Knapp, M.; Stöckler, K.; Havell, D.; Delsuc, F.; Sebastiani, F.; Lockhart, P. J. , 2005: Relaxed molecular clock provides evidence for long-distance dispersal of *Nothofagus* (southern beech). *PLoS Biology 3*: 38-43.
Knapp, S. 2005: Biogeography - space, form and time.*Journal of Biogeography 32*: 3-4.
Lee, D. E.; Bannister, J. M.; Lindqvist, J. K.; 2007: Late Oligocene-early Miocene leaf macrofossils confirm a long history of *Agathis* in New Zealand. *NZ Journal of Botany 45*: 565-578.
McGlone, M. 2005: Goodbye Gondwana.*Journal of Biogeography 32*: 739-740.
Mildenhall, D. C. 1980: New Zealand late Cretaceous and Cenozoic plant biogeography: a contribution. *Palaeogeography, Palaeoclimatology, Palaeoecology 31*: 197-233.
Nelson, G. 1975: Book Review: Kuschel, G. (Ed) Biogeography and ecology in New Zealand. 1975. W. Junk, The Hague. *Systematic Zoology 24*: 494-495.
Page, T. J.; Baker, A. M.; Cook, B. D.; Highes, J. M. 2005: Historical transoceanic dispersal of a freshwater shrimp: the colonization of the South Pacific by the genus *Paratya* (Atyidae). *Journal of Biogeography 32*: 581-593.
Phillips, M. J.; Gibb, G. C.; Crimp, G. C.; Penny, D. 2010: Tinamous and moa flock together: mitochondrial genome sequence analysis reveals independent losses of flight among ratites. *Systematic Biology 59*: 90-107.
Pratt, R. C.; Morgan-Richards, M.; Trewick, S. A. 2008: Diversification of New Zealand weta (Orthoptera: Ensifera: Anostostomatidae) and their relationships in Australasia. *Philosophical Transactions Royal Society B 363*: 3427-3437.
Royal Society of New Zealand, 2000: Yearbook of the Academy Council. http://www.rsnz.org/directory/yearbooks/year00/cranwell
Sanmartín, I.; Ronquist, F. 2004: Southern Hemisphere biogeography inferred by event-based models: plants versus animal patterns. *Systematic Biology 53*: 216-243.
Swenson, U.; Hill, R. S. 2001: Most parsimonious areagrams versus fossils: the case of *Nothofagus* (Nothofagaceae). *Australian Journal of Botany 49*: 367-376.
Tennyson, A. 2010: The origin and history of New Zealand's terrestrial vertebrates. *New Zealand Journal of Ecology 34*: 6-27.
Trewick, S. A. Paterson, A. M.; Campbell, H. J. 2007: Hello New Zealand. *Journal of Biogeography 34*: 1-6.
Vink, C. J.; Paterson, A. M. 2003: Combined molecular and morphological phylogenetic analyses of the New Zealand wolf spider genus *Anoteropsis* (Araneae: Lycosidae) *Molecular Phylogenetics and Evolution 28*: 576-587.
Wallis, G.; Trewick, S. 2009: New Zealand phylogeography; evolution on a small continent. *Molecular Ecology 18*: 3548-3580.
Winkworth, R.C.; Wagstaff, S.; Glenny, D.; Lockhart, P.J. 2002: Plant dispersal N.E.W.S. from New Zealand.*Trends in Ecology & Evolution 17*: 514-520.

Botanical excursion to Sydney, New South Wales, Australia

Mike Wilcox, Christine Major and Maureen Young

Summary

A group of 15 Auckland Botanical Society members spent nine days from 4-13 September 2009 exploring the plants of the Sydney region. It was spring, and flowering was abundant. The places visited were the Cronulla coast, Kamay Botany Bay National Park at Kurnell, Royal National Park from Bundeena and Waterfall, the Blue Mountains (Katoomba, Wentworth Falls, Blackheath, Mt Banks, Mt Wilson, Mt Tomah Botanic Gardens), Royal Sydney Botanic Gardens and NSW National Herbarium, and Berowra Valley Regional Park. The visit gave us a good appreciation and introduction to the Australian flora and the great importance there of the families Myrtaceae, Proteaceae, Fabaceae, Ericaceae, Rutaceae and Casuarinaceae – all well represented and ubiquitous on our field trips. Orchids and ferns were other groups to particularly grab our attention. Every place visited had some new plants for us to discover and enjoy. Vegetation types we studied were coastal dunes, cliffs and heaths; mangroves; dry sclerophyll forests; wet sclerophyll forests; cool-temperate rainforest; and various kinds of open heathlands and cliff communities, including hanging swamps. We were predominantly on the Triassic Narrabeen and Hawkesbury Sandstone formations. The weather was pleasantly fine and warm in Sydney (22-30°C) and cool and sometimes breezy in the Blue Mountains (3°C in the morning, 14-16 °C in the day).

Programme

As far as we know the Auckland Botanical Society has not previously had a group trip to Australia. We all found it a most rewarding experience, and saw a wonderful array of plants and spectacular scenery in one of Australia's best and most convenient places to study the native flora. Our group was *Jan Butcher*, *Colleen Crampton*, *Barrie McLeay*, *Gretta McLeay*, *Anne Fraser*, *Leslie Haines*, *Christine Major*, *Helen Preston Jones*, *Juliet Richmond*, *Doug Sheppherd*, *Alison Wesley*, *Diana Whimp*, *Mike Wilcox* (leader), *Nancy Wilcox*, *Maureen Young*. We stayed in youth hostels, and got around by bus, ferry, train or hired minibuses.

Thursday 3 September: Travel to Sydney.

Friday 4 September: On foot along the foreshore at Cronulla, looking at coastal cliff plants. By bus from Cronulla to Kurnell. Visited the Kamay Botany Bay National Park via Yena Track, Banks & Solander Track and Muru Track. Accommodation at Cronulla Beach Youth Hostel.

Saturday 5 September: By ferry from Cronulla to Bundeena, and then on foot to Jibbon Beach, Port Hacking Point, and a coastal walk in Royal National Park (Fig. 1), returning to Bundeena. Accommodation at Cronulla Beach Youth Hostel.

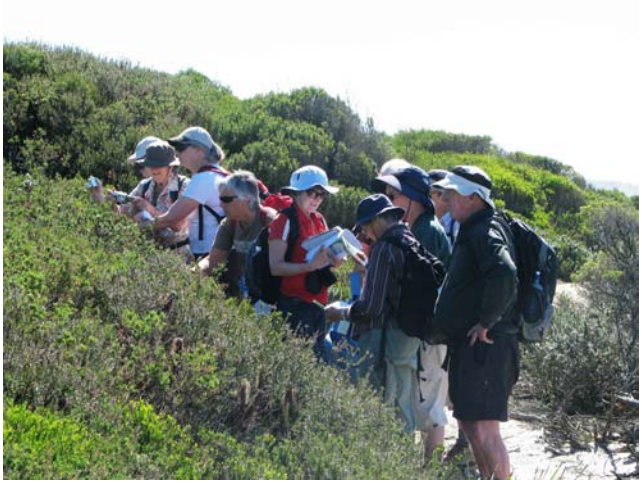


Fig. 1. Keen botanists in the coastal heath, Royal National Park, Bundeena, 5 Sep 2009. Photo: Mike Wilcox.

Sunday 6 September: By train to Waterfall. On foot through Royal National Park via the Uloola Track, then the Couranga Track to Lady Carrington Drive and Bola Creek, returning via McKell Ave on foot to Waterfall. Accommodation at Cronulla Beach Youth Hostel.

Monday 7 September: By train to Sydney Central and then to Katoomba (1050 m). On foot along Prince Henry Cliff Walk to the Three Sisters and Echo Point. Accommodation at Katoomba Youth Hostel.

Tuesday 8 September: By minibus to Narrow Neck Plateau, and to Conservation Hut at Wentworth Falls (Fig. 2). Descending along the Valley of the Waters Track to Sylvia Falls, and returning to the Conservation Hut along the Nature Track via Edinborough Castle Rock. Accommodation at Katoomba Youth Hostel.

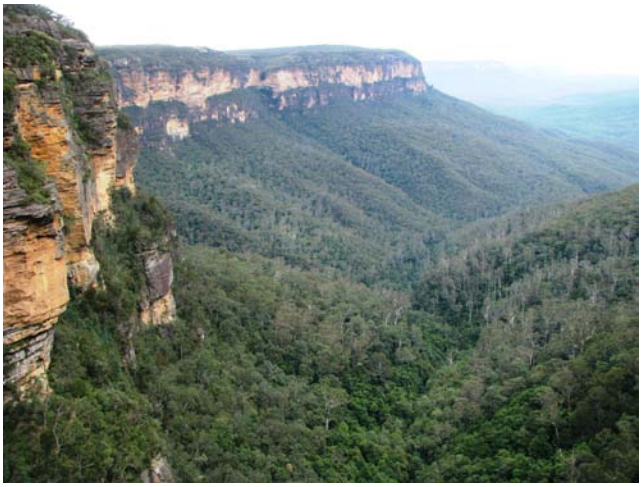


Fig. 2. Blue Mountains, Wentworth Falls, 8 Sep 2009. Photo: Mike Wilcox.

Wednesday 9 September: By minibus to Mt Tomah Botanic Garden, Mt Banks (Fig. 3) and Mt Wilson. Accommodation at Katoomba Youth Hostel.

