TRILEPIDEA

Newsletter of the New Zealand Plant Conservation Network

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Deadline for next issue:
Monday 15 January 2014

SUBMIT AN ARTICLE TO THE NEWSLETTER

Contributions are welcome to the newsletter at any time. The closing date for articles for each issue is approximately the 15th of each month.

Articles may be edited and used in the newsletter and/or on the website news page.

The Network will publish almost any article about plants and plant conservation with a particular focus on the plant life of New Zealand and Oceania.

Please send news items or event information to events@nzpcn.org.nz

Postal address:
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NEW ZEALAND

PLANT OF THE MONTH, p. 2
Alepis flavida

President's message

Wishing everyone a very Merry Christmas and Happy New Year. I hope you all have a relaxing holiday with family and friends. Summer holidays are always a good opportunity to explore new terrain or revisit familiar places with fresh eyes. There is some fascinating information in the newsletter, so enjoy. Happy botanising out there and take care.

Sarah Beadel
President

Fascinations and frustrations: voting for New Zealand's favourite plant and worst weed begins for 2013

The New Zealand Plant Conservation Network's annual favourite plant and worst weed vote opened on 9 December, and will run until 29 December, with the winners being announced in the New Year. Each year since 2002, the Plant Conservation Network has asked New Zealanders to vote for their favourite plant. In 2012, the worst weed was added into the mix, which also proved popular. Last year the threatened and iconic kauri / *Agathis australis* took the title of favourite plant, closely followed by two famous iconic species, pohutukawa / *Metrosideros excelsa* and puriri / *Vitex lucens*. The winner or loser, depending on your point of view, of the worst weed title went to wandering Jew / *Tradescantia fluminensis*, with veldt grass / *Ehrharta erecta* and convovulus / *Convovulus arvensis* following behind.

Kauri—*Agathis australis*, 2012 Favourite Plant winner; New Zealand's best known giant, Tane Mahuta, God of the forest, residing in Waipoua Forest, Northland Photo John Sawyer.

With voting having been underway for only seven days at the time of writing, there are some expected contenders and a few not so expected candidates. In the first couple of days, the early leaders for favourite plant included the very worthy and "Nationally Critical" endangered Bartlett's rata—*Metrosideros bartlettii* (now sixth). Then another "Nationally Critical" threatened plant, kakabeak—*Clianthus puniceus*—took over briefly (now fourth) before being pipped by the current leader our first fern to feature so dominantly the "simply spectacular", "more silver than silver fern!", filmy fern—*Hymenophyllum malingii*.

Like the favourites there has been some fluctuating at the lead in the race to become 2013's worst weed. As you would expect, those showing their ugly heads are species many gardeners and conservationists are familiar with; initially, agapanthus /

PLANT OF THE MONTH – *ALEPIS FLAVIDA*

Alepis flavida. Photo: John Barkla.

Plant of the month for December is pirita, the yellow mistletoe (*Alepis flavida*). Mistletoe is often associated with Christmas and pirita doesn't disappoint, flowering over New Zealand's summer, producing beautiful small orange-yellow to yellow flowers. The flowers are followed by small, shiny, translucent oval berries that ripen to yellow or gold.

Like other mistletoe, pirita grows as a semi-parasitic shrub, mainly on the outer branches of beech trees, often on mountain or black beech. Leaves are thick and oval with margins tinged red that are rough to the touch.

Unfortunately, pirita is listed as declining. As with other native mistletoe, threats to pirita include animal browsing, fire, collectors, destruction of habitat and hosts, and fungal diseases.

The Network fact sheet for pirita may be found at: www.nzpcn.org.nz/flora_details.aspx?ID=146

Agapanthus praecox subsp. *orientalis* held the lead for some time (currently fourth). Then, out of the shadows, slowly smothering everything in its path, travelling through fences and proving yet again hard to eliminate, last year's winner, wandering Jew / *Tradescantia fluminensis*.

Leader Board 16 December

Favourite Plant	Worst Weed
Filmy fern—*Hymenophyllum malingii*	Wandering Jew—*Tradescantia fluminensis*
Pohutukawa—*Metrosideros excelsa*	Convolvulus—*Convolvulus arvensis*
Coastal kowhai—*Sophora chathamica*	English ivy—*Hedera helix subsp. helix*
Kakabeak—*Clianthus puniceus*	Agapanthus—*Agapanthus praecox* subsp. *orientalis*
Rewarewa—*Knightia excelsa*	Gorse—*Ulex europaeus*

Often, when it comes to the general knowledge of New Zealanders and their native plants it's iconic, bright flowered and common species that most people are familiar with and can name. The New Zealand Plant Conservation Network website has 27,000 images of native and weed species which you may wish have a look at and vote for. Any species featured on the site can be voted for; including native and non-native orchids, ferns, trees, shrubs, vines, herbs, grasses, sedges, bryophytes, lichens and algae. The Network's focus is to promote and highlight the protection of threatened plants and their environs. The more knowledge about plants we as a network can share can only benefit people and plants in the future.

With plenty of time still left to vote, the Network invites members, as well as anyone else you know, to vote for New Zealand's favourite plant and worst weed of 2013. Simply select the species you wish to vote for using the "Search Flora" window on the NZPCN homepage, or alternatively support a species' election already voted for, by hitting the "Vote for New Zealand's Favourite Plant & Worst Weed" button also featured on the homepage. Voting closes at midnight 29 December.

For more information contact: Matt Ward, email: mattdavidward@gmail.com, mobile 021 1891062.

Posters promoting the vote can be downloaded from these links: Climbing broom poster, Speargrass poster, Douglar fir poster.

Why record phenology on NZPCN's website?

Matt Ward, Network Council member (mattdavidward@gmail.com)

Phenology is a word I use regularly when answering questions about whether seed is available for use by a restoration group or plant nursery. Phenology, in the world of plant conservation is a very important word. *Phenology* (pronounced [fĭnǫ·lŏdʒɪ]), is defined as "the study of cyclic and seasonal natural phenomena, especially in relation to climate and plant and animal life."

Understanding the phenological behaviour of plants allows us to better understand plants' connectivity to their surroundings and reactions to climatic factors season to season. In this article we will first look at the importance of you, the observer, collecting phenology observations, and then explain how anyone can contribute to the NZPCN data set.

In the area, after seeing dozens of specimens, this was the only *Toronia toru* in flower, unopened flower buds can also be seen, therefore recorded as "first flowering". Photo Matt Ward.

The importance of recording phenological observations serves several purposes in plant conservation. Primarily, phenology recording gives us a very accurate verification of the reproductive stages of a species during the year or that year in particular. This information may suggest a mast year, for example, which then may have consequences for other species' conservation. An example that many people may be familiar with is the mast year of rimu producing plentiful receptacles that is thought to provoke kakapo into breeding action. If you are looking at the native plants in flower in your area this year, it may be evident that 2013/14 is a mast season. Recording this information over time, if done consistently and methodically, will show when the best time of year to perhaps collect seed, take a photo of your favourite plant in flower, or even do some weed control after an annual has died back for the season. This then improves our knowledge of variation in times of flowering each year, for example, this year most species appear to be early in their reproductive cycles. I recently found a *Caladenia* orchid in flower earlier than its suggested flowering time, which was confusing, yet it showed the seasonal variation that plants are prone to exhibit. The more information that is collected, the more accurately we can suggest when a plant's likely flowering or seed set is expected to be. Therefore, if annual climate variation is taken into account, these phenological assumptions may be further refined.

