

# Otari BioBlitz: detailing vascular plants, mosses and liverworts

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## INTRODUCTION

To celebrate the centenary of Otari-Wilton's Bush the Trust Board carried out a BioBlitz. Members of the Wellington Botanical Society were involved in the planning and took responsibility for the vascular plants, liverworts, mosses and lichens. Others were responsible for fungi and algae, and for the mammal, bird, fish and insect life. In this report we give an outline of the planning and implementation of the Otari-Wilton's Bush BioBlitz held on 23/24 March 2007 and present a summary of the floristic outcome.



Figure 1. Otari-Wilton's bush looking east from the lookout at Cockayne Lawn.

Landcare Research had carried out a BioBlitz in Hagley Park, Christchurch, in 2005 and we were aware of several others in Auckland and in Minnesota. There are no rules for such enterprises. The general principle is to find as many species of flora and fauna as possible, in a predetermined area, in a 24-hour period.

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## VEGETATION AND INFLUENCES

Otari-Wilton's Bush consists of about 100 hectares of mainly native bush of which 5 to 7 hectares are formal planting. The reserve, at latitude 41°S, is on hill slopes in the catchment of the Kaiwharawhara Stream. The stream flows generally north-east within Otari. The valley sides rise from about 70 to 280 metres above sea level. The underlying rock is greywacke. There are several side streams cutting through on the north side of the main valley giving well shaded gullies. Generally east/west earthquake faulting has resulted in small waterfalls in some of the side gullies.

Originally, Otari was predominantly podocarp-hardwood forest and kohekohe semi-coastal forest (Reid 1996). On the lower slopes there is now regenerating forest with substantial trees and with some emergent older podocarps and rewarewa (Fig. 1). On the higher south-facing slopes of the main valley the regeneration is less advanced with shrubs to around 2 m tall.

Otari has a temperate climate with occasional frosts in open areas. Average annual rainfall in the period 1971–2000 at nearby Kelburn was 1,249 mm. Wind has not had a great influence, however, windfall damage does occur spasmodically in the valley. Wind sheer of the vegetation on the higher north slopes is apparent. Although Otari is inland, Stan Reid (1989 p. 114) noted that some of his plots were affected by 'blasting salt laden southerly winds'. This is not now apparent to the casual observer.

Felling and clearing during the second half of the 19th century resulted in the removal of larger trees and nikau. From 1840, timber was taken for building and fencing whilst nikau was cut to supply firewood. The bush on the ridges and spurs was burnt off when the land was cleared for farming but the bush in the gullies survived. Job Wilton, an early land owner on the Tinakori Hill side of the Kaiwharawhara Stream, turned much of the bush into pasture from 1860 onwards. He retained 11 acres of forest intact around the house and cow paddock. This forms the mature forest to the west of Churchill Drive between the stream and Wilton Road, described by Myers (1985) as near virgin rimu-tawa forest. Deeper valleys on the north-west side of the stream, such as the Bledisloe Gorge, also retain remnants of the original forest.

The first block of land that now makes up Otari was "*set apart in 1927 by the Wellington City Council as a reserve for planting within its boundaries of as complete a collection as possible of the indigenous plants of the New Zealand Botanical Region*" (Cockayne 1932, p.1).

Farming on the northern boundary now has minimal impact, although animal intrusion in the past did reduce palatable species. Possum control was instigated by Leonard Cockayne in 1928—possibly the earliest such programme in a reserve (Nightingale and Dingwall 2003). Whilst periodic control has kept numbers down, palatable plants, such as *Pseudopanax* and *Schefflera*, are not as well represented as they might be.

The urban neighbours on two sides of Otari have contributed a good representation of garden plants and weeds. This is especially so at the eastern end where garden waste has entered the headwaters of the MacKenzie Burn and been carried downstream to the pathed areas of the reserve. This has occurred to a lesser extent where the Kaiwharawhara Stream enters the reserve from the old tip face at the south-western end of Otari. Another source of weeds is bird-carried from uncontrolled barberry on nearby reserves such as Johnson Hill. Within the Otari Reserve, kererū (NZ pigeon) have helped spread karaka.

The early management plans for Otari proposed it as a repository of representative ecosystems from around New Zealand (Cockayne 1932). This has led to planting of species in the bush which are not represented in the Wellington area. Examples of the more persistent species of these plantings are the kauri and beech above the flax patch, *Elatostema rugosum* in the stream below the Information Centre and, more recently, a full representation of New Zealand beeches on the slope to the north-east of Wilton House.

## **THE BIOBLITZ AT OTARI**

The area chosen for this BioBlitz was the natural area of Otari-Wilton's Bush, excluding the formally planted areas and the nursery. The declared aim was two-fold: to increase public awareness and to generate scientific knowledge.

Public awareness centred on informing people of the variety of life in an area contiguous with the city and to show how the biodiversity in our own backyard provides us with clean air and controlled water run off when it forms a healthy, functioning ecosystem.

The collection of information on what is growing in a specific area provides information necessary for resource management. A BioBlitz may also identify unique aspects of the area that might not otherwise be known and identify species that should be monitored or controlled.

### **Planning and preparation**

In August 2006 the secretary of the Otari-Wilton's Bush Trust outlined the proposal for a BioBlitz to a meeting of the Wellington Botanical Society. In September, a meeting was convened at Victoria University and the initial allocation of responsibility for the scientific aspects was made under the leadership of Professor Phil Garnock-Jones. Phil continued in the role of science leader for the whole project.

Wellington Botanical Society took responsibility for the vascular and cryptogam flora, led by Rodney Lewington. The first steps were to establish what we already knew about the botany of the area and to set up teams to handle groups of taxa. Decisions were made on how to proceed prior to the BioBlitz and on the day.



Figure 2. In the lab, Rudi Schnitzler points out an entry on the screen to Joe Zuccarello, Lisa Bryant, and Eleanor Burton. Photo: Tim O'Leary.

This included preparation of lists of what was known to be in the area, determining who would look for what, and where. As the BioBlitz date got closer databases were prepared and loaded ready to portray data as the day proceeded. This was necessary both to keep a running total of the count of reported species and to generate lists of plants that were known from Otari but had not been found so far on the day.

The native vascular plants have been well recorded although a few species were added to previously prepared lists in the month leading up to 23 March. Exotic vascular plants, mosses, liverworts and lichens were less well known. Small groups of experts each made several excursions to Otari, both to list species and to get to know where to look “on the day”. (Since there are no rules this was not considered unsporting.)

The vascular plant lists we worked from were based on the most recent published list (Myers 1985, Wellington City Council 1975 and 1987) and unpublished lists prepared by local botanists as well as the database maintained by staff at Otari (see Appendix).

Most of the historical moss records for Otari-Wilton's Bush derive from a bryophyte survey conducted by Ruth Mason in 1939. Her investigation was co-authored by G. O. K. Sainsbury and E. A. Hodgson, who, respectively, identified the mosses and liverworts. This unpublished document of Botany Division, DSIR (Mason *et al.* 1941) listed 79 mosses and records distribution on various substrates in four major habitats: open ground, dry bush, bush and wet bush. The survey was conducted over four days and sampled the major streams and tracks. The Te Papa herbarium (WELT) subsequently acquired, with the Sainsbury herbarium, voucher specimens for most of these records.

