	91	105	109	99	30	30	30	30	30	30	30	30	30	30
1930	71	101	130	120	142	77	104	129	79	80	30	30	30	30	30	30	30	30	30	30
1940	84	79	94	104	104	102	92	111	92	101	30	30	30	30	30	30	30	30	30	30
1950	115	100	107	130	129	125	117	123	131	131	30	30	30	30	30	30	30	29	29	29
1960	127	111	91	98	98	106	105	111	96	102	29	29	29	29	29	29	28	28	28	28
1970	85	93	99	98	92	77	95				28	27	27	27	27	27	27			

SITE AND COLLECTION INFORMATION

Site name *MANGAWHERO RIVER BRIDGE*
Country *NEW ZEALAND* **State or Province** *NORTH ISLAND*
Latitude *39°21'S* **Longitude** *175°29'E* **Altitude** *1000 m*
Species collected *Libocedrus bidwillii*
Date of collection *15 January 1978*
Collectors *P.W.Dunwiddie, M.R.Boase*
No. of trees sampled *12* **No. of cores** *48* **No. of discs** *0*

Site description:

On the southwest slopes of Mt. Ruapehu in Tongariro National Park approximately 9 km north of Ohakune, the Ohakune Mountain Road crosses to the west side of the Mangawhero River. Subsite I is located just west of the road above the bridge on a 15° southeast facing slope. Mature Libocedrus bidwillii up to 13 m tall are emergent from an 8 m tall forest of Nothofagus solandri var cliffortioides. Drainage is poor in the site, which is boggy in places. Coprosma, Myrsine, Griselinia, small Phyllocladus alpinus, and some young L. bidwillii are also present.

Subsite II is 0.7 km farther up the road, in a nearly level area immediately west of the road. The forest has an open canopy of 11 m tall Dacrydium colensoi with L. bidwillii, N. solandri var cliffortioides, and P. alpinus with a moderate understory of shrubs and ferns. Drainage is poor, with Sphagnum found in the boggy places. The subalpine forest at both subsites is well-developed, with little of the stunting or deformation characteristic of the trees at timberline several km higher. Substrate is predominantly volcanic ash. Recent disturbance appeared to be negligible.

SAMPLE STATISTICS

Interval analyzed (A.D.)	*1875 - 1975*
No. of trees *10* No. of radii per tree *2*	
Mean ring width (mm)	*0.71*
% locally absent rings	*0.00*
Analysis of variance:	
Estimated mean square of Y	*0.105*
Sources of variation, % variance	
Mean chronology	*38*
Differences between trees	*23*
Other	*39*
Cross-correlation analysis:	
Radii within trees	*0.59*
Radii among trees	*0.39*
Between tree means	*0.40*

CHRONOLOGY STATISTICS

Identification	*MWO189*
Interval (A.D.)	*1662 - 1976*
No. of trees *11* Total no. of radii *28*	
Autocorrelation	*0.87*
Standard deviation	*0.32*
Mean sensitivity	*0.12*
Mean standard error	*0.07*

MW0189
MANGAWHERO RIVER BRIDGE
LIBOCEDRUS BIDWILLII

	TREE RING INDICES										NUMBER OF SAMPLES									
DATE	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
1662			131	130	109	102	105	115	139	151			1	1	1	1	1	1	1	1
1670	125	151	185	170	177	152	146	164	167	175	1	1	1	1	1	1	1	1	1	1
1680	141	167	173	199	191	199	143	191	185	164	1	1	1	1	1	1	1	1	1	1
1690	154	170	138	146	130	139	123	138	160	138	1	1	1	1	1	1	1	1	1	1
1700	126	130	91	95	75	70	88	98	77	70	1	1	2	2	2	3	4	4	4	4
1710	66	69	68	53	45	44	60	61	57	71	4	4	5	5	5	5	5	5	5	5
1720	50	59	63	86	102	97	83	88	103	79	9	9	9	9	9	10	11	11	11	11
1730	87	74	61	75	72	66	78	76	74	74	12	13	13	13	13	13	14	14	14	14
1740	73	73	93	97	96	121	112	118	118	121	14	14	15	15	15	15	16	17	18	18
1750	97	99	86	98	109	99	96	112	95	94	18	18	18	18	18	18	18	18	18	18
1760	124	138	122	127	123	110	127	108	106	143	19	19	19	19	19	19	19	19	19	19
1770	114	143	138	118	105	104	92	115	117	110	19	19	19	19	19	19	19	19	19	19
1780	102	100	87	88	85	87	93	97	107	127	19	19	19	19	19	19	19	20	20	20
1790	130	128	114	139	119	112	112	164	134	167	20	20	20	20	20	20	20	20	20	20
1800	163	155	151	100	113	126	108	100	81	74	20	20	20	20	20	20	21	21	21	21
1810	75	65	69	77	93	108	85	88	99	97	21	22	22	22	22	23	23	23	23	23
1820	86	86	85	93	102	105	89	114	105	93	23	24	24	24	24	24	24	24	24	24
1830	77	79	65	59	66	73	95	102	113	104	24	24	24	24	24	24	26	26	27	27
1840	70	95	94	100	81	97	76	71	86	56	27	27	27	27	27	27	27	27	27	27
1850	59	80	99	105	92	92	101	102	90	88	27	27	27	27	27	27	27	27	27	27
1860	77	96	101	126	121	103	116	94	107	110	27	27	27	27	27	27	27	27	27	27
1870	105	111	63	86	94	103	117	111	114	115	27	27	27	27	27	28	28	28	28	28
1880	99	111	103	89	93	100	99	87	92	107	28	28	28	28	28	28	28	28	28	28
1890	133	131	153	173	172	174	185	162	160	150	28	28	28	28	28	28	28	28	28	28
1900	145	129	99	91	77	97	86	44	61	80	28	28	28	28	27	27	27	27	27	27
1910	81	99	91	98	97	87	66	79	63	66	27	27	27	27	27	27	27	27	27	27
1920	58	72	70	70	72	71	91	95	114	102	27	27	27	27	27	27	27	27	27	27
1930	77	93	133	139	130	76	84	97	68	68	27	27	27	27	27	27	27	27	27	27
1940	79	68	76	77	76	65	58	65	59	58	27	27	27	27	27	27	27	26	26	26
1950	59	56	56	64	64	58	65	90	108	124	26	26	26	25	25	25	25	25	25	25
1960	132	110	118	139	143	125	122	161	117	126	25	25	25	25	25	25	25	25	25	25
1970	122	144	140	137	128	132	145				25	25	25	25	25	25	24			

SITE AND COLLECTION INFORMATION

Site name *MT. EGMONT*
Country *NEW ZEALAND* **State or Province** *NORTH ISLAND*
Latitude *39°15'S* **Longitude** *174°05'E* **Altitude** *1050 m*
Species collected *Libocedrus bidwillii*
Date of collection *14,15 May 1977*
Collectors *P.W.Dunwiddie, D.A.Campbell*
No. of trees sampled *12* **No. of cores** *46* **No. of discs** *0*

Site description:

The site is in the subalpine forest on the southeast slopes of Mt. Egmont, in the Mt. Egmont National Park. It is located along the hiking track from Dawson Falls to Fanthams Peak, about 1.6 km above the road end at Dawson Falls Lodge.

Collections were made from 8 Podocarpus hallii and 12 Libocedrus bidwillii in the forests adjacent to the track. The former ranged from 2 m tall at the higher elevations where the forest grades into small shrubs, to 7 m tall lower down. The Libocedrus were scattered in the taller forest, and reached heights of 15 m. They were infrequent, with no apparent regeneration, and almost all individuals were cored.

The substrate is volcanic ash and lapilli, some of which has apparently fallen since trees began growth (Druce, N.Z. Jrl. Bot., 1966). Other disturbance appeared to be minimal. Epiphytic ferns and mosses are common due to abundant moisture.

SAMPLE STATISTICS

Interval analyzed (A.D.)	*1790 - 1965*
No. of trees *11* No. of radii per tree *2*	
Mean ring width (mm)	*0.91*
% locally absent rings	*0.03*
Analysis of variance:	
Estimated mean square of Y	*0.038*
Sources of variation, % variance	
Mean chronology	*28*
Differences between trees	*21*
Other	*51*
Cross-correlation analysis:	
Radii within trees	*0.50*
Radii among trees	*0.26*
Between tree means	*0.27*

CHRONOLOGY STATISTICS

Identification	*EMT188*
Interval (A.D.)	*1616 - 1975*
No. of trees *12* Total no. of radii *42*	
Autocorrelation	*0.50*
Standard deviation	*0.19*
Mean sensitivity	*0.16*
Mean standard error	*0.06*

EMT188
MT. EGMONT
LIBOCEDRUS BIDWILLII

	TREE RING INDICES										NUMBER OF SAMPLES									
DATE	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
1616							100	124	128	136							2	2	2	2
1620	160	165	88	84	106	69	68	75	95	106	3	3	3	3	3	3	3	3	3	3
1630	89	99	121	80	100	83	91	80	61	72	4	4	4	4	4	4	4	4	4	4
1640	67	63	85	105	83	81	93	108	116	107	4	4	4	4	4	4	4	4	4	4
1650	94	99	49	83	108	96	133	133	124	95	5	5	5	5	5	5	5	5	5	5
1660	106	109	104	109	112	115	115	131	129	128	5	5	5	5	5	5	5	5	5	5
1670	101	144	162	118	114	88	107	101	115	123	6	6	6	6	6	6	6	6	6	6
1680	112	97	65	89	85	68	68	62	82	77	6	6	6	6	6	6	6	7	8	8
1690	84	87	108	104	117	113	116	111	110	92	9	9	9	9	9	9	9	10	10	10
1700	108	104	107	118	108	88	120	100	98	87	10	10	10	11	11	11	11	11	11	11
1710	99	100	113	103	119	100	96	94	99	95	12	12	12	12	13	13	13	13	13	13
1720	71	81	85	100	70	88	99	99	134	112	16	16	16	16	16	16	17	17	17	17
1730	123	85	113	97	93	88	103	88	97	105	18	18	18	18	18	20	20	20	20	20
1740	93	50	91	78	65	72	80	91	89	103	21	21	22	22	23	23	23	23	23	23
1750	101	97	56	95	111	92	97	101	115	117	24	24	24	24	24	24	24	24	24	24
1760	101	108	101	108	95	70	91	87	89	93	24	24	24	24	24	24	25	25	25	25
1770	89	111	119	117	125	124	101	122	107	121	28	29	29	29	30	31	31	31	31	31
1780	101	80	92	100	111	100	127	111	116	126	32	32	32	34	34	34	34	34	34	34
1790	86	91	98	72	88	102	105	134	109	125	36	36	36	36	36	36	36	36	36	36
1800	132	122	98	101	122	110	117	116	106	128	36	36	36	36	36	36	36	37	37	37
1810	114	88	120	107	101	117	111	87	127	88	39	39	39	39	39	39	39	39	39	39
1820	106	108	91	105	130	109	95	105	112	98	39	39	39	39	39	39	39	39	39	39
1830	57	81	91	80	75	87	92	108	138	116	40	40	40	40	40	40	40	40	40	41
1840	88	134	115	102	68	88	84	63	100	83	41	41	42	42	42	42	42	42	42	42
1850	91	96	107	109	61	77	104	95	93	115	42	41	41	41	41	41	41	41	41	41
1860	113	105	134	128	127	109	127	120	129	113	41	41	41	41	41	41	41	41	41	41
1870	81	100	67	82	92	90	113	115	119	88	41	41	41	41	41	41	41	41	41	41
1880	102	109	113	81	90	107	111	87	90	69	41	40	40	40	40	40	40	40	40	40
1890	96	104	105	106	117	121	110	123	104	119	40	40	40	40	40	40	40	40	40	40
1900	98	106	96	99	84	98	107	54	88	84	40	40	40	40	40	40	40	40	40	40
1910	79	84	77	81	106	112	88	94	91	100	40	40	40	40	40	40	40	40	40	40
1920	99	109	118	109	49	70	104	85	77	90	40	40	40	40	40	40	40	40	40	40
1930	86	101	107	115	125	49	82	81	48	59	39	39	39	39	39	39	39	39	39	39
1940	88	87	121	117	142	145	96	110	109	102	38	38	38	38	38	38	38	38	38	38
1950	110	110	130	138	87	108	98	96	106	106	38	38	38	38	38	38	38	38	38	38
1960	97	110	85	122	117	113	80	80	65	81	38	38	38	38	38	38	37	36	35	35
1970	86	87	104	100	110	97					35	33	33	33	33	33				

SITE AND COLLECTION INFORMATION

Site name *NORTH EGMONT*
Country *NEW ZEALAND* State or Province *NORTH ISLAND*
Latitude *39°17'S* Longitude *174°06'E* Altitude *991 m*
Species collected *Libocedrus bidwillii*
Date of collection *30 January 1978*
Collectors *P. W. Dunwiddie, K. Buchan, M. R. Boase*
No. of trees sampled *16* No. of cores *60* No. of discs *1*

Site description:

The North Egmont Chalet is on the northern slopes of the volcano in Egmont National Park. A 29 km. road from New Plymouth provides access to the area. A restricted access road, known as the Translator Road, ascends the mountain above the chalet.

Mature Libocedrus up to 13 m tall are common along the road in the rocky valley bottom with Podocarpus hallii. Those selected for coring are located between the ford where the road crosses the Ngatoro stream and the sharp turn farther up the valley. Drainage is good in the rocky soil, and disturbance appears slight.

SAMPLE STATISTICS

Interval analyzed (A.D.)	*1757 - 1900*
No. of trees *12* No. of radii per tree *3*	
Mean ring width (mm)	*0.86*
% locally absent rings	*0.00*
Analysis of variance:	
Estimated mean square of Y	*0.03*
Sources of variation, % variance	
Mean chronology	*25*
Differences between trees	*33*
Other	*42*
Cross-correlation analysis:	
Radii within trees	*0.61*
Radii among trees	*0.27*
Between tree means	*0.29*

CHRONOLOGY STATISTICS

Identification	*NET189*
Interval (A.D.)	*1625 - 1976*
No. of trees *14* Total no. of radii *53*	
Autocorrelation	*0.58*
Standard deviation	*0.20*
Mean sensitivity	*0.15*
Mean standard error	*0.06*

NET189
NORTH EGMONT
LIBOCEDRUS BIDWILLII

DATE	TREE RING INDICES										NUMBER OF SAMPLES									
	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
1625						44	74	119	87	58						1	1	1	1	1
1630	40	84	94	80	80	76	91	108	92	72	2	2	2	2	2	2	2	3	3	3
1640	90	89	69	81	92	80	69	63	65	63	5	5	5	5	5	5	7	7	7	7
1650	61	68	73	99	101	81	95	91	85	86	7	8	8	8	8	8	8	8	8	8
1660	79	87	84	82	88	81	79	72	93	101	8	8	8	8	8	8	8	10	11	11
1670	103	125	119	85	113	95	98	103	104	110	12	12	14	14	14	14	14	15	16	16
1680	92	88	69	96	86	77	72	88	86	71	16	16	18	18	18	18	18	18	18	18
1690	86	92	100	99	128	115	109	128	121	104	18	18	18	18	19	19	20	20	20	20
1700	126	117	109	129	127	107	133	99	96	96	21	21	22	22	22	22	23	25	25	26
1710	102	102	105	99	122	104	125	117	123	116	27	30	30	30	30	30	30	30	30	31
1720	98	104	108	102	74	97	102	103	123	119	32	32	32	32	32	32	32	35	35	35
1730	119	92	121	104	107	108	114	90	108	119	35	35	35	36	37	38	38	39	40	41
1740	99	61	100	96	103	94	93	91	101	115	42	42	43	43	43	43	43	45	45	47
1750	110	106	89	122	133	106	128	127	109	101	48	49	49	50	51	51	51	52	52	52
1760	89	101	95	94	84	72	83	87	87	90	53	53	53	53	53	53	53	53	53	53
1770	70	92	106	100	116	115	104	123	116	129	53	53	53	53	53	53	53	53	53	53
1780	108	86	104	89	89	85	107	94	94	105	53	53	53	53	53	53	53	53	53	53
1790	96	89	89	82	91	98	84	112	111	142	53	53	53	53	53	53	53	53	53	53
1800	151	136	123	120	133	128	116	113	104	101	53	53	53	53	53	53	53	53	53	53
1810	84	72	107	81	79	95	88	67	85	84	53	52	52	52	52	52	52	52	52	52
1820	85	93	86	99	116	105	85	110	114	89	52	52	52	52	52	52	52	52	52	52
1830	54	75	74	58	50	53	71	82	104	91	51	51	51	51	51	51	51	51	50	50
1840	89	122	116	97	73	111	100	80	116	89	50	50	50	50	50	50	50	50	50	50
1850	110	121	132	111	69	94	106	109	90	90	49	49	49	49	49	49	49	49	49	49
1860	79	84	110	128	125	120	130	111	131	112	49	48	48	48	48	48	48	48	48	48
1870	94	101	68	75	90	100	120	144	119	96	48	48	48	48	48	48	48	48	48	48
1880	101	112	115	80	91	107	97	79	90	91	48	48	48	47	47	47	47	47	47	47
1890	76	103	109	114	97	94	114	134	121	130	47	47	47	47	47	47	47	47	47	47
1900	107	119	103	84	75	107	102	81	105	96	47	46	46	46	46	46	46	46	46	46
1910	69	105	88	92	113	109	65	123	94	104	46	46	46	46	46	46	46	46	45	45
1920	93	125	114	107	49	58	82	84	79	80	45	44	44	43	42	42	42	42	42	42
1930	76	104	85	102	97	40	77	88	69	71	42	41	41	41	41	40	40	40	40	40
1940	102	108	118	118	135	128	89	80	85	97	40	40	40	40	40	40	40	40	40	40
1950	103	130	131	136	85	92	95	104	108	128	40	40	40	40	40	40	40	40	40	40
1960	139	123	78	129	130	121	103	121	93	115	39	39	39	38	38	38	38	38	38	38
1970	112	129	121	131	121	131	147				38	38	38	38	38	38	38			

SITE AND COLLECTION INFORMATION

Site name *PAPAROA*
Country *NEW ZEALAND* **State or Province** *NORTH ISLAND*
Latitude *36° 07'S* **Longitude** *174° 15'E* **Altitude** *160 m*
Species collected *Phyllocladus trichomanoides*
Date of collection *24,25 April 1977*
Collectors *P.W.Dunwiddie, D.A.Campbell, A.Wilson*
No. of trees sampled *19* **No. of cores** *86* **No. of discs** *0*

Site description:

Two subsites were cored near the town of Paparoa in Northland. The Kauri Bushmen's Memorial Reserve is located on a small hill 2.5 km east of town. It was grazed until 1954, when it was fenced as a reserve. The flat top of the hill is a nearly pure stand of 60-90 cm dbh Agathis australis with a sparse understory of ferns and shrubs. The canopy is dense and soils are well-developed. The slopes are predominantly Phyllocladus trichomanoides of various sizes, with Podocarpus totara, Podocarpus ferrugineus, and Agathis australis.