Secondarily, nested within the records of any phenology recordings is the actual distribution of a species. Documenting this via the website (www.nzpcn.org.nz) enhances the true range of a species that, although suggested in the literature and even on the NZPCN site, may not always be 100 per cent accurate. This documentation may also pick up any range changes, which may suggest a species' range could be increasing or retreating. Any change could then be related to a cause such as climate change, habitat loss or modification, or natural habitat creation for such species as some native orchids that favour disturbance. These range shifts are already evident for many species, one example is the majestic kahikatea, once a dominant specialised wetland forest type, with human intervention, these trees are now mainly present in relatively low numbers of individuals featured in fragmented degraded remnants.

Recording the phenology of the same species throughout the country during the same season may show the variation from the effects of local climatic conditions; these conditions may be spatial or altitudinal. For example, if we, the observers, were to accurately record the first flowering of naturally occurring *Sophora microphylla* along the entire length of the country it's quite possible the dates would vary. This of course may also be true for gorse, lawn buttercups and dandelions.

On the NZPCN website we can record the phenology of all the plant species featured by means of

an active button on the right of the page. To record phenology you can either enter data as a member, which we really appreciate, or you can just register as a recorder. If you are not sure of the species you have found in some stage of its reproductive cycle or even as a casual observation, simply take a photo and post it on our 'Forum' and we will identify it for you. (The Forum button can be found in grey on the left of the Home page.)

Once you know which species you wish to record, find it on the 'Flora' dropdown menu, [Record your observations] this will also prompt you to become a recorder if you are not a member who has logged in. Type in the Latin or common name for your species and hit "Search"; it will appear on the right. You can then hover over the "Record observation" on the far right and start the data entry. Below are the steps you need to follow:

Note the difference in degree of these *Olearia cheesemanii* in flower during 2011 (top) and 2010 (bottom). 2011 would be recorded as "heavy" and 2010 "little". Photos: Matt Ward.

- **Step 1) Select or create a site**—follow the instructions to create a site, once you have logged an observation that site will be remembered as an existing site.
- **Step 2) Enter event details—**Event type (8 choices); Degree (5 choices); Abundance (3 choices); Date of observation (any date can be added here, so that historic data can be logged if you wish); Status (3 choices, if you are not sure if a plant is wild, naturalised or cultivated, please think about the situation where it was found, for example, was the location a remnant, covenant, garden or reserve; were there other plants exactly the same age regularly spaced nearby, suggesting planted; or were there several generations represented, suggesting possibly wild).
- **Step 3) Upload a photo (optional)—**Currently, the photo needs to be reduced to 500KB (but this is likely to change in the future); providing a photo will provide greater credibility to the data over time.
- **Step 4) Submit—**check your details and hit "SUBMIT".

The more recording you do, the easier it becomes. If you are unsure about the "status" of the plant you are observing, please submit a question to the Forum; we will always answer any query you have to the best of our knowledge. Status is very important as a cultivated specimen may not truly behave the same way as a naturally occurring specimen, but it's absolutely great to record any species at all, native, non-native, invasive, and naturalised. The more information we gather the greater its value for possible future research and/or reference. So spend a little time recording phenology on the NZPCN site and watch the data grow.

Cook's scurvy grass and the role of seabirds

Esther Dale (edal004@aucklanduni.ac.nz)

Seabird activity at colony sites results in an environment with high salt, nutrients and disturbance. There is a suite of plants adapted to these conditions which are called guano endemics or ornithocoprophilous species (Ornduff, 1965). One such New Zealand endemic is *Lepidium oleraceum*, Cook's scurvy grass (Fig. 1). *Lepidium oleraceum*, along with other *Lepidium* species whose taxonomy has recently been revised (de Lange et al., 2013), has experienced on-going declines at least since European arrival in New Zealand (Norton et al., 1997). One possible driver of decline, first suggested by Ogle (1987), is declines in seabirds, and therefore suitable habitat, with the arrival of various mammalian pests in New Zealand. My research looked at the effect of seabirds on *L. oleraceum* to investigate whether seabird declines are a likely driver of decline. I was interested in how nutrient enrichment by seabirds in the form of guano influenced establishment, growth and flowering of *L. oleraceum*.

Figure 1: Flowering *Lepidium oleraceum* on North Brother Island.

First, I tested the nutrient content of soil at wild *L. oleraceum* populations. I visited Stephens Island in Cook Strait, Matariki Island, Firth of Thames, and Mahuki Island in the Broken Islands group off Great Barrier Island (Fig. 2). Soil at all these sites was clearly seabird influenced with low pH, high nitrogen and very high phosphorous (Gillham, 1956; Gillham, 1960). Although Matariki Island has no current nesting seabirds, the soil was still acidic and nutrient rich, indicating a seabird legacy which often remains many years after seabirds no longer occur at a site (Ellis et al., 2011).

Figure 2: The author in the field on Mahuki Island collecting soil next to a *Lepidium oleraceum* individual for nutrient analysis. Photo: Alwyn Dale

The next question to address was whether guano-rich soil influenced the growth and flowering of *L. oleraceum*. To answer this, I set up an experiment with different application rates of gannet guano and inorganic fertiliser. Plants had greater shoot, root and total biomass with greater amounts of guano or fertiliser applied up to a point after which biomass remained similar or declined despite increasing fertiliser or guano (Fig. 3). Increased growth in response to elevated nutrients is a common response and inhibition at even higher nutrient conditions usually reflects nitrogen toxicity (Ellis et al., 2011). Flowering occurred almost entirely in plants with higher fertiliser or guano applications, suggesting sufficient resources or size to support flowering. Optimal application rates were slightly higher than soil nutrient conditions experienced by wild populations. Similar responses to guano and fertiliser suggested the response of *L. oleraceum* to guano was because of its nutrient content rather than any other component. This indicates that, where seabirds are absent, guano inputs could be simulated using applications of fertiliser to create favourable soil conditions for *L. oleraceum* and other ornithocoprophilous species.

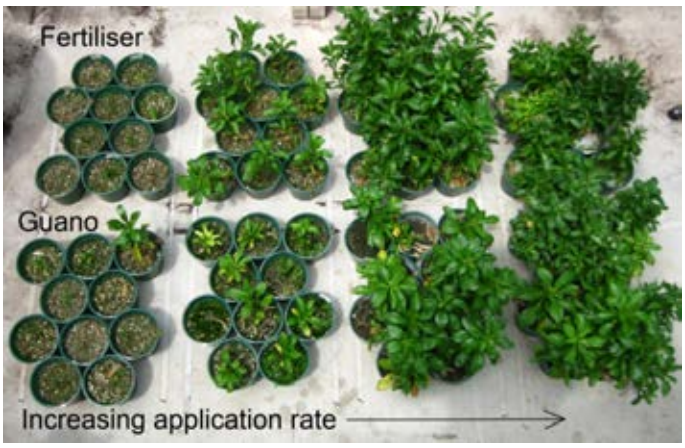

Figure 3: *Lepidium oleraceum* growth experiment involving different application rates of inorganic fertiliser or gannet guano.

I also tested the effect of nutrients on seed germination by placing *L. oleraceum* seeds on filter paper moistened with solutions of fertiliser or guano of different concentrations. There was no difference in proportion of seeds germinated up to a point, above which there was little or no germination for guano and fertiliser, respectively. This indicates nutrients are not required or even beneficial to seed germination of *L. oleraceum,* and even inhibit germination when concentrated. Inhibitory concentrations of guano or fertiliser had 10 times greater nitrogen than soils of natural *L. oleraceum* populations, therefore germination inhibition by excessive nutrients is highly unlikely in the wild.