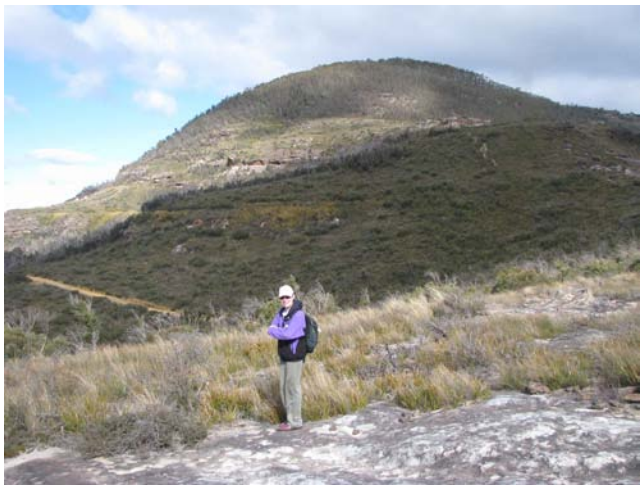


Fig. 3. Mt Banks, 9 Sep 2009. Photo: Mike Wilcox.

Thursday 10 September: By minibus to Blackheath. Visited the National Park Visitor Centre. To Govetts Leap. On foot to Pulpit Rock and return. Accommodation at Katoomba Youth Hostel.

Friday 11 September: By train to Sydney. Visited the Royal Sydney Botanic Gardens and NSW National Herbarium – lunch, lectures, library, public herbarium. Accommodation at Sydney Central Youth Hostel.

Saturday 12 September: By train to Mt Kur-ing-gai station. On foot along the Great North Walk in Berowra Valley Regional Park, returning to Berowra station, and back to Sydney by train. Accommodation at Sydney Central Youth Hostel.

Sunday 13 September: Returned to Auckland.

Myrtaceae

This is a dominant family in much of the Australian vegetation. Beginning with the eucalypts, on the Hawkesbury Sandstone north and south of Sydney itself, and extending to the Blue Mountains, the rather open, dry sclerophyll forest had an abundance of black ash (*Eucalyptus sieberi*), scribbly gum (*Eucalyptus haemastoma* and *E. racemosa*), Sydney peppermint (*Eucalyptus piperita*), red bloodwood (*Corymbia gummifera*) and smooth-barked apple (*Angophora costata*). Scribbly gum was our particular favourite, its diagnostic graffiti on the bark caused by burrowing larvae of a moth, *Ogmograptis scribula* (Fig. 4). Near the coast (e.g. Botany Bay, Royal NP and Berowra) the scribbly gum is mainly *Eucalyptus haemastoma*, while more inland populations such as in the Blue Mountains are the smaller-fruited species, *E. racemosa*. *Angophora costata* was also striking for its pink, smooth bark and twisted branches (Fig. 5). These are fire-resistant species, regenerating by epicormic shoots following burning. *Corymbia gummifera* has the distinction of being the first eucalypt collected (by Banks & Solander in 1770, from Botany Bay). The specimen found its way to Europe, but languished without formal description, the honour of the first described eucalypt eventually going to

Eucalyptus obliqua, described by Charles L'Héritier in 1788 from a specimen collected in Tasmania.

Fig. 4. Scribbly gum (*Eucalyptus haemastoma*), Kamay Botany Bay NP, 4 Sep 2009. Photo: Mike Wilcox.

Fig. 5. Smooth-barked apple (*Angophora costata*), Kamay Botany Bay NP, 4 Sep 2009. Photo: Mike Wilcox.

Bangalay (*Eucalyptus botryoides*) was a feature close to the coast, while on better, moister sites in Royal National Park there were some fine stands of blackbutt (*Eucalyptus pilularis*) and Sydney blue gum (*Eucalyptus saligna*) (Fig. 6). There were a few tallow-wood (*Eucalyptus microcorys*) along the Banks Solander Track in the Kamay Botany Bay National Park, but these would have been planted as this is well south of its natural range. In Berowra Valley Regional Park there were the usual common Sydney dry sclerophyll eucalypts, but some others as well, notably yellow bloodwood (*Corymbia eximia*) and grey gum (*Eucalyptus punctata*), scorched black by a controlled fuel-reduction fire carried out by the NSW Rural Fire Service the previous day. Other eucalypts occurring in the northern Sydney area, including Kur-ing-gai Chase National Park, are *Angophora bakeri*, *Angophora floribunda*, *Corymbia maculata*, *Eucalyptus agglomerata*, *Eucalyptus camfieldii*, *Eucalyptus capitellata*, *Eucalyptus paniculata*, *Eucalyptus resinifera*, *Eucalyptus scias*, *Eucalyptus sparsifolia* and *Eucalyptus umbra* (Benson & Howell 1994).

Fig. 6. Sydney blue gum (*Eucalyptus saligna*), Royal NP Waterfall, 6 Sep 2009. Photo: Doug Sheppherd.

In the Blue Mountains a eucalypt of special note was Blue Mountains ash (*Eucalyptus oreades*) growing in the shelter of gully heads below the cliffs and standing out with its fresh smooth white bark, with hanging streamers of old peeling bark (Fig. 7). It is easily killed by fire (as we observed along the track to Pulpit Rock), but regenerates freely from seed. Narrow-leaved peppermint (*Eucalyptus radiata*) was a common associate of *E. piperita* and *E. sieberi* at higher elevations. At Mt Tomah and Mt Wilson, where there are caps of basalt soil, brown barrel (*Eucalyptus fastigata*) formed impressive stands (Fig. 8), together with Blue Mountains stringybark (*Eucalyptus blaxlandii*), ribbon gum (*Eucalyptus viminalis*) and mountain grey gum (*Eucalyptus cypellocarpa*) and a sub-canopy of blackwood (*Acacia melanoxylon*) and cedar wattle (*Acacia elata*).

One very tall eucalypt, round-leaved gum (*Eucalyptus deanei*), is especially famous in the Blue Mountains, but we only looked down on it from afar, from Pulpit

Rock. The Bluegum Forest of the Grose Valley has been called the "Jewel in the Crown" of the Blue Mountains National Park. This stand of around 40 ha of majestic trees is located at the junction of Govett's Creek and the Grose River and attracts bushwalkers from all over Australia, along with many overseas visitors. Some trees are 65 m tall, and hundreds of years old, having escaped the numerous bush fires that have periodically swept the nearby slopes. It's a big hike down there from Govetts Leap - next time !

Fig. 7. Blue Mountains ash (*Eucalyptus oreades*), Katoomba, 7 Sep 2009. Photo: Mike Wilcox.

A number of mallee eucalypts were seen. These are of short stature and respond to fire by resprouting as slender multiple-stems from underground lignotubers. In Royal National Park on sandy sites near the coast near Bundeena, Port Jackson mallee (*Eucalyptus obstans*) was common in places, and several other eucalypts such as *Corymbia gummifera* (Plate 1), *Eucalyptus sieberi* and *Angophora costata* also there assumed the mallee habit on these impoverished soils. Yellow-top mallee ash (*Eucalyptus luehmanniana*) is a rare, striking, strongly-featured species which we were pleased to see along the Ooolola Track east of Waterfall, in Royal National Park (Fig. 9), where we also found scrub apple (*Angophora hispida*) with its strikingly-red, hairy leaf buds,and sandstone stringybark (*Eucalyptus oblonga*). Several mallee eucalypts are found in the Blue Mountains. Blue Mountains mallee ash (*Eucalyptus stricta*) was common in open heathland (e.g. Narrow Neck Plateau, Mt Banks), while cliff mallee ash (*Eucalyptus cunninghamii*) occurred near cliff tops at Echo Point (Katoomba) and abundantly at Pulpit Rock (Blackheath), this latter site being its type locality. A broad-leaved mallee ash with shining green leaves was abundant along parts of the track from Govetts Leap to Pulpit Rock, its identity being somewhat uncertain, but probably *Eucalyptus dendromorpha* or perhaps *E. burgessiana*.

Fig. 8. Brown barrel (*Eucalyptus fastigata*), Mt Tomah, 9 Sep 2009. Photo: Mike Wilcox.

One of the most impressive trees encountered on the trip was turpentine (*Syncarpia glomulifera*). It was abundant, gregarious, tall and straight in the Royal National Park, its ecological niche being on better, moister soils at the ecotone between eucalypt forest and rainforest. There were some particularly big trees near Bola Creek. It was in the Blue Mountains, too, and also commonly along the Lyrebird Gully in the Berowra Regional Park. Brush box (*Lophostemon confertus*) was recorded (planted) in Kamay Botany Bay National Park. Water gum or kanooka (*Tristaniopsis laurina*) and water gum (*Tristania neriifolia*) both are species that grow along shaded streams, and could probably be classed as rheophytes. We saw these in Royal National Park, and also some very fine examples in Berowra Valley Regional Park. *Tristaniopsis collina* was seen in the Blackheath area, Blue Mountains.

Lilly pilly (*Acmena smithii*, or now *Syzygium smithii*) was a tree many of us were eager to see in the wild as it is well-known in Auckland as a street tree, and is

one of our worst environmental woody weeds. We encountered it in several places, including Kamay Botany Bay National Park and Royal National Park, and in the Blue Mountains. It typically grows along shaded stream banks in a gallery rainforest. Along Lyrebird Gully at Berowra we came across grey myrtle (*Backhousia myrtifolia*).