A stand of large P. trichomanoides is found on the farm of Derek Hames. Franklin Road from Paparoa is followed 2 km north to Wearmouth Road. A track follows through moderately dense forest in a valley below the farm buildings along a south-running stream. The trees are common in the very wet forest, with Podocarpus dacrydioides and Podocarpus ferrugineus. Soils are deep, and epiphytes are abundant.

SAMPLE STATISTICS

Interval analyzed (A.D.)	*1891 - 1975*
No. of trees *10* No. of radii per tree *2*	
Mean ring width (mm)	*1.78*
% locally absent rings	*0.47*
Analysis of variance:	
Estimated mean square of Y	*0.052*
Sources of variation, % variance	
Mean chronology	*32*
Differences between trees	*23*
Other	*45*
Cross-correlation analysis:	
Radii within trees	*0.56*
Radii among trees	*0.33*
Between tree means	*0.34*

CHRONOLOGY STATISTICS

Identification	*PAP178*
Interval (A.D.)	*1779 - 1975*
No. of trees *12* Total no. of radii *37*	
Autocorrelation	*0.26*
Standard deviation	*0.22*
Mean sensitivity	*0.22*
Mean standard error	*0.07*

PAP178
PAPAROA
PHYLLOCLADUS TRICHOMANOIDES

	TREE RING INDICES										NUMBER OF SAMPLES									
DATE	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
1779										127										1
1780	94	105	115	124	61	106	79	73	112	102	1	1	1	1	1	1	1	1	1	1
1790	53	86	50	120	108	113	105	130	106	114	1	1	1	1	1	1	1	1	1	1
1800	61	57	61	123	95	121	108	83	79	115	2	2	2	2	2	2	2	2	2	2
1810	110	128	122	120	137	107	100	130	109	94	2	3	3	3	3	3	3	3	3	3
1820	81	96	124	113	131	111	133	83	133	95	3	3	3	3	3	3	4	4	4	4
1830	119	89	97	85	52	34	97	104	121	82	5	5	5	5	5	5	6	6	6	7
1840	89	108	96	122	80	88	73	89	97	100	9	10	10	10	11	12	12	12	12	12
1850	99	128	127	109	103	86	121	110	109	78	15	15	16	16	16	16	16	16	16	17
1860	100	101	85	92	93	105	98	108	104	94	18	18	18	18	18	18	18	18	18	19
1870	108	82	70	77	85	67	81	90	75	77	20	22	22	22	22	22	22	22	23	23
1880	71	122	68	100	95	97	75	83	114	94	24	24	26	26	27	28	28	28	28	28
1890	100	123	124	108	113	92	85	85	115	70	29	33	33	34	35	35	35	35	35	35
1900	119	141	125	104	115	133	123	54	74	87	35	36	36	36	36	36	36	36	36	36
1910	101	116	106	104	42	108	105	121	121	101	36	36	36	36	36	36	36	36	36	36
1920	101	101	112	105	100	105	140	80	99	121	34	34	34	34	34	34	34	34	34	34
1930	127	66	63	89	105	146	134	126	66	87	34	34	34	34	34	34	34	34	34	34
1940	115	107	55	134	107	88	68	70	89	74	34	34	34	34	34	34	34	34	34	33
1950	124	126	132	83	84	72	86	127	115	96	33	33	33	33	33	33	33	33	33	33
1960	119	95	120	104	147	124	111	86	113	90	33	32	32	32	32	32	32	32	32	32
1970	92	53	102	89	71	38					31	31	31	31	31	31				

SITE AND COLLECTION INFORMATION

Site name *TAKAPARI*
Country *NEW ZEALAND* **State or Province** *NORTH ISLAND*
Latitude *40°05'S* **Longitude** *176°00'E* **Altitude** *838 m*
Species collected *Libocedrus bidwillii*
Date of collection *13 January 1978*
Collectors *P.W.Dunwiddie, M.R.Boase*
No. of trees sampled *16* **No. of cores** *60* **No. of discs** *0*

Site description:

Libocedrus bidwillii is abundant in nearly pure stands in some areas of the Ruahine Range. This site was cored in one such area in the central part of the range. Takapari Road takes off from the main road, which follows along the Pohangina River north of Ashhurst. This road, which is referred to by the Forest Service as the Delaware Ridge Road, runs east into the range about 3 km south of the bridge near Piripiri.

The site, 11 km up this road, is on a level area in a very open, wet stand. The understory is composed primarily of mosses, grasses, and the shrub Pseudowintera colorata. A few small L. bidwillii are found, but almost no saplings. Trees tend to have full, healthy crowns, reach heights of 15 m, and diameters of 80 cm.

SAMPLE STATISTICS

Interval analyzed (A.D.)	*1710 - 1903*
No. of trees *11* No. of radii per tree *2*	
Mean ring width (mm)	*0.67*
% locally absent rings	*0.77*
Analysis of variance:	
Estimated mean square of Y	*0.053*
Sources of variation, % variance	
Mean chronology	*29*
Differences between trees	*26*
Other	*45*
Cross-correlation analysis:	
Radii within trees	*0.58*
Radii among trees	*0.30*
Between tree means	*0.31*

CHRONOLOGY STATISTICS

Identification	*TKP189*
Interval (A.D.)	*1256 - 1976*
No. of trees *14* Total no. of radii *37*	
Autocorrelation	*0.79*
Standard deviation	*0.28*
Mean sensitivity	*0.14*
Mean standard error	*0.09*

TKP189
TAKAPARI
LIBOCEDRUS BIDWILLII

	TREE RING INDICES										NUMBER OF SAMPLES									
DATE	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
1256							136	139	166	185							1	1	1	1
1260	165	159	110	116	108	89	87	60	56	61	1	1	1	1	1	1	1	2	2	2
1270	74	68	80	77	69	56	79	95	80	68	3	3	3	3	3	3	3	3	3	3
1280	48	67	56	57	51	83	84	102	104	124	3	3	3	3	3	3	3	3	3	3
1290	109	74	97	102	92	90	115	146	106	126	3	3	3	3	3	3	3	3	3	3
1300	130	120	145	137	82	108	111	116	100	102	3	3	3	3	4	4	4	4	4	4
1310	93	89	101	87	74	85	88	85	78	74	4	4	4	4	4	4	4	4	4	4
1320	84	76	90	86	75	66	51	72	75	79	4	4	4	4	4	4	4	4	4	4
1330	82	75	71	80	80	51	59	86	79	112	4	4	4	4	4	4	4	4	4	4
1340	82	105	105	111	120	134	110	97	73	87	4	4	4	4	4	4	4	4	4	4
1350	101	79	71	69	79	78	75	68	94	90	4	4	4	4	4	4	4	4	4	4
1360	83	68	101	136	155	110	116	105	93	90	4	4	4	4	4	5	5	5	5	5
1370	111	154	182	163	149	176	243	197	197	158	5	5	5	5	5	6	6	6	6	6
1380	128	199	168	157	153	118	146	159	147	168	6	6	6	6	6	6	6	6	6	6
1390	134	128	102	110	94	98	77	92	145	150	6	6	6	6	6	6	6	6	6	6
1400	157	166	167	154	148	163	140	134	165	140	6	6	6	6	6	6	6	6	6	6
1410	116	98	100	100	88	125	90	92	95	77	6	6	6	6	6	6	6	6	6	6
1420	83	83	109	76	95	102	105	80	84	68	6	7	7	7	7	7	7	7	7	7
1430	65	64	74	90	95	103	94	105	90	109	7	7	8	8	8	8	8	8	8	8
1440	110	93	87	78	78	69	88	74	85	115	8	8	8	8	8	8	8	8	8	8
1450	108	136	92	90	71	75	74	90	112	137	8	8	8	8	8	9	9	9	9	10
1460	83	83	83	102	96	104	113	109	98	94	12	12	12	12	12	12	12	12	12	12
1470	85	73	91	105	131	183	173	125	110	102	12	12	13	14	14	14	14	14	14	14
1480	139	141	146	176	132	133	137	103	89	116	14	14	14	14	14	14	14	14	14	14
1490	115	129	149	131	132	156	137	135	122	110	14	14	14	15	15	15	17	17	18	18
1500	115	123	125	113	113	98	101	93	114	105	18	18	18	18	18	18	18	18	18	18
1510	110	112	88	97	72	75	100	92	89	78	18	18	18	18	18	18	18	18	18	18
1520	93	111	122	129	130	108	111	111	98	92	18	18	18	18	18	18	18	18	19	19
1530	107	102	92	90	94	99	107	150	98	96	19	19	19	18	18	18	18	18	18	18
1540	117	126	116	113	105	123	90	110	110	124	19	19	19	19	19	19	19	19	19	19
1550	123	139	66	57	84	79	65	65	55	98	19	19	19	19	18	18	18	18	18	18
1560	103	103	99	104	100	91	64	84	116	132	18	18	18	18	18	18	18	18	18	18
1570	156	171	157	149	148	154	102	83	84	58	18	18	18	18	18	18	18	17	17	17
1580	56	63	56	82	112	128	141	163	147	129	17	17	17	17	17	17	17	17	18	18
1590	123	126	113	119	102	84	81	76	70	72	18	17	17	17	17	17	17	16	16	16
1600	74	76	94	31	46	58	59	62	62	66	16	16	16	16	16	16	16	16	16	16
1610	92	91	97	119	113	121	114	134	111	121	16	16	16	16	16	16	16	16	16	16
1620	103	102	57	68	85	75	92	106	104	112	16	16	16	16	17	17	17	17	18	18
1630	109	117	127	82	72	76	96	85	88	92	18	18	18	18	18	18	19	19	19	19
1640	100	110	115	100	87	79	77	101	97	120	19	20	21	21	21	21	21	21	21	21
1650	111	94	59	51	52	55	70	72	94	101	21	21	21	21	21	21	21	21	22	22
1660	92	101	74	68	55	61	74	107	110	131	23	24	24	24	24	25	25	26	28	28
1670	111	122	116	97	88	90	100	114	79	90	28	29	29	29	29	29	29	29	30	30
1680	84	92	68	82	73	87	84	91	98	112	30	30	30	30	30	30	31	31	31	31
1690	129	112	98	112	96	103	89	87	99	92	31	31	31	31	31	31	31	31	31	31
1700	100	96	104	116	99	101	136	120	108	108	31	31	32	32	32	32	32	32	32	32
1710	102	121	144	115	128	141	115	101	96	84	33	33	33	33	33	33	33	33	33	33
1720	76	80	69	71	64	74	61	72	110	78	33	33	33	33	33	33	33	33	33	33
1730	117	102	113	103	102	107	121	98	110	112	33	33	33	33	33	33	33	33	33	33
1740	98	51	57	74	67	80	67	59	74	87	33	33	33	33	33	33	33	33	34	34
1750	73	81	61	66	71	74	70	81	70	73	34	34	34	34	34	34	34	34	34	34
1760	79	80	77	86	81	83	108	86	91	108	34	34	34	34	34	34	34	34	34	34
1770	82	91	102	105	109	110	82	101	115	137	34	34	34	36	36	37	37	37	37	37
1780	137	101	82	88	80	83	97	98	102	129	37	37	37	37	37	37	37	37	37	37
1790	133	126	112	142	121	128	134	144	103	115	37	37	37	37	37	37	37	37	37	37
1800	129	148	132	105	115	132	122	114	122	107	37	37	37	37	37	37	37	37	37	37
1810	103	94	93	92	115	129	112	82	96	90	37	37	37	37	37	37	37	37	37	37
1820	85	95	94	97	108	145	101	133	124	121	37	37	37	36	36	36	36	36	36	36
1830	69	78	59	46	58	72	88	99	94	111	36	36	36	36	36	36	36	36	36	36
1840	84	112	93	78	77	76	75	50	69	79	36	36	36	36	36	36	36	36	36	36
1850	88	90	99	100	86	100	100	103	90	101	36	36	36	36	36	36	36	36	36	36
1860	94	99	81	103	110	64	94	99	124	118	36	36	36	36	36	36	36	36	36	36
1870	136	131	98	122	124	133	163	152	131	152	36	36	36	36	36	36	36	36	36	36
1880	140	146	133	69	76	95	79	63	62	88	36	36	36	36	36	36	36	36	36	36
1890	105	123	124	134	124	123	147	139	150	149	36	36	36	36	36	36	36	36	36	36
1900	160	168	134	135	96	95	100	76	76	74	36	36	36	36	33	32	32	30	29	29
1910	73	97	82	98	92	111	49	88	52	54	29	29	29	29	29	27	26	26	25	25
1920	67	101	95	105	117	101	111	81	81	105	25	24	24	24	24	24	24	24	24	24
1930	81	86	92	86	89	53	66	87	84	60	24	23	23	23	22	17	16	16	14	14
1940	61	64	63	68	74	67	50	62	49	53	13	12	12	11	11	11	11	11	11	11
1950	82	86	84	75	88	86	73	70	72	97	11	11	11	11	10	10	9	9	9	9
1960	101	81	81	76	81	89	91	122	82	102	9	9	9	9	9	9	9	9	9	9
1970	100	103	107	116	112	107	116				9	9	9	9	9	9	9			

SITE AND COLLECTION INFORMATION

Site name *TE AROHA*
Country *NEW ZEALAND* **State or Province** *NORTH ISLAND*
Latitude *37°30'S* **Longitude** *175°50'E* **Altitude** *950 m - 1050 m*
Species collected *Phyllocladus glaucus*
Date of collection *4 November 1976, 28 April 1977, 10 December 1977*
Collectors *V.C.LaMarche, P.W.Dunwiddie, D.A.Campbell*
No. of trees sampled *12* **No. of cores** *38* **No. of discs** *0*

Site description:

A private road to the New Zealand television broadcasting tower provides access to the summit of this mountain. Subsites of Phyllocladus glaucus and Libocedrus bidwillii were cored in the stunted bush found near the top.

P. glaucus up to 5 m tall were cored along a trail on the north side of the peak. The trees are growing in dense bush including Ixerba, Nothofagus, and Dracophyllum, north of the road. They form part of the tight canopy along with the shrubs. Slope angle and direction are variable, although the entire area is quite wet. Disturbance by fire may have occurred in the past.

Stands of Libocedrus bidwillii on the south and west sides are reported by Clayton-Greene (N.Z. Jrl. Bot., 1977), and are found in dense bush similar to that described above. The Libocedrus bidwillii frequently have very sparse foliage, are scattered infrequently in the bush, and generally are doing poorly. They often are 10-12 m tall and emergent from the surrounding scrub. Fires may have occurred in this area as well.

SAMPLE STATISTICS

Interval analyzed (A.D.)	*1887 - 1967*
No. of trees *9* No. of radii per tree *2*	
Mean ring width (mm)	*0.51*
% locally absent rings	*1.51*
Analysis of variance:	
Estimated mean square of Y	*0.143*
Sources of variation, % variance	
Mean chronology	*46*
Differences between trees	*26*
Other	*28*
Cross-correlation analysis:	
Radii within trees	*0.75*
Radii among trees	*0.50*
Between tree means	*0.51*

CHRONOLOGY STATISTICS

Identification	*TEH168*
Interval (A.D.)	*1779 - 1975*
No. of trees *9* Total no. of radii *25*	
Autocorrelation	*-0.28*
Standard deviation	*0.36*
Mean sensitivity	*0.53*
Mean standard error	*0.09*

TEH168
TE AROHA
PHYLLOCLADUS GLAUCUS

	TREE RING INDICES										NUMBER OF SAMPLES									
DATE	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
1779										92										1
1780	69	63	33	88	31	101	120	122	29	137	1	1	1	1	1	1	1	1	1	1
1790	46	125	83	86	19	135	77	143	119	53	2	2	2	2	2	2	2	2	2	2
1800	122	96	96	83	32	99	105	125	27	152	3	3	3	3	3	3	3	3	3	3
1810	98	43	147	90	80	82	142	90	108	40	8	8	8	9	9	10	10	10	10	10
1820	98	81	110	52	116	77	100	125	111	123	13	14	14	14	14	15	15	15	15	15
1830	46	132	83	119	34	157	151	91	109	116	15	15	15	15	15	15	15	15	15	15
1840	69	167	117	116	51	148	99	94	155	69	15	15	15	15	15	15	15	15	15	15
1850	142	99	135	98	118	132	91	129	108	60	22	22	22	22	22	22	22	22	22	22
1860	118	76	115	84	142	79	142	85	144	98	23	23	23	23	23	23	23	23	23	23
1870	69	111	49	134	71	119	103	129	69	84	23	23	23	23	23	23	23	23	23	23
1880	99	110	72	97	124	32	63	48	94	63	23	23	23	23	23	23	23	25	25	24
1890	152	132	52	199	152	75	95	105	110	126	24	24	24	24	24	24	24	24	24	24
1900	91	86	31	123	45	102	81	44	110	123	24	24	24	24	24	24	24	24	24	24
1910	42	140	134	49	86	63	45	202	139	108	24	24	24	24	24	24	24	24	24	24
1920	45	137	98	136	49	143	144	94	97	117	24	24	24	24	24	24	24	24	24	24
1930	117	74	100	128	158	26	96	96	27	107	24	24	24	24	24	24	24	24	24	24
1940	97	57	122	78	104	136	55	166	101	111	24	24	24	24	24	24	24	24	24	24
1950	70	120	96	42	124	73	129	120	117	56	24	24	24	24	24	24	24	24	24	24
1960	122	95	35	148	129	77	96	147	56	142	24	24	24	24	24	24	24	24	23	23
1970	54	106	97	58	130	108					23	23	23	23	23	23				

SITE AND COLLECTION INFORMATION

Site name *UREWERA*
Country *NEW ZEALAND* **State or Province** *NORTH ISLAND*
Latitude *38°41'S* **Longitude** *177°12'E* **Altitude** *854 m*
Species collected *Libocedrus bidwillii*
Date of collection *28 January 1978*
Collectors *P.W.Dunwiddie, M.R.Boase*
No. of trees sampled *14* **No. of cores** *56* **No. of discs** *0*

Site description:

The site is 2 km north of Sandy Bay (see Lake Waikareiti site) on the slopes immediately southeast of Kaipo Lagoon in Urewera National Park. Libocedrus bidwillii, 22-25 m tall, are scattered in a predominantly Nothofagus menziesii forest on a 15°, west-northwest facing slope. They appear to be remnants of an earlier successional stage, as they are somewhat emergent from the dense Nothofagus canopy, and no trees under 50 cm dbh were found. All trees cored were northeast of where the trail enters the "lagoon", a boggy depression opening in the forest. An understory of Myrsine divaricata and Phyllocladus alpinus was present on the moderately drained slope. Disturbance appeared minimal. Two cores were also collected from a single Dacrydium colensoi growing in the lagoon.