For the purpose of the BioBlitz, moss records in WELT were taken as a baseline. The historical records, together with more recent collections before the BioBlitz, had increased the total to 92 with a further six added during the BioBlitz. Recent access to Mason's list adds a further five mosses to the list (see Appendix), all recorded as from open ground.

Liverwort and lichen lists initially drew on herbarium records at Te Papa, and were substantially added to during preparation for the BioBlitz. The unpublished DSIR list, referred to above, (Mason *et al.* 1941) has been sighted since the BioBlitz. Additional liverwort species from this paper have been included in the Appendix but not included in the tables and discussion in the body of this paper.

By the week before BioBlitz the lists had all been prepared and entered in the computer. Printed lists were prepared for field recorders to use and our President had determined where each field group would go in the initial search.

The lab was in the Otari school hall adjacent to the reserve, and it was here that microscopes, reference material and the map to record areas visited were assembled on the morning of 23 March. The school hall was used as the control centre for both fieldwork and computer entry (Fig. 2).

At 2.30 p.m. on 23 March the field teams assembled on the Cockayne Lawn and, after some speeches, moved into the field. Most stayed out until dusk. The lists of reported species were entered into the database and by first light on the next day the lists of “missing” native and exotic vascular plants were ready for the field parties to take out. Mobile phones proved their worth with the last few finds from the higher slopes being phoned in ten minutes before the close-off at 3.00 p.m. on 24 March.

A few vascular species were not identified in the field and specimens were brought back to the “lab” for identification by experts on particular taxon groups. Lab work was necessary to identify many of the cryptogams so it was microscope work for those experts.

For the public awareness aspect, the Wellington Botanical Society members prepared a series of posters covering the history and the forest structure of Otari-Wilton’s Bush as well as posters on each of the taxon groups. These posters were hung in the “lab” and later used in the Information Centre at Otari. Preparation of the posters required some research and several walks in Otari to obtain illustrative photographs.

Several members gave Powerpoint presentations during the day and took groups on short excursions into the bush. There was also a steady, if small, stream of interested people who visited the “lab”. A few “set pieces” showing the smallest liverwort and the largest moss and a selection of lichens provided interest. Some visitors were encouraged to look down the microscopes.

Two trees were climbed to provide information on epiphytes. This activity proved to be popular with the public as well as yielding quite a number of mosses, liverworts and lichens and some animals.

The running total of all species was projected onto a screen in the lab and in the Otari-Wilton’s Bush Information Centre where there were other displays.

## RESULTS

The tally of species identified during the 24 hours of the BioBlitz was 1,345 taxa of flora and fauna within the natural area of Otari-Wilton's Bush. The flora component (excluding algae) of this total is shown in Table 1.

Fig. 3 shows that for most plant groups, new records were added to the list, with the greatest number of additions being to the adventive herbs and grasses.

Table 1. Number of taxa identified in each plant group during the BioBlitz at Otari-Wilton's Bush.

| Flora                     | Number     |
|---------------------------|------------|
| Native vascular plants    | 208        |
| Adventive vascular plants | 153        |
| Mosses                    | 73         |
| Liverworts and hornworts  | 51         |
| Lichens                   | 10         |
| <b>Total</b>              | <b>495</b> |

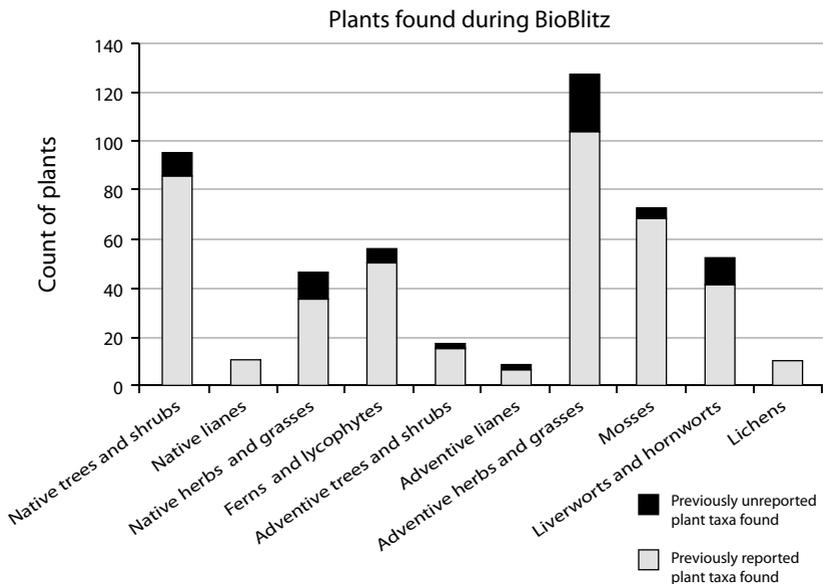


Figure 3. Relative proportions of previously reported and unreported taxa found during the BioBlitz at Otari-Wilton's Bush.



Figure 4. *Veronica javanica*. Photos: Phil Garnock-Jones.

The most significant find was *Veronica javanica*, a species not only new to Otari but a new adventive record for New Zealand (Anon. 2007), collected and identified by Prof. Phil Garnock-Jones (Fig. 4).

One new liverwort discovery for the Wellington area was *Marchantia polymorpha* subsp. *ruderalis*. This northern hemisphere subspecies was first noted in the nursery and later found in the bush area. Subsequently it has been reported from other parts of Wellington.

No new lichens were added to the list during the BioBlitz because effort was expended on collecting (especially via climbing into the tree tops) and identification involves painstaking microscope work. A total of 70 lichen species were identified in the three months leading up to the BioBlitz and 10 of these species were recorded on the day, these being distinctive foliose and fruticose species that can be readily identified. In total about 170 lichen species have been identified from Otari-Wilton's Bush but there are many still to be identified.

A full list of all vascular plants, mosses, liverworts and hornworts from Otari-Wilton's Bush is presented in the Appendix. Species found and identified during the BioBlitz are indicated with "Bb". Species that are recorded as, or otherwise known to have been, planted are noted with "P". The number of

plants listed in the Appendix does not tally with the numbers recorded during the BioBlitz. The rules adopted for the BioBlitz were that unidentified species could be recorded as such, e.g., *Uncinia* sp. #1, *Uncinia* sp. #2. However, while the material was sufficient for this purpose, it wasn't sufficient in some cases for positive identification subsequently because it was solely vegetative material, so some of these entries have been deleted. Plant species noted subsequent to the BioBlitz have been included in the Appendix.

## DISCUSSION

### Features of the flora

The number of native vascular plants found during the BioBlitz exceeds the number of exotic vascular plants by approximately 50. Two factors account for the balance favouring native species. Firstly, at least 25 of the native species recorded are known to have been planted, e.g., *Agathis australis*, *Nothofagus fusca*, *Cortaderia fulvida*. Secondly, some of the exotic species may have been eradicated, e.g., *Euonymus japonicus*, *Elaeagnus ×reflexa*. Species such as Darwin's barberry (*Berberis darwinii*) and wandering willie (*Tradescantia fluminensis*) have been actively controlled although are still present. Both species were recorded by Stan Reid (1996) as being particularly aggressive and requiring control. Myers (1985) also noted the need for control of adventive plants, particularly Darwin's barberry. She listed just five adventive species: onion weed (*Allium triquetrum*), Darwin's barberry, *Selaginella kraussiana*, wandering willie and gorse (*Ulex europaeus*), all of which were recorded during the BioBlitz.