Seabirds also benefit their associated plants through seed dispersal. External seed dispersal is a common strategy for seabird-associated plants (Ellis, 2005). Attachment typically occurs via hooks or a sticky seed coating as seen in *Rorippa divaricata* and *Pisonia brunoniana*. Sticky seed mucilage is common in the Brassicaceae (Morton & Hogg, 1989), including New Zealand *Lepidium* (Thorsen et al., 2009), so it had been suggested that external dispersal by seabirds could be a possibility for *L. oleraceum* (Norton et al., 1997). I tested this by soaking seeds in water and sticky mucilage developed within five minutes (Fig. 4). To be a successful dispersal strategy, seeds would need to stick for long periods of time and survive immersion in seawater while birds were feeding at sea. To simulate this I soaked seeds in seawater or freshwater for up to a month. During soaking many of the seeds in freshwater germinated, but none in the seawater or controls. Germination of controls was not significantly different from seeds soaked in seawater, indicating seawater did not affect seed viability, but soaking in freshwater promoted germination, perhaps by kick-starting germination through imbibition. Once the mucilage had dried, seeds remained stuck for extended periods, to the extent that it has been over eight months since I finished this experiment and many of the steeds remain attached!

Figure 4: *Lepidium oleraceum* seed after soaking in water showing sticky mucilage layer.

These results, in combination with other aspects of my research (see Dale, 2013) and the likely positive impact of seabird disturbance (Norton et al., 1997), indicate seabirds are beneficial to *L. oleraceum* and reductions in available habitat with declines in seabirds is likely to be a contributor to the historic and on-going declines of *L. oleraceum* in New Zealand.

Acknowledgements

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Global Environments summer academy

The Global Diversity Foundation announces GESA 2014: the fourth Global Environments Summer Academy, held in collaboration with the Centre for Development and Environment of the University of Bern (Switzerland) between 26 July and 15 August 2014. More details are available on the GESA website (http://www.globalenvironments.org/courses/gesa-2014/) , which also provides an overview of previous years' courses, including alumni profiles, a blog, course themes, photos and videos.

There is a two-stage application process for GESA 2014. Candidates are invited to complete the application form (http://www.global-diversity.org/content/gesa-application-form) and upload their CV before 15 January 2014. All applicants will be notified of the first stage results by 15 February 2014 and finalists will be invited to the second stage, during which they will be asked for additional information that must be submitted by 15 March 2014. A final selection of participants will be completed by 1 May 2014. The cost of the Academy is €2000 plus international travel costs.

Since 2011, the GDF has organised GESA to broaden and deepen the knowledge, networking and communication skills of activists, postgraduate students and professionals who are concerned about the human dimensions of environmental challenges. The Academy spans local to global scales and diverse ecosystems, exploring the most critical contemporary environmental issues from multiple perspectives including biocultural diversity, environmental history, political ecology, sustainability studies and personal activism.

Network image library tops 27,000 images

Photographers across New Zealand have continued to provide an amazing array of images for use on the Network website taking the total number of images to over 27,000. This includes images taken by Bill Clarkson, Jack Mace, Simon Walls, Kristy Hall, Lisa Forester, Val Smith, Jeremy Rolfe, Paul Champion, Rowan Wells, John Clayton, Kerry Bodmin, Debra Hofstra, Mary de Winton, Aleki Taumoepeau, Philip Mabin, Paula Reeves, Donna Sutherland, Tracey Burton, Andrew Petroeschevsky and Trevor James. Thanks go to all these photographers who have helped illustrate the Network's online flora.

Nematoceras iridescens, recently added to the website, Photo: Jeremy Rolfe.

As part of these latest additions we have added over 500 images provided by NIWA of aquatic plants in order to illustrate their new aquatic pest plant species pages. Image gaps for more than 25 species have also been plugged. The online image library is growing at 12 images per day and we still have more than 2000 images to load. If you would like to help plug gaps or provide better images of any species on the website including photographs of flowers, habitat, bark and fruit, then please send them to the following email address and include the name of the species (accurately identified), the location and date the photograph was taken and the name of the photographer: info@nzpcn.org.nz.

Lichen notes 2—*Umbilicaria murihikuana* and *Lobothallia alphoplaca*

David Galloway (gallowayd@xtra.co.nz)

Fifteen years ago, I began accumulating information on the lichen genus *Umbilicaria* in New Zealand, a study that is still not complete. After going through numerous packets of unidentified material from CHR, WELT, AK and OTA in New Zealand, and from several overseas herbaria, eight collections of an undescribed endemic species emerged, having both a well-defined morphology and a distinctive chemistry. It seemed to be geographically restricted, at least in terms of extant collections, to alpine sites close to the Main Divide from the Gertrude Valley in Southland to the Matukituki Valley in Otago. My colleague, Leo Sancho, from the Universidad Complutense in Madrid, who has studied *Umbilicaria* in Antarctica for several years and is collaborating in the study of the New Zealand taxa, was confident that this particular species was new. We decided to name it *Umbilicaria murihikuana*, in reference to its known distribution in our southern mountains, and chose a collection made from near Park Pass, at the head of the Rockburn, in May 1968 as its type (Galloway & Sancho 2005). It was a hurried collection from a very memorable trip.

May in the Rockburn, a pleasant valley running into the Dart above the Routeburn, can be an enchanting place in fine weather even though the days are short. In February 1968, as part of Alan Mark's vegetation survey of Mt Aspiring National Park (Mark 1977), I had a memorable trip with Alan. We started up the Brideburn, a little-visited western tributary of the middle Dart, over a saddle into the Beansburn, across Fohn Saddle, through Fiery Col, down Hidden Falls Stream and up onto Park Pass for a glorious midday of botanising, before heading out down the Rockburn and over Sugarloaf Saddle to the Routeburn. A very satisfying few days during which Alan collected lots of data for his survey. He therefore took very little persuading that, in May, we should revisit the Rockburn. Our aim was to go through the gorge and then straight up the hill from the first flat, to Lake Unknown and recce the peaks around the Park Pass Glacier, before journeying south along the Main Divide to North Col and Serpentine Saddle before ending again in the Routeburn. Alas we didn't make it to Lake Unknown. On 14 May, late in the afternoon, well off the blazed track and in pouring rain in the Rockburn Gorge, we made camp. Let my trip diary take up the story:

"…**15.v.1968**: Passed a moderately comfortable night, although a bit cramped; at 7.30 a.m. heard a kaka singing to us somewhere along the gorge. Also miraculously the rain had stopped, however the valley was still full of mist. Alan prepared some coffee (last night's water supply had all but disappeared) and this was followed by sausages and eggs. I was thankful that we had managed to get almost everything packed before the rain started again… At about 9 am we shouldered packs and headed up the ridge. A quarter of an hour's steep climbing had us on the track (we had gone far too low) on the upstream end of the prominent boggy patch in the gorge. This was doubly pleasing because it meant that we didn't have to negotiate the bog where the track is pretty indistinct, and we had also passed by the turnoff to Sugar Loaf Saddle. Very soon the track descended and we crossed the water course and made quick time down to the first flat which was pretty wet. On to the next flat and took a few photos. It was abundantly clear that climbing up to Lake Unknown would be out of the question as the tops were under heavy murk. Anyway a crossing of the Rockburn in its present state would be a fairly dicey business.