SAMPLE STATISTICS

Interval analyzed (A.D.)	*1697 - 1770*
No. of trees *9* No. of radii per tree *2*	
Mean ring width (mm)	*0.58*
% locally absent rings	*2.17*
Analysis of variance:	
Estimated mean square of Y	*0.048*
Sources of variation, % variance	
Mean chronology	*29*
Differences between trees	*9*
Other	*62*
Cross-correlation analysis:	
Radii within trees	*0.41*
Radii among trees	*0.31*
Between tree means	*0.32*

CHRONOLOGY STATISTICS

Identification	*UWR189*
Interval (A.D.)	*1346 - 1976*
No. of trees *12* Total no. of radii *39*	
Autocorrelation	*0.66*
Standard deviation	*0.25*
Mean sensitivity	*0.17*
Mean standard error	*0.09*

UWR189
UREWERA
LIBOCEDRUS BIDWILLII

DATE	TREE RING INDICES										NUMBER OF SAMPLES									
	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
1346							188	115	89	76							1	1	1	1
1350	69	72	70	90	79	55	68	80	52	77	1	1	1	1	1	1	1	1	1	1
1360	92	108	97	125	131	117	95	106	132	131	1	1	1	2	2	2	2	2	2	2
1370	61	72	92	93	208	196	122	81	113	123	2	2	2	2	2	2	2	2	2	2
1380	102	82	73	64	38	63	96	105	95	119	3	3	3	3	4	4	4	5	5	5
1390	118	190	177	142	125	101	89	84	83	63	6	6	6	7	7	7	7	7	7	7
1400	78	64	62	74	82	40	26	41	42	51	7	7	7	7	7	7	7	7	7	8
1410	72	68	61	58	51	49	62	64	64	75	8	9	9	9	9	9	9	9	9	9
1420	65	64	52	62	67	56	57	74	86	91	9	9	10	10	10	10	10	11	12	12
1430	93	113	90	88	75	108	101	107	91	102	12	11	11	13	14	14	14	14	14	14
1440	103	94	93	99	97	96	100	113	110	131	15	15	15	15	15	15	15	15	15	15
1450	120	114	110	116	120	114	121	123	118	145	15	15	15	15	15	15	15	15	15	15
1460	107	115	111	104	94	107	93	95	90	106	15	15	15	16	16	17	17	17	17	17
1470	97	108	73	100	86	76	89	98	109	91	17	17	17	17	17	17	17	17	17	17
1480	101	77	82	104	79	94	89	53	74	123	18	18	18	19	19	19	19	19	19	19
1490	104	79	73	103	85	106	102	97	120	100	19	19	19	19	19	19	19	19	19	19
1500	102	87	111	102	113	117	120	106	109	90	20	20	20	20	20	20	20	21	21	21
1510	85	112	85	104	106	110	118	119	110	116	21	21	21	21	21	21	21	22	22	22
1520	109	102	85	101	87	110	110	84	72	100	22	22	22	22	22	22	22	22	22	22
1530	118	112	112	140	127	150	149	148	95	110	22	22	22	22	22	22	22	22	23	23
1540	111	86	94	123	111	122	115	109	85	114	23	24	24	24	24	24	24	24	24	24
1550	113	130	100	121	115	117	97	111	104	138	24	24	24	24	24	24	24	24	24	24
1560	124	135	118	116	119	130	77	69	73	74	24	24	24	24	24	24	24	24	24	24
1570	75	106	99	121	118	117	121	122	116	124	24	24	24	24	24	24	24	24	24	24
1580	127	120	119	115	107	90	103	99	100	92	24	24	24	24	24	24	24	23	23	23
1590	99	95	95	95	80	97	84	93	72	78	23	23	23	23	24	24	24	24	24	24
1600	75	96	46	53	79	94	96	132	119	154	24	24	24	24	24	24	24	24	25	26
1610	159	142	127	124	133	137	110	114	99	121	25	25	25	25	25	25	25	25	25	25
1620	107	106	69	84	87	67	48	87	71	114	25	25	25	25	25	25	25	25	25	25
1630	118	108	94	85	108	98	96	71	77	78	26	26	27	27	28	28	28	28	28	28
1640	57	60	74	57	53	74	100	135	127	109	28	28	28	28	28	28	28	28	28	28
1650	103	110	90	97	91	95	104	77	96	98	28	28	28	28	28	28	29	29	29	29
1660	102	102	69	82	87	96	81	96	100	92	29	29	29	29	29	29	29	29	29	29
1670	91	110	97	86	82	79	76	63	60	97	29	29	29	29	29	29	29	29	29	30
1680	130	127	102	132	110	115	94	69	70	79	31	31	31	31	31	31	31	31	31	31
1690	73	89	91	99	115	141	96	105	105	94	31	31	31	31	31	31	31	31	31	31
1700	111	108	104	131	115	117	125	126	123	97	31	31	31	31	31	31	31	31	31	31
1710	95	112	103	103	115	103	108	119	113	140	31	30	30	30	30	30	30	30	31	31
1720	125	124	105	112	59	81	109	98	120	97	31	31	31	30	30	30	30	30	30	30
1730	118	91	86	120	111	69	102	107	81	93	30	30	30	30	30	30	31	31	31	31
1740	88	32	50	79	72	90	92	123	116	156	31	29	29	29	29	29	30	30	30	30
1750	151	129	77	107	131	122	111	121	124	143	30	30	30	30	30	30	30	30	31	31
1760	153	144	110	114	97	72	83	63	72	91	31	31	31	31	31	30	30	30	30	30
1770	93	63	79	89	85	112	95	120	112	145	30	29	29	29	29	29	29	29	29	29
1780	128	86	100	107	110	104	102	93	93	99	29	29	29	29	29	29	29	29	29	29
1790	97	118	109	113	95	85	80	86	83	102	29	29	29	29	29	28	28	28	28	28
1800	108	118	112	107	150	111	122	144	150	143	28	28	28	28	28	28	28	28	28	28
1810	132	107	113	121	125	137	105	102	106	104	28	28	28	28	28	28	28	28	28	28
1820	82	107	77	126	164	152	110	125	120	133	28	28	28	28	28	28	28	28	28	28
1830	86	117	106	116	64	62	68	106	126	110	28	28	28	28	27	27	27	27	27	27
1840	86	142	124	138	115	111	89	52	66	55	27	27	27	27	27	27	27	25	25	25
1850	67	64	83	101	76	89	113	115	115	107	25	25	25	25	25	25	25	25	25	25
1860	79	75	95	118	110	111	112	79	109	108	25	25	25	25	25	25	25	25	25	25
1870	73	99	54	63	91	97	123	135	145	125	25	25	25	25	25	25	25	25	25	25
1880	98	112	114	98	115	126	110	76	101	93	25	25	25	25	25	25	25	25	25	25
1890	100	102	97	89	108	116	92	105	115	83	25	25	25	25	25	25	25	25	25	25
1900	93	106	104	97	101	152	136	61	91	103	25	25	25	24	24	24	24	22	22	22
1910	83	103	110	89	94	95	59	74	70	88	22	21	21	21	21	21	21	21	21	21
1920	67	108	103	104	92	89	91	92	94	81	21	21	21	21	21	21	21	21	21	21
1930	78	111	101	88	101	33	58	78	37	42	21	21	21	21	20	19	19	18	18	18
1940	50	57	87	67	79	87	76	81	73	74	18	18	18	18	18	18	17	17	17	17
1950	54	67	63	80	52	58	41	86	76	73	15	12	12	12	12	12	12	12	12	12
1960	76	102	76	116	125	120	68	92	74	104	11	11	11	11	11	11	11	11	11	11
1970	66	79	116	80	52	59	89				11	11	11	11	11	10	10			

SITE AND COLLECTION INFORMATION

Site name *WAIMANOA*
Country *NEW ZEALAND* **State or Province** *NORTH ISLAND*
Latitude *38°34'S* **Longitude** *175°42'E* **Altitude** *518 m*
Species collected *Phyllocladus glaucus*
Date of collection *7 February 1978*
Collectors *P.W.Dunwiddie, M.R.Boase, D.Cown*
No. of trees sampled *14* **No. of cores** *66* **No. of discs** *0*

Site description:

The Waimanoa Ecological Reserve is near the town of Tihoi, west of Lake Taupo. The site is in the forest several kilometers off a road branching off from Kakaho Road. A nearly pure stand of Phyllocladus glaucus is located on the top of a sharp, 30 m high ridge crest at the fork of a stream. Trees are up to 18 m tall, with full crowns and foliage. Soils are thin on the rocky bluff and disturbance appears slight.

SAMPLE STATISTICS

Interval analyzed (A.D.)	*1813 - 1945*
No. of trees *12* No. of radii per tree *2*	
Mean ring width (mm)	*0.80*
% locally absent rings	*2.63*
Analysis of variance:	
Estimated mean square of Y	*0.081*
Sources of variation, % variance	
Mean chronology	*43*
Differences between trees	*31*
Other	*26*
Cross-correlation analysis:	
Radii within trees	*0.76*
Radii among trees	*0.46*
Between tree means	*0.47*

CHRONOLOGY STATISTICS

Identification	*WMN169*
Interval (A.D.)	*1745 - 1976*
No. of trees *14* Total no. of radii *24*	
Autocorrelation	*-0.65*
Standard deviation	*0.26*
Mean sensitivity	*0.34*
Mean standard error	*0.05*

WMN169
WAIMANOA
PHYLLOCLADUS GLAUCUS

	TREE RING INDICES										NUMBER OF SAMPLES									
DATE	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
1745						85	83	92	72	97						1	2	2	2	4
1750	71	92	69	100	76	95	77	105	98	104	4	4	4	4	5	8	10	12	13	15
1760	80	103	83	99	91	96	123	75	124	94	23	23	23	23	23	23	23	24	25	25
1770	110	113	122	87	121	112	75	139	93	136	27	27	27	27	27	28	29	29	30	30
1780	94	99	129	104	60	128	105	99	125	130	31	32	33	33	33	33	33	33	33	33
1790	71	112	104	108	65	115	63	120	100	82	34	34	34	34	34	35	35	35	35	35
1800	106	83	103	119	91	119	98	134	59	99	36	36	36	36	36	37	38	38	38	38
1810	99	67	125	109	84	118	110	57	106	73	38	38	39	40	40	40	40	40	41	41
1820	126	98	129	90	142	105	109	112	107	118	41	41	42	42	42	42	42	42	42	42
1830	49	90	82	108	40	83	102	73	84	91	42	42	42	42	42	42	42	42	42	42
1840	47	111	103	113	56	125	87	48	93	56	42	42	42	42	42	42	42	42	42	42
1850	93	70	106	105	64	94	75	114	110	53	42	42	43	43	43	43	43	43	43	43
1860	96	69	112	71	113	81	119	65	110	95	43	42	42	42	42	42	42	42	42	42
1870	73	95	76	110	88	135	97	146	124	107	42	42	42	42	42	42	42	44	44	44
1880	157	158	113	165	192	75	116	93	147	77	44	44	44	44	44	44	44	44	44	44
1890	151	158	67	116	118	92	120	133	161	102	44	44	44	44	44	44	44	44	44	44
1900	127	167	81	130	72	117	108	55	102	93	45	45	45	45	45	45	46	46	46	46
1910	78	122	128	50	59	50	41	104	115	110	46	46	46	46	46	46	46	46	46	46
1920	56	131	118	97	92	109	105	117	74	111	46	46	46	46	46	46	46	46	46	46
1930	102	72	116	97	123	59	103	95	51	100	46	46	46	46	46	45	45	45	45	45
1940	98	86	141	85	116	111	65	97	61	110	45	45	45	45	45	45	43	43	43	43
1950	87	112	130	72	119	77	110	129	112	75	43	43	43	43	43	43	43	43	43	43
1960	125	125	54	124	126	107	97	130	63	116	43	43	41	41	41	41	41	41	41	41
1970	42	85	122	57	95	101	140				41	41	41	41	41	41	40			

SITE AND COLLECTION INFORMATION

Site name *WAIOMU*
Country *NEW ZEALAND* **State or Province** *NORTH ISLAND*
Latitude *37° 02'S* **Longitude** *175° 32'E* **Altitude** *61 m*
Species collected *Phyllocladus trichomanoides*
Date of collection *26 January 1978*
Collectors *P.W.Dunwiddie, M.R.Boase, S.Bigwood, K.Buchan, D.Cown*
No. of trees sampled *15* **No. of cores** *62* **No. of discs** *0*

Site description:

A mixed stand of Phyllocladus trichomanoides and Agathis australis is found on a ridge 2.5 km along the track above the Waiomu road end on the Coromandel Peninsula. Most trees are overtopped by the larger A. australis, which form a dense canopy. The P. trichomanoides have full foliage, and are up to 20 m tall, with many epiphytes on the trunks. They are found on slopes up to 40°, along with some P. glaucus. Disturbance appears minimal.

SAMPLE STATISTICS

Interval analyzed (A.D.)	*1810 - 1970*
No. of trees *9* No. of radii per tree *2*	
Mean ring width (mm)	*0.73*
% locally absent rings	*0.69*
Analysis of variance:	
Estimated mean square of Y	*0.055*
Sources of variation, % variance	
Mean chronology	*32*
Differences between trees	*24*
Other	*44*
Cross-correlation analysis:	
Radii within trees	*0.45*
Radii among trees	*0.22*
Between tree means	*0.23*

CHRONOLOGY STATISTICS

Identification	*WMU179*
Interval (A.D.)	*1664 - 1976*
No. of trees *10* Total no. of radii *35*	
Autocorrelation	*0.15*
Standard deviation	*0.23*
Mean sensitivity	*0.24*
Mean standard error	*0.08*

WMU179
WAIOMU
PHYLLOCLADUS TRICHOMANOIDES

	TREE RING INDICES										NUMBER OF SAMPLES									
DATE	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
1664					87	136	123	113	106	98					2	2	2	2	3	3
1670	83	102	100	76	70	63	85	83	90	87	3	3	3	3	3	3	3	3	3	3
1680	97	65	115	107	105	105	91	87	87	135	3	3	3	3	3	3	4	4	4	5
1690	94	136	135	119	155	149	117	122	100	121	7	7	7	7	7	7	7	7	7	7
1700	73	118	94	117	102	82	106	81	110	59	7	8	8	8	8	8	8	8	8	8
1710	99	72	124	86	135	68	172	88	127	93	9	9	9	9	9	9	9	9	9	9
1720	102	68	76	83	56	88	97	83	81	92	9	9	9	10	10	10	10	10	10	11
1730	95	99	124	140	94	72	122	110	104	81	11	11	12	13	13	13	13	13	13	13
1740	106	84	113	92	121	112	128	109	83	84	14	14	14	14	14	14	14	15	15	15
1750	75	85	82	93	109	117	109	132	115	113	15	15	15	15	15	15	15	15	15	15
1760	94	122	106	114	105	95	86	87	118	101	15	15	15	15	16	16	16	16	17	17
1770	98	82	97	73	93	85	86	113	86	109	17	17	18	18	18	18	18	18	18	18
1780	88	102	107	98	99	102	106	95	121	101	18	18	18	18	18	18	18	18	18	18
1790	88	113	92	109	86	117	97	112	109	128	18	18	18	18	20	21	22	24	24	25
1800	96	118	71	123	99	110	125	97	95	103	28	28	28	29	29	29	29	29	29	29
1810	98	89	113	88	111	106	121	102	108	71	30	30	30	30	30	30	31	31	31	31
1820	104	83	114	93	73	88	80	100	73	121	32	33	34	35	35	35	35	35	35	35
1830	84	121	84	118	73	109	103	115	83	99	35	35	35	35	35	35	35	35	35	35
1840	66	107	92	125	88	115	63	59	92	58	35	35	35	35	35	35	35	35	35	35
1850	103	90	131	105	104	120	99	108	103	70	35	34	34	34	34	34	34	34	34	34
1860	93	85	99	84	128	82	124	77	111	95	34	34	34	34	34	34	34	34	34	34
1870	106	89	58	91	85	111	86	128	64	128	34	34	34	34	34	34	34	34	34	34
1880	100	138	84	137	143	99	114	102	140	91	34	34	34	34	34	34	34	34	34	34
1890	115	109	162	130	168	136	146	127	138	120	34	34	34	34	34	34	34	34	34	34
1900	72	145	82	113	61	122	88	98	82	105	34	32	32	32	31	31	31	31	31	30
1910	42	100	85	61	68	63	89	91	145	140	30	30	30	30	30	30	30	30	30	30
1920	98	128	74	115	46	120	93	120	67	87	30	30	30	30	30	30	30	30	30	30
1930	80	76	80	86	99	65	92	87	83	126	30	30	30	30	30	30	30	30	30	30
1940	120	110	99	105	99	104	90	112	70	98	30	30	30	30	30	30	30	30	30	30
1950	50	93	55	99	57	67	97	101	94	121	30	30	30	30	30	30	30	30	30	30
1960	131	118	100	145	136	155	151	129	127	123	30	30	30	30	30	30	30	30	30	30
1970	55	72	94	65	87	132	138				30	29	29	29	29	29	29			

SITE AND COLLECTION INFORMATION

Site name *WAIPOUA*
Country *NEW ZEALAND* **State or Province** *NORTH ISLAND*
Latitude *35° 41'S* **Longitude** *173° 33'E* **Altitude** *244 m*
Species collected *Phyllocladus glaucus*
Date of collection *5 February 1978*
Collectors *P.W.Dunwiddie, M.R.Boase*
No. of trees sampled *12* **No. of cores** *42* **No. of discs** *0*

Site description:

A stand of mature Phyllocladus glaucus is located near Katui in Waipoua State Forest at an area signed and located on maps as "Toatoa". A short scenic walk loops through this stand, mixed with P. trichomanoides, Agathis australis, Podocarpus ferrugineus, and Dacrydium cupressinum. This species is not common outside this stand, so all individuals of reasonable size were cored. They reached heights of 18 m, with generally full crowns, but were frequently overtopped by A. australis. Four individuals of P. trichomanoides were also cored at this site. The terrain sloped gently to the north, with moderate moisture and soil development.