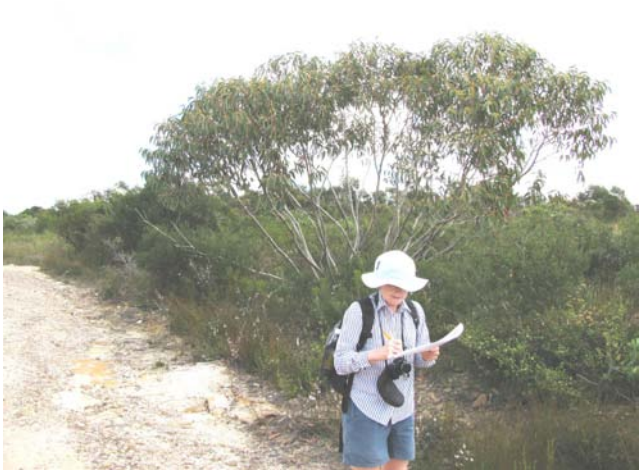


Fig. 9. Yellow-top mallee ash (*Eucalyptus luehmanniana*), Royal NP, Waterfall, Sep 2009. Photo: Doug Sheppherd.

Turning now to the more shrubby genera of the Myrtaceae, we saw examples of *Kunzea*, *Leptospermum*, *Callistemon*, *Melaleuca*, *Calytrix*, *Baeckea* and *Darwinia*. Coast tea tree (*Leptospermum laevigatum*) was seen on sandy coastal heathlands in Kamay Botany Bay and Royal National Parks, where in places it formed pure, dense, fire-induced thickets to the exclusion of other shrub species. Other tea trees seen were *Leptospermum polygalifolium*, abundant in the understorey of taller eucalypt forest and also fringing streams, *Leptospermum grandifolium* in Berowra Valley Regional Park, *Leptospermum juniperinum* and *Leptospermum attenuatum* in low heath and *Leptospermum trinervium* in sclerophyll forest in the Blue Mountains, and the purple-flowered *Kunzea capitata* in the Waterfall section of Royal National Park (Plate 1). *Darwinia fascicularis* was one of our favourite plants (Plate 1). We first came across it on the coastal heathland south of Port Hacking Point, and heath myrtle (*Baeckea brevifolia*) grew with it. Another species, *Darwinia taxifolia*, with red flowers, is found in heathland on the Blue Mountains, but we did not find it. *Baeckea linifolia* was seen on the walk to Pulpit Rock. Fringe myrtle (*Calytrix tetragona*) was a delight in the Berowra Valley Regional Park (Plate 3). Bracelet honey myrtle (*Melaeuca armillaris*) and broad-leaved paperbark (*Melaleuca quinquenervia*) were seen at Botany Bay.

Proteaceae

This important Australian family was constantly present in all the sites we visited. Foliage form is highly diverse. In *Banksia* (79 spp. in Australia) the leaves are generally thick and harsh, and commonly serrated or at least pointed or notched. Old man banksia (*Banksia serrata*) occurred abundantly on sandstone sites from the coast to the mountains. Coast banksia (*B. integrifolia*) was commonly seen at Kurnell and in the coastal parts of Royal National Park. It is the biggest of the Sydney banksias. Both these species have their type locality at Botany Bay, collected by Banks & Solander in 1770 (Collins et al. 2008). The mountain form of coast banksia, *B. integrifolia* subsp. *monticola*, was seen at Mt Wilson (its type locality). Two very common banksias on coastal heathlands and woodlands were heath-leaved banksia (*B. ericifolia*) (Plate 1) and hairpin banksia (*B. spinulosa*). Others in the area were *B. oblongifolia* (e.g. Royal National Park), and silver banksia (*B. marginata*) (coast) and *B. spinulosa* var. *cunninghamii* and *B. conferta* subsp. *penicillata* (mountains). We did not see swamp banksia (*B. paludosa*) or *B. robur*, and also missed out on wallum banksia (*B. aemula*), its southernmost occurrence being at La Perouse on the northern of Kamay Botany Bay National Park, and visible from the Jennifer Street Boardwalk.

Mountain devil (*Lambertia formosa*) forms low bushes, and we found it commonly in the Blue Mountains and also north and south of Sydney (Plate 2). It has prickle-pointed leaves, an attractive and peculiar inflorescence (a 7-flowered conflorescence) and an amazing horned, woody fruit. Flowers and fruits, however, were hard to find, much to the frustration of our photographers.

Our first encounter with woody pear (*Xylomelum pyriforme*) was in the Kamay Botany Bay National Park, where we were attracted to its bold, rusty-coloured foliage and curious woody fruit. We found it again, at Berowra.

Hakea (149 spp. ìn Australia) was a common genus, seen at most places we visited. Three coastal species – with pungent, terete leaves – were *H. gibbosa*, silky hakea (*H. sericea*), and dagger hakea (*H. teretifolia*), encountered at Botany Bay and in the Royal National Park. Willow-leaved hakea (*Hakea salicifolia*) and *Hakea dactyloides*, both with flat leaves, were seen in the Blue Mountains.

Grevillea is another one of those special, large, attractive Australian genera, with c. 320 species. We came across only a few in our travels. In the Blue Mountains and at Berowra were *Grevillea sericea*, *Grevillea buxifolia* and *Grevillea mucronulata*, the former with pink flowers, *G. buxifolia* with a head of greyish-pink, hairy flowers, and the latter with small, rounded leaves and a greenish flowers hidden from view.

Now to the NSW state flower, waratah (*Telopea speciosissima*). This, of course, was something we all wanted to see, and we were not disappointed. We encountered it in Royal National Park, in flower in the understorey, and rather commonly along the track

from Govetts Leap to Pulpit Rock in the Blue Mountains, where it was coming away vigorously after a fairly recent fire. The flowers were not yet open there, but they were magnificently, on cultivated specimens at the Mt Tomah Botanical Garden.

One of the catches in getting to grips with a new flora is becoming familiar with the changes in species assemblages in different habitats. One such habitat with its own flora was stream banks, providing moisture and shade in otherwise hostile, dry sandstone country. It was in such places that we commonly found river lomatia (*Lomatia myricoides*) – a small tree or shrub with attractive, serrate leaves.

Conospermum longifolium confused us all at first as to it family affiliation, as it has a corymbose inflorescence made up of small white flowers. It was in the understorey of dry sclerophyll forest in Royal National Park and at Berowra. Other species in the area were *Conospermum taxifolia* and *Conospermum tenuifolium*. In this same habitat we commonly came across conesticks (*Petrophile pulchella*) and drumsticks (*Isopogon anethifolius*, *I. anemonifolius*) (Plate 2), all attractively in flower or fruit. *Symphionema montanum* was seen in the Blue Mountains at Wentworth Falls.

This really leaves only *Persoonia* to mention, and this proved to be an important, ubiquitous genus in all the sites we visited. They are generally known as geebungs. Broad-leaved geebung (*Persoonia levis*) and *Persoonia lanceolata* were common in dry sclerophyll forest, narrow-leaved geebung (*Persoonia pinifolia*) was particularly noticeable at Berowra, while the softly-foliaged *Persoonia chamaepitys* caught our attention in the Blue Mountains.

To conclude this brief overview of the Proteaceae of the Sydney area, two very attractive rainforest tree species were seen in cultivation. At Mt Tomah Botanic Gardens prickly ash (*Orites excelsa*) caught our attention with its glossy foliage and abundant white blossoms, while in the Sydney Botanic Gardens a big specimen of *Oreocallis flammeum* (a native of Queensland) was a blaze of red, and harboured slumbering flying foxes.

Fabaceae

It is difficult to know where to start (or stop) with this group, such was its prominence. *Acacia* probably deserves to be mentioned first as it is New South Wales's largest genus, with 216 species, even exceeding *Eucalyptus*. Some tall trees – *Acacia melanoxylon* and *Acacia elata* – have already been mentioned. Cedar wattle (*Acacia elata*) was much in evidence in the Blue Mountains, being an associate in the rainforest patches and with *Eucalyptus oreades* in the gully heads below the escarpments. Mike was particularly interested to see cedar wattle as it one of the largest of the wattles and he has made furniture from its timber, milled from an old grove planted at Titirangi. It has bi-pinnate leaves, as do many other species in the area, including sunshine wattle (*Acacia terminalis*) which we saw in the Blue Mountains, Parramatta wattle (*Acacia parramattensis*) and *Acacia irrorata* along the Lyrebird Gully at Berowra. Those with phyllodinous adult leaves (as in *Acacia melanoxylon*) were numerically more important, and some we identified were broad-leaved hickory (*Acacia falciformis*) at Mt Wilson, coastal wattle (*Acacia sophorae*) at Jibbon Beach, Sydney golden wattle (*Acacia longifolia*), white sally (*Acacia floribunda*), and a prickly one, prickly Moses (*Acacia ulicifolia*).

Now to the pea shrubs of which we came across many. One of the first we enthused about was *Daviesia mimoisoides*, common in the Kamay Botany Bay National Park. It is a shrub with a greyish, hue, with wattle-like phyllodinous leaves, reddish young pods and golden yellow flowers. At this same place we found *Bossiaea scolopendria* – a leafless broom-like shrub with flattened stems. Heathy parrot pea (*Dillwynia retorta*), large wedge pea (*Gompholobium grandiflorum*) and golden glory pea (*Gompholobium latifolium*) were common in sandstone woodland and coastal heath. *Pultenaea stipularis* was a feature of Botany Bay and the Uloola Track in Royal National Park (Plate 2), and parrot pea (*Dillwynia floribunda*), *Pultenaea daphnoides* and *Pultenaea flexilis* were noted in Berowra Valley Regional Park. Common leguminous vines or scramblers were false sarsparilla (*Hardenbergia violacea*) and dusky coral pea (*Kennedia rubicunda*). On the basalt soils at Mt Tomah and Mt Banks the beautiful shrub *Indigofera australis* in the understorey was a great sight (Plate 2), while in the Blue Mountains at Wentworth Falls we found handsome flat-pea (*Platylobium formosum*), a shrub with flat, embossed leaves.