We had lunch at the bottom end of Theatre Flats under a dry rock just back from the bush edge at about 11.45 am. Next important event was crossing the stream. I tried out the usual place, but by one third of the way across it was above waist deep and pulling me downstream. Gave up and walked about midway up the flat where it was running in two streams. The first was just fordable but the second was too deep for Alan to manage safely. From the safety of the bank I unpacked the rope and after several unsuccessful attempts managed to get a double length across to Alan. He tied on and in a few more moments he was ashore, but it was a very anxious business. The track up to the top flats was a veritable waterfall and the slog across to the last tongue of bush was fairly automatic, Amphion's rock shaft was clear and it looked most enticing even in this weather. From every aside huge cascades of water whitened the rock walls of the valley head. A most memorable sight.

The steep deer trail route to the Park Pass approaches was wet and miserable. Emerging on to the sodden tussock the nearby pass caused a sudden lift of spirits. It seemed so close and accessible and despite the weather marvellously attractive. We found a perfect level campsite in the lee of a huge boulder marvellously smooth and planed on its western side; erected the tent and moved in. Everything a bit damp, but we are warm and now are hoping for a break in the weather. Had a bit of a disaster with the soup which fell off the primus but retrieved most of it with a mug and cleared up the rest with a sock…

16.v.1968: A cold grey morning with low-slung cloud thick around Somnus and still the slight fall of rain… At 9.30 am we crossed the stream and began the grind up to the ridge SE from Park Pass by about a mile. It was damn steep but we were heartened considerably by clearing skies over Poseidon and the Park Pass Glacier. The view of the peaks about the glacier was very fine from the ridge (Fig. 1). I must say the ice was right back further than two years ago. The weather improved quite a bit and it seemed that we would be assured of a moderately good day to get round to North Col. A fairly easy route can be made from the pass to the minor peak southwards, almost to the top of the peak then sidling steep snowgrass on the Rockburn side and gradually climbing into the head of a scree basin the divide of which overlooks the Nerine cirque below Nereus. We climbed down to a small tarn above Lake Nerine for lunch at 3.10 pm and watched solitary aeroplanes droning their way to destinations unknown. The day held remarkably fine though cool and as it seemed likely not to rain we decided to push on to North Col.

Figure 1. The Park Pass Glacier and Mt Poseidon (left rear) from the ridge above Park Pass, 16 May 1968. Photo: David Galloway

Our way lay over the huge rubble slopes that clutter up the Hidden Falls of the range—to think that last time we were over here we did it in a whiteout. It is infinitely preferable to be able to see where you are going along here. On the way we had a close look at Serpentine Saddle (Fig. 2) very aptly named as there is the tell-tale stain of peridotite rubble tumbling from its saddle. We are aiming for there tomorrow. Just after 5 we climbed up to North Col—a little rain but fine weather signs east and west. Selected a not too bad tent site and retired to eat a large meal. A bit gargantuan so soon after lunch. Mark was assailed with hiccups which didn't make it any easier…Well, in spite of a good warm sunset and a clear sky out west, by 9.30 pm we had a raging storm on our hands and a wet tent flapping round our faces. I struggled into a parka and foundered out into the wet to see what good could be done. Rescued the tent somewhat and secured the fly which had worked loose. One of the tent poles had got itself curiously twisted during proceedings, so we lay low and hope things would not get any worse. Shipped a reasonable amount of water. Managed to get just the bare minimum of sleep and pretty damp sleep at that with a sopping tent draped across one's face. Finally dawn came with a let up from the wind and an atmosphere thick with fog…"

Figure 2. Alan Mark above Park Pass, with Serpentine Saddle in the distance, 16 May 1968. Photo: David Galloway.

In the diary there is no mention of collecting lichens on these two event-filled days, let alone a nice new *Umbilicaria* from off the rock where we pitched our tent near Park Pass. But collect it I obviously did, and the specimen waited in the Landcare Herbarium (CHR) for 37 years before its correct status was recognised (Galloway & Sancho 2005; Galloway 2007).

Forty three years on, it was time to see this new, but rather scarce lichen in the field, so in April 2011, Janet Ledingham and I thought we would have a look at the Homer and Gertrude Valley lichens from a base at Murray Gunn's Camp in the Hollyford Valley. Two fine days allowed us to search carefully for *U. murihikuana* (Fig. 3), which grows on large boulders on the floor of the valley, although we didn't have time to climb up to Gertrude Saddle where no doubt it is also likely to be found. The whitish dry thallus (olive-green when wet) and the prominent, slightly sunken black apothecia make the lichen instantly recognisable. The K+ blood-red chemical reaction (given by norstictic acid) is also characteristic of this species and not seen in any of the other species of *Umbilicaria* known from New Zealand. While looking for *U. murihikuana* near the head of the valley, on the sunny flat top of a large rock out in its own in open grassland, we found a small specimen of it growing with a lichen quite unknown to me. This proved to be *Lobothallia alphoplaca* (Fig. 4), a bipolar species known from North America, Europe, Scandinavia, Morocco, Turkey, Iran, Ukraine and Asia (Galloway & Ledingham 2012: 16). To date, this is the only record of this lichen from New Zealand and also the Southern Hemisphere.

Figure 3. *Umbilicaria murihikuana*, Gertrude Valley, April 2011. Photo: Janet Ledingham

As though this was not enough, mossy rocks at the forest margin low down in the Gertrude Valley disclosed another bipolar rarity, this time a parasite on the lichen *Leptogium laceroides*. This species, *Paranectria alstrupii*, is a lichenicolous fungus earlier recorded from Greenland, Alaska and Papua New Guinea (Galloway & Ledingham 2012: 17). Obviously, the Getrude Valley is a lichen hotspot and would amply repay further studies there. Since information on both *Umbilicaria murihikuana* and *Lobothallia alphoplaca* is still very limited, any further records of these two taxa would be very gratefully received.

Figure 4. *Lobothallia alphoplaca* (left) and *U. mirihikuana* (right), Gertrude Valley, April 2011. Photo: Janet Ledingham.

Acknowlegements

It is a pleasure to acknowledge the field companionship of Alan Mark, and Janet Ledingham. Janet also provided two of the images.

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New generic names for New Zealand's southern beech species

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In a recent revision of the taxonomy of the southern beech family (Nothofagaceae), we split the genus *Nothofagus* into four distinct genera: *Nothofagus*, *Fuscospora*, *Lophozonia* and *Trisyngyne* (Heenan & Smissen, 2013). Under the new classification, the genus *Nothofagus* comprises only five South American species. *Lophozonia* (seven species) and *Fuscospora* (six species) are both found in Australia, New Zealand and South America, and *Trisyngyne* is a tropical genus of 25 species from New Guinea and New Caledonia. These four genera were previously recognised as subgenera within *Nothofagus* (Hill & Read, 1991). During the last two decades, confidence in these groups as evolutionary lineages has increased markedly thanks to analyses of DNA sequences. Over the same time, the relationship of the southern beeches to other tree species has been clarified. The old view that the southern beeches were closely related to the northern beeches (*Fagus*) and should be included in the family Fagaceae has been overturned and they are now seen as a distinct family (Nothofagaceae) and were in fact the first of the extant families to diverge within the order Fagales.