The timing of the BioBlitz was not ideal for observation of geophytic orchids but it was reasonably good for other monocot groups. The team lacked specialist expertise in these groups and that probably explains the smaller than expected number of species. Future investigation and collection effort should focus on native and adventive monocots in all groups with orchids being targeted in spring/summer and other monocots in summer/autumn.

The list in the Appendix has increased the number of native vascular plants upon the previous published list (Myers 1985) by almost 50 species. The number of adventive species is substantially greater but that was to be expected as the records compiled by Myers (1985) were from reports that placed little emphasis on adventives other than the most obvious invasive species.

During the BioBlitz six additions were made to the previously recorded mosses, giving a total of 103. The total and species composition are not unexpected for this relatively dry coastal forest in the Wellington Ecological District. It is perhaps significant that about 50% of the recent additions have been epiphytes, including *Cryphaea* species (2), and *Macromitrium* (3), which are generally not abundant or conspicuous elements of the flora in the reserve. Other additions have included some of the smaller mosses of stream

and trackside soil banks such as *Fissidens* species (4) and *Distichophyllum* (2). Given the number of records recently added, further exploration is likely to add more.

There are currently 96 liverworts and 2 hornworts identified from Otari-Wilton's Bush. Further work will identify more. The occasionally dry spells in Otari result in a lack of the larger species that can be found in those parts of the Wellington district where moisture is more persistent. *Schistochila* and *Lepidozia* are notably missing from the Otari record and there is only one collection of *Balantiopsis*. On the other hand, the conditions appear to favour *Radula* which is plentiful in Otari and represented by six species.

Some harder to access parts of Otari-Wilton's Bush may yield new records, particularly of the nonvascular species. The microclimate varies considerably throughout the reserve, providing different habitats for plants.

### **Value of the BioBlitz**

The data presented in Fig. 3 show clearly that despite considerable effort being put into compilation of lists prior to the 24 hours of the BioBlitz, concerted effort by teams of people dedicated to observation resulted in many additions to the lists. A total of 66 previously unreported taxa were found during the BioBlitz, 24 of which were adventive herbs and grasses, and 11 being native herbs and grasses. This outcome substantiates the old observation that the distribution of plant species reflects the distribution of plant collectors and, in the case of the BioBlitz, the collection effort.

BioBlitzes are an effective way of determining the biodiversity of a place and in doing so can indicate where there might be deficiencies and therefore a need for remedial management or where there is particularly rich or unique diversity that gives a place extra value. They are therefore a useful event for managers of those places. We're not so sure how much the BioBlitz may have raised the profile of biodiversity with the public. The event received a pleasing amount of media coverage but we have no way of knowing what influence the coverage or the event itself had on helping people to understand the value of biodiversity.

### **FUTURE**

Members of the Wellington Botanical Society continue to work on the cryptogams of Otari-Wilton's Bush and additional vascular plants are certain to be noticed in the future. Some areas on the higher northern slopes above the Blue Trail and the higher catchment of the MacKenzie Burn and Bledisloe Stream remain to be explored.

The Appendix to this paper will be held on the Wellington Botanical Society website ([www.wellingtonbotsoc.wellington.net.nz](http://www.wellingtonbotsoc.wellington.net.nz)) and will be updated periodically as work proceeds. It is intended to add lichens to the website once work on these is further advanced.

## ACKNOWLEDGEMENTS

The BioBlitz was a cooperative effort with many organisations and individuals providing funds, time and expertise. We are grateful to all of these for making the project successful.

From the botanical side we are particularly grateful to all the staff of Otari-Wilton's Bush who helped in many ways. Rewi Elliot provided permits and advice, Eleanor Burton handled the computing entry and processing on the day and suggested places to look for species not found on the first sorties. Other staff assisted with setting up the laboratory and provided assistance in the field.

Members of the Otari-Wilton's Bush Trust planned and managed the infrastructure of the BioBlitz and provided food and drink. The Otari School allowed the use of their hall and classrooms.

Twenty seven Wellington Botanical Society members assisted during the 24 hours, making sorties into the bush to find species on the prepared lists and to identify others. Others members willingly provided help prior to the BioBlitz by updating and checking plant lists. Our sincere thanks to all of these. In particular:

- Bev Abbott allocated areas to be covered by each field team to ensure that all of the natural bush was covered. She also played a major part in the preparation of posters;
- Chris Horne and Barbara Mitcalfe led the groups responsible for native vascular plants;
- Phil Garnock-Jones, Barry Sneddon and Carol West took care of adventive vascular plants;
- Patrick Brownsey and Leon Perrie covered ferns and lycophytes;
- Jayden van Horik led the tree climbing team;
- For the cryptogams, lichens were handled by Barbara Polly and liverworts by Rodney Lewington. Peter Beveridge covered mosses, obtained moss information from the Te Papa database and tracked down the document by Mason *et al.* (1941).
- We thank Bryony Macmillan, research associate, and Tanya Webster, librarian, Landcare Research, Lincoln, for assistance in locating the 1941 Mason *et al.* document.

The Wellington Botanical Society contributed the cost of posters. Major funding was from Wellington City Council who provided an Environmental Grant and other funding assistance.

Special thanks are due to Prof. Phil Garnock-Jones of Victoria University of Wellington who led the science teams, provided microscopes and other equipment and reviewed an earlier version of this paper.

## APPENDIX

**Vascular plants, mosses and liverworts in the bush area of Otari-Wilton's Bush**

This list is of all plants ever recorded in Otari-Wilton's Bush, excluding the formal planted areas and nursery. It is annotated to show those recorded at the BioBlitz held on 23/24 March 2007. "Bb" in the first column indicates that the species was found and identified during the BioBlitz. "P" indicates species that are known or believed to have been planted.