Ericaceae

The heaths (which include all those genera formerly in Epacridaceae) were particularly colourful and ubiquitous group in the area. We were very pleased to see necklace heath (*Dracophyllum secundum*) fairly common on damp trackside banks and cliff faces in the Blue Mountains. It is the only *Dracophyllum* in New South Wales. *Sprengelia monticola* was one of our nicest discoveries, its clusters of white flowers attracting our attention. We saw it on roadside banks out along the road to Narrow Neck Plateau. The pink-flowered *Sprengelia incarnata* had a quite different habitat in the Blue Mountains – in hanging swamps above the tracks from Govetts Leap to Pulpit Rock, and along the Nature Track at Wentworth Falls, and was much admired (Plate 3).

Several species of *Epacris* were seen, with coral heath (*Epacris microphylla*) being perhaps the commonest. *Epacris reclinata* was much admired (Plate 2). It grew on steep rock faces in the Blue Mountains, and had attractive pink flowers. Fuchsia heath (*Epacris*

longiflora) was one of the highlights in the coastal heathlands of Royal National Park, as was five-corners (*Styphelia triflora*). In this genus the bearded corolla lobes curl back.

Pigeon berry (*Monotoca elliptica*) and *Monotoca scoparia* are prickly-leaved heaths with tiny white flowers, and along with coastal bearded-heath (*Leucopogon parviflorus*), were present at Kurnell and in the Royal National Park, towards Port Hacking Point. Tree heath (*Trochocarpa laurina*) is an unusual-looking heath, with broad, glossy, parallel-veined leaves, seen in Berowra Valley Regional Park.

Rutaceae

This is another family richly represented in Australia, and one we targeted for photography. Genera to catch our attention were *Boronia*, *Zieria*, *Correa*, *Philotheca*, *Eriostemon* and *Phebalium*. Sydney boronia (*Boronia ledifolia*) with rose-pink flowers was seen on many of our walks in dry sclerophyll forests, especially in Royal National Park and at Berowra (Plate 3), where there was also *Boronia pinnata*. We also saw Fraser's boronia (*Boronia fraseri*), in the Blue Mountains, in the rainforest patches. *Philotheca buxifolia* was beautifully in flower at Botany Bay, and *Philotheca obovata* was observed at Mt Banks.

The only *Zieria* we saw was at Mt Tomah, where stinkwood (*Zieria arborescens*) was prominent in the understorey of *Eucalyptus fastigata* forest, and *Correa* was only noticed once – common correa (*Correa reflexa*) in Royal National Park, south of Port Hacking Point. A beautiful shrub, seen at its best in the Berowra Valley Regional Park, was *Eriostemon australasius*, with large, pink starry flowers. Scaly phebalium (*Phebalium squamulosum*) was seen in the same area.

Casuarinaceae

This is a highly characteristic, ancient Australian family, with a good diversity of species in the Sydney region. They were seen in nearly all plant communities, sometimes abundantly. Swamp sheoak (*Casuarina glauca*) is a coastal species whose particular habitat is the damp, sheltered flats in behind mangroves. The best example we saw of this was beside Berowra Creek (Fig. 10). It was also at Kurnell, in the Quibray Bay and Towra Point estuaries. River sheoak (*Casuarina cunninghamiana*) was seen only in the upper freshwater reaches of the Berowra Creek, as we began our ascent up to Berowra station. Black sheoak (*Allocasuarina littoralis*), despite its name, is not particularly coastal in its occurrence. It was very common in eucalypt forest along the track from Mt Kur-ing-gai station to Berowra Creek, in Royal National Park (usually associated with turpentine), and also at Katoomba. In coastal heathland, such as in Royal National Park, *Allocasuarina distyla* was a common component, while dwarf sheoak (*Casuarina nana*) was seen in the Blue Mountains in the short vegetation of the plateau tops, with *Eucalyptus stricta*.

Fig. 10. Swamp sheoak (*Casuarina glauca*), Berowra Valley Regional Park, 12 Sep 2009. Photo: Mike Wilcox.

Rainforest trees and shrubs

Cool-temperate rainforest was encountered in several places during our visit, including Royal National Park, the Blue Mountains, Mt Tomah and Mt Wilson, and Berowra Regional Park. Several species were of constant occurrence in this plant community, which occurred in shaded, damp valleys or along streams as a narrow gallery forest. Coachwood (*Ceratopetalum apetalum*) of the Cunoniaceae and sassafras (*Doryphora sassafras*) of the Atherospermataceae were ever-present (Fig. 11), the former recognisable by its smooth, pale bark, and elongate, serrated leaves. The presence of sassafras was detectable by the white petals in the crown or on the ground, and its somewhat rough bark. In the Blue Mountains at Wentworth Falls Mike also spotted seedlings with serrated leaves, tomentose below, and concluded they were southern sassafras (*Atherosperma moschatum*). Common associates were possumwood (*Quintinia sieberi*) of the Quintiniaceae, and native mulberry (*Hedycarya angustifolia*) of the Monimiaceae. Unlike the New Zealand *Hedycarya arborea*, whose fruit is a single drupe, *H. angustifolia* has an aggregate of fruits (drupelets), akin to a mulberry. Lilly pilly (*Syzygium smithii*) was also often present, and callicoma (*Callicoma serratifolia*), blueberry ash (*Elaeocarpus reticulatus*) and sweet pittosporum (*Pittosporum undulatum*) occurred

abundantly at the rainforest margins, or near streams within eucalypt forest. The rainforest at Bola Creek in Royal National Park is particularly tall and impressive, and includes crabapple or white cherry (*Schizomeria ovata*) of the Cunoniaceae. Though also found in eucalypt forest at rainforest margins, brush pepper-bush (*Tasmannia inspida*) of the Winteraceae was widely encountered in rainforest gullies (Plate 3), at lower elevations, mountain pepper (*Tasmannia lanceolata*) was seen in the Blue Mountains, and *Bauera rubioides* of the Cunoniaceae occurred on more open sites in dense patches near creeks (Plate 3).

Fig. 11. Coachwood (*Ceratopetalum apetalum*) and sassafras (*Doryphora sassafras*) rainforest gulley, Wentworth Falls, Blue Mountains, 8 Sep 2009. Photo: Doug Sheppherd.

Tuckeroo (*Cupaniopsis anacardioides*) of the Sapindaceae deserves special mention. This attractive smooth-barked tree occurs on sand on the coast in a so-called littoral rainforest, the best example we saw being at Jibbon Beach, Bundeena, where it grew with *Eucalyptus botryoides* and *Banksia integrifolia* (Plate 1). It was also seen on the Burrawang Walk in Kamay Botany Bay National Park, and is a common street tree in Cronulla.

Miscellaneous dicots

Here we will mention a selection of some of the many other eye-catching dicot plants seen in our travels.

On the coastal cliffs at Cronulla one of the first plants we saw was mirror bush or taupata (*Coprosma repens*), looking happily naturalised. It was accompanied by other familiar plants such as pellitory (*Parietaria judaica*), *Lobelia alata*, *Ipomoea cairica*, New Zealand spinach (*Tetragonia tetragonioides*), *Senecio lautus* and a large-leaved adventive herb known as Kurnell curse (*Hydrocotyle bonariensis*). The lovely shrub, coast rosemary (*Westringia fruticosa*), was also common here, as was bitou bush (*Chrysanthemoides monolifera* subsp. *rotundata*), which looked much more downy-grey and broader in the leaf compared with the bright green boneseed we have in Auckland.

At Kamay Botany Bay National Park we quickly came across sweet pittosporum (*Pittosporum undulatum*) and were to see it everywhere, especially on rainforest margins. Though native it is has spread to places where it did not used to grow (Howell 2003). A second *Pittosporum*, *P. revolutum*, was seen in Berowra Valley Regional Park, and another member of the Pittosporaceae, the thorny *Bursaria spinosa*, was also seen here, and on Mt Banks. Tree violet (*Melicytus dentatus*) was rather similar, and was common at Mt Tomah. The Banks & Solander Walk at Botany Bay gave us our first introduction to several common and interesting woodland shrubs – hop bush *Dodonaea triquetra* (Sapindaceae), granny's bonnet *Pimelea linifolia* (Thymeleaceae), matchsticks *Comesperma ericinum* (Polygalaceae), cheese tree *Glochidion ferdinandi* (Phyllanthaceae), *Ceratopetalum gummiferum* (Cunoniaceae), coffee bush *Breynia oblongifolia* (Phyllanthaceae), and wedding bush *Ricinocarpus pinifolius* (Euphorbiaceae). New South Wales Christmas bush (*Ceratopetalum gummiferum*) seems to be a widely adaptable species, being at home in the understorey of eucalypt forest as well as in rainforest. Woolly pomaderris (*Pomaderris lanigera*) was a feature of the walk in Berowra Valley Regional Park.

In Royal National Park two leafless plants of the Santalaceae were seen. The first was *Exocarpos cupressiformis*, at Bundeena, and the other, acid drops (*Leptomeria acida*) at several places, in woodland. Acid drops is a bush tucker plant. Some introduced plants were of interest at the end of Jibbon Beach out towards Port Hacking Point. *Cestrum parqui* and *Bryophyllum delagoense* were making a nuisance of themselves, and there was a peculiar plant there in the Rubiaceae, *Richardia brasiliense*. In this same area we found the paper daisies *Ozothamnus diosmifolium* and *Helichrysum elatum*. On the rock coast here there were bushes of boobialla (*Myoporum boninense* subsp. *australis*) – see Chinnock (2007).