We compared the level of variation within the Nothofagaceae to that in other families of Fagales, using both morphological characters (e.g., pollen, leaf hairs and stomata, flower and fruit morphology) and DNA sequence differences. Differences among the subgenera of *Nothofagus* were as great as or greater than differences among genera in the other families. In keeping with this, current estimates of the age of the subgenera also suggest that they are at least equivalent to genera in other families (Sauquet et al., 2012).

Our decision to recognise the four subgenera of *Nothofagus* as genera is based on the following criteria: robust support from DNA sequence data for their monophyly; each genus is defined by

unique morphological characters (synapomorphies) and is morphologically homogeneous; primary taxonomic ranks (e.g., family, genus, species) should be used first in a classification and have preference over secondary ranks (e.g., subgenus); the new classification maximises phylogenetic information on generic and species relationships; classifications should minimise redundancy (under the old classification the family Nothofagaceae and the genus *Nothofagus* refer to the same taxa, whereas in the new classification Nothofagaceae is the family and it includes four genera); taxonomic ranks should reflect evolutionarily-equivalent groups (in this case the four genera of Nothofagaceae are more-or-less equivalent to genera in other families related to Nothofagaceae). Evolutionary equivalence encompasses clade age, genetic distance, and morphological differences.

Other important biological differences among the four genera continue to be turned up by studies not directly concerned with their taxonomy. For example, species of southern beech hybridise within each of the four genera but not among them, different sets of fungi and insects associate with the different genera, and molecular markers are more similar and more readily transferred within genera than among them.

So why were these four groups recognised as subgenera and not genera in the first place? When these groups were first used as the basis of a formal taxonomy, they already had a long history among palaeobotanists because they differ in features of their pollen grains that are preserved in fossils. However, in earlier infra-generic classifications influential plant taxonomists had stressed other characters, such as whether the trees were evergreen or deciduous. In 1991, when Bob Hill and Jennifer Read (Hill & Read, 1991) from the University of Tasmania proposed as subgenera the groups we now recognise as genera, their thinking represented a major shift forward. Because the southern beeches were still being included in the family Fagaceae, it made sense to recognise a broad genus *Nothofagus*, comprising all the species of southern beech, distinct from the other genera of that family. The new groups Hill and Read proposed could be slotted into the hierarchy at the level of subgenus, without changing the scientific names of the species. However, once the southern beeches were classified in their own family, the family name Nothofagaceae and the genus name *Nothofagus* named exactly the same group of species. This was not only inefficient, but unnecessarily obscured the differences between the distinct groups of southern beeches, especially because subgenera receive much less use and attention than genera (since genera form part of the scientific names of species).

The only argument favouring the use of subgenera rather than genera to name the major groups of Nothofagaceae species now is that it is the status quo, and that changes in scientific names can be inconvenient. In this case, we believe that raising the subgenera to the rank of genus better reflects the genetic and morphological diversity of Nothofagaceae relative to other families in the order Fagales and better highlights important groupings of species. These benefits outweigh the short-term inconvenience of adopting new names. For example, the New Zealand species of *Fuscospora* (red beech, hard beech, black beech and mountain beech) are much more closely related to the Australian species *F. gunnii* and the south American species *F. alessandri* than they are to New Zealand silver beech (*Lophozonia menziesii*). In turn, silver beech is most closely related to some different species from Australia, *L. cunninghamii* and *L. moorei*. Collectively, the four genera of southern beeches we recognise can be referred to as Nothofagaceae where the generic name *Nothofagus* might have been used in the past. Indeed, in some ecological and geological literature (where taxonomic correctness is not so rigorously enforced) the subgeneric names have already been used as if they were genera!

Moreover, *Nothofagus sensu lato* does not entirely deserve the perception of stability and simplicity that it currently enjoys in some quarters. In fact, its nomenclatural history is quite tortuous, and it was a considerable job for us to sort through the histories of all the names involved and their changing meanings. The tropical species of southern beech from New Caledonia and New Guinea are an interesting case. When first brought to the attention of European botanists in the 19th century, not much plant material was available for study and they were mistakenly placed in the family Euphorbiaceae (the spurge family) as the genus *Trisyngyne*. In the 1950s, they were recognised as

southern beeches not spurges and they were transferred to the Fagaceae, initially maintained as the genus *Trisyngyne*. There followed a 40-year debate between the Dutch botanist Cornelis van Steenis and the Swiss Marcel Baumann-Bodenheim whether these plants should be considered their own genus or included in *Nothofagus,* with each overriding the other's scientific names. Both men died last century and it is unnecessary to rehash their argument here since much of it is irrelevant in the light of today's understanding, but their debate illustrates that the circumscription of *Nothofagus* has not been a long settled matter. Indeed, *Nothofagus* was not even the earliest generic name for the southern beeches, but is used today because of a mid-20th century decision to conserve that name against several names that would have had priority.

Fuscospora cliffortioides. Photo: Jeremy Rolfe.

In making new combinations for the New Zealand species now in *Fuscospora*, we had to address the issue of whether black and mountain beech were one taxon, varieties of a single species, or distinct species. Historically, they had been considered different species (e.g., by Joseph Dalton Hooker and by Leonard Cockayne) but Lindsay Poole reduced them to varieties of a single species in 1958 after examination of the characters said to distinguish them. Poole concluded that the two taxa appear to intergrade over altitudinal gradients and stressed that many samples could not be reliably assigned to one or the other. This position was adopted by H H Allan, although not in time to make the main text of his *Flora of New Zealand* Volume 1—it was included in the supplementary notes. Poole's position has not been universally accepted, with some prominent botanists continuing to recognise these taxa at species rank because they consider them distinct ecologically and morphologically. Moreover, because the two forms overlap geographically, it can be argued that if they are recognised at all, it should be at species rank. Poole's position can be seen as something of an unhappy compromise—it makes assigning a species name easier, but use of the varietal names is still just as difficult. Recent (as yet unpublished) results from our genetic studies of New Zealand *Fuscospora* species suggest that there is some degree of reproductive isolation between black and mountain beech, and that morphologically intermediate forms may be the result of hybridisation between them. Although this genetic work is not yet complete, we have considered it in our decision to make the combinations in *Fuscospora* at the rank of species so that mountain beech becomes *F. cliffortioides* and black beech *F. solandri*. Populations where the two meet and hybridise are probably common, and the hybrid formula *F. cliffortioides* × *F. solandri* can be used to name these.

Old name	**New name**
Nothofagus fusca	*Fuscospora fusca*
Nothofagus menziesii	*Lophozonia menziesii*
Nothofagus truncata	*Fuscospora truncata*
Nothofagus solandri var. *cliffortioides*	*Fuscospora cliffortioides*
Nothofagus solandri var. *solandri*	*Fuscospora solandri*

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Mass planting boosts rare tree numbers by 10 per cent: Seed nursery will form "genetic life-raft" for Turner's kohuhu

Forest Lifeforce Restoration Trust press release

A single mass planting has boosted the national population of the rare and threatened Turner's kohuhu (*Pittosporum turneri* or tent pole tree) by over 10 per cent. The Forest Lifeforce Restoration (FLR) Trust has planted 5500 seedlings propagated from seed collected in May 2009, in specially-constructed predator-proof enclosures at its Pohokura property in inland Hawke's Bay. The Trust collected six litres of *Pittosporum turneri* seed pods and paid to have them propagated at the Taupo Native Plant Nursery. They germinated in mid 2010.