|  |      |  |
|--|------|--|
| <b>Native gymnosperms</b>                              | Bb   | <i>Coprosma rhamnoides</i>                                     |
| Bb P <i>Agathis australis</i>                          |      | <i>Coprosma rigida</i>   |
| Bb <i>Dacrycarpus dacrydioides</i>                     | Bb   | <i>Coprosma robusta</i>  |
| Bb <i>Dacrydium cupressinum</i>                        | Bb   | <i>Coprosma rotundifolia</i>                                   |
| Bb P <i>Libocedrus bidwillii</i>                       | Bb   | <i>Coriaria arborea</i>  |
| P <i>Phyllocladus glaucus</i>                          | Bb   | <i>Corokia cotoneaster</i> <sup>2</sup>                        |
| Bb P <i>Phyllocladus trichomanoides</i>                | Bb   | <i>Corynocarpus laevigatus</i>                                 |
| <i>Podocarpus hallii</i>                               | Bb P | <i>Dodonaea viscosa</i>  |
| Bb <i>Podocarpus totara</i>                            | Bb   | <i>Dysoxylum spectabile</i>                                    |
| Bb <i>Prumnopitys ferruginea</i>                       | Bb   | <i>Elaeocarpus dentatus</i>                                    |
| Bb <i>Prumnopitys taxifolia</i>                        | Bb   | <i>Elaeocarpus hookerianus</i>                                 |
| <b>Native monocot trees</b>                            | Bb   | <i>Entelea arborescens</i>                                     |
| Bb <i>Cordyline australis</i>                          | Bb   | <i>Fuchsia excorticata</i>                                     |
| Bb <i>Rhopalostylis sapida</i>                         |      | <i>Gaultheria antipoda</i>                                     |
| <b>Native dicot trees and shrubs</b>                   | Bb   | <i>Geniostoma ligustrifolium</i> var.<br><i>ligustrifolium</i> |
| Bb P <i>Ackama rosifolia</i> <sup>1</sup>              | Bb P | <i>Griselinia littoralis</i>                                   |
| Bb <i>Alectryon excelsus</i>                           | Bb   | <i>Griselinia lucida</i>                                       |
| Bb <i>Aristotelia serrata</i>                          | Bb   | <i>Hedycarya arborea</i>                                       |
| Bb <i>Beilschmiedia tawa</i>                           | Bb   | <i>Hoheria ovata</i>   |
| Bb <i>Brachyglottis repanda</i> var.<br><i>repanda</i> | Bb   | <i>Hoheria populnea</i>  |
| Bb <i>Carpodetus serratus</i>                          | Bb   | <i>Knightia excelsa</i>  |
| Bb <i>Coprosma areolata</i>                            | Bb   | <i>Kunzea ericoides</i> var. <i>ericoides</i>                  |
| Bb <i>Coprosma crassifolia</i>                         | Bb   | <i>Laurelia novae-zelandiae</i>                                |
| Bb <i>Coprosma grandifolia</i>                         | Bb   | <i>Leptospermum scoparium</i>                                  |
| <i>Coprosma linariifolia</i>                           | Bb   | <i>Leucopogon fasciculatus</i>                                 |
| Bb <i>Coprosma lucida</i>                              | Bb   | <i>Lophomyrtus bullata</i>                                     |
| Bb <i>Coprosma propinqua</i>                           |      | <i>Lophomyrtus obcordata</i>                                   |
| Bb <i>Coprosma propinqua</i> × <i>robusta</i>          | Bb   | <i>Macropiper excelsum</i> subsp.<br><i>excelsum</i>           |
| Bb <i>Coprosma repens</i>                              | Bb   | <i>Melicope simplex</i>  |

1. The only *Ackama rosifolia* tree known is on the boundary between the native and planted areas.

2. We have found no previous record of *Corokia cotoneaster* being in the natural area of Otari-Wilton's bush. The specimen reported in the BioBlitz may have been planted. More probably it is self-sown from the planted area of Otari or from adjacent areas since it has been reported as self-sown in the Karori Sanctuary (Chris Horne, pers. comm.).

|      |   |                              |                                  |
|------|---|------------------------------|----------------------------------|
| Bb   | <i>Melicope ternata</i>                                 | Bb                           | <i>Raukaua anomalus</i>          |
| Bb   | <i>Melicope simplex</i> × <i>M. ternata</i>             | Bb                           | <i>Raukaua edgerleyi</i>         |
| Bb   | <i>Melicytus ramiflorus</i> subsp.<br><i>ramiflorus</i> | Bb                           | <i>Raukaua simplex</i>           |
| Bb   | <i>Metrosideros robusta</i>                             | Bb                           | <i>Schefflera digitata</i>       |
| Bb   | <i>Myoporum laetum</i>                                  | Bb                           | <i>Solanum laciniatum</i>        |
| Bb   | <i>Myrsine australis</i>                                | Bb P                         | <i>Sophora microphylla</i>       |
| Bb   | <i>Myrsine salicina</i>                                 | Bb                           | <i>Streblus banksii</i>          |
| Bb   | <i>Neomyrtus pedunculata</i>                            | Bb                           | <i>Streblus heterophyllus</i>    |
| Bb   | <i>Nestegis cunninghamii</i>                            |                              | <i>Syzygium maire</i>            |
| Bb   | <i>Nestegis lanceolata</i>                              | Bb P                         | <i>Teucrium parvifolium</i>      |
| Bb   | <i>Nestegis montana</i>                                 | Bb                           | <i>Urtica ferox</i>              |
| Bb P | <i>Nothofagus fusca</i>                                 | Bb P                         | <i>Veronica diosmifolia</i>      |
| Bb P | <i>Nothofagus menziesii</i>                             | Bb                           | <i>Veronica parviflora</i>       |
| Bb P | <i>Nothofagus solandri</i> var. <i>solandri</i>         | Bb                           | <i>Veronica stricta</i>          |
| Bb P | <i>Nothofagus truncata</i>                              | Bb                           | <i>Weinmannia racemosa</i>       |
| Bb P | <i>Olearia albida</i>                                   | <b>Native monocot lianes</b> |                                  |
| Bb   | <i>Olearia furfuracea</i>                               | Bb                           | <i>Freycinetia banksii</i>       |
| Bb P | <i>Olearia paniculata</i> <sup>3</sup>                  | Bb                           | <i>Ripogonum scandens</i>        |
| Bb   | <i>Olearia rani</i>                                     | <b>Native dicot lianes</b>   |                                  |
| Bb P | <i>Olearia solandri</i>                                 | Bb                           | <i>Clematis forsteri</i>         |
| Bb   | <i>Ozothamnus leptophyllus</i>                          | Bb                           | <i>Clematis paniculata</i>       |
| Bb   | <i>Pennantia corymbosa</i>                              | Bb                           | <i>Metrosideros diffusa</i>      |
| Bb P | <i>Peraxilla tetrapetala</i> <sup>4</sup>               | Bb                           | <i>Metrosideros fulgens</i>      |
| Bb   | <i>Pittosporum cornifolium</i>                          | Bb                           | <i>Metrosideros perforata</i>    |
| Bb   | <i>Pittosporum eugenioides</i>                          | Bb                           | <i>Muehlenbeckia australis</i>   |
| Bb   | <i>Pittosporum ralphii</i>                              |                              | <i>Muehlenbeckia complexa</i>    |
| Bb   | <i>Pittosporum tenuifolium</i>                          | Bb                           | <i>Parsonsia heterophylla</i>    |
| P    | <i>Pittosporum umbellatum</i>                           | Bb                           | <i>Passiflora tetrandra</i>      |
| Bb P | <i>Pittosporum cultivars</i>                            | Bb                           | <i>Rubus cissoides</i>           |
| Bb P | <i>Pomaderris apetala</i>                               | <b>Native lycophytes</b>     |                                  |
| Bb P | <i>Pomaderris kumerahou</i>                             | Bb                           | <i>Huperzia varia</i>            |
| Bb   | <i>Pseudopanax arboreus</i> var.<br><i>arboreus</i>     |                              | <i>Lycopodium volubile</i>       |
| Bb   | <i>Pseudopanax crassifolius</i>                         | <b>Native ferns</b>          |                                  |
| Bb   | <i>Pseudopanax crassifolius</i><br>hybrids <sup>5</sup> | Bb                           | <i>Adiantum cunninghamii</i>     |
| Bb   | <i>Pseudowintera axillaris</i>                          |                              | <i>Adiantum diaphanum</i>        |
|      |   |                              | <i>Adiantum viridescens</i>      |
|      |   | Bb                           | <i>Anarthropteris lanceolata</i> |

3. BioBlitz field records note this species as planted. The previous lists of plants do not record *Olearia paniculata* in the native bush (Wellington City Council 1987). The species is widespread in the North Island and could well be growing naturally in the bush area.