Sydney flannel flower (*Actinotus helianthi*) rivals waratah as a floral emblem of New South Wales. It is a short-lived perennial, and we saw it in lowland sclerophyll forest. It is in the Apiaceae family, but the bracts surrounding the flower heads make it look at first like a daisy. Lesser flannel flower (*Actinotus*

minor) was also common. In similar open, disturbed habitats in Royal National Park was everlasting daisy (*Helichrysum elatum*). Two members of the Araliaceae were seen. On Mt Banks we found the shrub elderberry panax (*Polyscias sambucifolia*), and in several places in the Blue Mountains the rather weedy looking flannel leaf (*Astrotricha latifolia*) on disturbed sites, an unusually soft-leaved plant amongst an otherwise sclerophyllous flora.

Our last outing in the Blue Mountains – from Govetts Leap to Pulpit Rock – was very rewarding and brought to light many further plants of interest. Some damp seeping banks had patches of *Celmisia longifolia*, and two other composites, silky daisy bush (*Olearia erubescens*) and oak-leaved daisy bush (*Olearia quercifolia*). There were also *Drosera binata*, *Drosera spatulata* and *Drosera auriculata* on these banks (earlier on, at Bundeena, we had seen *Drosera peltata*, too, distinguished by its hairy sepals). Native parsnip (*Platysace lanceolata*), hop goodenia (*Goodenia decurrens* and *G. ovata*) and rusty petals (*Lasiopetalum ferrugineum*) were also recorded. *Hibbertia* (Dilleniaceae) was instantly recognisable by its yellow flowers, and we commonly saw it in all vegetation types, though did not sort out all the species, other than the twining Guinea flower (*Hibbertia dentata*), climbing or golden Guinea flower (*Hibbertia scandens*) (common in Royal National Park, Bundeena), and the shrubby *Hibbertia riparia*. *Dampiera* (Goodeniaceae) with blue flowers was another eye-catcher, and we identified purple dampiera (*Dampiera purpurea*) and blue dampiera (*D. stricta*) in several places. Inconspicuous but rather common was germander raspwort (*Gonocarpus teucrioides*).

The only mistletoe we saw anything of was *Amyema pendulum*, its favoured host in the Blue Mountains being *Eucalyptus piperita*. It was plentiful near the Conservation Hut, Wentworth Falls. Some dicot climbers and scramblers recorded were water vine (*Cissus hypoglauca*), a very robust liane particularly abundant along the margins of Berowra Creek, *Cassytha pubescens*, and forest clematis (*Clematis glycinoides*).

Though not in flower, we identified two trigger plants in the family Stylidiaceae, *Stylidium graminifolium* and *Stylidium lineare*, both tufted and grass-like, and common along shaded tracks in the Blue Mountains. Of the herbaceous Violaceae we came across ivy-leaved violet (*Viola hederacea*) in several places, and were pleased to identify slender violet-bush or spadeflower (*Hybanthus monopetalus*) on Mt Banks, its very large, blue-mauve lower petal being its most obvious feature. At Berowra a common forest herb was *Mitrasacme polymorpha* (Loganiaceae) and there were sightings there of the lovely, mauve-flowered mint bush (*Prostanthera linearis*).

Mangroves were encountered at Kurnell (Botany Bay) and Berowra Creek (Hawkesbury River). There are two species in Sydney, the grey mangrove (*Avicennia marina* var. *australasica*) in the Acanthaceae and the river mangrove (*Aegiceras corniculatum*) in the Myrsinaceae. *Aegiceras corniculatum* is a shrub (2-4 m) and grows on higher ground and further upstream than the taller *Avicennia marina* (6-10 m). Generally the estuarine intertidal region has a dense stand of *Avicennia marina*, ringed on the landward side by a narrow undergrowth of *Aegiceras corniculatum* (Fig. 12).

Fig. 12. Grey mangrove (*Avicennia marina* var. *australasica*) and river mangrove (*Aegiceras corniculatum*), Berowra Valley Regional Park, 12 Sep 2009. Photo: Mike Wilcox.

Orchids

Seasonal timing is all-important for orchid spotting, but we did rather well and found something of interest each day. Anne and Maureen were our main orchid experts, with skilled photographers Alison and Christine eagerly at hand to capture the various discoveries. The large, multi-headed greenhoods of the genus *Bunochilus* were among the most eye-catching, with numerous sightings of the common tall greenhood (*Bunochilus longifolius*) at Katoomba, and a good find along the Pulpit Rock Track at Blackheath of the wondrous chocolate-lip leafy greenhood (*Bunochilus chocolatinus*) (Plate 4). This orchid was first discovered and recognised from this area, and named in 1999 (Jones 2006). Of *Pterostylis* s.s. itself we recorded three species: nodding greenhood (*Pterostylis nutans*) at Botany Bay and Royal National Park, blunt greenhood (*Pterostylis curta*) in Royal National Park east of Waterfall, and upright maroonhood (*Pterostylis erecta*) in Royal National Park, Bundeena (Plate 4).

One of the first orchids we saw was red beard orchid (*Calochilus paludosus*) at Botany Bay, and Doug Sheppherd saw it again towards the end of the trip, in Ku-ring-gai Chase National Park. Perhaps the commonest orchids in the sandstone woodlands were white fingers (*Petalochilus catenatus*) (Plate 4), pink fingers (*P. carneus*), and the diminuitive small waxlip

orchid (*Glossodia minor*) (Plate 4). It should be mentioned here that the splitting of *Caladenia* by Jones et al. (2001) into six genera (including *Petalochilus*) is not widely accepted, and the consensus at a symposium on *Caladenia* held in Australia in 2007 favoured retention of *Caladenia* with various subgenera (Dixon & Hopper 2009). Spotted sun orchid (*Thelymitra ixioides*) was generally fairly common and we found several in Royal National Park and Berowra Valley Regional Park. Some were beautifully spotted, while others had no spots at all.

Broad-lipped bird orchid (*Myrmechila trapeziformis*) (Plate 4), brown beak orchid (*Lyperanthus suaveolens*) and mayfly orchid (*Nemacianthus cordatus*) were treasured finds in Royal National Park, while on our long trek up to Berowra station on our last day we were delighted to find a splendid colony of rock lily (*Thelychiton speciosum*) perched on a rock (Plate 4).

Table 1: Current and alternative names of orchids seen on the trip.

Current name ¶	**Alternative name**	**Common name**
Bunochilus chocolatinus D.L.Jones		chocolate-lip leafy greenhood
Bunochilus longifolius (R.Br.) D.L.Jones & M.A.Clem.	*Pterostylis longifolius* R.Br.	tall greenhood
Calochilus paludosus R.Br.		red beard orchid
Glossodia minor R.Br.		small waxslip orchid
Lyperanthus suaveolens R.Br.		brown beak orchid
Myrmechila trapeziformis (Fitzg.) D.L.Jones & M.A.Clem	*Chiloglottis trapeziformis* Fitzg.	broad-lip bird orchid
Nemacianthus cordatus (R.Br.) D.L.Jones & M.A.Clem.	*Acianthus cordatus* R.Br.	mayfly orchid
Petalochilus carneus (R.Br.) D.L.Jones & M.A.Clem.	*Caladenia carnea* R.Br.	pink fingers
Petalochilus catenatus (Sm.) D.L.Jones & M.A.Clem.	*Caladenia catenata* (Sm.) Druce	white fingers
Petalochilus fuscatus (Reichb.f.) D.L.Jones & M.A.Clem.	*Caladenia fuscata* (Reichb.f.) M.A.Clem. & D.L.Jones	dusky fingers
Pterostylis curta R.Br.		blunt greenhood
Pterostylis erecta T.E.Hunt		upright maroonhood
Pterostylis nutans R.Br.		nodding greenhood
Thelychiton speciosum (Sm.) M.A.Clem. & D.L.Jones	*Dendrobium speciosum* Sm.	rock lily
Thelymitra ixioides Sw.		spotted sun orchid

¶ AUSTRALIAN ORCHID NAME INDEX (13/6/2008) by
Mark A. Clements and David L. Jones, Centre for Plant Biodiversity Research/Australian National Herbarium
GPO Box 1600, Canberra ACT 2601, Australalia, Corresponding author: mark.clements@csiro.au

Other monocots

The Royal National Park had two of our plant highlights of the trip – cabbage palm (*Livistona australis*) of the Arecaceae and Gymea lily (*Doryanthes excelsa*) of the Doryanthaceae. Cabbage palm was particularly impressive and prevalent in the more sheltered valleys under tall eucalypt forest (Fig. 13), while Gymea lily grew in and on the margins of dry sclerophyll forest. There were also a few cabbage palms at Kamay Botany Bay National Park. Native iris (*Patersonia sericea*) of the Iridaceae was seen in various localities, blue flax lily (*Dianella caerulea*) at Botany Bay, and rush lily (*Sowerbaea juncea*) of the Laxmanniaceae flourished in damp heath in the Blue Mountains, especially on Mt Banks. *Alania endlicheri* is a monotypic NSW endemic in the family Boryaceae which we were excited to find along the track down to the Valley of Waters, Wentworth Falls. Maureen spotted a little monocot on a damp, sandy site above Jibbon Beach, and correctly recognised it as a *Centrolepis* – it turned out to be *C. strigosa*.

Lomandra of the Laxmanniaceae is yet another highly distinctive Australian genus. Long-leaved mat rush (*Lomandra longifolia*) is the biggest of these, and also the commonest. *Lomandra filiformis*, with very slender leaves, was recorded at Berowra, and we saw the aberrant *Lomandra obliqua*, with 2-ranked leaves.