SAMPLE STATISTICS

Interval analyzed (A.D.)	*1829 - 1962*
No. of trees *10* No. of radii per tree *2*	
Mean ring width (mm)	*0.89*
% locally absent rings	*0.26*
Analysis of variance:	
Estimated mean square of Y	*0.067*
Sources of variation, % variance	
Mean chronology	*37*
Differences between trees	*25*
Other	*38*
Cross-correlation analysis:	
Radii within trees	*0.67*
Radii among trees	*0.40*
Between tree means	*0.41*

CHRONOLOGY STATISTICS

Identification	*WPA179*
Interval (A.D.)	*1585 - 1976*
No. of trees *12* Total no. of radii *41*	
Autocorrelation	*0.06*
Standard deviation	*0.25*
Mean sensitivity	*0.30*
Mean standard error	*0.07*

WPA179
WAIPOUA
PHYLLOCLADUS TRICHOMANOIDES

	TREE RING INDICES										NUMBER OF SAMPLES									
DATE	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
1585						92	120	155	129	90						1	1	1	1	?
1590	75	64	64	67	64	46	64	45	41	32	?	?	?	?	?	?	?	?	?	?
1600	58	103	53	69	74	90	68	81	79	94	?	?	?	?	?	?	?	?	?	?
1610	84	118	91	110	95	116	85	87	61	78	?	?	?	?	?	?	?	?	3	3
1620	83	136	84	81	113	68	118	106	88	106	3	3	3	3	3	3	3	3	3	3
1630	75	117	73	115	120	73	147	113	107	100	3	3	3	3	3	3	3	3	3	3
1640	110	83	163	87	160	109	134	108	63	113	3	3	3	3	3	3	3	3	3	3
1650	143	112	49	148	114	145	155	78	176	143	3	3	3	3	3	3	3	3	3	3
1660	132	75	76	135	102	139	77	81	100	109	3	3	4	4	4	4	5	5	5	5
1670	64	169	94	95	116	69	99	94	76	79	5	6	7	7	7	7	8	8	8	8
1680	79	79	50	76	80	70	86	76	82	80	8	8	8	8	8	8	8	8	8	8
1690	75	82	95	70	95	111	59	76	103	80	8	8	8	9	9	9	9	9	9	9
1700	109	68	79	103	82	73	81	56	79	80	9	10	10	10	10	10	10	10	10	10
1710	85	77	80	77	103	75	94	83	94	110	10	10	10	10	10	10	10	11	12	12
1720	69	95	98	88	51	108	120	94	95	85	12	12	12	12	13	13	16	16	17	17
1730	80	84	112	101	106	93	127	117	82	100	17	17	17	17	17	17	17	17	18	18
1740	89	65	119	89	108	92	96	129	92	107	18	18	19	20	20	20	20	20	20	20
1750	86	103	78	97	108	97	88	119	110	116	20	20	21	22	22	23	23	23	23	24
1760	81	124	103	100	113	83	113	83	122	123	24	24	24	24	24	24	24	24	24	24
1770	87	117	112	97	82	99	72	107	81	118	24	25	25	25	25	25	25	26	26	26
1780	101	90	107	98	67	109	103	95	131	112	26	26	26	26	26	26	26	27	28	28
1790	78	124	114	116	106	130	104	123	109	144	28	28	28	28	28	28	28	28	29	30
1800	90	106	102	128	93	86	117	102	76	122	32	32	32	32	33	34	30	30	32	33
1810	113	97	120	101	129	110	119	106	136	90	33	33	33	33	33	33	33	33	34	34
1820	138	109	127	101	112	91	122	105	116	133	34	34	34	34	34	34	34	34	34	35
1830	89	128	97	116	56	93	93	92	66	99	35	35	35	35	35	35	35	35	35	35
1840	79	111	116	135	103	146	98	63	108	80	36	36	36	36	36	36	36	36	37	37
1850	100	79	123	120	64	126	120	106	133	98	37	37	37	37	37	37	37	37	37	37
1860	104	79	85	51	100	77	87	56	123	93	37	37	37	37	37	37	37	37	37	37
1870	139	156	107	147	114	129	71	152	108	79	37	37	37	37	37	37	37	37	37	37
1880	106	123	89	117	145	79	83	55	105	75	37	37	37	37	37	37	37	37	37	37
1890	95	101	99	86	137	96	113	97	115	103	37	37	37	37	37	37	37	37	37	37
1900	122	149	78	116	67	134	114	50	118	92	37	37	37	37	37	37	37	37	37	37
1910	55	98	105	36	88	70	32	91	83	106	37	36	36	36	35	35	35	35	35	35
1920	58	99	69	105	33	109	93	63	84	97	35	35	35	35	35	35	35	35	35	35
1930	123	83	116	107	142	57	96	80	48	120	35	35	35	35	35	34	34	34	34	34
1940	122	60	112	92	120	124	61	124	76	115	34	34	34	34	34	34	34	34	34	34
1950	58	145	133	96	94	113	115	125	115	131	34	34	34	34	33	33	33	33	33	33
1960	104	132	47	126	69	114	68	129	60	120	33	32	32	28	28	27	27	27	27	27
1970	31	102	98	91	57	100	100				26	26	26	26	26	26	26			

SITE AND COLLECTION INFORMATION

Site name *AHAURA*
Country *NEW ZEALAND* **State or Province** *SOUTH ISLAND*
Latitude *42° 23'S* **Longitude** *171° 48'E* **Altitude** *244 m*
Species collected *Dacrydium colensoi*
Date of collection *27 December 1977*
Collectors *P.W.Dunwiddie, M.R.Boase*
No. of trees sampled *12* **No. of cores** *44* **No. of discs** *1*

Site description:

Two species, Dacrydium colensoi and Libocedrus bidwillii, were collected at the Ahaura site located in western South Island. The trees are fairly common in the area, but occurrence is very scattered in the gently rolling, boggy countryside. Both species are emergent (12-15 m tall) from a 6-8 m scrub of Phyllocladus alpinus, Nothofagus solandri var solandri, and Leptospermum scoparium. Libocedrus regeneration is abundant in the very open forest.

The site is reached by following Orwell Creek road east 22 km from Ahaura, then turning left at all intersections for 8 km. Relocation of exact trees is probably impossible; numerous gravel roads bisect this area, and trees were cored along a 0.5 km stretch of road with no notable landmarks. No stumps from logging or other signs of disturbance were found, although the open character of the forest suggests a possible fire at some time in the past. A single disc of L. bidwillii, cut near Clark's River, was obtained from a local sawmill.

SAMPLE STATISTICS

Interval analyzed (A.D.)	*1725 - 1975*
No. of trees *9* No. of radii per tree *2*	
Mean ring width (mm)	*0.51*
% locally absent rings	*3.00*
Analysis of variance:	
Estimated mean square of Y	*0.012*
Sources of variation, % variance	
Mean chronology	*9*
Differences between trees	*48*
Other	*43*
Cross-correlation analysis:	
Radii within trees	*0.57*
Radii among trees	*0.11*
Between tree means	*0.14*

CHRONOLOGY STATISTICS

Identification	*AHA209*
Interval (A.D.)	*1403 - 1976*
No. of trees *11* Total no. of radii *33*	
Autocorrelation	*0.69*
Standard deviation	*0.20*
Mean sensitivity	*0.13*
Mean standard error	*0.08*

AHA209
AHAURA
DACRYDIUM COLENSOI

	TREE RING INDICES										NUMBER OF SAMPLES									
DATE	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
1403				43	37	46	48	50	59	74				1	1	1	1	1	1	1
1410	67	45	60	50	50	48	68	68	59	64	3	3	3	3	3	3	3	3	3	3
1420	71	82	90	77	71	82	64	83	118	125	3	3	3	3	3	3	4	4	4	4
1430	127	100	104	79	99	117	120	81	107	80	4	4	4	4	4	4	4	4	4	4
1440	90	87	95	95	98	112	120	101	112	89	4	4	4	4	4	4	4	4	5	5
1450	81	96	96	94	94	88	73	97	99	97	5	5	5	5	5	6	6	6	6	6
1460	102	104	53	101	108	133	134	137	138	108	6	6	7	7	7	7	7	7	7	7
1470	140	151	115	108	71	105	100	93	119	124	7	7	7	7	7	7	7	7	7	7
1480	122	117	103	116	114	122	137	130	117	110	7	7	7	7	7	7	7	7	7	7
1490	100	105	116	130	85	117	83	122	136	144	7	7	7	7	7	7	7	7	7	7
1500	123	113	84	113	64	71	65	33	40	37	7	7	7	7	7	7	7	6	6	6
1510	37	32	33	32	41	56	68	62	68	82	6	6	6	6	6	6	6	6	6	6
1520	80	70	66	68	70	76	90	124	95	107	6	6	6	6	6	6	6	6	6	6
1530	117	102	91	102	109	90	103	90	102	92	7	7	7	7	8	8	8	8	8	8
1540	102	83	106	98	105	110	102	99	94	112	8	8	8	8	8	8	8	8	8	8
1550	110	123	129	108	115	146	125	138	119	126	8	8	8	8	8	8	8	8	8	8
1560	139	125	144	115	132	165	128	101	108	125	8	8	8	8	8	8	8	8	8	8
1570	104	120	148	112	130	129	98	97	121	118	8	8	8	8	8	8	8	8	8	8
1580	124	124	113	105	126	118	122	107	89	86	8	8	8	8	8	8	8	9	9	9
1590	80	88	88	89	96	81	76	99	117	114	9	9	9	9	9	9	9	9	9	9
1600	100	138	120	140	97	122	92	94	103	96	9	9	9	9	9	9	9	9	9	9
1610	118	105	103	129	90	111	105	111	116	101	12	13	13	13	13	13	13	13	13	13
1620	100	131	90	78	101	74	82	96	88	101	14	14	14	14	14	14	14	14	14	14
1630	87	96	107	73	79	83	112	117	78	88	14	14	14	14	14	14	14	14	14	14
1640	91	87	86	78	79	85	97	113	106	103	14	14	14	14	14	14	16	16	17	17
1650	111	138	132	127	128	126	118	119	125	120	17	18	18	18	18	18	18	18	18	18
1660	119	137	120	126	107	119	123	83	98	91	18	18	18	18	18	19	19	19	19	19
1670	103	96	92	81	110	100	111	132	108	80	20	20	20	20	20	20	20	20	20	20
1680	81	106	97	86	92	104	108	98	95	90	22	22	22	22	22	22	22	22	22	22
1690	91	73	90	92	79	88	95	89	96	91	22	21	21	21	21	21	23	23	23	23
1700	83	95	83	70	84	84	105	75	97	117	23	22	22	22	22	22	22	22	22	24
1710	116	121	122	103	126	121	116	113	102	120	26	26	26	26	26	26	26	26	26	26
1720	118	113	90	113	113	107	116	125	124	101	27	27	27	27	28	29	29	29	29	29
1730	124	95	79	79	88	103	96	90	97	114	29	29	29	29	29	29	29	29	29	29
1740	112	92	107	92	84	106	101	101	99	81	29	29	29	29	29	29	29	29	29	29
1750	76	95	104	85	85	100	109	90	94	82	29	29	29	29	29	29	29	29	29	29
1760	110	90	91	93	115	110	118	107	115	121	29	29	29	29	29	29	29	29	29	29
1770	115	125	112	121	105	114	97	107	100	89	29	29	29	29	29	29	29	29	29	29
1780	106	95	92	121	77	89	104	99	86	96	29	29	29	29	29	29	29	29	29	29
1790	78	73	73	79	93	89	96	77	75	83	29	29	29	29	29	29	29	29	29	29
1800	101	87	97	109	106	132	67	94	94	95	29	29	29	29	29	29	29	29	29	29
1810	101	98	107	106	99	93	103	81	92	87	29	29	29	29	29	29	29	29	29	29
1820	98	89	95	91	84	95	64	84	97	92	28	27	27	27	27	27	27	27	27	27
1830	82	84	76	103	107	94	95	113	94	108	27	27	27	27	27	27	27	27	27	27
1840	85	67	79	92	102	88	97	97	96	95	27	27	27	27	27	28	28	28	28	28
1850	99	103	96	124	102	103	100	115	120	110	28	28	28	28	29	29	29	29	29	29
1860	125	98	94	72	88	79	99	88	98	94	29	29	29	29	29	29	29	29	29	29
1870	107	106	105	105	105	104	92	111	110	140	29	29	29	29	29	29	29	29	29	29
1880	118	114	124	95	100	88	91	73	98	113	29	29	29	29	29	29	29	29	29	29
1890	91	110	97	113	117	109	115	96	97	107	30	30	30	30	30	30	30	30	30	30
1900	121	118	133	150	129	103	116	114	115	113	30	30	30	30	30	30	29	29	29	29
1910	108	74	92	111	88	105	84	89	90	99	29	28	28	28	28	28	28	28	28	28
1920	100	90	67	97	103	91	91	104	76	85	28	27	27	27	27	27	27	27	27	27
1930	76	86	118	115	120	100	84	98	79	86	27	27	28	28	28	28	28	28	28	28
1940	105	112	110	121	98	116	112	108	105	108	28	28	28	28	28	28	28	28	28	28
1950	88	84	106	107	106	106	79	81	85	90	28	28	28	28	28	28	28	28	28	28
1960	104	101	99	91	79	83	96	94	89	95	28	28	28	28	28	28	28	28	28	28
1970	96	96	95	105	110	106	120				28	28	28	29	28	28	25			

SITE AND COLLECTION INFORMATION

Site name *AHAURA*
Country *NEW ZEALAND* **State or Province** *SOUTH ISLAND*
Latitude *42° 23'S* **Longitude** *173° 48'E* **Altitude** *244 m*
Species collected *Libocedrus bidwillii*
Date of collection *27 December 1977*
Collectors *P.W.Dunwiddie, M.R.Boase*
No. of trees sampled *15* **No. of cores** *58* **No. of discs** *1*

Site description:

Two species, Dacrydium colensoi and Libocedrus bidwillii, were collected at the Ahaura site located in western South Island. The trees are fairly common in the area, but occurrence is very scattered in the gently rolling, boggy countryside. Both species are emergent (12-15 m tall) from a 6-8 m scrub of Phyllocladus alpinus, Nothofagus solandri var solandri, and Leptospermum scoparium. Libocedrus regeneration is abundant in the very open forest.

The site is reached by following Orwell Creek road east 22 km from Ahaura, then turning left at all intersections for 8 km. Relocation of exact trees is probably impossible; numerous gravel roads bisect this area, and trees were cored along a 0.5 km stretch of road with no notable landmarks. No stumps from logging or other signs of disturbance were found, although the open character of the forest suggests a possible fire at some time in the past. A single disc of L. bidwillii, cut near Clark's River, was obtained from a local sawmill.

SAMPLE STATISTICS

Interval analyzed (A.D.)	*1782 - 1957*
No. of trees *9* No. of radii per tree *2*	
Mean ring width (mm)	*0.58*
% locally absent rings	*0.28*
Analysis of variance:	
Estimated mean square of Y	*0.061*
Sources of variation, % variance	
Mean chronology	*28*
Differences between trees	*39*
Other	*33*
Cross-correlation analysis:	
Radii within trees	*0.66*
Radii among trees	*0.29*
Between tree means	*0.31*

CHRONOLOGY STATISTICS

Identification	*AHA189*
Interval (A.D.)	*1525 - 1976*
No. of trees *10* Total no. of radii *32*	
Autocorrelation	*0.77*
Standard deviation	*0.28*
Mean sensitivity	*0.16*
Mean standard error	*0.08*

AHA189
AHAURA
LIBOCEDRUS BIDWILLII

DATE	TREE RING INDICES										NUMBER OF SAMPLES									
	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
1525						40	46	38	52	38						1	1	1	1	1
1530	50	48	60	46	50	46	50	42	66	72	1	1	1	1	1	1	1	1	1	1
1540	48	76	88	78	60	76	56	54	46	52	1	1	1	1	1	1	1	1	1	1
1550	46	46	74	64	44	44	54	58	44	38	1	1	1	1	1	1	1	1	1	1
1560	42	24	50	44	100	122	80	98	110	98	1	1	1	1	1	1	1	1	1	1
1570	38	20	30	48	63	40	46	54	63	50	1	1	1	1	2	2	2	2	2	2
1580	70	65	54	81	83	69	118	137	100	112	2	2	2	3	3	3	3	3	4	4
1590	110	110	108	107	102	83	103	97	76	80	4	4	4	4	4	4	4	4	4	4
1600	90	85	82	98	141	171	129	129	101	120	5	5	5	5	5	5	6	6	6	6
1610	101	80	116	121	107	93	79	77	76	69	6	6	6	6	6	6	6	6	6	6
1620	70	83	80	88	109	93	71	96	148	139	6	6	6	6	6	6	6	6	6	6
1630	120	108	106	91	116	117	143	98	71	108	7	7	7	7	7	7	7	7	7	7
1640	145	131	125	111	133	167	141	118	106	90	7	7	7	7	8	8	8	8	8	8
1650	120	208	145	146	119	98	93	105	110	98	8	8	8	9	9	9	9	9	9	9
1660	104	93	73	81	105	98	87	67	111	101	9	9	9	9	9	10	10	10	10	10
1670	127	149	145	148	152	130	114	133	133	113	10	10	10	10	10	10	10	10	10	10
1680	123	136	100	90	84	98	77	112	184	165	11	11	11	11	11	11	11	11	11	11
1690	136	77	103	106	117	124	90	88	84	79	11	11	11	11	11	13	13	13	13	13
1700	84	94	86	77	75	59	77	61	68	100	14	14	14	14	14	15	15	15	15	15
1710	81	102	86	73	104	124	131	117	110	151	16	16	16	16	16	17	17	17	17	17
1720	122	111	102	111	105	104	111	126	120	79	17	17	17	17	18	20	20	20	20	20
1730	97	80	79	98	108	98	88	82	76	115	20	21	21	21	21	21	21	23	23	23
1740	98	75	93	97	91	116	124	109	127	119	23	23	23	23	23	23	23	23	23	23
1750	108	116	93	103	104	102	103	80	80	81	23	23	24	24	24	24	24	24	24	24
1760	99	90	110	130	131	113	116	119	101	99	24	24	24	25	26	28	28	28	28	28
1770	70	87	86	101	97	106	103	108	92	78	28	28	28	28	28	28	28	28	28	28
1780	107	116	122	95	83	87	106	105	115	112	28	29	30	30	30	30	30	30	30	30
1790	98	86	103	106	87	68	76	86	113	90	30	30	30	30	30	30	30	30	30	30
1800	112	83	106	101	100	101	69	79	111	118	30	30	30	30	30	30	30	30	30	30
1810	135	158	193	163	131	110	96	108	132	103	30	30	30	30	30	30	30	30	30	30
1820	101	81	90	93	102	99	60	77	99	95	30	30	30	30	30	30	30	30	30	30
1830	91	96	102	89	113	157	189	194	175	140	30	30	30	30	31	31	31	31	31	31
1840	96	109	113	123	109	120	105	102	98	94	31	31	31	31	31	31	31	31	31	31
1850	123	117	122	109	103	83	84	115	101	76	31	31	31	31	31	31	31	31	31	31
1860	83	93	124	149	131	110	108	84	90	68	31	31	31	31	31	31	31	31	31	31
1870	82	81	61	49	57	64	62	80	96	99	31	31	31	31	31	31	31	31	31	31
1880	94	99	101	100	109	81	76	65	100	100	31	31	31	31	31	32	32	32	32	32
1890	87	92	111	116	95	100	103	95	87	90	32	32	32	32	32	32	32	32	32	32
1900	86	96	105	92	83	78	79	53	54	43	32	32	32	32	32	31	31	31	31	31
1910	48	72	78	88	88	90	57	41	53	60	31	31	31	31	31	31	31	31	31	31
1920	63	57	68	104	118	110	106	115	78	79	32	32	32	32	32	32	32	32	32	32
1930	80	78	102	110	111	83	107	129	93	96	32	32	32	32	32	32	32	32	32	32
1940	102	119	135	110	109	120	118	84	93	109	32	32	32	32	32	32	32	32	32	32
1950	93	88	107	99	94	94	80	105	127	146	32	32	32	32	32	32	32	32	31	31
1960	138	128	120	116	107	99	93	85	82	90	31	31	31	31	31	31	31	31	31	31
1970	95	81	99	98	98	103	134				31	31	31	31	31	31	31			

SITE AND COLLECTION INFORMATION

Site name *ARMSTRONG RESERVE*
Country *NEW ZEALAND* **State or Province** *SOUTH ISLAND*
Latitude *43°50'S* **Longitude** *173°00'E* **Altitude** *731 m*
Species collected *Libocedrus bidwillii*
Date of collection *10 February 1978*
Collectors *P.W.Dunwiddie, K.Platt, J.Leathwick*
No. of trees sampled *18* **No. of cores** *70* **No. of discs** *0*

Site description:

Armstrong Scenic Reserve is located above the town of Akaroa on Banks Peninsula. The site is in a stand of Podocarpus totara and Nothofagus fusca forest (elevation 730 m) on the east slopes of Flag Peak in the headwaters above Flea Bay. Stony Bay Road from Akaroa Provides close access to the site.