4. With no *Quintinia* or *Nothofagus* growing naturally in Otari it seems unlikely that *Peraxilla tetrapetala* would have been there naturally or survived possum browsing. Over the past decade several attempts have been made to grow this from seed. A single successful implant from 2001 is on black beech.

5. *Pseudopanax crassifolius* hybrids are found in several places in the bush area. It is suggested that they are the result of crossing with species in gardens adjacent to Otari.



Bb *Gahnia pauciflora*  
 Bb *Isolepis prolifer*  
 Bb *Luzula banksiana*  
 Bb *Uncinia banksii*  
 Bb *Uncinia scabra*  
 Bb *Uncinia* sp.  
 Bb *Uncinia uncinata*

**Native grasses**

Bb *Anemanthele lessoniana*  
 Bb P *Cortaderia fulvida*  
     *Cortaderia toetoe*  
     *Dichelachne crinita*  
 Bb *Microlaena avenacea*  
     *Microlaena stipoides*  
 Bb *Rytidosperma gracile*

**Native remaining monocots**

Bb *Astelia solandri*  
     *Astelia fragrans*  
 Bb *Collospermum hastatum*  
 Bb *Dianella nigra*  
 Bb *Juncus pallidus*  
 Bb *Juncus planifolius*  
 Bb *Libertia grandiflora*  
 Bb *Luzula picta* var. *picta*  
 Bb P *Phormium cookianum*  
 Bb *Phormium tenax*

**Native composite herbs**

Bb *Euchiton sphaericum*  
     *Helichrysum filicaule*  
 Bb *Pseudognaphalium luteo-album*  
 Bb *Senecio minimus*

**Native dicot herbs (other than composite herbs)**

Bb *Acaena anserinifolia*  
 Bb *Arthropodium cirratum*  
 Bb *Australina pusilla*  
 Bb *Cardamine debilis*  
     *Centella uniflora*  
     *Dichondra repens*  
 Bp P *Elatostema rugosum*<sup>7</sup>  
 Bb *Epilobium nummularifolium*  
     *Epilobium pubens*

Bb *Epilobium rotundifolium*  
 Bb *Haloragis erecta*  
     *Hydrocotyle americana*  
     *Hydrocotyle dissecta*  
     *Hydrocotyle elongata*  
     *Hydrocotyle heteromeria*  
     *Hydrocotyle moschata*  
 Bb *Hydrocotyle novae-zelandiae*  
 Bb *Ranunculus reflexus*  
 Bb *Stellaria parviflora*  
 Bb *Urtica ferox*  
 Bb *Urtica incisa*  
     *Wahlenbergia ramosa*  
 Bb *Wahlenbergia violacea*

**Adventive gymnosperm trees and shrubs**

*Cupressus macrocarpa*  
 Bb *Pinus radiata*

**Adventive dicot trees and shrubs**

*Acacia longifolia*  
*Acacia melanoxylon*  
 Bb *Acer pseudoplatanus*  
     *Alnus glutinosa*  
 Bb *Berberis darwinii*  
 Bb *Buddleja davidii*  
     *Buddleja salviifolia*  
 Bb *Chamaecytisus palmensis*  
     *Cotoneaster glaucophyllus*  
     *Crataegus monogyna*  
 Bb *Cyphomandra betacea*  
 Bb *Cytisus scoparius*  
     *Dendrobenthamia capitata*  
     *Eleagnus* × *reflexa*  
 Bb *Escallonia rubra*  
     *Euonymus japonicus*  
     *Fatsia japonica*  
 Bb *Hypericum androsaemum*  
     *Ilex aquifolium*  
     *Ligustrum lucidum*  
 Bb *Ligustrum vulgare*  
     *Myoporum* aff. *insulare*  
     *Prunus avium*  
 Bb *Prunus campanulata*

7. This has been recorded here as planted. In the Wellington City Council *Guide to native plants* 1987 it is recorded as growing in Otari Bush. It seems unlikely that it would be growing naturally in Otari although H.H. Allan (1961, p. 406) has it growing locally in the southern part of the Tararua Ranges.

- Bb *Prunus laurocerasus*  
 Bb *Prunus serrulata*  
*Quercus ilex*  
*Quercus robur*  
*Rhododendron ponticum*  
*Salix fragilis*  
*Sambucus nigra*  
 Bb *Teline monspessulana*  
 Bb *Teline stenopetala*  
 Bb *Ulex europaeus*  
 Bb *Ulmus* sp.

**Adventive dicot lianes**

- Bb *Acetosa sagittata*  
 Bb *Aphanopetalum resinosum*  
 Bb *Calystegia silvatica*  
 Bb *Clematis vitalba*  
 Bb *Convolvulus arvensis*  
*Dioscorea communis*  
 Bb *Hedera helix* subsp. *helix*  
*Jasminum polyanthum*  
*Lathyrus latifolius*  
 Bb *Lonicera japonica*  
 Bb *Rubus fruticosus* agg.  
*Senecio mikanioides*  
*Solanum jasminoides*

**Adventive lycophytes**

- Bb *Selaginella kraussiana*

**Adventive ferns**

- Dryopteris filix-mas*

**Adventive grasses**

- Bb *Agrostis capillaris*  
 Bb *Agrostis stolonifera*  
 Bb *Anthoxanthum odoratum*  
 Bb *Arrhenatherum elatius*  
 Bb *Bambusa multiplex*  
 Bb *Briza maxima*  
*Briza minor*  
 Bb *Bromus hordeaceus*  
 Bb *Bromus willdenowii*  
*Cortaderia selloana*  
 Bb *Cynodon dactylon*  
 Bb *Cynosurus cristatus*  
 Bb *Dactylis glomerata*  
 Bb *Ehrharta erecta*  
 Bb *Festuca rubra*  
 Bb *Holcus lanatus*

- Bb *Lolium perenne*  
*Phyllostachys* sp.  
 Bb *Poa annua*  
*Poa pratensis*  
*Pseudosasa japonica*  
 Bb *Schedonorus arundinaceus*  
*Stenotaphrum secundatum*

**Adventive sedges**

- Cyperus albostriatus*  
 Bb *Cyperus eragrostis*  
 Bb *Juncus articulatus*  
 Bb *Juncus bufonius*  
 Bb *Juncus effusus*

**Adventive monocot herbs (other than orchids, grasses, sedges and rushes)**

- Agapanthus praecox*  
 Bb *Allium triquetrum*  
 Bb *Crocosmia ×crocsmiiflora*  
 Bb *Iris foetidissima*  
*Iris germanica*  
*Lilium tigrinum*  
 Bb *Sisyrinchium iridifolium*  
 Bb *Sisyrinchium* sp. (yellow)  
 Bb *Tradescantia fluminensis*  
*Zantedeschia aethiopica*