Only 30,000 to 40,000 *Pittosporum turneri* plants are known to exist in New Zealand and the species has a threat status of Nationally Vulnerable. When mature, the seedlings will form the country's first seed nursery for the plant, the first step towards ensuring a national recovery. "We hope it'll be a kind of genetic life-raft for this species," said FLR Trust forest manager Pete Shaw.

The Hawke's Bay-based trust has form when it comes to establishing seed nurseries for rare and endangered New Zealand native plants. It runs the largest kakabeak (C*lianthus maximus* or ngutukākā in te reo*)* propagation and restoration programme in the country and now has five seed nurseries dedicated to this plant; four in Hawke's Bay and one in the Bay of Islands. These have produced hundreds of juvenile kakabeak that staff have started planting on conservation land.

Wild *Pittosporum turneri* at Pohokura have been suppressed in their juvenile foliage stage as a result of possum predation. Aerial drops of 1080 poison in 2008 reduced the possum population and enabled the plants to flower for the first time in decades. The number of seeding plants recorded leapt from fewer than five in 2008 to over 90 in 2012. The special enclosures will protect the plants from possum and from the deer, hare and rabbits that would be attracted to the young, fertiliser-laden nursery plants. The enclosures will allow seed to be produced and germinated in quantity and have effectively created a new site for the species as previously only a single plant was known to exist in that part of Pohokura.

"This project demonstrates clearly the highly inter-connected nature of the thing that conservation in New Zealand has become," said FLR Trust Chairman Simon Hall. "It can no longer be purely the preserve of government agencies. The job's too big, the battle's too fierce. Landowners and the private sector all have a role to play."

In addition to its work with *Pittosporum turneri* and kakabeak, the FLR Trust is fast carving out a name for itself with the Maungataniwha Kiwi Project, one of the most prolific and successful kiwi conservation initiatives in the country. It is also involved with the on 4000 hectares currently, or until recently, under pine.

A little bit of New Zealand in Seattle

Bec Stanley, Auckland Botanic Gardens (rebecca.stanley@aucklandcouncil.govt.nz)

During a Pacific Northwest US holiday, I visited the New Zealand garden at the University of Washington Botanic Gardens (which unites the Washington Park Arboretum and the Centre for Urban Horticulture). The beautifully landscaped garden focuses on South Island species (Seattle's climate more or less matches up with that). The one-hectare garden is part of the "Pacific Connections" garden that contains plants from those continents connected by the Pacific. New Zealand is associated with Seattle by the fact that Christchurch is its sister city.

As a New Zealand botanist, it was fascinating to think about how North Americans react to our flora—not something I've previously dwelt on—but, in a country of elk, deer and other vegetation nibbling mammals, a "land of birds" is a wonderful and foreign concept. Divaricating plants, *Fuchsia procumbens* (with its large most-probably lizard-dispersed fruit), broadleaved trees that don't lose their leaves, and flax with its tremendous Maori uses (and a ubiquitous garden plant in this part of

the US)—many aspects of our flora fascinate visitors. It's supposedly the biggest New Zealand garden in the US and will give visitors a sense of what New Zealand is like, even though we are thousands of kilometres away.

The Gardens do not have any propagators on staff; they buy in all their plants. If anyone has contacts in the US that grow good-quality New Zealand native plants, Kathleen DeMaria, the New Zealand Garden curator would be keen to hear from you. Some of the plants in the garden have suffered a bit since planting and it will take Kathleen a while to work out which New Zealand natives do best in the Seattle climate. She is also keen to hear if anyone supplies South Island (or at least cold/wet–tolerant) tree seeds to the US. If you're ever in Seattle, the Gardens are a 20 minute bus ride from the centre of Seattle and, apart from the New Zealand garden they have a Wollemi pine, and some beautiful maples, oaks and ashes, which looked stunning for my autumn visit. Contact Kathleen through e-mail uwbg@u.washington.edu. The link to Kathleen's blog on my visit with photos is at: http://depts.washington.edu/uwbg/news/2013/10/31/a-kiwi-botanist-in-our-mist/

Sediment dumping refused for Whitford's embayment: A vital reprieve for marine and coastal ecosystems

Anthony R Bellvé, Whitford Estuaries Conservation Society Inc. (bellve@snap.net.nz)

Contaminated sand, silt and clay from Pine Harbour Marina Limited's (PMH) outer harbour and navigation channel will no longer be dumped into the shallow waters of Whitford's embayment, in Auckland. The marina's owners recently withdrew their legal challenge against Auckland Council, regarding the latter's refusal to renew the required resource consents. In response, New Zealand's Environment Court has declared the case closed. At last, the local marine environment is protected from the marina's disposal of sediment.

Historical aspects

The dumping practice has a dubious history. The marina and its navigation channel were formed on dredging Green Bay (1986–1988), previously a small, shallow depression on the eastern shore of the embayment. The inlet's sand flats had been a tapu burial site for iwi of Ngai Tai Umupuia Te Waka Totara. Specialists had claimed the marina's navigation channel would not require re-dredging for 10 to 20 years. Manukau City Council approved PHM's resource consent applications against voluble disagreement of community groups, including Ngai Tai *Umupuia*, Royal Forest and Bird Protection Society (South Auckland Branch), and Whitford Residents' and Ratepayers' Association. PHM subsequently provided the local communities with valued amenities by harbouring recreation vessels and operating ferry services to Auckland. It soon became apparent, however, despite claims otherwise, that PHM's operations were causing damage to marine eco-systems:

First, Green Bay's meadows of eel grass (*Zostera muelleri* subsp. *novozelandica*) were destroyed on creating the marina, thereby negating the plant's invaluable role in protecting the marine environment. Crucially, *Zostera* meadows filter contaminants from seawater and protect endemic and pelagic species by sheltering their eggs and juveniles from predation. Otherwise, breeding of marine species is compromised.

Figure 1: Border of yellow-flowered, whakariki/coastal flax (*Phormium cookanium* subsp. *hookeri*) and some harakeke or kōrari/swamp flax (*P. tenax*), with a distant clump of mānuka (*Leptospermum scoparium*). Whitford Village Green across the Tūranga Creek has pines (*Pinus radiata*), weeping willow (*Salix babylonica*) and recently planted pōhutukawa (*Metrosideros excelsa*). The estuary now supports, due to its heavy sediment accumulation, ever encroaching populations of mangrove (mānawa; *Avicennia marina* var. *resinifera.*
Photo: Anthony R Bellvé.

Second, the marina's navigation channel filled quickly with sediment. Dredging had to be initiated within two years to ensure vessels could transit through the channel. The Department of Conservation halted the operator's illicit dumping practices and requested it apply for the necessary resource consents. Permits then were granted, including those needed for dumping sediment (3000 m^3 annually) at a site close to Motu Karaka (Flat Island), within Whitford's embayment.

Third, dumped sediment was smothering native shell fish to the point that endemic crustaceans were suffocated and much diminished. Only mobile species of worm, crab and shrimp survived, to the detriment of native shore birds. The embayment has been subjected to ever encroaching mangrove forests and been invaded by exotic crustaceans (e.g., *Theora lubrica*), which flourish in their preferred anoxic conditions (Fig. 1).

Fourth, sediment in the marina's harbour and thereafter the navigation channel became contaminated with toxic, heavy metals, particularly arsenic, chromium, copper, lead, and zinc emanating from moored and washed vessels. Recently, though, there have been commendable changes. PHM has coated the hulls' of its catamaran ferries with effective bio-release agents that mitigate fouling, while enhancing fuel efficiency. The material lasts several seasons and the hulls are cleaned only with water—no sandpaper. No more copper-based toxicity!