Grass-trees (*Xanthorrhoea*) of the Xanthorrhoeaceae were much in evidence at most places we went to. Some Sydney species are trunkless, notably *X. minor*, *X. media*, *X. resinifera*, while others have a definite trunk, e.g., *X. arborea*, *X. glauca*. We did not really sort them out too well.

Sedges were common on the coast and in woodlands and the hanging swamps in the Blue Mountains. We did not pay sufficient attention to them to adequately do justice to the rich diversity of this group, so can just highlight a few. Two familiar coastal ones at the base of cliffs at Cronulla were *Isolepis cernua* and

Fig. 13. Cabbage palm (*Livistona australis*), Royal NP Waterfall, 6 Sep 2009. Photo: Doug Sheppherd.

Ficinia nodosa, while *Baumea juncea* (and the sea rush *Juncus kraussii*) grew in salt meadows beside Berowra Creek. *Gahnia sieberiana* was generally abundant in the Blue Mountains, where we also saw button grass (*Gymnoschoenus sphaerocephalus*) in wet areas. The sedge which attracted most interest was curly wig (*Caustis flexuosa*). It has curly branches and was common in eucalypt woodland. Restiads, too, did not get enough of our attention, though we did recognise *Empodisma minus* in hanging swamps in the Blue Mountains (where *Lepyrodia scariosa* is also common). Grasses were mostly overlooked, though *Poa labillardieri* was recognised under tall eucalypts in Royal National Park, *Poa sieberiana* in the Blue Mountains forests, bordered panic (*Entolasia marginata*) in Berowra Valley Regional Park, and kangaroo grass (*Themeda triandra*) at Kurnell.

Three monocot vines seen were lawyer vine (*Smilax australis*), native sarsparilla (*Smilax glyciphylla*) and wombat berry (*Eustrephus latifolius*), and a monocot weed of significance at Jibbon Beach was *Protasparagus aethiopicus*.

Gymnosperms

We have little to report in this department. The cycad known as burrawang (*Macrozamia communis*) was present in small numbers at Kamay Botany Bay Regional Park, but we did not see it anywhere else. We missed seeing the rare dwarf podocarp *Pherosphaera fitzgeraldii* (syn. *Microstrobos fitzgeraldii*) on dripping rock faces at Wentworth Falls, Bridal Veil Falls and Leura Falls (but saw it in cultivation at Mt Tomah Botanic Gardens), and we somehow missed the cypress pine *Callitris muelleri*, but saw *C. rhomboidea* at Botany Bay, evidently planted as they were in a distinct row. *Pinus radiata* was common in cultivation in the townships such as Katoomba, Blackheath and Mt Victoria in the Blue Mountains. Our viewings of the Araucariaceae were confined to fine plantings of Norfolk Island pine (*Araucaria heterophylla*), hoop pine (*Araucaria cunninghamii*), and Cook pine (*Araucaria columnaris*) at Kurnell and Cronulla, a great specimen of Fijian kauri (*Agathis macrophylla*) in the Sydney Botanic Gardens, and cultivated Wollemi pine (*Wollemia nobilis*) at Mt Tomah Botanic Garden.

Ferns and clubmosses

Australia and New Zealand share many fern species, as was observed in the course of this trip. Fertile fronds were hard to find, which made the identification of some terrestrial ferns with highly divided fronds almost impossible. Two species growing on the sandstone rocks on the coast at Cronulla were *Gleichenia rupestris*, the fronds with wide pinnules and glaucous beneath, and the Japanese holly fern (*Cyrtomium falcatum*), which is also much naturalised in Auckland (Benham 2008). The dry heath lands were not conducive to fern growth, with the occasional exception of two species of *Lindsaea*; our own *L. linearis,* and the dainty, finely divided lacy wedge fern (*Lindsaea microphylla*), the fronds of which sometimes reached 50 cm. *Asplenium flabellifolium* was often seen peeping out from sheltering rocks. Where the vegetation was taller, bracken (*Pteridium esculentum*) was common, as was the "false bracken" (*Calochlaena dubia*) (Plate 3), and in two places grew good populations of sickle fern (*Pellaea falcata*).

Blechnum was the most prolific genus encountered. At Botany Bay we saw *B. camfieldii*, here near its southern limit, and *B. indicum* – the fertile fronds of the latter barely differing from the sterile. In more humid gullies and by streams, *B. nudum*, with a small trunk, was very common, as was the attractive creeping *B. wattsii*, its rather leathery fronds often coloured pink when young. We were very interested to see *B. patersonii* growing near a waterfall below the Conservation Hut at Wentworth Falls, as our own *B. colensoi* once bore that name. As with *B. colensoi,* the fronds of *B. patersonii* can be undivided or pinnatifid, but in this case they were all, even the fertile fronds, undivided. A large member of the genus, first seen in quantities at Mt Wilson, had Maureen puxxled at first, as it took much hunting to finally find a fertile frond. This fertile frond, once again barely discernable from the sterile, the pale green colour, and the broad bases of the pinnae, declared it to be *B. cartilagineum*. It was seen again at Blackheath, on the walk to Pulpit Rock.

Perhaps the most surprising fern phenomenon was the abundance of *Todea barbara* (Osmundaceae) wherever there was some shelter (Plate 2). Small plants grew in the shade of large rocks, but this species came into its own on stream sides, where thick trunks supported huge fronds, the basal pinnae often sporting the patches of naked sori that proclaim its ancient lineage. Where it grew, as it often did, with *Sticherus flabellatus,* those of us familiar with the Shenstone Block, Te Paki, Northland, felt right at home. Other "umbrella" ferns seen were *Gleichenia dicarpa, G. microphylla* and the very common

Sticherus lobatus. We learned to distinguish *S. lobatus* from other species of *Sticherus* by the pinnules being at right angles to the rachis, and the lobed pinnae at the rachis junctions. It was seen at Echo Point, Mt Wilson, Blackheath and Berowra. A second member of the Osmundaceae was *Leptopteris fraseri*, with lacy membranous fronds, and growing typically in the humid atmosphere close to the waterfall at Wentworth Falls.

No epiphytic ferns were present in the dry eucalypt forests, but by the river on the Bola Track in Royal National Park impressive bird's nest ferns (*Asplenium australasicum*) perched in the branches of the tall trees, as did the elkhorn (*Platycerium bifurcatum*). *Microsorum scandens* was an occasional climber there, and *Asplenium bulbiferum* and *Lastreopsis decomposita* also grew by the river. Rupestral species were the aptly named *Pyrrosia rupestris*; the only filmy fern seen, *Hymenophyllum cupressiforme*, often with *Grammitis stenophylla*; and in the Blue Mountains, *G. billardierei.* A lovely surprise occurred when flat-leaved plants growing in swards on damp rock faces were examined with a lens and were found to be sporting little "combs" on the end. This was *Schizaea rupestris,* and it was seen at Echo Point and Wentworth Falls. The only other comb fern seen was a giant *S. bifida* growing from a rock crevice in Berowra Valley Regional Park.

Cyathea australis was the commonest tree fern, and we learned to look for the rough tubercles on the stipes, and the persistent stipe bases on the trunks. A few specimens of *Cyathea cooperi* were seen in Berowra Valley Regional Park, sporting the long, pale, silky scales that distinguish it from other species. A brief walk at Mt Wilson proved it to be a fern stronghold, and *Dicksonia antarctica*, with thick, fibrous trunks*,* was common as an under storey species. Among the many ferns growing there, one that we saw nowhere else was *Polystichum proliferum,* with the characteristic plantlets forming near the ends of the fronds.

Adiantum formosum, now reduced to one natural population in New Zealand, covered large areas in the Royal National Park (Plate 1), and *A. aethiopicum* grew there too. There were occasional sightings of *Doodia aspera* and *D. caudata* and a lovely display of *Psilotum nudum* growing all along a rock crevice, and one sturdy *Pteris vittata*, were both in Berowra Valley Regional Park. Small plants of *Histiopteris incisa* were seen on a couple of occasions. *Cheilanthes sieberi,* sometimes with fronds reaching 40 cm in length, was seen several times, always, as would be expected, growing on dry, rocky bluffs. Species of *Hypolepis* were seen on three occasions, but the only one we were able to identify was *H. muelleri,* which formed a large mixed colony in Kamay Botany Bay National Park, along with bracken. The difference between the two was easy to miss at a casual glance.

It was interesting to see one of our worst environmental weeds, the sword fern (*Nephrolepis cordifolia*), growing by the track in the lower reaches of the Berowra Valley Regional Park. One tuber was exposed to help us with our identification.

At the Sydney Botanical Gardens fernery we were able to check out some species that we did not see in the wild. One that caught our eye was a very slender tree fern, *Cyathea baileyana*. The lower pinnae on each frond were reduced to bright green lacy outgrowths, and these curious wig-like structures give rise to the common name of wig tree fern. Seen on a street tree in Sydney, but not in the wild, was a second species of *Pyrrosia*, this time *P. confluens*, with the sori restricted to the apex of the fertile fronds, as a confluent horseshoe-shaped brown patch.

The two lycopods seen were *Lycopodium deuterodensum* and *Lycopodiella lateralis*.

Mt Tomah Botanic Gardens

Our visit to these gardens was very worthwhile, and we were warmly welcomed by Jan Allen, the Garden Information Officer. She and Rob Keith, the Manager, are both Kiwis. We enjoyed walking through the Gondwana section, with good collections from Chile, New Zealand and Australia set in amongst a natural remnant of natural coachwood-sassafras rainforest, with blackwood and tall *Eucalyptus fastigata* (Fig. 8). *Nothofagus moorei* was much planted here, and looked very vigorous and healthy, though a fair way south of its natural range (it is on the Barrington Tops, inland from Newcastle). The Chilean *Griselinia scandens* was an eye-opener for us, as it is a scrambler and the leaves are strongly toothed. There is a comprehensive conifer section, rock garden, and numerous cool-temperate trees and shrubs from around the world. As expected *Wollemia nobilis* had been planted out in the gardens, and the Visitor Centre had them for sale ($A40-60 each).