**Adventive composite herbs**

- Bb *Bellis perennis*  
 Bb *Carduus pycnocephalus*  
 Bb *Chrysanthemoides monilifera*  
 Bb *Cirsium vulgare*  
 Bb *Conyza bilbaoana*  
 Bb *Conyza sumatrensis*  
 Bb *Cotula australis*  
 Bb *Crepis capillaris*  
 Bb *Erigeron karvinskianus*  
 Bb *Gnaphalium* sp.  
 Bb *Hypochoeris radicata*  
 Bb *Lapsana communis*  
 Bb *Leontodon taraxacoides*  
 Bb *Leucanthemum vulgare*  
 Bb *Matricaria dioscoidea*  
 Bb *Picris echioides*  
*Senecio bipinnatisectus*  
 Bb *Senecio glastifolius*  
 Bb *Senecio jacobaea*  
 Bb *Senecio vulgaris*

Bb *Sonchus oleraceus*  
 Bb *Taraxacum officinale*

**Adventive dicot herbs (other than composite herbs)**

Bb *Achillea millefolium*  
 Bb *Anagallis arvensis*  
 Bb *Angelica pachycarpa*  
 Bb *Brassica fruticulosa*  
 Bb *Brassica rapa*  
 Bb *Calceolaria tripartita*  
 Bb *Callitriche stagnalis*  
 Bb *Capsella bursa-pastoris*  
 Bb *Cardamine flexuosa*  
 Bb *Cedronella canariensis*  
 Bb *Centaurium erythraea*  
 Bb *Centranthus ruber*  
 Bb *Cerastium glomeratum*  
 Bb *Cerastium* sp.  
 Bb *Chenopodium album*  
 Bb *Conium maculatum*  
 Bb *Coronopus didymus*  
 Bb *Cymbalaria muralis*  
 Bb *Digitalis purpurea*  
 Bb *Epilobium ciliatum*  
 Bb *Epilobium* sp.  
 Bb *Erodium moschatum*  
 Bb *Euphorbia pepus*  
 Bb *Foeniculum vulgare*  
 Bb *Fumaria muralis*  
 Bb *Galinsoga parviflora*  
 Bb *Galium aparine*  
 Bb *Geranium molle*  
 Bb *Geranium robertianum*  
 Bb *Impatiens glandulifera*  
 Bb *Lamium purpureum*  
 Bb *Linaria purpurea*  
 Bb *Lotus angustissimus*  
 Bb *Lotus pedunculatus*  
 Bb *Lotus suaveolens*  
 Bb *Lythrum hyssopifolia*  
 Bb *Mimulus guttatus*  
 Bb *Mycelis muralis*  
 Bb *Myosotis laxa*  
 Bb *Nasturtium microphyllum*

Bb *Nasturtium officinale*  
*Oxalis vallicola*  
 Bb *Persicaria hydropiper*  
 Bb *Persicaria maculosa*  
 Bb *Plantago lanceolata*  
 Bb *Plantago major*  
 Bb *Polycarpon tetraphyllum*  
 Bb *Polygonum aviculare*  
 Bb *Prunella vulgaris*  
 Bb *Ranunculus repens*  
 Bb *Raphanus raphanistrum* subsp.  
*raphanistrum*  
 Bb *Rumex acetosella*  
 Bb *Rumex obtusifolius*  
*Rumex sagittatus*  
 Bb *Sagina procumbens*  
 Bb *Silene gallica*  
 Bb *Silene pendula*  
 Bb *Sisymbrium officinale*  
 Bb *Solanum chenopodioides*  
 Bb *Solanum lycopersicum*  
 Bb *Solanum nigrum*  
 Bb *Solanum tuberosum*  
 Bb *Soliva sessilis*  
 Bb *Spergula arvensis*  
 Bb *Stachys arvensis*  
 Bb *Stachys sylvatica*  
 Bb *Stellaria media*  
 Bb *Trifolium dubium*  
 Bb *Trifolium pratense*  
 Bb *Trifolium repens*  
 Bb *Tropaeolum majus*  
 Bb *Veronica arvensis*  
 Bb *Veronica javanica*  
 Bb *Veronica persica*  
 Bb *Vicia sativa*  
 Bb *Vicia tetrasperma*  
 Bb *Vinca major*  
 Bb *Wahlenbergia* sp.

**Mosses**

Bb *Acrophyllum dentatum*  
*Brachythecium salebrosum*  
*Bryoerythrophyllum binnsii*<sup>8</sup>  
 Bb *Bryum billardieri*