All Libocedrus bidwillii in the stand, of varying sizes and ages, are dead. Rot has begun on the outsides of most individuals, but all appear to have died within a few years of each other, between 1950 and 1960. The site was fenced in 1969, but disturbance by grazing probably was considerable in the past, and may have contributed to the death of the trees. Living Libocedrus are present up to 1 meter tall in the tussock grass above the stand, but were stunted by excessive browsing and not cored. Trees in the stand are up to 16 m tall, and some are emergent from the canopy.

The slope averages 20° toward the south and east, and is moderately well-drained. Bedrock is primarily andesite and basalts, with moderate soil development. Understory growth in the stand is slight.

SAMPLE STATISTICS

Interval analyzed (A.D.)	*1739 - 1822*
No. of trees *10* No. of radii per tree *2*	
Mean ring width (mm)	*0.79*
% locally absent rings	*0.60*
Analysis of variance:	
Estimated mean square of Y	*0.018*
Sources of variation, % variance	
Mean chronology	*18*
Differences between trees	*39*
Other	*43*
Cross-correlation analysis:	
Radii within trees	*0.57*
Radii among trees	*0.20*
Between tree means	*0.22*

CHRONOLOGY STATISTICS

Identification	*ARM189*
Interval (A.D.)	*1450 - 1958*
No. of trees *12* Total no. of radii *39*	
Autocorrelation	*0.62*
Standard deviation	*0.24*
Mean sensitivity	*0.16*
Mean standard error	*0.07*

ARM189
ARMSTRONG RESERVE
LIBOCEDRUS BIDWILLII

	TREE RING INDICES										NUMBER OF SAMPLES									
DATE	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
1450	122	131	137	96	123	215	131	157	158	148	1	1	1	1	1	1	1	1	1	1
1460	75	79	74	90	123	112	153	119	97	105	1	1	1	1	1	1	1	1	2	2
1470	88	96	106	83	70	76	91	81	88	110	2	2	2	2	2	2	2	2	3	3
1480	88	121	104	66	106	88	91	63	96	117	3	3	3	3	3	3	3	3	3	3
1490	91	69	61	69	41	69	78	106	99	93	3	3	3	3	3	3	3	3	3	3
1500	78	102	163	145	138	143	98	101	114	115	3	3	3	3	3	3	3	3	3	3
1510	115	125	106	123	116	129	134	126	119	128	3	3	4	4	4	4	5	5	5	5
1520	103	128	142	150	141	150	120	134	131	112	6	6	6	7	7	7	7	7	7	7
1530	122	108	128	119	103	114	125	130	107	85	8	8	8	8	8	8	8	8	8	8
1540	97	63	85	71	81	75	92	93	92	99	9	9	10	10	10	10	10	10	10	10
1550	64	88	90	103	112	103	85	100	91	94	10	10	10	10	10	10	10	10	10	10
1560	121	132	116	95	116	123	105	107	105	97	10	10	11	11	11	11	11	11	11	12
1570	107	112	98	130	124	111	95	97	107	79	12	12	12	12	12	12	12	12	12	12
1580	91	93	63	98	95	89	106	125	131	118	12	12	12	12	12	12	12	12	12	13
1590	114	112	89	98	86	110	99	92	60	103	13	14	14	14	14	14	14	14	14	14
1600	110	118	43	70	74	75	79	112	92	91	14	14	14	14	14	14	14	14	14	14
1610	101	117	53	80	75	97	67	75	99	97	14	14	14	14	14	14	14	14	14	14
1620	94	88	84	94	98	86	91	97	102	112	13	13	13	14	14	14	14	14	14	14
1630	93	80	60	73	93	74	100	75	98	93	14	14	14	14	14	14	14	14	15	15
1640	110	131	127	139	116	116	101	102	109	85	15	15	15	15	14	14	14	14	14	14
1650	104	105	60	79	59	70	89	79	100	97	14	13	13	13	13	14	14	14	15	15
1660	93	94	63	85	98	102	109	123	112	114	16	16	16	16	16	16	17	17	17	17
1670	87	118	156	122	125	87	99	104	88	109	17	17	17	17	17	17	17	17	17	17
1680	115	128	113	123	103	104	100	88	100	98	18	18	18	18	18	18	18	19	21	21
1690	107	94	94	87	94	102	93	95	91	75	22	21	21	21	21	21	21	22	22	22
1700	87	87	96	102	88	69	136	125	107	103	23	23	23	23	23	24	25	25	25	25
1710	114	119	123	114	133	108	117	116	97	91	25	25	25	24	24	25	25	26	26	26
1720	49	66	70	91	68	93	103	97	129	92	27	27	27	27	27	27	27	27	27	27
1730	100	114	110	118	112	116	131	114	113	98	31	31	31	31	31	31	31	31	31	32
1740	103	62	69	90	93	120	88	109	112	126	32	32	32	32	32	32	32	32	32	32
1750	118	113	120	126	118	107	108	102	93	104	32	32	32	32	32	32	32	32	32	32
1760	113	101	100	104	113	103	132	128	116	120	32	32	32	32	32	32	32	32	32	32
1770	79	87	89	85	75	83	84	87	83	107	32	32	32	32	32	32	32	32	32	32
1780	99	106	105	130	102	104	112	86	104	105	32	32	32	32	32	32	32	32	32	32
1790	77	75	89	106	79	91	76	111	113	130	32	32	32	32	32	32	32	32	32	32
1800	123	136	116	110	97	114	119	117	68	75	32	32	32	32	32	32	32	32	32	32
1810	87	82	92	76	73	98	96	77	89	84	32	32	32	32	32	32	32	32	32	32
1820	83	102	97	104	114	127	115	137	137	128	32	32	32	31	31	30	30	30	30	30
1830	70	90	80	68	45	51	62	77	70	85	30	29	28	27	27	27	27	27	27	27
1840	85	118	98	98	109	116	96	52	67	74	28	28	28	28	28	27	26	26	26	26
1850	77	77	90	105	67	87	89	89	75	77	26	25	25	23	23	23	23	23	23	23
1860	93	82	75	63	73	70	84	77	99	112	23	23	23	23	23	23	23	23	23	23
1870	72	77	62	95	93	113	126	114	128	111	22	22	22	22	22	22	22	22	22	21
1880	131	109	112	93	101	100	90	65	85	85	21	21	21	21	21	21	21	21	21	21
1890	100	115	122	135	135	112	131	137	147	157	21	21	21	21	21	20	19	19	19	19
1900	160	180	122	146	137	136	146	55	102	125	19	19	19	18	18	18	18	17	17	17
1910	117	127	109	88	112	130	84	119	108	114	16	16	16	16	16	14	14	14	14	14
1920	102	126	148	139	89	106	119	106	122	102	13	13	13	13	13	13	13	13	13	12
1930	85	108	118	118	122	65	78	85	93	75	11	11	10	10	10	10	10	10	9	9
1940	88	67	56	55	88	91	117	132	89	140	9	9	7	6	5	5	5	5	4	4
1950	116	118	75	76	60	59	50	24	21		4	4	4	3	3	2	2	1	1	

SITE AND COLLECTION INFORMATION

Site name *MANAPOURI*
Country *NEW ZEALAND* **State or Province** *SOUTH ISLAND*
Latitude *45° 32'S* **Longitude** *167° 18'E* **Altitude** *305 m*
Species collected *Dacrydium biforme*
Date of collection *16 December 1977*
Collectors *P.W.Dunwiddie, M.R.Boase*
No. of trees sampled *7* **No. of cores** *26* **No. of discs** *0*

Site description:

An electric power generating facility was built on the west arm of Lake Manapouri between 1963 and 1971. A 30 km boat trip provides access from the town of Manapouri to the power station. Forests of Nothofagus solandri and Dacrydium cupressinum predominate in this very wet area. Individuals of Dacrydium biforme up to 13 m tall are scattered along streams in boggy areas. An exploratory collection was made of 7 trees growing near the road that follows along the power lines from the generating facility. Disturbance from the road construction in the mid to late 1960's was probable with several individuals. The trees are of various sizes and growth forms and on both level and sloping terrain. Dense scrub of several Dacrydium species, Leptospermum, and N. solandri are common in some areas. Soil development is thin on bedrock of granites and gneisses.

SAMPLE STATISTICS

Interval analyzed (A.D.)	*1840 - 1936*
No. of trees *7* No. of radii per tree *2*	
Mean ring width (mm)	*0.38*
% locally absent rings	*0.15*
Analysis of variance:	
Estimated mean square of Y	*0.023*
Sources of variation, % variance	
Mean chronology	*16*
Differences between trees	*39*
Other	*45*
Cross-correlation analysis:	
Radii within trees	*0.49*
Radii among trees	*0.18*
Between tree means	*0.20*

CHRONOLOGY STATISTICS

Identification	*MAP229*
Interval (A.D.)	*1567 - 1976*
No. of trees *7* Total no. of radii *25*	
Autocorrelation	*0.75*
Standard deviation	*0.18*
Mean sensitivity	*0.10*
Mean standard error	*0.08*

MAP229
MANAPOURI
DACRYDIUM BIFORME

DATE	TREE RING INDICES										NUMBER OF SAMPLES									
	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
1567								63	94	117								1	1	1
1570	102	107	100	131	123	136	117	106	137	112	1	1	1	1	1	1	1	1	1	1
1580	92	96	145	122	102	110	109	89	68	118	1	2	2	2	2	2	2	2	2	2
1590	108	115	86	110	106	97	76	81	103	92	2	2	2	2	2	2	2	2	2	3
1600	79	78	82	89	100	121	120	113	121	91	3	3	3	3	3	4	4	4	4	4
1610	90	90	82	83	87	82	79	88	111	94	4	4	4	4	4	4	4	4	5	6
1620	97	90	106	115	111	115	97	95	105	97	6	6	6	6	6	6	6	6	6	6
1630	85	68	82	90	74	64	68	66	72	67	6	6	6	6	6	6	6	6	6	6
1640	97	91	86	92	108	125	122	115	108	116	6	6	6	6	6	6	6	6	6	6
1650	111	110	99	125	116	108	101	93	101	103	6	6	6	6	6	6	6	6	6	6
1660	89	100	103	109	102	96	96	82	108	111	6	6	6	6	6	6	6	6	6	6
1670	127	115	105	103	96	96	73	81	100	82	6	6	8	8	8	8	8	8	8	7
1680	81	82	88	101	99	96	96	97	105	94	7	7	7	7	7	9	9	9	10	10
1690	102	92	86	97	103	86	100	110	99	97	10	10	10	10	11	11	11	11	11	12
1700	90	104	102	99	106	97	94	89	85	93	13	13	13	13	13	13	13	13	13	13
1710	79	90	96	102	105	91	96	89	78	79	13	13	13	13	13	13	13	13	13	13
1720	86	87	79	97	105	91	100	98	97	81	13	13	13	13	13	13	14	14	14	14
1730	62	76	100	100	93	108	99	86	104	130	15	15	15	15	15	15	15	15	15	15
1740	107	127	124	132	140	96	102	115	131	140	15	15	15	15	15	15	15	15	15	15
1750	112	151	158	148	130	135	126	134	121	124	16	16	16	16	16	16	16	17	17	17
1760	105	103	95	101	93	106	100	105	98	98	17	17	17	17	17	17	17	17	17	17
1770	99	100	107	115	116	111	99	114	125	118	18	18	18	18	18	18	19	20	20	20
1780	134	120	116	107	115	119	143	150	137	142	21	21	21	21	21	21	21	21	21	21
1790	134	140	110	106	104	108	103	115	97	86	20	20	20	20	20	20	20	19	19	19
1800	95	81	96	95	94	100	87	64	84	78	19	19	19	19	19	19	19	19	19	19
1810	88	91	106	97	102	101	113	115	108	108	19	19	19	19	19	19	19	19	19	19
1820	89	101	95	90	95	79	69	75	89	73	19	19	19	19	19	19	19	19	20	20
1830	91	84	81	64	67	65	60	70	66	68	20	20	20	20	20	20	20	20	20	20
1840	67	72	81	80	93	98	86	90	87	83	21	21	21	21	21	21	21	22	22	22
1850	84	75	77	74	71	75	76	80	74	78	22	22	22	22	23	23	23	23	23	23
1860	72	83	102	106	101	93	102	99	106	106	23	23	23	23	23	23	23	23	23	23
1870	117	111	95	100	93	104	93	81	66	73	23	23	23	23	23	23	23	23	23	23
1880	74	87	92	97	95	91	93	86	95	105	24	24	24	24	24	25	25	25	25	25
1890	88	115	123	153	150	127	126	98	101	103	25	25	25	25	25	25	25	25	25	25
1900	109	120	103	110	127	113	126	109	124	124	25	25	25	25	25	25	25	25	25	25
1910	135	120	103	101	81	86	86	113	109	114	25	25	25	25	25	25	25	25	25	25
1920	118	125	110	112	98	103	103	100	77	88	25	25	25	25	25	25	25	25	25	25
1930	84	90	102	93	99	104	105	89	85	77	25	25	25	25	25	25	25	24	24	24
1940	102	102	99	92	98	106	104	111	117	114	24	24	24	24	24	24	24	24	24	24
1950	113	89	97	82	74	86	98	110	114	128	21	21	21	21	21	19	18	18	18	18
1960	120	118	110	115	113	96	88	101	84	89	18	17	17	17	17	17	15	12	12	12
1970	81	85	109	111	106	106	111				9	9	9	9	9	9	9			

SITE AND COLLECTION INFORMATION

Site name *MT. CARGILL*
Country *NEW ZEALAND* **State or Province** *SOUTH ISLAND*
Latitude *45° 50'S* **Longitude** *170° 32'E* **Altitude** *576 m*
Species collected *Libocedrus bidwillii*
Date of collection *9 May 1977*
Collectors *P.W.Dunwiddie, D.A. Campbell*
No. of trees sampled *16* **No. of cores** *61* **No. of discs** *0*

Site description:

The site is just north of the city of Dunedin, on the slopes of Mt. Cargill. Pinehill Road is followed to the television transmitting tower at the summit. Subsite I is about 100 m down the north side, below very dense shrubs regrowing after a burn. Libocedrus bidwillii, averaging 13 m tall, are emergent from 5 m tall shrubs, and appear to have been outside the burned area. Epiphytic mosses and ferns are abundant. The slope varies from 10° to 25°, with moderate soil development on an igneous substrate.

Subsite II is on a 20° east-southeast facing slope, south of the transmitting tower. Large (greater than one m dbh) Nothofagus menziesii are found in a limited stand about 0.5 km below the road. The trees have been studied previously by Alan Mark (Univ. of Otago), and some have labels. This is the only stand of N. menziesii in the area.