The challenge

For these reasons, PHM's consent renewal applications, lodged in 2007, were contested by the Cockle Bay Residents' & Ratepayers' Association, Pohutukawa Coast Community Association (PCCA) and Royal Forest and Bird Protection Society (South Auckland Branch), and Whitford Estuaries Conservation Society Inc. Individual submitters included: Patricia Cooke, Michael Lee (as a special witness for PCCA), Alan La Roche, Anna Rugis and Philip Scotherm. WECS co-founded the Southeast Environmental Alliance (SEA) to ensure representation of 15 other local societies, including that of SEA's other co-founder, Allan Riley, Chairman, Friends of Mangemangeroa'. SEA's members now extend along the Hauraki Gulf's shores from Tamaki Estuary to Miranda. The alliance held its '*Sixth Annual Seminar and Potluck Supper'* in mid-February, 2013.

The Commission, in 2008, after reviewing PHM's applications and consulting with interested parties, permitted consents for dredging the navigation channel; but, wisely, it refused dumping of sediment in the embayment. In response, PHM challenged Auckland Council's decision by appealing to the Environment Court. The appeal was followed by a critical mediation session held between the appellant, PHM, and representatives of the respondent, Auckland Council; Dr Anthony R Bellvé, then Chairman, and Melissa Laver, WECS [both also SEA's representatives], Bruce Davies, then Chairman, Ngati Rehua/Ngati Wai; Grant George, then Chairman, and Don Willan, PCCA; and Alan La Roche, as an individual.

Oceanic sediment disposal

Meanwhile, during 2008, Coastal Resources Limited, PHM's associated company, lodged resource consent applications with Maritime New Zealand, Wellington, for permission to dredge the marina's harbour basin and dump the contaminated sediment (<50,000 m^3/annum) at an oceanic site, with depths of 135 m to 155 m, east of the southern tip of Great Barrier Island (Aotea), just outside the Hauraki Gulf Marine Park and Auckland's coastal limits (12 NM)[1]. The applications were lodged without notifying local communities or Ngati Rehua Ki Aotea. The proposed site, in the south-flowing, East Auckland Current, was reviewed by Maritime New Zealand to assess the effects of

1 Coastal Resource Limited's dump circle is centred on co-ordinates: 175° 48' 0.122" E and 36° 12' 20.416" S; with a 1.5 km dump radius and an additional 1.0 km survey boundary. The centre is ~13.9 NM (25.7 km) from the nearest point of land on Great Barrier Island (Aotea), while the survey boundary extends nearly to the limit of Auckland's territorial waters (~150 metres).

sediment dispersal on marine life. The consents were granted about six months ago, regardless of international evidence that oceanic dump sites cause significant environmental problems[2].

In the future, PHM will be able to dredge contaminated sediment from its harbour and navigation channel, and transport it to the newly consented, oceanic dump site near Great Barrier Island. It will probably be joined by other marinas, from Whangarei to Turanga, having sediment of equal or even greater metal contamination.

Impact on marine ecosystems

The East Auckland Current conveys marine animals (zooplankton) and plants (phytoplankton) from Great Barrier Reef, Australia. Sub-tropical marine species are known to populate Three Kings Islands and Te Paepae Aotea (Volkner Rocks) Marine Reserves, and along the coast of Coromandel Peninsula. Now, after a ~3000 km voyage from Australia, embryonic biota will be exposed to coastal resources' buoyant clay sediment with its lacings of toxic metals. Plankton, the base of the marine food chain, provides nourishment for higher species, including Auckland's population of Bryde's whales (*Balaenoptera cf. brydei*) and, ultimately, human populations[2].

PHM's owners could have disposed of its contaminated sediment on specially-consented, land-based sites, as undertaken by some of Auckland's other marinas. In this context, WECS committee members met with principals of Pacific Waste Management Limited to discuss options for disposing of oceanic sediment in the Whitford Landfill. Viable economic options were found and formally documented. Such alternatives were advocated strongly by WECS and also subsequently supported by Hone Harawira, then Maori Party MP for Tai Tokerau, in his submission of 29 October 2009. Yet, the marina's owners did not engage with Whitford Landfill's management to explore fiscally and environmentally sound options for avoiding oceanic contamination.

Recovery of marine and estuarine ecosystems

Cessation of local sediment dumping is a positive change that will enable Whitford's embayment and coastal margins to begin recovering for the first time in nearly 30 years. Unfortunately, though, sediment also comes from other sources; strong storms are known to erode silt and clay (~8,000 m^3) from local catchments each year. Whitford's marine environment is being enhanced by planting of native trees along riparian margins to prevent continually eroded sediment from reaching streams, wetlands and estuaries. WECS, in this regard, has made substantial progress. A Heads-of-Agreement established between the society and Manukau Parks, Manukau City Council (MCC), in 2006, led to the development of the Tūranga Reserve (2007–2012). Competitive

Fig 2: Resplendent toetoe (*Astroderia splendens*, formerly *Cortaderia splendens*) and whakariki/coastal flax (*Phormium cookianum* subsp. *hookeri*) and karamū (*Coprosma robusta*). Excellent specimens of saltmarsh ribbonwood (*Plagianthus divaricatus*) grow nearby just above high-water mark. Image: Anthony R Bellvé.

2 Metals—arsenic, chromium, copper, lead and mercury—bind strongly to clay, particularly to bentonite's major component, montmorillonite, the principal constituent of Whitford's clays. Clay particles are buoyant in seawater, taking 560–640 days to settle from the surface to the sea floor (135–155 m), in the absence of water motion or turbulence. Thus, clay dispersing from a dumped bolus can be expected to travel great distances when subjected to oceanic currents, tides and waves. During this period, released metals will become concentrated through the marine food chain, from plankton into edible fish. In humans, once ingested, copper binds avidly to two neural proteins (amyloid-α/ß and their precursors). These components of our nervous system form large complexes that are associated with Alzheimer's disease—a major form of dementia occurring with increasing frequency among aging human populations world-wide. These adverse biological links demand government authorities take a precautionary approach, fully consistent with '*Section 4, 1996 Protocol; London Convention, 1972*'.

grants were awarded to WECS by the Environmental Initiative Fund, Auckland Regional Council, latterly by Auckland Council, and funds from private sources, totalling ~$18,500, along with in-kind contributions by the sponsoring society and MCC. The various funds have enabled successful planting of 25,500 native trees on the Tūranga Reserve and 4500 trees on the Porterfield Reserve, Whitford, from 2008 to 2012 (Figures 1 & 2), as documented previously (*Trilepidea* 119). These land-based efforts to restore the estuaries will be successful, ultimately, when applied in conjunction with better ocean-based, environmental management. Curbing estuarine sediment will enable the recovery of healthy *Zostera* meadows in Whitford's embayment and thereafter the survival of marine biota. The society's efforts will continue to avert erosion and degradation of Whitford's coastal marine environment by restoring its natural state for sustaining healthy, native flora and fauna.

Acknowledgements[3]

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3 This article was first published, in part, by the *Whitford Turanga Newsreel*, Whitford, Auckland, August, 2013, and is reproduced here with permission.