8. Species identified in 1939 but not known to be recorded subsequently. See Mason *et al.* (1941).

|    |   |    |  |
|----|---|----|--|
|    | <i>Bryum blandum</i> subsp. <i>blandum</i>                    | Bb | <i>Fissidens leptocladus</i>                                   |
|    | <i>Bryum dichotomum</i>                                       | Bb | <i>Fissidens linearis</i> var. <i>angustifolius</i>            |
|    | <i>Bryum sauteri</i>  | Bb | <i>Fissidens rigidulus</i>                                     |
| Bb | <i>Calomnion complanatum</i>                                  |    | <i>Funaria hygrometrica</i>                                    |
| Bb | <i>Calyptopogon mnioides</i>                                  |    | <i>Grimmia trichophylla</i> <sup>8</sup>                       |
| Bb | <i>Calyptrochaeta brownii</i>                                 |    | <i>Holomitrium perichaetiale</i>                               |
| Bb | <i>Calyptrochaeta cristata</i>                                | Bb | <i>Hymenodon pilifer</i>                                       |
| Bb | <i>Camptochaete angustata</i>                                 | Bb | <i>Hypnodendron arcuatum</i>                                   |
| Bb | <i>Camptochaete arbuscula</i> var. <i>arbuscula</i>           | Bb | <i>Hypnum chrysogaster</i>                                     |
| Bb | <i>Camptochaete deflexa</i>                                   |    | <i>Hypnum cupressiforme</i> var. <i>cupressiforme</i>          |
| Bb | <i>Camptochaete pulvinata</i>                                 |    | <i>Hypnum cupressiforme</i> var. <i>filiforme</i> <sup>8</sup> |
|    | <i>Campylopus clavatus</i>                                    | Bb | <i>Hypopterygium didictyon</i>                                 |
|    | <i>Campylopus introflexus</i>                                 | Bb | <i>Hypopterygium tamarisci</i>                                 |
|    | <i>Campylopus pyriformis</i> var. <i>pyriformis</i>           | Bb | <i>Leptodon smithii</i>  |
| Bb | <i>Canalohypopterygium tamariscinum</i>                       | Bb | <i>Leptostomum inclinans</i>                                   |
| Bb | <i>Catagonium nitens</i> subsp. <i>nitens</i>                 | Bb | <i>Leptostomum macrocarpum</i>                                 |
|    | <i>Catharomnion ciliatum</i>                                  | Bb | <i>Leucobryum candidum</i>                                     |
|    | <i>Ceratodon purpureus</i> <sup>8</sup>                       | Bb | <i>Lopidium concinnum</i>                                      |
|    | <i>Cladomnion ericoides</i>                                   | Bb | <i>Macrocoma tenue</i> subsp. <i>tenue</i>                     |
| Bb | <i>Cratoneuroopsis relaxa</i>                                 | Bb | <i>Macromitrium gracile</i>                                    |
|    | <i>Cryphaea acuminata</i>                                     | Bb | <i>Macromitrium helmsii</i>                                    |
|    | <i>Cryphaea chlorophyllosa</i>                                | Bb | <i>Macromitrium ligulare</i>                                   |
| Bb | <i>Cyathophorum bulbosum</i>                                  | Bb | <i>Macromitrium prorepens</i>                                  |
| Bb | <i>Dendrohypopterygium filiculaeforme</i>                     | Bb | <i>Macromitrium retusum</i>                                    |
| Bb | <i>Dichelodontium nitidum</i>                                 | Bb | <i>Neckera laevigata</i>                                       |
| Bb | <i>Dicranoloma menziesii</i>                                  | Bb | <i>Neckera pennata</i>   |
|    | <i>Distichophyllum crispulum</i>                              | Bb | <i>Orthorrhynchium elegans</i>                                 |
| Bb | <i>Distichophyllum microcarpum</i>                            | Bb | <i>Papillaria crocea</i>                                       |
|    | <i>Distichophyllum pulchellum</i> var. <i>ellipticifolium</i> | Bb | <i>Pendulothecium oblongifolium</i>                            |
| Bb | <i>Distichophyllum rotundifolium</i>                          | Bb | <i>Pendulothecium punctatum</i>                                |
|    | <i>Ditrichum cylindricarpum</i>                               | Bb | <i>Philonotis tenuis</i>                                       |
| Bb | <i>Ditrichum difficile</i>                                    | Bb | <i>Plagiomnium novae-zealandiae</i>                            |
| Bb | <i>Ditrichum punctulatum</i>                                  | Bb | <i>Platyhypnidium austrinum</i>                                |
| Bb | <i>Echinodium hispidum</i>                                    | Bb | <i>Pogonatum subulatum</i>                                     |
| Bb | <i>Echinodium umbrosum</i>                                    | Bb | <i>Pohlia wahlenbergia</i>                                     |
| Bb | <i>Eurhynchium praelongum</i>                                 | Bb | <i>Polytrichadelphus magellanicus</i>                          |
| Bb | <i>Fallaciella gracilis</i>                                   | Bb | <i>Pseudotaxiphyllum falcifolium</i>                           |
| Bb | <i>Fissidens asplenioides</i>                                 | Bb | <i>Ptychomnion aciculare</i>                                   |
| Bb | <i>Fissidens blechnoides</i>                                  | Bb | <i>Pyrrhobryum bifarium</i>                                    |
| Bb | <i>Fissidens curvatus</i> var. <i>curvatus</i>                | Bb | <i>Racomitrium crispulum</i> <sup>8</sup>                      |
| Bb | <i>Fissidens curvatus</i> var. <i>inclinabilis</i>            | Bb | <i>Racopilum strumiferum</i>                                   |
| Bb | <i>Fissidens dealbatus</i>                                    | Bb | <i>Rhaphidorrhynchium amoenum</i>                              |
|    |   | Bb | <i>Rhynchostegium laxatum</i>                                  |
|    |   | Bb | <i>Rhynchostegium muriculatum</i>                              |
|    |   | Bb | <i>Rhynchostegium tenuifolium</i>                              |

|                   |  |    |  |
|-------------------|--|----|--|
|                   | <i>Syntrichia princeps</i>   | Bb | <i>Frullania fugax</i>                               |
| Bb                | <i>Tetraphidopsis pusilla</i>  | Bb | <i>Frullania monocera</i>                            |
| Bb                | <i>Thamnobryum pandum</i>  | Bb | <i>Frullania patula</i>                              |
| Bb                | <i>Thuidium furfurosum</i>   |    | <i>Frullania pycnantha</i>                           |
| Bb                | <i>Thuidium laeviusculum</i>   |    | <i>Frullania rostellata</i>                          |
| Bb                | <i>Thuidium sparsum</i> var. <i>sparsum</i>                          | Bb | <i>Frullania solanderiana</i>                        |
| Bb                | <i>Trachyloma diversinerve</i>                                       |    | <i>Frullania spinifera</i>                           |
| Bb                | <i>Trachyloma planifolium</i>  |    | <i>Frullania squarrosula</i>                         |
| Bb                | <i>Weissia controversa</i>   |    | <i>Frullania subhampeana</i>                         |
|                   | <i>Weissia patula</i>  | Bb | <i>Harpalejeunea latitans</i>                        |
|                   | <i>Weymouthia mollis</i>   |    | <i>Heteroscyphus biciliatus</i>                      |
| Bb                | <i>Zygodon intermedius</i>   | Bb | <i>Heteroscyphus coalitis</i>                        |
|                   |  |    | <i>Heteroscyphus colensoi</i> <sup>8</sup>           |
|                   |  |    | <i>Heteroscyphus fissistipus</i>                     |
|                   |  |    | <i>Heteroscyphus normalis</i> <sup>8</sup>           |
|                   |  | Bb | <i>Heteroscyphus triacanthus</i>                     |
|                   |  | Bb | <i>Hymenophyton leptopodium</i>                      |
|                   |  | Bb | <i>Lejeunea flava</i>                                |
|                   |  | Bb | <i>Lejeunea primordialis</i>                         |
|                   |  |    | <i>Lejeunea tumida</i> <sup>8</sup>                  |
|                   |  |    | <i>Lopholejeunea plicatiscypha</i> <sup>8</sup>      |
|                   |  | Bb | <i>Lunularia cruciata</i>                            |
|                   |  | Bb | <i>Marchantia berteriana</i>                         |
|                   |  | Bb | <i>Marchantia foliacea</i>                           |
|                   |  | Bb | <i>Marchantia polymorpha</i> subsp. <i>ruderalis</i> |
|                   |  |    | <i>Marsupidium setulosum</i>                         |
|                   |  |    | <i>Metalejeunea cucullata</i>                        |
|                   |  | Bb | <i>Metzgeria crassipilus</i>                         |
|                   |  | Bb | <i>Metzgeria furcata</i>                             |
|                   |  | Bb | <i>Monoclea forsteri</i>                             |
|                   |  | Bb | <i>Pallavicinia innovans</i>                         |
|                   |  | Bb | <i>Pallavicinia tenuinervis</i>                      |
|                   |  | Bb | <i>Pallavicinia xiphoides</i>                        |
|                   |  | Bb | <i>Plagiochila fasciculata</i>                       |
|                   |  | Bb | <i>Plagiochila baileyana</i>                         |
|                   |  |    | <i>Plagiochila deltoidea</i>                         |
|                   |  | Bb | <i>Plagiochila fruticella</i>                        |
|                   |  | Bb | <i>Plagiochila intertexta</i>                        |
|                   |  | Bb | <i>Plagiochila obscura</i>                           |
|                   |  |    | <i>Plagiochila pleurata</i> var. <i>pleurata</i>     |
|                   |  | Bb | <i>Plagiochila ramosissima</i>                       |
|                   |  | Bb | <i>Plagiochila rutlandii</i>                         |
| <b>Hornworts</b>  |  |    |  |
| Bb                | <i>Megaceros flagellaris</i>   |    |  |
| Bb                | <i>Phaeoceros carolinianus</i>                                       |    |  |
| <b>Liverworts</b> |  |    |  |
|                   | <i>Acrolejeunea mollis</i>   |    |  |
|                   | <i>Acromastigum colensoanum</i>                                      |    |  |
| Bb                | <i>Aneura alterniloba</i>  |    |  |
| Bb                | <i>Aneura</i> aff. <i>novoguineensis</i>                             |    |  |
|                   | <i>Aneura lobata</i> subsp. <i>australis</i>                         |    |  |
| Bb                | <i>Aneura pinguis</i>  |    |  |
|                   | <i>Aneura subaquatica</i>  |    |  |
|                   | <i>Archilejeunea olivacea</i>  |    |  |
|                   | <i>Asterella tenera</i>  |    |  |
|                   | <i>Balantiopsis diplophylla</i>                                      |    |  |
|                   | <i>Bazzania adnexa</i> var. <i>adnexa</i>                            |    |  |
|                   | <i>Bazzania tayloriana</i>   |    |  |
|                   | <i>Cheilolejeunea intertexta</i> <sup>8</sup>                        |    |  |
|                   | <i>Chiloscyphus dallianus</i> <sup>8</sup>                           |    |  |
| Bb                | <i>Chiloscyphus herzogii</i>   |    |  |
| Bb                | <i>Chiloscyphus muricatus</i>  |    |  |
| Bb                | <i>Chiloscyphus novae-zeelandiae</i><br>var. <i>novae-zeelandiae</i> |    |  |
|                   | <i>Chiloscyphus pallidus</i> <sup>8</sup>                            |    |  |
|                   | <i>Chiloscyphus subporosus</i> <sup>8</sup>                          |    |  |
| Bb                | <i>Cololejeunea hodgsoniae</i>                                       |    |  |
| Bb                | <i>Cyanolophocolea</i> aff. <i>echinella</i> <sup>9</sup>            |    |  |
|                   | <i>Cyanolophocolea echinella</i> s.s.                                |    |  |
|                   | <i>Diplasiolejeunea plicatiloba</i> <sup>8</sup>                     |    |  |
|                   | <i>Frullania deplanata</i>   |    |  |
|                   | <i>Frullania falciloba</i>   |    |  |