NSW National Herbarium

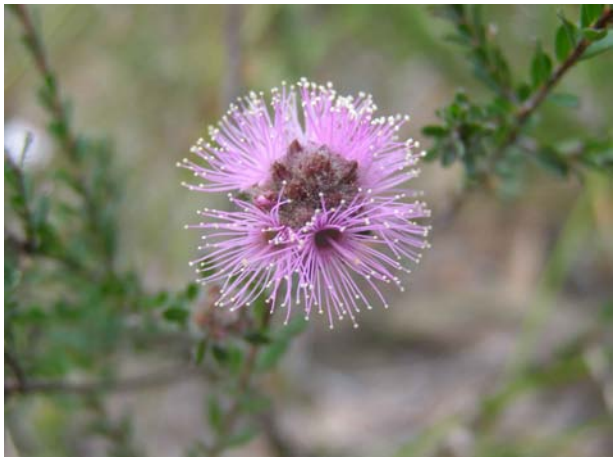
A very good programme had been set up for us by Elizabeth Brown and Peter Wilson. During lunch we met Executive Director Tim Entwisle, and had informative lectures from Doug Benson and Katie Thurlby. Doug spoke about the ecology and conservation of Sydney's bushland, pointing out that the flora and vegetation of the poorer sandstone country is still very well represented, as the land was not fit for agriculture or settlement. The more fertile clay soils derived from shale, however, have only a few remaining remnants of the original vegetation. Katie spoke about her BSc (Hons.) on the genetics, ecology and conservation of magenta lilly pilly (*Syzygium paniculatum*). This is a seriously endangered tree in the wild, with just four tiny populations remaining, including the Towra Point-Kurnell area. This species is unusual in that each seed

Plate 1

Tuckeroo (*Cupaniopsis anacardioides*), Sapindaceae, Cronulla, 4 Sep 2009. Photo: Mike Wilcox.

Heath banksia (*Banksia ericifolia*), Proteaceae, Royal National Park, 5 Sep 2009. Photo: Mike Wilcox.

***Darwinia fascicularis*, Myrtaceae, Royal National Park, 5 Sep 2009. Photo: Mike Wilcox.**



***Kunzea capitata*, Royal National Park, 6. Sep 2009. Phxoto: Christine Major.**

***Corymbia gummifera*, Myrtaceae, Royal National Park, 5 Sep 2009. Photo: Mike Wilcox.**

***Adiantum formosum*, Pteridaceae, Royal National Park, 6 Sep 2009. Photo: Mike Wilcox.**

Plate 2

Drumsticks (*Isopogon anemonifolius*), Royal National Park, 6 Sep 2009. Photo: Christine Major.

***Pultenaea stipularis*, Leguminosae, Royal National Park, 6 Sep 2009. Photo: Mike Wilcox.**

***Todea barbara*, Osmundaceae, Blue Mountains, Katoomba, 7 Sep 2009. Photo: Mike Wilcox.**

***Epacris reclinata*, Ericaceae, Blue Mountains, Wentworth Falls, 8 Sep 2009. Photo: Mike Wilcox.**

Mountain devil *(Lambertia formosa*), Proteaceae, Blue Mountains, Wentworth Falls, 8 Sep 2009. Photo: Doug Sheppherd.

***Indigofera australis*, Fabaceae, Mt Banks, 9 Sep 2009. Photo: Mike Wilcox.**

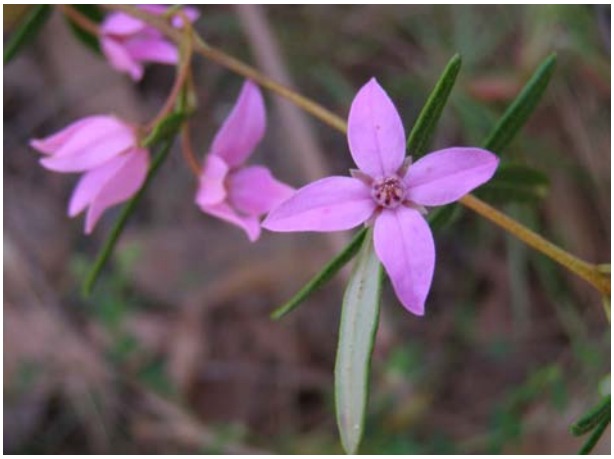
Plate 3

***Calochlaena dubia*, Dicksoniaceae, Mt Wilson, 9 Sep 2009. Photo: Mike Wilcox.**

***Sprengelia incarnata*, Ericaceae, Blue Mountains, Pulpit Rock, 10 Sep 2009. Photo: Doug Sheppherd.**

***Calytrix tetragona*, Ericaceae, Berowra, 12 Sep 2009. Photo: Mike Wilcox.**

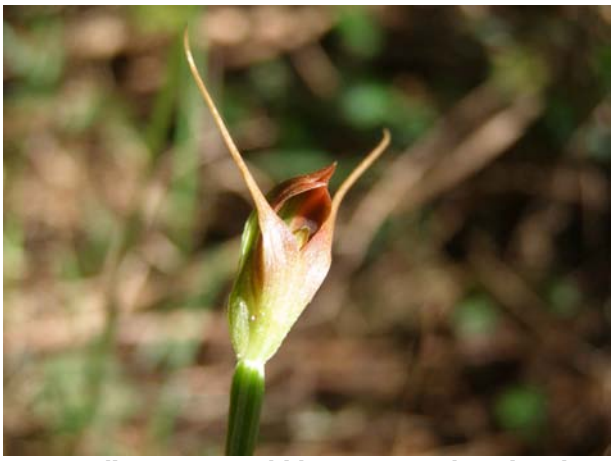
***Tasmannia insipida*, Winteraceae, Berowra, 12 Sep 2009. Photo: Mike Wilcox.**



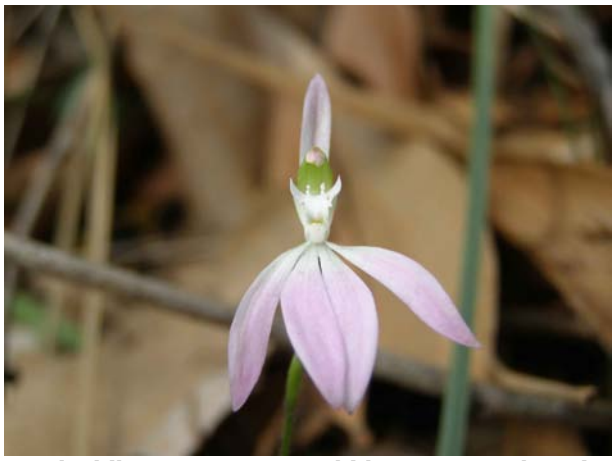
***Boronia ledifolia*, Rutaceae, Berowra, 12 Sep 2009. Photo: Christine Major.**

***Bauera rubioides*, Cunoniaceae, Berowra, 12 Sep 2009. Photo: Mike Wilcox.**

Plate 4



***Pterostylis erecta*, Orchidaceae, Royal National Park, Bundeena, 5 Sep 2009. Photo: Christine Major.**



***Petalochilus catenatus*, Orchidaceae, Royal National Park, Waterfall, 6 Sep 2009. Photo: Christine Major.**

***Bunochilus chocolatinus*, Orchidaceae, Pulpit Rock Track, Blackheath, 10 Sep 2009. Photo: Mike Wilcox.**

***Glossodia minor*, Orchidaceae, Royal National Park, Waterfall, 6 Sep 2009. Photo: Christine Major.**

***Thelychiton speciosum*, Orchidaceae, Berowra Regional Park, 12 Sep 2009. Photo: Christine Major.**

***Myrmechila trapeziformis*, Orchidaceae, Royal National Park, Waterfall, 6 Sep 2009. Photo: Christine Major.**

produces numerous embryos, and potentially numerous seedlings. There is no detectable genetic variation between the populations.

These presentations were followed by a tour of the herbarium, taking in the library, where a set of Banks' Florilegium paintings is held (Ebes 1988), with a lively commentary from librarian Miguel Garcia, the illustration department, and the preparation room where volunteers prepare the specimens. Interestingly, some plants (e.g. grasses and eucalypts) are often left loose on the sheets. The standard fastening method, however, is using dental floss. We had the opportunity to check a few of our identifications in the public herbarium.

Conclusion

We were able to get a good appreciation of the main features of the Australian botany, moulded by the sunburnt landscape, the mostly impoverished soils derived from ancient rocks, and the ever-presence and influence of fire. Old Gondwana families frequented the cool rainforest gullies, while the open sandstone country was ruled by the plants Australian is most famous for: eucalypts, Proteaceae, legumes and casuarinas. Shrubs in flower during our visit were naturally the ones we got to know best. We enjoyed the scenery and the plants, Sydney's trains, the convenient youth hostels, and the warm welcome at the NSW Herbarium.