SAMPLE STATISTICS

Interval analyzed (A.D.)	*1875 - 1955*
No. of trees *9* No. of radii per tree *3*	
Mean ring width (mm)	*0.89*
% locally absent rings	*0.00*
Analysis of variance:	
Estimated mean square of Y	*0.038*
Sources of variation, % variance	
Mean chronology	*34*
Differences between trees	*28*
Other	*38*
Cross-correlation analysis:	
Radii within trees	*0.63*
Radii among trees	*0.36*
Between tree means	*0.38*

CHRONOLOGY STATISTICS

Identification	*CRG189*
Interval (A.D.)	*1492 - 1975*
No. of trees *12* Total no. of radii *38*	
Autocorrelation	*0.75*
Standard deviation	*0.26*
Mean sensitivity	*0.16*
Mean standard error	*0.08*

CRG189
MT. CARGILL
LIBOCEDRUS BIDWILLII

	TREE RING INDICES										NUMBER OF SAMPLES									
DATE	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
1492			73	54	59	85	79	69	78	82			1	1	1	1	1	1	1	1
1500	81	103	66	78	118	113	98	93	88	106	1	1	1	1	1	1	1	1	1	1
1510	127	100	96	102	88	108	123	85	75	84	1	1	1	1	1	1	1	2	2	2
1520	77	75	77	103	112	104	97	106	91	90	2	2	2	2	2	2	2	2	2	2
1530	118	101	78	123	142	152	165	167	179	148	2	2	2	2	2	2	2	2	2	2
1540	182	171	151	137	137	105	122	115	104	92	2	2	2	2	2	2	2	2	2	2
1550	44	56	56	62	88	83	75	101	95	114	2	2	2	2	2	2	2	2	2	2
1560	110	104	104	78	96	90	37	64	73	97	2	2	2	2	2	2	2	2	2	2
1570	134	152	154	196	187	182	123	125	154	109	2	2	2	2	2	2	2	2	2	2
1580	140	126	77	111	112	105	100	112	95	108	2	2	4	4	4	4	4	4	4	4
1590	103	92	54	91	95	98	90	65	36	66	4	4	4	4	4	4	4	4	4	4
1600	81	77	37	55	54	59	52	63	61	59	4	4	4	4	4	4	5	5	5	5
1610	72	77	68	86	79	96	60	79	86	80	5	5	5	5	5	5	5	5	5	5
1620	85	84	90	130	133	113	123	130	131	124	5	5	5	5	5	5	5	5	5	5
1630	130	111	103	148	159	105	135	107	138	113	5	5	5	5	5	5	5	5	5	5
1640	138	137	127	146	126	127	99	70	88	72	5	5	5	5	5	5	5	5	5	5
1650	86	93	47	93	84	96	111	79	122	126	5	5	5	5	5	5	5	5	5	5
1660	105	108	60	77	68	68	23	55	82	91	5	5	5	5	5	5	5	5	5	5
1670	87	95	96	94	98	58	76	73	64	91	5	5	5	5	5	5	5	5	5	5
1680	99	122	101	136	137	154	125	78	118	114	5	5	5	5	5	5	5	5	5	5
1690	111	92	108	136	156	190	175	192	169	122	5	5	5	5	5	5	5	5	5	5
1700	141	134	123	127	103	49	85	84	94	91	5	5	5	5	5	5	5	5	5	5
1710	93	109	90	91	99	75	87	85	98	80	5	5	5	5	5	5	5	5	5	5
1720	46	73	82	73	43	75	104	91	110	80	3	3	4	4	4	4	4	4	4	4
1730	84	76	72	83	39	64	75	83	96	107	4	4	4	4	4	4	4	4	4	4
1740	92	44	71	62	81	73	72	87	95	87	4	4	4	4	4	4	4	4	5	5
1750	109	105	93	115	100	86	79	93	115	116	5	5	5	5	6	6	6	7	7	7
1760	128	130	122	123	129	113	116	136	130	138	7	7	8	8	8	9	10	10	10	10
1770	113	121	121	114	104	104	93	115	90	112	10	10	10	10	10	10	10	10	10	10
1780	94	96	104	102	96	93	104	89	97	95	10	9	9	9	9	9	9	9	9	10
1790	86	92	104	108	105	104	101	121	113	129	10	10	10	10	10	10	11	11	11	11
1800	120	125	141	126	126	124	125	115	93	99	12	12	12	13	13	14	14	15	15	17
1810	92	74	84	86	90	107	100	85	83	83	18	18	18	18	20	21	23	23	23	23
1820	91	66	89	77	90	88	85	97	98	103	24	24	25	26	26	26	26	26	26	26
1830	82	99	95	75	73	85	96	106	101	100	26	26	26	26	26	26	27	27	27	27
1840	97	110	112	99	109	118	90	72	87	100	27	27	27	27	27	27	30	30	30	30
1850	100	109	117	112	60	82	88	89	95	95	30	30	31	31	31	31	31	31	31	31
1860	101	106	93	84	87	77	90	88	96	102	31	31	31	31	31	32	32	32	32	32
1870	86	85	58	85	97	113	116	132	131	130	33	34	35	35	36	37	38	38	38	38
1880	131	115	106	105	101	86	87	73	86	89	38	38	38	38	38	38	38	38	38	38
1890	109	112	110	115	98	96	100	99	107	114	38	38	38	38	38	38	38	38	38	38
1900	105	98	94	82	83	88	76	23	65	66	38	38	38	38	38	37	36	34	34	34
1910	87	104	98	72	107	116	99	129	130	131	34	34	34	34	34	34	34	34	34	34
1920	113	136	127	116	66	83	92	95	118	122	34	34	34	34	34	34	34	33	33	33
1930	112	116	143	144	128	100	127	105	66	64	33	33	33	33	33	33	33	33	33	33
1940	89	89	99	100	112	125	116	127	108	119	33	33	33	33	33	33	33	33	33	33
1950	110	117	116	115	104	90	68	74	83	89	33	33	33	33	33	33	29	29	29	29
1960	90	85	105	112	121	125	104	118	118	107	29	29	29	29	29	29	29	29	29	29
1970	90	87	90	102	102	113					29	29	29	29	29	29				

SITE AND COLLECTION INFORMATION

Site name *OKIWI*
Country *NEW ZEALAND* State or Province *SOUTH ISLAND*
Latitude *41°07'S* Longitude *173°40'E* Altitude *15 m*
Species collected *Phyllocladus trichomanoides*
Date of collection *6,7 January 1978*
Collectors *P.W.Dunwiddie, M.R.Boase*
No. of trees sampled *23* No. of cores *87* No. of discs *0*

Site description:

The road from Okiwi Bay to Elaine Bay in the Marlborough Sounds area of South Island passes through the Moncrief Scenic Reserve. All large Phyllocladus trichomanoides (up to 70 cm dbh) were cored on the terraces of a small stream (Pouawhariki Stream) below the road. The forest is very dense, with large Podocarpus spicatus, Beilschmiedia tawa, and Rhopalostylis sapida. Epiphytes and lianas are abundant.

Thirteen somewhat smaller trees growing on a 25° south-facing slope above the stream terraces were also cored. This stand is predominantly P. trichomanoides and Nothofagus fusca of various sizes. Soils are well developed in both areas, and disturbance appears minimal. The ocean is within one km of these trees, which are some of the farthest south P. trichomanoides in New Zealand.

SAMPLE STATISTICS

Interval analyzed (A.D.)	1845 - 1954
No. of trees 8 No. of radii per tree 2	
Mean ring width (mm)	0.87
% locally absent rings	0.28
Analysis of variance:	
Estimated mean square of Y	0.051
Sources of variation, % variance	
Mean chronology	29
Differences between trees	30
Other	41
Cross-correlation analysis:	
Radii within trees	0.59
Radii among trees	0.31
Between tree means	0.32

CHRONOLOGY STATISTICS

Identification	OWI179
Interval (A.D.)	1724 - 1976
No. of trees 9 Total no. of radii 31	
Autocorrelation	0.06
Standard deviation	0.25
Mean sensitivity	0.29
Mean standard error	0.08

OWI179
OKIWI
PHYLLOCLADUS TRICHOMANOIDES

	TREE RING INDICES										NUMBER OF SAMPLES									
DATE	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
1724					157	127	134	105	106	74					2	2	2	2	2	2
1730	121	65	99	122	131	110	130	135	115	97	3	3	3	3	3	3	3	3	3	3
1740	98	44	75	88	116	105	145	114	75	105	5	5	5	5	5	6	7	7	7	7
1750	97	109	71	107	105	69	91	100	111	89	9	9	9	9	9	9	9	9	9	9
1760	92	120	85	89	105	72	94	106	112	108	10	10	10	10	10	10	10	10	10	10
1770	82	105	98	77	86	110	47	139	121	112	14	14	14	15	15	15	15	16	16	16
1780	96	147	113	128	66	119	92	95	98	108	17	18	18	18	18	18	19	19	19	19
1790	50	106	91	123	79	109	95	136	103	125	20	20	20	21	21	22	23	23	23	23
1800	74	104	64	124	86	136	70	97	98	83	23	23	23	23	23	23	23	23	23	23
1810	123	65	89	86	106	83	125	73	100	61	23	23	23	23	23	23	23	23	23	23
1820	134	106	157	100	119	100	143	90	63	83	26	26	26	26	26	26	26	26	26	26
1830	40	90	80	73	36	100	72	95	79	149	26	26	26	27	27	28	28	28	28	28
1840	53	126	113	104	106	128	76	115	123	116	30	30	30	30	30	31	31	31	31	31
1850	96	124	134	127	77	128	102	102	98	62	31	31	31	31	31	31	31	31	31	31
1860	89	79	85	113	147	116	85	103	153	107	31	31	31	31	31	31	31	31	31	31
1870	111	100	91	79	93	92	81	86	106	88	31	31	31	31	31	31	31	31	31	31
1880	72	127	100	145	132	109	91	65	123	84	31	31	31	31	31	31	31	31	31	31
1890	92	97	86	143	127	113	124	72	95	106	31	31	31	30	30	30	30	30	30	30
1900	98	113	88	119	58	96	83	61	59	113	30	30	30	30	30	30	30	30	30	30
1910	48	98	93	108	88	110	57	87	102	118	30	30	30	30	30	30	30	30	30	30
1920	97	125	105	124	88	91	94	92	81	139	30	30	30	30	30	30	30	30	30	30
1930	107	154	85	82	49	142	132	135	63	95	30	30	29	28	28	28	28	28	28	27
1940	170	100	159	72	93	102	99	114	116	100	27	27	27	27	27	27	27	27	27	27
1950	93	80	107	106	127	97	86	119	121	46	27	27	27	26	26	23	23	23	23	23
1960	81	72	69	95	100	139	161	133	125	91	23	23	23	23	23	23	23	23	23	23
1970	45	48	89	143	108	93	89				23	23	23	23	23	23	23			

SITE AND COLLECTION INFORMATION

Site name *OWAKA*
Country *NEW ZEALAND* **State or Province** *SOUTH ISLAND*
Latitude *46° 23'S* **Longitude** *169° 27'E* **Altitude** *305 m*
Species collected *Libocedrus bidwillii*
Date of collection *14 December 1977*
Collectors *P.W.Dunwiddie, M.R.Boase*
No. of trees sampled *14* **No. of cores** *54* **No. of discs** *1*

Site description:

This site is in a forest reserve west of the town of Owaka in eastern South Island. Clearcutting in the predominantly Nothofagus menziesii forest is common in this area. The road west from Owaka is followed 17 km to a junction with a road south to Chloris Pass, 3 km from the junction. Thirteen trees of L. bidwillii were cored at the pass on the west side of the road, where it enters Catlin Forest. Cedar Hill Scenic Reserve is on the opposite side of the road, with more L. bidwillii growing in it.

Disturbance appeared minimal in the area near the trees, which were emergent from the surrounding bush of Leptospermum, Pseudowintera, Coprosma, Fuchsia and Nothofagus. Trees were mature and up to 20 m tall, growing in moderately dense forest which gently sloped west and south from the Pass. Other collections included a single core from Leptospermum ericoides and a disc from L. bidwillii adjacent to a clearcut area nearby.

SAMPLE STATISTICS

Interval analyzed (A.D.)	*1892 - 1975*
No. of trees *11* No. of radii per tree *2*	
Mean ring width (mm)	*0.90*
% locally absent rings	*0.11*
Analysis of variance:	
Estimated mean square of Y	*0.040*
Sources of variation, % variance	
Mean chronology	*24*
Differences between trees	*17*
Other	*59*
Cross-correlation analysis:	
Radii within trees	*0.41*
Radii among trees	*0.27*
Between tree means	*0.28*

CHRONOLOGY STATISTICS

Identification	*OKA189*
Interval (A.D.)	*1732 - 1976*
No. of trees *14* Total no. of radii *40*	
Autocorrelation	*0.66*
Standard deviation	*0.18*
Mean sensitivity	*0.12*
Mean standard error	*0.05*

OKA189
OWAKA
LIBOCEDRUS BIDWILLII

	TREE RING INDICES										NUMBER OF SAMPLES									
DATE	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
1732			86	89	85	79	75	93	101	110			1	1	1	1	1	1	1	1
1740	125	94	95	114	136	138	113	95	112	100	1	1	1	1	1	1	1	1	1	1
1750	93	109	98	87	105	119	120	131	113	105	1	1	1	1	1	1	1	1	1	1
1760	108	106	105	90	88	82	81	81	72	82	1	1	1	1	1	1	2	2	2	2
1770	71	80	88	96	95	97	90	110	94	101	3	3	4	5	6	6	6	6	7	7
1780	104	108	110	97	97	90	95	83	109	100	10	10	10	11	11	11	11	11	12	12
1790	97	88	109	114	86	99	108	102	104	104	12	12	12	12	14	14	14	15	15	16
1800	103	92	114	112	106	104	98	95	102	102	19	19	19	20	21	22	24	24	24	24
1810	117	126	133	126	121	119	110	81	92	97	25	25	26	26	27	27	28	28	28	28
1820	102	68	91	94	102	102	96	102	99	91	29	29	29	29	29	29	30	31	32	32
1830	59	87	86	78	70	80	81	82	92	88	32	32	32	32	32	32	32	32	32	32
1840	71	92	84	93	111	127	111	111	104	96	32	32	32	32	32	32	32	32	32	32
1850	95	109	101	95	63	82	90	94	92	57	32	32	32	32	32	32	32	32	32	32
1860	71	78	88	93	102	97	113	95	116	120	32	32	32	32	32	32	32	32	32	32
1870	119	110	84	100	111	109	100	119	125	116	32	32	32	32	32	32	33	33	34	34
1880	119	120	116	87	118	111	118	103	119	111	35	35	35	35	35	35	35	35	36	37
1890	124	110	114	140	137	148	132	104	121	124	39	39	40	40	40	40	40	40	40	40
1900	109	113	98	97	78	99	83	57	86	68	40	40	40	40	40	40	40	40	40	40
1910	69	83	82	54	76	83	65	102	110	106	39	38	38	38	38	38	38	38	38	38
1920	95	115	117	106	67	99	122	107	113	126	38	37	37	37	37	37	37	37	37	37
1930	118	101	103	117	99	80	119	108	67	66	37	37	37	36	36	35	35	35	34	34
1940	85	83	107	102	112	120	113	123	127	129	33	33	33	33	33	33	33	33	33	33
1950	120	126	124	129	121	106	65	86	80	84	33	33	33	33	33	33	33	33	33	33
1960	89	92	79	110	112	108	102	121	117	112	33	33	33	33	33	33	33	33	33	33
1970	88	79	81	79	76	73	77				33	33	33	33	33	33	31			

SITE AND COLLECTION INFORMATION

Site name *PEGLEG CREEK*
Country *NEW ZEALAND* **State or Province** *SOUTH ISLAND*
Latitude *42° 54'S* **Longitude** *171° 34'E* **Altitude** *915 m*
Species collected *Phyllocladus alpinus*
Date of collection *26 December 1977*
Collectors *P.W.Dunwiddie, M.R.Boase*
No. of trees sampled *15* **No. of cores** *56* **No. of discs** *0*

Site description:

Pegleg Creek is located 1.3 km north of the pass in Arthur's Pass National Park. Libocedrus bidwillii and Phyllocladus alpinus are scattered in the dense subalpine scrub above the bridge where the road crosses the creek. These trees are the highest elevation trees north of the pass. The slope is 20° - 60°, west to north-facing, with thin rocky soil. L. bidwillii are few and scattered up to 10 m tall, with generally sparse foliage and abundant rot. P. alpinus reach heights of 6 m, and are primarily single-trunked trees with full foliage.

SAMPLE STATISTICS

Interval analyzed (A.D.)	*1878 - 1976*
No. of trees *10* No. of radii per tree *2*	
Mean ring width (mm)	*0.61*
% locally absent rings	*0.00*
Analysis of variance:	
Estimated mean square of Y	*0.012*
Sources of variation, % variance	
Mean chronology	*16*
Differences between trees	*28*
Other	*56*
Cross-correlation analysis:	
Radii within trees	*0.43*
Radii among trees	*0.18*
Between tree means	*0.19*

CHRONOLOGY STATISTICS

Identification	*PLC259*
Interval (A.D.)	*1717 - 1976*
No. of trees *12* Total no. of radii *38*	
Autocorrelation	*0.57*
Standard deviation	*0.18*
Mean sensitivity	*0.13*
Mean standard error	*0.05*

PLC259
PEGLEG CREEK
PHYLLOCLADUS ALPINUS

	TREE RING INDICES										NUMBER OF SAMPLES									
DATE	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
1717								69	76	83								1	1	1
1720	87	82	82	78	62	66	61	92	95	83	1	1	1	1	1	1	1	1	1	1
1730	128	101	71	71	67	77	106	77	62	80	1	1	1	1	1	1	1	1	1	1
1740	79	57	32	29	60	46	67	88	91	118	1	1	1	1	1	1	1	1	1	1
1750	107	110	93	140	139	112	98	94	131	130	1	1	1	1	1	1	1	1	1	1
1760	123	83	132	115	108	88	107	120	100	101	1	1	1	1	1	1	1	1	2	2
1770	92	115	78	89	93	84	84	118	89	81	2	2	2	2	2	2	2	3	3	3
1780	91	73	56	80	73	73	95	102	84	113	3	3	3	4	4	4	4	4	4	4
1790	103	112	99	90	104	91	103	132	82	93	4	4	4	4	4	4	4	4	4	5
1800	113	115	95	100	106	110	104	101	113	115	5	6	6	6	6	7	9	9	9	9
1810	135	122	155	134	123	130	110	107	97	105	9	9	9	9	9	9	9	9	10	10
1820	103	112	88	93	93	98	76	87	88	90	11	11	11	11	11	11	11	11	11	11
1830	115	111	85	84	85	90	97	104	104	97	11	11	11	11	11	11	12	13	13	15
1840	109	115	100	97	91	109	93	107	89	77	15	15	16	17	17	17	18	20	20	20
1850	93	96	83	86	102	100	75	82	81	97	21	21	22	23	23	23	23	24	26	26
1860	101	108	89	95	98	89	96	92	97	97	27	29	30	30	31	31	31	32	32	34
1870	113	107	97	121	104	112	105	106	93	139	36	36	36	36	36	36	36	36	37	37
1880	114	112	100	103	98	113	113	109	93	90	37	36	36	35	35	35	35	35	35	35
1890	96	86	115	116	125	93	121	105	112	104	35	35	35	35	35	35	35	35	35	35
1900	117	104	113	101	107	89	95	102	101	99	36	36	36	36	36	36	36	36	36	36
1910	108	89	91	114	84	94	113	107	81	89	36	36	36	36	36	36	36	36	36	36
1920	93	92	94	94	101	82	96	117	86	75	36	36	36	36	36	36	36	36	36	36
1930	78	90	109	104	110	116	99	104	107	94	36	36	36	36	36	36	36	36	36	36
1940	95	79	79	88	93	74	77	90	94	87	36	36	36	36	36	36	36	36	36	36
1950	121	100	115	117	114	115	118	83	100	90	36	36	36	36	36	36	36	36	36	36
1960	111	96	108	93	103	98	100	93	86	91	36	35	35	35	35	35	35	35	35	35
1970	104	97	99	124	119	104	114				35	35	35	35	35	35	35			

OTHER COLLECTIONS

SITE AND COLLECTION INFORMATION

Site name *HAKARIMATA RESERVE*
Country *NEW ZEALAND* **State or Province** *NORTH ISLAND*
Latitude *37°40'S* **Longitude** *175°10'E* **Altitude** *ca. 300 m*
Species collected *See list below.*
Date of collection *20 April 1977*
Collectors *P.W. Dunwiddie, D.A. Campbell*
No. of trees sampled **No. of cores** **No. of discs**

Site description:

The Hakarimata Reserve is on a hill near Ngaruawahia on the west side of the Waikato River. Access is made from Parker Road on the north edge of the reserve. A trail was followed through the reserve, along which cores were collected from the following species:

Agathis australis	*2 trees, 5 cores*
Phyllocladus trichomanoides	*6 trees, 14 cores*
Dacrydium cupressinum	*2 trees, 4 cores*
Podocarpus ferrugineus	*1 tree, 2 cores*

A few A. australis are emergent from a dense forest on a 20°- 35° southwest-facing slope. Soils are wet and deep, and epiphytes and understory shrubs are abundant.