8. Species identified in 1939 but not known to be recorded subsequently. See Mason *et al.* (1941).

9. Similar to *Cyanolophocolea echinella* s.s. but with uncoloured, as opposed to blue, oil bodies.

|    |   |    |   |
|----|---|----|---|
| Bb | <i>Plagiochila stephensoniana</i>           | Bb | <i>Siphonolejeunea nudipes</i>                            |
|    | <i>Podomitrium phyllanthus</i>              | Bb | <i>Symphyogyna hymenophyllum</i>                          |
|    | <i>Porella elegantula</i>                   | Bb | <i>Symphyogyna undulata</i>                               |
|    | <i>Psiloclada clandestina</i>               | Bb | <i>Telaranea herzogii</i>                                 |
|    | <i>Radula allisonii</i>                     | Bb | <i>Telaranea lindenbergii</i> var.<br><i>lindenbergii</i> |
| Bb | <i>Radula buccinifera</i>                   |    | <i>Telaranea remotifolia</i>                              |
| Bb | <i>Radula marginata</i>                     |    | <i>Telaranea tetradactyla</i> <sup>8</sup>                |
|    | <i>Radula retroflexa</i> <sup>8</sup>       |    | <i>Trichocolea hatcheri</i>                               |
| Bb | <i>Radula silvosa</i>                       | Bb | <i>Trichocolea mollissima</i>                             |
| Bb | <i>Radula uvifera</i>                       |    | <i>Trichocolea rigida</i>                                 |
|    | <i>Rectolejeunea ocellata</i>               |    | <i>Tylimanthus diversifolius</i>                          |
|    | <i>Riccardia bipinnatifida</i> <sup>8</sup> |    | <i>Tylimanthus tenellus</i>                               |
|    | <i>Riccardia colensoi</i>                   | Bb | <i>Zoopsis argentea</i> var. <i>argentea</i>              |
| Bb | <i>Riccardia crassa</i>                     | Bb | <i>Zoopsis leitgebiana</i>                                |
|    | <i>Saccogynidium australe</i> <sup>8</sup>  |    |   |

## REFERENCES

- Allan, H.H. 1961: Flora of New Zealand Vol. 1. Indigenous Tracheophyta. Government Printer, Wellington, New Zealand.
- Anon. 2007: BioBlitz turns up some unexpected finds. *Branch Out* 24: 2-3.
- Cockayne, L. 1932: A Scheme for the Development and Arrangement of the Otari Open-Air Native Plant Museum. Whitcombe and Tombs Ltd, Wellington, New Zealand.
- Ebihara, A.; Dubuisson, J-Y.; Iwatsuki, K.; Hennequin, S.; Ito, M. 2006: A Taxonomic Revision of Hymenophyllaceae. *Blumea. Journal of Plant Taxonomy and Plant Geography* 51: 221–280.
- Mason, R.; Sainsbury, G.O.K.; Hodgson E.A. 1941: Mosses and Liverworts of Wilton's Bush, Wellington. Unpublished list, Botany Division, DSIR.
- Moar, N.T. 1990: Obituary: Ruth Mason. *New Zealand Journal of Botany* 28: 485–490.
- Myers, S.C. 1985: Native forest remnants of Wellington City – a survey of five sites. Biological Resources Centre, DSIR, Wellington.
- Nightingale, T.; Dingwall, P. 2003: Our Picturesque Heritage: 100 Years of Scenery Preservation in New Zealand. Department of Conservation, Wellington.
- Reid, J.S. 1985: Changes over 50 years in a native forest quadrat in Otari Reserve, Wellington. *Wellington Botanical Society Bulletin* 42: 41–57.
- Reid, J.S. 1989: Bracken fern and scrub communities in Otari Reserve, re-observed after fifty years. *Wellington Botanical Society Bulletin* 45: 100–114.
- Reid, J.S. 1996: Otari Vegetation. *Wellington Botanical Society Bulletin* 47: 34–53.
- Webb, C.J.; Sykes, W.R.; Garnock-Jones, P.J. 1988: Flora of New Zealand. Vol. IV. Naturalised Pteridophytes, Gymnosperms, Dicotyledons. Botany Division, D.S.I.R.. Christchurch, New Zealand.
- Wellington City Council Parks and Recreation Department 1975: Guide list to plants: the Otari open-air native plant museum. Second edition.
- Wellington City Council Parks and Recreation Department. 1987: Guide list to plants: Otari open-air native plant museum. Third edition.

The following web sites have been referred to:

[www.niwa.cri.nz/edu/resources/climate/station](http://www.niwa.cri.nz/edu/resources/climate/station) for climate information

<http://nzflora.landcareresearch.co.nz> and [www.nzpcn.org.nz](http://www.nzpcn.org.nz) for the current names of species.