Our favourite plants were:

Diana: river mangrove (*Aegiceras corniculatum*) Myrsinaceae
Colleen: waratah (*Telopea specioissima*) Proteaceae
Mike: cabbage palm (*Livistona australis*) Arecaceae
Maureen: "flat-stipe" comb fern (*Schizaea rupestris*) Schizaeaceae
Nancy: Sydney boronia (*Boronia ledifolia*) Rutaceae
Gretta: Gymea lily (*Doryanthes excelsa*) Doryanthaceae
Barrie: mountain devil (*Lambertia formosa*) Proteaceae
Jan: cliff heath (*Epacris reclinata*) Ericaceae
Alison: darwinia (*Darwinia fascicularis*) Myrtaceae
Christine: maidenhair fern (*Adiantum formosum*) Pteridaceae
Leslie: *Alania endlicheri* Boryaceae
Juliet: five-corners (*Styphelia triflora*) Ericaceae
Helen: yellow-top mallee ash (*Eucalyptus luehmanniana*) Myrtaceae
Doug: Sydney red gum, smooth-barked apple (*Angophora costata*) Myrtaceae
Anne: rock lily (*Thelychiton speciosum*) Orchidaceae

Authorship: Christine Major provided a photographic record of most of the plants seen as an aid to identification and recording for this report, Maureen Young wrote about ferns, and Mike Wilcox wrote about the other groups mentioned.

References about Sydney's plants

In the field we found the well-illustrated Baker & Corringham (2004), Howell & Benson (2000), Jones & Clemesha (1993) and Robinson (2003) most useful. The latest edition of the "Flora of the Sydney Region" (Pellow et al. 2009) has just been released. It covers all the area we visited and features keys to all the genera and species, but has few illustrations. Harden (1993) is the most comprehensive reference, and is now on the internet (plantnet.rbgsyd.nsw.gov.au). Keith (2004) is a comprehensive, illustrated account of the vegetation. A useful website is www.waratahsoftware.com.au/wp_flora_bluemountains.html

Armstrong, J. 1981: *A botanical excursion to the Blue Mountains*. XIII International Botanical Congress Field Trip 19/2: 29 August – 4 September 1981. Sydney, Australia.

Baker, M.; Corringham, R. 2004: *Native plants of the Blue Mountains*. 2nd ed. Bower Bird Books, NSW.

Benham, S. 2008: Japanese holly fern invader – *Cyrtomium falcatum* (L.f.) C.Presl *Auckland Botanical Society Journal* 63: 25-27.

Benson, D.; Howell, J. 1994: *Natural vegetation of the Sydney area*. Royal Botanic Gardens Sydney.

Boland, D.J., Brooker, M.I.H., Chippendale, G.M., Hall, N., Hyland, B.P.M., Johnston, R.D., Kleinig, D.A., Turner, J.D. 1984: *Forest Trees of Australia*. CSIRO, Australia.

Chinnock, R.J. 2007: *Eremophilaand allied genera*. Rosenburg Publishing, NSW, Australia.

Collins, K.; Collins, K.; George, A. 2008: *Banksias*. Bloomings Books Pty Ltd, Melbourne.

Costermans, L. 1992: *Native trees and shrubs of south-eastern Australia*. Weldon Publishing 424 p.

Cronin, L. 2009: *Cronin's key guide. Australian rainforest plants*. Jacana Books, Allen & Unwin, NSW.

Dixon, K.W.; Hopper, S.D. 2009: An introduction to *Caladenia* R.Br. – Australasia's jewel amongst terrestrial orchids. *Australian Journal of Botany 57*: i-vii.

Ebes, H. 1988: The Florilegium of Captain Cook's First voyage to Australia 1768-1771. Ebes Douwma Sotheby's Australia.

Fairley, I.; Moore, P. 2002: *Native Plants of the Sydney District: an identification guide,* Kangaroo Press, New South Wales.

Floyd, A.G. 2008: *Rainforest trees of mainland south-eastern Australia.* Terania Rainforest Publishing, Lismore, Australia.

Harden, G.J. (ed.) 1993: *Flora of New South Wales*. Volumes 1-4. New South Wales University Press.

Higgins, L.; Rodd, A. 2000: *A day in the bush. Sydney region bushwalks*. New Holland Publishers, Sydney.

Howell, J. 2003: *Pittosporum undulatum* as a case study for native species that change range – how to avoid inappropriate responses ? *Cunninghamia 8*: 153-155.

Howell, J.; Benson, D. 2000: *Sydney's bushland*. Royal Botanic Gardens, Sydney.

Jones, D.L. 2006: Towards a revision of *Bunochilus* D.L.Jones & M.A.Clem. *Australian Orchid Research 5*: 112-142.

Jones, D.L.; Clemesha, S.C. 1993: *Australian Ferns and Fern Allies*. The Currawong Press, Chatswood.

Jones, D.L.; Clements, M.A.; Sharma, I.K.; Mackenzie, A.M. 2001: A new classification of *Caladenia* R.Br. (Orchidaceae). *Orchadian 13*: 389–419.
Keith, D. 2004: *Ocean Shores to Desert Dunes*. *The Native Vegetation of New South Wales and the ACT*. CSIRO.
Pellow, B.J.; Henwood, M.J.; Carolin, R.C. 2009: *Flora of the Sydney region*: *a complete revision*. Sydney University Press.
Robinson, L. 2003: *Field guide to the native plants of Sydney*. 3rd edit. Kangaroo Press, Sydney.
Williams, J.B.; Harden, G.J.; McDonald, W.J.F. 1984: *Trees & shrubs in rainforests of New South Wales & southern Queensland*. Botany Department, University of New England, Armidale, NSW.
Williams, J.B.; Harden, G.J. 2000: *Rainforest climbing plants. A field guide to the rainforest climbing plants of New South Wales using vegetative characters*. Botany Department, University of New England, Armidale, NSW.

Vascular Flora of Pakatoa Island – the missing link, inner Hauraki Gulf

Ewen K. Cameron

Introduction

In a continuation of the Auckland Botanical Society (ABS) visiting and recording the vegetation and floras of Hauraki Gulf Islands, on 17 Oct 2009 we visited the privately owned Pakatoa Island which was one of the largest Hauraki Gulf islands with little botany recorded. It was also the missing link in the seven-island chain, east and south east of Waiheke Island published by Cameron et al. (2007).

We departed from the Maraetai wharf at 9.15 am with 41 people on the Department of Conservation (DoC) boat *Hauturu.* Ten minutes after leaving the wharf a fur seal was observed rolling around in the water (flippers in the air). Rotoroa Island, which was the destination of ABS's 2006 island trip (see Cameron 2007), looked quite different with its screen of planted exotic trees (mainly pines) around most of the island's perimeter having very recently been cut down and mulched *in situ*. We arrived at the Pakatoa wharf about 10 am where we were welcomed by the island caretaker Tony Russell. After a brief introduction from Tony we drifted into small informal groups and attempted to cover most of the island – the 1.15 pm low tide assisted coastal access. The wild vascular plants were the focus of most people's interest; however, Mike Wilcox concentrated on the marine algae.

The forecast for the day was for thunderstorms and possible hail, however, the worst that we received was a light short-lived shower, and until later in the afternoon the winds remained light. At the end of the day we all met up at 4 pm and departed Pakatoa 15 minutes later.

Participants of the field trip (41): Chris Ashton, Ezra Barwell, Steve Benham, Duncan Benzie, Linda Bethell, Robert Brassey, Jan Butcher, Ewen Cameron (leader), Paul Cashmore, Xin Cheng, Jess Clark, Bev & Geoff Davidson, Claire de Luen, Frances Duff, Christine Fildes, Alan Foubister, Michelle Findlay, Richard Gallen, Simon Grant, Leslie Haines, John Hobbs, Marcel Horvath, Richard Hursthouse, Peter Hutton, Mei Nee Lee, Helen Lyons, Elaine Marshall, Carol & Garry McSweeney, Suman Pancha, Helen Preston Jones, Juliet Richmond, Emily Roper, Bec Stanley (booking officer), Claire Stevens, Valerie Tomlinson, Liesbeth Van Kerckhoven, Mike Wilcox, and Philip & William Wrigley.

Brief history of Pakatoa Island (from: *NZ Herald,* 15 & 24 Dec 1992; Paul Monin *in*: Craig & Lee 1993; Lee 1996; and Cameron 2007)

1845 – Pakatoa (and Rotoroa Id) purchased from its Maori owners (Ngati Paoa) by Charles H. McIntosh for £20, 10 blankets and 23 lbs of tobacco (all pre-1900 information from Monin *in*: Craig & Lee 1993).
1848 – Pakatoa purchased by I.A. Smith for £34 and sold onto Edward Fisher.
1861 – purchased by Donald McLean for £100.
1865 – leased to a fisherman (probably Alfred Sanford – founder of the Sanford fishing empire).
1870 – Alfred Sanford shifted his family to Pakatoa and set up a fish curing factory which was unsuccessful.
1871 – purchased by Thomas Fitzgerald for £150 who sold it in 1897; it then passed through several hands.
1901 – purchased by Mary Bell, wife of Frank Bell of Waiheke. During this period it became more than just a base for fishing: a long bungalow was built to accommodate c.50 people, presumably to serve as a tourist boarding house, with a boiler house, a smoke house, even a tennis court, and was known during this period as "Bell's Island".
1907 – Salvation Army leased Pakatoa to provide a safe place for recovering male alcoholics.
1909 – the 50 men were transferred to Rotoroa Id, and replaced with 50 women alcoholics on Pakatoa.
1932 – Salvation Army purchased Pakatoa Island.
1942-43 – to accommodate some of the Porirua psychiatric patients displaced by an earthquake, the women on Pakatoa were discharged or transferred and the men on Rotoroa Id were transferred to Pakatoa for 12 months.
1943-49 – after 12 months the men were moved back to Rotoroa Id, and Pakatoa was used as an Aged Man's retreat.
1949 – Salvation Army sold Pakatoa Id.
1951 – most of the island was grazed pasture (see Fig. 1).