SITE AND COLLECTION INFORMATION

Site name *HIHITAHI*
Country *NEW ZEALAND* **State or Province** *NORTH ISLAND*
Latitude *39°32'S* **Longitude** *175°44'E* **Altitude** *976 m*
Species collected *Libocedrus bidwillii*
Date of collection *14 January 1978*
Collectors *P.W. Dunwiddie, M.R. Boase*
No. of trees sampled *19* **No. of cores** *75* **No. of discs** *0*

Site description:

Very large Libocedrus bidwillii, up to 160 cm in diameter, are found in gently rolling terrain near Hihitahi. The site is near a ridge top above the "Para Farms" on the road between Waioura and Taihape. The area has been selectively logged, and may have some grazing at present. Podocarpus totara, P. ferrugineus, P. spicatus, and various shrubs are present in the forest, which is bisected by numerous logging tracks. The Libocedrus are emergent from the very open canopy, and all individuals appear old; no small or middle-size trees were found. Moisture and soil development are moderate.

SITE AND COLLECTION INFORMATION

Site name *MAMAKU*
Country *NEW ZEALAND* **State or Province** *NORTH ISLAND*
Latitude *38°08'S* **Longitude** *176°07'E* **Altitude** *305 m*
Species collected *Phyllocladus trichomanoides*
Date of collection *26 April 1977, 16 May 1977*
Collectors *P.W.Dunwiddie, D.A.Campbell, L.Scudder, D.Cown*
No. of trees sampled *20* **No. of cores** *76* **No. of discs** *1*

Site description:

A stand of large, virgin Phyllocladus trichomanoides is found in a 20-chain wide forest between two recently clear-cut areas of Dacrydium cupressinum. The site is on McPherson's Road, in Hora Hora Forest, near the town of Mamaku. Immense trees up to 80 cm in diameter are found in this stand on slopes up to 30°. Trees of this size are uncommon anywhere in the area. A second group of 7 small P. trichomanoides were cored in the general vicinity, as none were found in the main stand. Soils are generally moist and well-developed on a volcanic substrate.

SITE AND COLLECTION INFORMATION

Site name *MAUNGAROA VALLEY ROAD*
Country *NEW ZEALAND* **State or Province** *NORTH ISLAND*
Latitude *37°45'S* **Longitude** *177°44'E* **Altitude** *229 m*
Species collected *Phyllocladus trichomanoides*
Date of collection *20 January 1978*
Collectors *P.W.Dunwiddie, M.R.Boase*
No. of trees sampled *9* **No. of cores** *33* **No. of discs** *0*

Site description:

The Maungaroa Access Road runs southeast over steep terrain away from the coast at Te Kaha. Phyllocladus trichomanoides up to 75 cm diameter are infrequently scattered in the forests, which are dominated by Nothofagus fusca. All trees between 8 and 10 km up the road were cored. Soils appeared to be thin, rocky, and of volcanic origin.

SITE AND COLLECTION INFORMATION

Site name *MAUNGATANIWHA*
Country *NEW ZEALAND* **State or Province** *NORTH ISLAND*
Latitude *38°55'S* **Longitude** *176°52'E* **Altitude** *640 m*
Species collected *Phyllocladus glaucus*
Date of collection *19 January 1978*
Collectors *P.W.Dunwiddie, M.R.Boase*
No. of trees sampled *9* **No. of cores** *33* **No. of discs** *0*

Site description:

The Maungataniwha Scientific Reserve is located 36 km west of Kotemaori. A stand of 16-18 m tall Phyllocladus glaucus is found on a stream terrace just north of the road before it enters the reserve. Nothofagus fusca and N. menziesii dominate the canopy, and occasionally overtop the P. glaucus. The trees appear quite healthy and free of disturbance on the level, mesic site. Ixerba and Weinmannia form an open shrubby understory.

SITE AND COLLECTION INFORMATION

Site name *MINGINUI*
Country *NEW ZEALAND* **State or Province** *NORTH ISLAND*
Latitude *38°40'S* **Longitude** *176°45'E* **Altitude** *350 m*
Species collected *See list below.*
Date of collection *27 April 1977*
Collectors *P.W.Dunwiddie, D.A.Campbell, D.Cown*
No. of trees sampled **No. of cores** **No. of discs**

Site description:

Cores were collected from 5 species in an exploratory sampling of mature Podocarp forest. An undisturbed area in Whirinaki State Forest, near Minginui, south of Te Whaiti, was chosen in this survey. Trees formed a dense canopy on moderately wet, rolling terrain. Collections were made of the following species:

Beilschmiedia tawa	*3 trees, 10 cores*
Podocarpus totara	*3 trees, 12 cores*
Dacrydium cupressinum	*1 tree, 4 cores*
Podocarpus dacrydioides	*1 tree, 4 cores*
Podocarpus spicatus	*2 trees, 8 cores*

SITE AND COLLECTION INFORMATION

Site name *MT. EGMONT*
Country *NEW ZEALAND* **State or Province** *NORTH ISLAND*
Latitude *39° 15'S* **Longitude** *174° 05'S* **Altitude** *1050 m*
Species collected *Podocarpus hallii*
Date of collection *14,15 May 1977*
Collectors *P.W.Dunwiddie, D.A.Campbell*
No. of trees sampled *8* **No. of cores** *31* **No. of discs** *0*

Site description:

The site is in the subalpine forest on the southeast slopes of Mt. Egmont, in the Mt. Egmont National Park. It is located along the hiking track from Dawson Falls to Fanthams Peak, about 1.6 km above the road end at Dawson Falls Lodge.

Collections were made from 8 Podocarpus hallii and 12 Libocedrus bidwillii in the forests adjacent to the track. The former ranged from 2 m tall at the higher elevations where the forest grades into small shrubs, to 7 m tall lower down. The Libocedrus were scattered in the taller forest, and reached heights of 15 m. They were infrequent, with no apparent regeneration, and almost all individuals were cored.

The substrate is volcanic ash and lapilli, some of which has apparently fallen since trees began growth (Druce, N.Z. Jrl. Bot., 1966). Other disturbance appeared to be minimal. Epiphytic ferns and mosses are common due to abundant moisture.

SITE AND COLLECTION INFORMATION

Site name *NGAHINAPOURI*
Country *NEW ZEALAND* **State or Province** *NORTH ISLAND*
Latitude *37° 54'S* **Longitude** *175° 12'E* **Altitude** *122 m*
Species collected *Podocarpus dacrydioides*
Date of collection *22 January 1978*
Collectors *P.W.Dunwiddie, M.R.Boase*
No. of trees sampled *12* **No. of cores** *47* **No. of discs** *0*

Site description:

A pure stand of healthy, symmetrically-shaped Podocarpus dacrydioides is found on the farm of Jan Kerin, near Ngahinapouri, south of Hamilton. These trees, up to 1 m in diameter, are in a grazed, level woodlot next to the main road. Similar stands are common in the area. Soils are well-developed, and continuing disturbance from grazing prohibits any woody understory growth.

SITE AND COLLECTION INFORMATION

Site name *PAPAROA*
Country *NEW ZEALAND* **State or Province** *NORTH ISLAND*
Latitude *36° 07'S* **Longitude** *174° 15'E* **Altitude** *160 m*
Species collected *Agathis australis*
Date of collection *24,25 April 1977*
Collectors *P.W.Dunwiddie, D.A.Campbell, A.Wilson*
No. of trees sampled *7* **No. of cores** *28* **No. of discs** *0*

Site description:

Agathis australis was cored near the town of Paparoa in Northland. The Kauri Bushmen's Memorial Reserve is located on a small hill 2.5 km east of town. It was grazed until 1954, when it was fenced as a reserve. The flat top of the hill is a nearly pure stand of 60-90 cm dbh Agathis australis with a sparse understory of ferns and shrubs. The canopy is dense and soils are well-developed. The slopes are predominantly Phyllocladus trichomanoides of various sizes, with Podocarpus totara, Podocarpus ferrugineus, and Agathis australis. Five P. trichomanoides were also cored in this subsite.

SITE AND COLLECTION INFORMATION

Site name *PIRONGIA*
Country *NEW ZEALAND* **State or Province** *NORTH ISLAND*
Latitude *38° 00'S* **Longitude** *175° 06'E* **Altitude** *962 m*
Species collected *Libocedrus bidwillii*
Date of collection *17 January 1978*
Collectors *P.W.Dunwiddie, M.R.Boase, M.Boyes*
No. of trees sampled *12* **No. of cores** *46* **No. of discs** *0*

Site description:

Libocedrus bidwillii is found at the summit of this peak, and on several adjoining spurs. Cored trees were mostly the same as those studied by Clayton-Greene (New Zealand Journal of Botany, 1977). Access is by trail from Corcoran's Road, between the towns of Te Pahu and Pirongia. Slope and exposure are variable, but generally all were in subalpine forest between 4 and 10 m tall, composed primarily of Podocarpus hallii, Weinmannia, Ixerba, Quintinia, and Pseudopanax.

SITE AND COLLECTION INFORMATION

Site name *PUKETI*
Country *NEW ZEALAND* **State or Province** *NORTH ISLAND*
Latitude *35° 14'S* **Longitude** *173° 48'E* **Altitude** *152 m*
Species collected *Phyllocladus trichomanoides*
Date of collection *3 February 1978*
Collectors *P.W. Dunwiddie, M.R. Boase*
No. of trees sampled *5* **No. of cores** *21* **No. of discs** *0*

Site description:

A few scattered Phyllocladus trichomaoides are found along logging roads in the Puketi Forest, north of Okaihau. Large individuals appear to be uncommon anywhere in the area. Agathis australis, Podocarpus totara, Dacrydium cupressinum, and Beilschmiedia tawa are common forest constituents. Cores were also collected from a single specimen of Dacrydium kirkii.

SITE AND COLLECTION INFORMATION

Site name *PUTARA*
Country *NEW ZEALAND* **State or Province** *NORTH ISLAND*
Latitude *40° 40'S* **Longitude** *175° 31'E* **Altitude** *650 m*
Species collected *Dacrydium biforme*
Date of collection *12 January 1978*
Collectors *P.W. Dunwiddie, M.R. Boase*
No. of trees sampled *12* **No. of cores** *47* **No. of discs** *0*

Site description:

West of Eketahuna, in Tararua State Forest, is a stand of large Dacrydium biforme. Access to the site was made by the Schormann hiking track from Putara. The trees form a tight canopy at 8-9 m, their stout, gnarled branches being supported by trunks up to one meter in diameter. A few Podocarpus hallii, Phyllocladus alpinus, and Weinmannia racemosa are scattered in the area. The D. biforme, while locally abundant in this dense stand, are not common lower down the ridges. P. alpinus found in the area are single-trunked, with diameters up to 35 cm. Both species were collected in a small area along the crest of a ridge. Disturbance appears slight within the stand, although evidence of fire, clearing, and grazing were noted nearby. Moisture is ample, and soils appear well-drained.

SITE AND COLLECTION INFORMATION

Site name *PUTARA*
Country *NEW ZEALAND* **State or Province** *NORTH ISLAND*
Latitude *40°40'S* **Longitude** *175°31'E* **Altitude** *650 m*
Species collected *Phyllocladus alpinus*
Date of collection *12 January 1978*
Collectors *P.W. Dunwiddie, M.R. Boase*
No. of trees sampled *10* **No. of cores** *40* **No. of discs** *0*

Site description:

West of Eketahuna, in Tararua State Forest, is a stand of large Dacrydium biforme. Access to the site was made by the Schormann hiking track from Putara. The trees form a tight canopy at 8-9 m, their stout, gnarled branches being supported by trunks up to one meter in diameter. A few Podocarpus hallii, Phyllocladus alpinus, and Weinmannia racemosa are scattered in the area. The D. biforme, while locally abundant in this dense stand, are not common lower down the ridges. P. alpinus found in the area are single-trunked, with diameters up to 35 cm. Both species were collected in a small area along the crest of a ridge. Disturbance appears slight within the stand, although evidence of fire, clearing, and grazing were noted nearby. Moisture is ample, and soils appear well-drained.

SITE AND COLLECTION INFORMATION

Site name *RUAPEHU CHATEAU*
Country *NEW ZEALAND* **State or Province** *NORTH ISLAND*
Latitude *39°12'S* **Longitude** *175°32'E* **Altitude** *ca. 1080 m*
Species collected *Libocedrus bidwillii*
Date of collection *7 December 1977*
Collectors *P.W.Dunwiddie, M.R. Boase, S.Bigwood, D.Cown*
No. of trees sampled *24* **No. of cores** *92* **No. of discs** *0*

Site description:

Two groups of Libocedrus bidwillii were cored near Ruapehu Chateau on the northwest slopes of Mt. Ruapehu, in Tongariro National Park. Subsite I is along the Ridge Trail, just above Park Headquarters, on a gentle (10°- 20°) northwest-facing slope. The trees are scattered in a 10 m tall subalpine bush of Nothofagus solandri, Phyllocladus alpinus, and Podocarpus hallii.

Subsite II is south of the Chateau, near the Whatapapanui track. L. bidwillii up to 50 cm diameter are emergent from N. solandri and P. alpinus forest on the south side of a bog. The trees are on slopes of varying steepness. Most have rotten centers. Drainage is poor around some trees. A single P. alpinus was also cored.

SITE AND COLLECTION INFORMATION

Site name *RUSSELL STATE FOREST*
Country *NEW ZEALAND* **State or Province** *NORTH ISLAND*
Latitude *35°25'S* **Longitude** *174°18'E* **Altitude** *274 m*
Species collected *Phyllocladus trichomanoides*
Date of collection *2 February 1978*
Collectors *P. W. Dunwiddie, M. R. Boase*
No. of trees sampled *12* **No. of cores** *47* **No. of discs**

Site description:

Access to this site is along a forest service road about 5 km west up Punaruka Stream, then by a track up Pukemoremore. Tanekaha grow along the track. The sampled trees are on a 20 to 30° northeast-facing slope along the track.

Site name *TE AROHA*
Country *NEW ZEALAND* **State or Province** *NORTH ISLAND*
Latitude *37°30'S* **Longitude** *175°50'E* **Altitude** *950 m - 1050 m*
Species collected *Libocedrus bidwillii*
Date of collection *10 December 1977*
Collectors *P.W.Dunwiddie, M.R.Boase*
No. of trees sampled *14* **No. of cores** *52* **No. of discs** *0*

Site description:

A private road to the New Zealand television broadcasting tower provides access to the summit of this mountain. Subsites of Phyllocladus glaucus and Libocedrus bidwillii were cored in the stunted bush found near the top.

P. glaucus up to 5 m tall were cored along a trail on the north side of the peak. The trees are growing in dense bush including Ixerba, Nothofagus, and Dracophyllum, north of the road. They form part of the tight canopy along with the shrubs. Slope angle and direction are variable although the entire area is quite wet. Disturbance by fire may have occurred in the past.

Stands of Libocedrus bidwillii on the south and west sides are reported by Clayton Greene (N.Z. Jrl. Bot.,1977), and are found in dense bush similar to that described above. The Libocedrus bidwillii frequently have very sparse foliage, are scattered infrequently in the bush, and generally are doing poorly. They often are 10-12 m tall and emergent from the surrounding scrub. Fires may have occurred in this area as well.

SITE AND COLLECTION INFORMATION

Site name *TE MOEHAU*
Country *NEW ZEALAND* **State or Province** *NORTH ISLAND*
Latitude *36°32'S* **Longitude** *175°24'E* **Altitude** *823 m*
Species collected *Libocedrus bidwillii*
Date of collection *25 January 1978*
Collectors *P.W.Dunwiddie, M.R.Boase, S.Bigwood, D.Cown, K.Buchan*
No. of trees sampled *13* **No. of cores** *52* **No. of discs** *0*

Site description:

On the summit of Te Moehau, at the north end of Coromandel Peninsula, Libocedrus bidwillii are abundant. Access to the peak is by hiking trail from Stony Bay, on the east side of the peninsula. Trees from seedlings up to 8 m tall are found in the dense, stunted (3 m tall) subalpine scrub of Phyllocladus alpinus, P. glaucus, Ixerba brexioides, and Podocarpus hallii. All trees were cored on the northeast side of the summit, as prevailing winds leave the western slopes largely void of trees. Wind deformation of the branches was common in most individuals. Moisture was adequate on the 15° slope.

SITE AND COLLECTION INFORMATION

Site name *WAIAU FALLS*
Country *NEW ZEALAND* **State or Province** *NORTH ISLAND*
Latitude *36°45'S* **Longitude** *175°30'E* **Altitude** *100 m*
Species collected *Agathis australis*
Date of collection *17 May 1977*
Collectors *P.W.Dunwiddie, D.A.Campbell*
No. of trees sampled *7* **No. of cores** *27* **No. of discs** *0*

Site description:

The Kauri Clump Bush Reserve is 3 km east of Waiau Falls, east of the town of Coromandel. This stand of several dozen Agathis australis over 1 m in diameter are remnants of a larger, cutover forest. The trees are on a generally east-facing slope of 15°-25°, and are the only large trees in the stand. Disturbance within the stands appears slight, except for hiking trails winding around the trunks.

SITE AND COLLECTION INFORMATION

Site name *WAIKOHA ROAD*
Country *NEW ZEALAND* **State or Province** *NORTH ISLAND*
Latitude *37°52'S* **Longitude** *175°07'E* **Altitude** *122 m*
Species collected *Phyllocladus trichomanoides*
Date of collection *9,11 December 1977*
Collectors *P.W.Dunwiddie, M.R.Boase, K.Buchan, E.Boase*
No. of trees sampled *18* **No. of cores** *54* **No. of discs** *4*

Site description:

Waikoha Road runs west from the road between Te Pahu and Whatawhata, south of Hamilton. The site is on the farm of Dick Charleston, 3.4 km up this road, on the slopes above a small stream. Phyllocladus trichomanoides share the canopy with Dacrydium cupressinum, Podocarpus ferrugineus, and Podocarpus dacrydioides. Epiphytes and lianas are common in the dense moist forest. Several P. trichomanoides have been felled for timber in the area. Three Libocedrus plumosa trees were also cored at this site.