Trees: our life savers are dying

Jim Robbins (The Guardian)

For centuries we've treated forests poorly. Yet we're only just learning how crucial trees are to our survival

- Several years ago a few trees in my 15 acres of pine forest in Montana turned from green to a rusty brown, killed by swarms of bark beetles. Four years later, virtually all of my centuries-old forest was dead. It wasn't just the beetles that did in my trees, but much warmer winters here in the Rocky Mountains that no longer killed the bugs, allowing them to expand exponentially.
- Since then, as a science journalist for the New York Times, I have written many stories about the dying of the trees—and the news is not good. Many forests across the length and breadth of the Rockies have died in the last decade. Most of the mature forests of British Columbia are gone, from a combination of climate and insects.
- The bristlecone pines of the US—the most ancient trees in the world, with some more than 4,000 years old—will die in the coming years because of a combination of bark beetles and a fungal disease, enabled by a warmer climate. Tree-ring studies on the bristlecones show that the last 50 years are the warmest half century in the last 3,700 years.
- All this is to say that the fungus killing ash trees in Britain story is unlikely to be a one-off. Trees across the world are dying. It's not only the changes brought by a warmer world. We've treated the world's trees poorly for centuries, without regard to ecological principles. We've fragmented forests into tiny slivers, and selected out the best genetics again and again with no regard to the fitness of those that remain. Air pollution and soil abuse has taken a toll. And scientists admit trees and forests are poorly studied. "It's embarrassing how little we know," a leading redwood expert told me.
- Yet the little that is known indicates trees are essential. They are the planet's heat shield, cooling temperatures beneath them by 10°C and blocking cancer-causing ultraviolet rays. They are

robust filters of our air and water, and soak up climate-warming carbon dioxide. Forests slow the runoff of rainfall. Many of the world's damaging floods are really caused by deforestation.

- These functions are well known, but trees play many other critical roles that we know little about. Katsuhiko Matsunaga, a marine chemist at Hokkaido University, Japan, discovered that as the leaves from trees decompose, humic acid leaches into the ocean and helps fertilise plankton, critical food for many other forms of sea life. Japanese fishermen began an award-winning campaign called Forests Are the Lovers of the Sea, and planted trees along the coasts and rivers that rejuvenated fish and oyster stocks.
- Also in Japan, researchers have long studied what they call "forest bathing". Hiking through the forest has been shown to reduce stress chemicals in the body and to increase NK or natural killer cells in the immune system that fight tumours and viruses. Elsewhere, researchers have demonstrated that anxiety, depression and even crime are lower in neighbourhoods with trees in the picture.
- Hundreds of different kinds of chemicals are emitted by trees and forests, many beneficial. Taxane from the Pacific yew tree is a powerful anti-cancer drug. Many other tree compounds have proven to be antibacterial, anti-fungal, anti-viral and even to prevent cancer. The active ingredient of aspirin, acetylsalicylic acid, for example, comes from willows. Recommended by doctors to prevent a range of cancers, as well as heart attack and stroke, some believe this chemical in the wild has a medicinal impact on the health of all creatures because it is aerosolised into the air and water, and breathed in and drunk. Yet, it hasn't been researched.
- Trees are greatly underused as an eco-technology—"working trees"—to make natural systems, as well as the world's cities and rural areas, more resilient. They are used here in the US to prevent soil erosion and shade crops. In a neat bit of alchemy, trees can be used to clean up the most toxic of wastes, including explosives, solvents and organic wastes, because of a dense community of microbes as thick as a finger around the tree's roots, a process known as phytoremediation.
- The question is what to plant to withstand the challenges of a changing world to assure a world with trees. In the UK, a group called Future Trees Trust is breeding more resilient trees. And a shade-tree farmer from the US, David Milarch, a co-founder of the Archangel Ancient Tree Archive, and whom I have written about, is making copies of some of the world's oldest and largest trees, from California redwoods to the oaks of Ireland—with proven survivor genetics—to be part of a future forest mix. "These are the supertrees," he says, "and they have stood the test of time."
- Before I began this journey, I felt planting trees was a feeble response to the planet's problems. No longer. As the proverb asks: "When is the best time to plant a tree?" Twenty years ago. "The second-best time? ' Today.

(First published in The Guardian, Sunday 7 July 2013 19.03 BST

UPCOMING EVENTS

If you have important events or news that you would like publicised via this newsletter please email the Network (events@nzpcn.org.nz):

National Wetland Restoration Symposium 2014—"Wetlands and Water – From Droughts to Storms"

Auckland 12-14 February: Registrations are now open and close on Waitangi Day, Thursday 6 February 2014.	**Registration details and draft programme:** www.wetlandtrust.org.nz/symposia.html

Auckland Botanical Society

Field trip: Saturday 11 - Friday 14 January for the South Island Camp at Tautuku Outdoor Education Lodge, Catlins. **Leader:** Anthony Wright.	**Contact:** Maureen Young (youngmaureen@xtra.co.nz)

Waikato Botanical Society

Field trip: Saturday 18 January to Lake Koroha (Hauturu Forest). **Meet:** 9.00 a.m. at Hauturu Hall, corner of Harbour Road and Hauturu Road, South Kawhia. **Grade:** medium-hard. **Bring: g**ood footwear, lunch, togs (if you are brave enough).	**Leader:** Thomas Emmitt, email: temmitt@doc.govt.nz, ph: 07 878 1055 (work) or 021 152 3030.

Rotorua Botanical Society

Field trip: Sunday 2 February to Umurua Scenic Reserve and Lake Rotohokahoka, Mamaku Plateau. **Meet: t**he car park Rotorua 8.30 a.m. or 9.00 a.m. at Mamaku School (South Road). **Grade:** easy to medium.	**Leader:** John Hobbs, ph: 07 348 6620, email: jffhobbs@clear.net.nz

Wellington Botanical Society

Field trip: 17—28 January 2014 for the Summer Camp at Te Urewera National Park and Whirinaki Forest Park. **Accommodation:** based 17—24/1/14 at Camp Kaitawa; then 25—28/1/14 at Whirinaki Recreation Camp, Minginui.	**Leader and Contact:** Mick Parsons, ph: 04 972 1148, or 06 273 8078 or 027 249 9663, email: mtparsons@paradise.net.nz, booking essential.

Nelson Botanical Society

Field trip: Sunday 19 January, 2014 to Beeby's Knob.	**Registration:** Trip leader, Uta Purcell, ph: 03 545 0280.

Canterbury Botanical Society

Meeting: Friday 31 January at 7.30 p.m. for a talk by Elise Arnst about native and exotic plants at Birdlings Flat. **Venue:** Room A5 University of Canterbury.	**Contact:** Gillian Giller, ph: 03 313 5315, email: ggillerma1@actrix.gen.nz.
Field trip: Thursday 13 to Sunday 16 February for the summer camp at Charleston. **Accommodation:** cabins have been blocked booked ($26/adult/night; see http://charlestonmotorcamp.yolasite.com/), please contact Alice; for a motel, book directly: http://www.charlestonmotel.co.nz/.	**Further information:** Alice Shanks, ph: 03 337 1256, email: Ashanks@openspace.org.nz

University of Canterbury summer course: Practical Field Botany

Practical Field Botany (BIOL305): an intensive, short summer course designed to meet the need for training in the collection, preparation and identification of botanical specimens. **Venue:** Mountain Biological Field Station at Cass, Canterbury. **Dates:** 7—15 January 2014.	**More information:** Dr Pieter Pelser, email: pieter.pelser@canterbury.ac.nz, ph: 03 364 2987 ext 45605).