SITE AND COLLECTION INFORMATION

Site name *ALEX KNOB*
Country *NEW ZEALAND* **State or Province** *SOUTH ISLAND*
Latitude *43°25'S* **Longitude** *170°09'E* **Altitude** *991 m*
Species collected *Libocedrus bidwillii*
Date of collection *24 December 1977*
Collectors *P.W.Dunwiddie, M.R.Boase*
No. of trees sampled *15* **No. of cores** *55* **No. of discs** *0*

Site description:

The site is on the slopes of Alex Knob, a prominent point above the Waiho River in Westland National Park. Access is provided by a hiking trail, which climbs the ridge above the town of Franz Josef. Large Libocedrus bidwillii are found scattered in the subalpine forest near "Christmas Outlook", about 8 km up the trail. They are emergent from a dense, 8 m tall shrub canopy of Olearia and Dracophyllum, on a 30° northeast-facing slope. Foliage and crowns are generally full, with trunk diameters up to 70 cm. The site is wet due to high precipitation, although drainage is good on the steep slopes.

SITE AND COLLECTION INFORMATION

Site name *CLINTON FORKS*
Country *NEW ZEALAND* **State or Province** *SOUTH ISLAND*
Latitude *44° 53'S* **Longitude** *167° 53'E* **Altitude** *152 m*
Species collected *Phyllocladus alpinus*
Date of collection *17 December 1977*
Collectors *P.W.Dunwiddie, M.R.Boase*
No. of trees sampled *5* **No. of cores** *17* **No. of discs** *0*

Site description:

Individuals of Nothofagus fusca and Phyllocladus alpinus were cored between mileposts 3 and 4 near Glade Hut on the Milford Track, Fiordland National Park. A dense canopy over 35 m tall is formed by N. fusca and N. menziesii. Occasional stunted, subcanopy, single-trunked individuals of P. alpinus are found, rarely exceeding 12 m in height. In this survey, 2 trees of N. fusca were cored, along with 5 P. alpinus. Slopes are generally less than 10°, and soils are thick in this wet coastal forest.

SITE AND COLLECTION INFORMATION

Site name *DENNISTON*
Country *NEW ZEALAND* **State or Province** *SOUTH ISLAND*
Latitude *41° 44'S* **Longitude** *171° 48'E* **Altitude** *457 m*
Species collected *Dacrydium biforme*
Date of collection *29 December 1977*
Collectors *P.W.Dunwiddie, M.R.Boase*
No. of trees sampled *6* **No. of cores** *20* **No. of discs** *0*

Site description:

A few small (up to 7 m tall) Dacrydium biforme were found growing along a stream with small Libocedrus bidwillii, Dacrydium cupressinum, and Phyllocladus alpinus. The site is in a narrow valley, on an otherwise exposed slope above the ocean, 7.5 km above Waimangaroa, on the west coast of South Island. Few trees were found, and disturbance appeared probable.

SITE AND COLLECTION INFORMATION

Site name *FISH CREEK BRIDGE*
Country *NEW ZEALAND* **State or Province** *SOUTH ISLAND*
Latitude *44°07'S* **Longitude** *169°21'E* **Altitude** *472 m*
Species collected *Libocedrus bidwillii*
Date of collection *22 December 1977*
Collectors *P.W.Dunwiddie, M.R.Boase*
No. of trees sampled *20* **No. of cores** *73* **No. of discs** *0*

Site description:

The site is 1.5 km south of Haast Pass at Fish Creek Bridge in Mt. Aspiring National Park. Libocedrus bidwillii are emergent from a 12 m Nothofagus menziesii canopy on a 20° - 30° east-facing slope above the road. Most trees have rotten centers, and several have cuts near the base from wood cutters. Soil development is thin on a gneiss substrate. Some shrubby Phyllocladus alpinus and Coprosma spp. are present in a generally open understory.

SITE AND COLLECTION INFORMATION

Site name *LODESTONE TRACK*
Country *NEW ZEALAND* **State or Province** *SOUTH ISLAND*
Latitude *41°11'S* **Longitude** *172°44'E* **Altitude** *1067 m*
Species collected *Libocedrus bidwillii*
Date of collection *1 January 1978*
Collectors *P.W.Dunwiddie, M.R.Boase*
No. of trees sampled *15* **No. of cores** *58* **No. of discs** *0*

Site description:

Libocedrus bidwillii are found in the subalpine forest in the Arthur Range, Takaka State Forest. Near Ngatimoti, on the Motueka River, a road follows up the Graham Stream Valley. Lodestone Track climbs the ridge above the road end, at Flora Saddle. A dense forest of stunted, 4 m tall Nothofagus solandri var cliffortioides with an understory of shrubby Phyllocladus alpinus is found on an exposed ridge. Many L. bidwillii are in or just emergent from this low canopy on the west side of the crest. Most are gnarled, but have full, compact crowns and foliage.

SITE AND COLLECTION INFORMATION

Site name *MAITAI VALLEY (South Fork)*
Country *NEW ZEALAND* **State or Province** *SOUTH ISLAND*
Latitude *41° 19'S* **Longitude** *173° 22'E* **Altitude** *183 m*
Species collected *Phyllocladus trichomanoides*
Date of collection *4 January 1978*
Collectors *P.W.Dunwiddie, M.R.Boase*
No. of trees sampled *15* **No. of cores** *59* **No. of discs** *0*

Site description:

Phyllocladus trichomanoides, near the southern limit of its range, is found in the Maitai River Valley near Nelson. Trees of various sizes occur in this forest dominated by Nothofagus fusca and N. solandri. Many cores were taken from smaller P. trichomanoides in the 25-30 cm class. A few larger trees were found, up to 55 cm in diameter, but if they were ever common, nearly all have been removed. Most trees were cored on moist, cobbly terraces, several kilometers up the trail beyond the road end.

SITE AND COLLECTION INFORMATION

Site name *MOA PARK*
Country *NEW ZEALAND* **State or Province** *SOUTH ISLAND*
Latitude *40° 56'S* **Longitude** *172° 56'E* **Altitude** *1036 m*
Species collected *Libocedrus bidwillii*
Date of collection *3 January 1978*
Collectors *P.W.Dunwiddie, M.R.Boase*
No. of trees sampled *16* **No. of cores** *64* **No. of discs** *0*

Site description:

The forests around Moa Park in Abel Tasman National Park have abundant Libocedrus bidwillii in various size classes. The site is reached by hiking the trail from Canaan Downs, and trees were cored on the slopes just west of Moa Park. These Libocedrus, some estimated to exceed 35 m in height, are emergent from a moderately dense, multi-layered forest of Nothofagus menziesii (15-20 m), Dracophyllum traversii (10 m), and Griselinia littoralis (10 m). Understory shrubs of Coprosma, Phyllocladus, Pseudowintera, and Myrsine are common in the slightly (5°) north-sloping area. Soils appear well-developed and poorly drained. Disturbance appears slight, although grazing may occur in nearby areas, where dead and dying Libocedrus are abundant.

SITE AND COLLECTION INFORMATION

Site name *MT. CARGILL*
Country *NEW ZEALAND* **State or Province** *SOUTH ISLAND*
Latitude *45° 50'S* **Longitude** *170° 32'E* **Altitude** *576 m*
Species collected *Nothofagus menziesii*
Date of collection *10 May 1977*
Collectors *P.W.Dunwiddie, D.A.Campbell*
No. of trees sampled *7* **No. of cores** *26* **No. of discs** *0*

Site description:

The site is just north of the city of Dunedin, on the slopes of Mt. Cargill. Pinehill Road is followed to the television transmitting tower at the summit. Subsite I is about 100 m down the north side, below very dense shrubs regrowing after a burn. Libocedrus bidwillii, averaging 13 m tall, are emergent from 5 m tall shrubs, and appear to have been outside the burned area. Epiphytic mosses and ferns are abundant. The slope varies from 10° to 25°, with moderate soil development on an igneous substrate.

Subsite II is on a 20° east-southeast facing slope, south of the transmitting tower. Large (greater than 1 m dbh) Nothofagus menziesii are found in a limited stand about 0.5 km below the road. The trees have been studied previously by Alan Mark (Univ. of Otago), and some have labels. This is the only stand of N. menziesii in the area.

SITE AND COLLECTION INFORMATION

Site name *OMOEROA BRIDGE*
Country *NEW ZEALAND* **State or Province** *SOUTH ISLAND*
Latitude *43° 24'S* **Longitude** *170° 06'E* **Altitude** *274 m*
Species collected *Libocedrus bidwillii*
Date of collection *23 December 1977*
Collectors *P.W.Dunwiddie*
No. of trees sampled *15* **No. of cores** *59* **No. of discs** *0*

Site description:

Libocedrus bidwillii of various sizes are abundant on a very boggy terrace along the Omoeroa River. The site is just east of the bridge crossing the river, about 10 km from the town of Franz Josef. High voltage power lines cross the site in one area. Single-trunked individuals of Phyllocladus alpinus, up to 25 cm diameter, are scattered among the emergent Libocedrus. Coprosma, Pseudopanax, and other shrubs form dense thickets in some areas. Sphagnum is common in this poorly drained area.

SITE AND COLLECTION INFORMATION

Site name *OMOEROA BRIDGE*
Country *NEW ZEALAND* **State or Province** *SOUTH ISLAND*
Latitude *43° 24'S* **Longitude** *170° 06'E* **Altitude** *274 m*
Species collected *Phyllocladus alpinus*
Date of collection *23 December 1977*
Collectors *P.W.Dunwiddie*
No. of trees sampled *7* **No. of cores** *26* **No. of discs** *0*

Site description:

Libocedrus bidwillii of various sizes are abundant on a very boggy terrace along the Omoeroa River. The site is just east of the bridge crossing the river, about 10 km from the town of Franz Josef. High voltage power lines cross the site in one area. Single-trunked individuals of Phyllocladus alpinus, up to 25 cm diameter, are scattered among the emergent Libocedrus. Coprosma, Pseudopanax, and other shrubs form dense thickets in some areas. Sphagnum is common in this poorly drained area.

SITE AND COLLECTION INFORMATION

Site name *PEGLEG CREEK*
Country *NEW ZEALAND* **State or Province** *SOUTH ISLAND*
Latitude *42° 54'S* **Longitude** *171° 34'E* **Altitude** *915 m*
Species collected *Libocedrus bidwillii*
Date of collection *26 December 1977*
Collectors *P.W.Dunwiddie, M.R.Boase*
No. of trees sampled *12* **No. of cores** *43* **No. of discs** *0*

Site description:

Pegleg Creek is located 1.3 km north of the pass in Arthur's Pass National Park. Libocedrus bidwillii and Phyllocladus alpinus are scattered in the dense subalpine scrub above the bridge where the road crosses the creek. These trees are the highest elevation trees north of the pass. The slope is 20° - 60°, west to north-facing, with thin rocky soil. L. bidwillii are few and scattered up to 10 m tall, with generally sparse foliage and abundant rot. P. alpinus reach heights of 6 m, and are primarily single-trunked trees with full foliage.

SITE AND COLLECTION INFORMATION

Site name *RAHU SADDLE*
Country *NEW ZEALAND* **State or Province** *SOUTH ISLAND*
Latitude *42°18'S* **Longitude** *172°06'E* **Altitude** *672 m*
Species collected *Libocedrus bidwillii*
Date of collection *28 December 1977*
Collectors *P.W.Dunwiddie, M.R.Boase*
No. of trees sampled *14* **No. of cores** *55* **No. of discs** *0*

Site description:

Scattered Libocedrus bidwillii are found in predominantly Nothofagus solandri forest at Rahu Saddle, west of Springs Junction. They are emergent from the 12 m Nothofagus canopy, with generally narrow, compact crowns. Many individuals have cuts at the base from wood cutters, and several have been felled. The terrain is mostly level in the pass area, and very wet to boggy in places. The understory is fairly open, with young Nothofagus and Coprosma shrubs. Trees were cored on both sides of the road at the pass.

SITE AND COLLECTION INFORMATION

Site name *ST. ARNAUD BOG*
Country *NEW ZEALAND* **State or Province** *SOUTH ISLAND*
Latitude *41°47'S* **Longitude** *172°54'E* **Altitude** *710 m*
Species collected *Libocedrus bidwillii*
Date of collection *31 December 1977*
Collectors *P.W.Dunwiddie, M.R.Boase*
No. of trees sampled *9* **No. of cores** *35* **No. of discs** *0*

Site description:

A bog is located on the north side of the road to Blenheim, 5.3 km east of St. Arnaud. Scattered 16 m tall Libocedrus bidwillii are emergent from surrounding Nothofagus solandri, Griselinia littoralis, Elaeocarpus hookerianus, Leptospermum, Podocarpus hallii, and Phyllocladus alpinus. Sphagnum is common in the poorly drained area.

SITE AND COLLECTION INFORMATION

Site name *ST. ARNAUD TRACK*
Country *NEW ZEALAND* **State or Province** *SOUTH ISLAND*
Latitude *41°48'S* **Longitude** *172°52'E* **Altitude** *671 m*
Species collected *Libocedrus bidwillii*
Date of collection *31 December 1977*
Collectors *P.W.Dunwiddie, M.R.Boase*
No. of trees sampled *14* **No. of cores** *52* **No. of discs** *0*

Site description:

On the east side of Lake Rotoiti, a hiking trail climbs the St. Arnaud Range. About 1 km from the road end, a few Libocedrus bidwillii are found scattered south of the track in a boggy Nothofagus fusca, N. menziesii, and N. solandri forest. All Libocedrus in the area were cored. They are generally quite sound, and share the dense canopy with the Nothofagus. Disturbance appeared minimal, although the understory was quite open.

SITE AND COLLECTION INFORMATION

Site name *TE ANAU DAM*
Country *NEW ZEALAND* **State or Province** *SOUTH ISLAND*
Latitude *45°26'S* **Longitude** *167°42'E* **Altitude** *152 m*
Species collected *Nothofagus fusca*
Date of collection *15 December 1978*
Collectors *P.W.Dunwiddie, M.R.Boase*
No. of trees sampled *10* **No. of cores** *36* **No. of discs** *0*

Site description:

The Waiau River drains Lake Te Anau at the south end. This site is on a 25 m terrace on the west bank of the river, about 300 m below the dam. Nothofagus fusca and N. solandri var. solandri form a tight canopy at a height of 30-35 m. The understory is very open, with abundant moss indicating ample moisture. Both species are straight and tall, with little evidence of disturbance or injury. Two individuals of N. solandri var solandri were also cored at this site.

Plate 3. *Libocedrus bidwillii*, Omoeroa Bridge site, South Island.

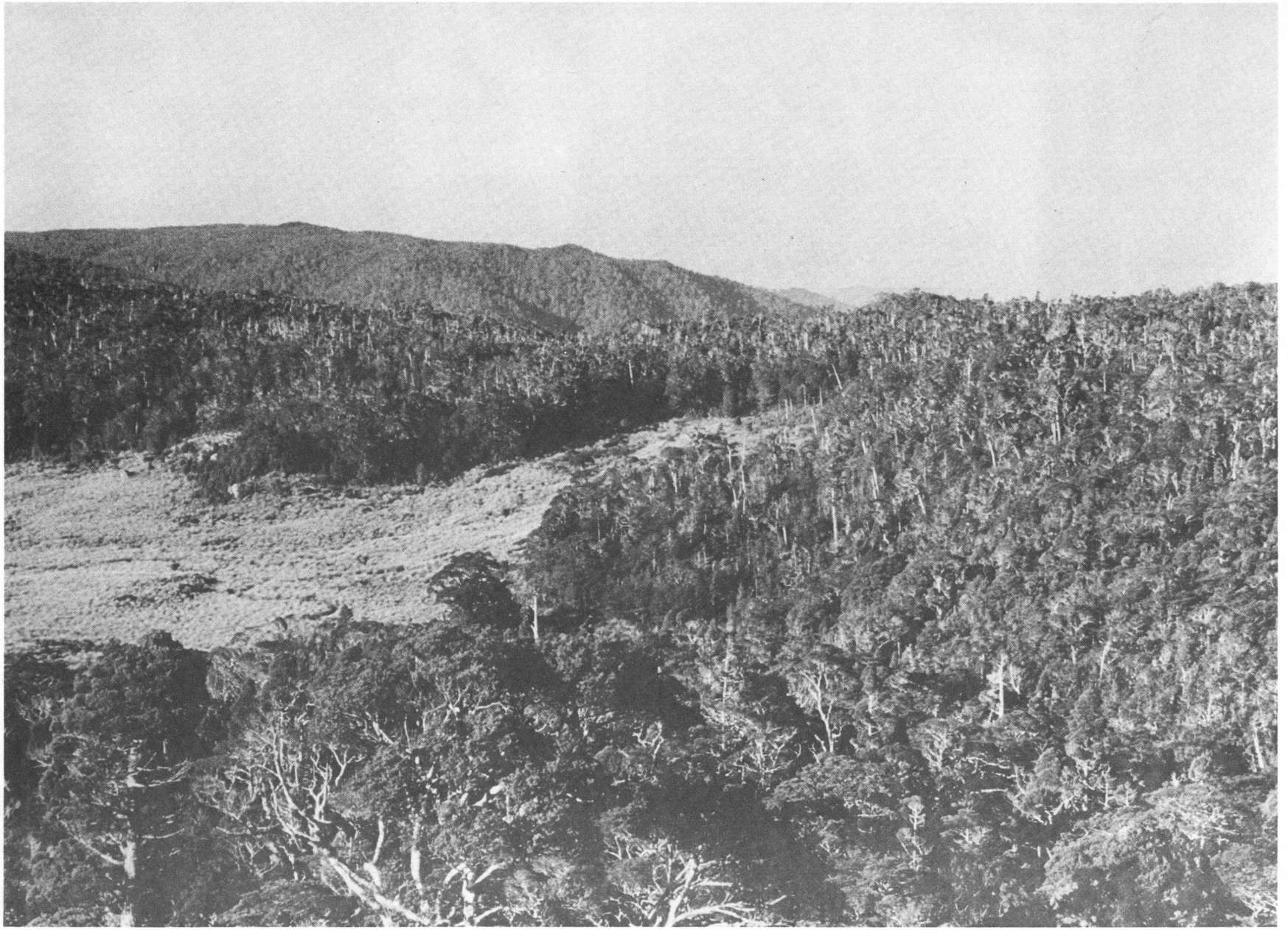

Plate 4. Moa Park site, South Island.

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