Waikato Botanical Society Inc.

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ANTARCTIC MOSSES AND LICHENS
16TH JUNE 2003

The Antarctic contentment is the coldest, windiest and driest on earth. At 48000 km2, it is 50% bigger than both Australia and USA. However, even in this apparent waste-land, plants survive, if only in the 2% of the continent not permanently covered in ice. The majority of the plants growing on mainland Antarctica are lichens and mosses. Although not highly specialised or remarkable, it is remarkable that these plants can survive the freezing, sandblasting desert-like conditions prevailing at the bottom of the world. How do these plants do it?

Professor Allan Green of the University of Waikato presented to the botanical society the most recent experimental data to show how he and colleagues have determined survival strategies of the two most commonly found plant types on the Antarctic continent; mosses and lichens. Both mosses and lichens require free water in order to photosynthesise. Free water is very hard to obtain in an environment where in winter the precipitation is in the form of snow which, during summer, evaporates, only to be replaced by freezing precipitation in winter again. However, during the brief spring season when snow-melt provides some free water, photosynthesis is able to be carried out. It is no wonder then that mosses in particular tend to be found in areas where snow melt streams meet, and pond briefly, before evaporation. Professor Green has found an amazingly low occurrence of photosynthesis in lichens when measured throughout the whole year. In one case he measured the occurrence of photosynthesis in a lichen on only 37 days within one year. It was within these 37 days that enough free water was provided for photosynthesis to occur. During the rest of the time both lichens and mosses have the ability to remain in a ‘freeze-dried’ state.

Professor Green also determined the ability of mosses to withstand the sub-zero conditions of the ambient air temperature. He found that they are able to ‘un-couple’ themselves from the freezing air temperature by being effectively insulated themselves from the freezing winds by

the blanketing snow above them. As the moss begins to freeze, the latent energy of fusion releases energy in the form of heat, keeping the mosses temperature above 0^{o}C. Professor Green has also determined the time-lag between freezing and photosynthetic activation of the mosses and lichens in the presence of free water. Lichens begin photosynthesising in response to the presence of free water (and of course light) within 2-4 hours. Mosses on the other hand require 14 to 24 hours.

These results are not common to Antarctic mosses and lichens, but are in fact characteristic to these plants as a whole. It is the inherent characteristics of these plants, which allow then to survive the extreme conditions of the Antarctic…….extremely cool plants for an extremely cool place!

Wade Tozer

GRASS-ENDOPHYTE RELATIONS 14TH JULY 2003

We heard a fascinating talk by Chris Miles of AgResearch on the role of endophytic fungi in grasses, and their implication for conservation. What is an endophytic fungi? Fungi which occurs within (endo) plants (phyte). Probably the best studied endophytes are those occurring in agricultural grasses such as perennial ryegrass and tall fescue. Endophytes were discovered in the early 1900's but their role in agricultural grasses wasn't determined until about 1980. These endophytes produce chemical compounds which can give the plant protection against abiotic stresses such as drought and, most importantly, act as feeding deterrents to insects. Unfortunately, endophytes also produce compounds which have neurotoxic effects on livestock, such as ryegrass staggers. Plant breeders have put a lot of effort in recent years into developing forage grasses with endophytes which still give protection against insects but don't produce compounds toxic to animals.

The ryegrass endophyte is *Neotyphodium lolii*. *Neotyphodium* endophytes grow intercellularly (between cells) and so produce no external signs of their presence, such as lesions, and can only be detected microscopically. *Neotyphodium* are asexual and can only be passed on in the seed of their host – the plants which grow from this seed will then contain the endophyte. If a plant doesn't contain the endophyte it cannot become infected with it. *Neotyphodium* are closely related to the choke grass pathogens of the *Epichloe* genus. Unlike the *Neotyphodium*-host relationship which is mutualistic, *Epichloe* can sterilise its host during sexual reproduction.

The genus *Echinopogon* occurs only in Australia and New Zealand, and contains 7 species of grasses. Of these only *Echinopogon ovatus* (hedgehog grass) is found in New Zealand. *E. ovatus* is a shade loving perennial grass that grows on dry forested banks. Its common name derives from its distinctive flower/seed head. In Australia, an *Echinopogon*, thought to be *E. ovatus*, has been reported to produce symptoms in livestock similar to ryegrass staggers. This prompted Chris and his colleagues to investigate *Echinopogon* and particularly *E. ovatus* for the presence of endophytes.

Examination of samples from the Waikato and New South Wales herbariums found *Neotyphodium*-like endophytes in 5 of the *Echinopogon* species. Live specimens of *E. ovatus* collected from Waingaro were found to be infected with a fungus that was similar to *Neotyphodium*, and tests confirmed it to be related to *N. lolii*. In tests of endophyte infected and uninfected plants, only those containing the endophyte contained toxic alkaloids. And in feeding tests with Argentine stem weevil – a major pasture pest – infected plants were less palatable than those without the endophyte. Such pests are only recent arrivals to New Zealand, but the endophyte may have evolved in response to an insect pest that has since disappeared. In the field, infection rates of the endophyte are high, suggesting there is still something operating to maintain the plant-endophyte relationship.

As *E. ovatus* isn't economically important it has not been moved around geographically, or changed through plant breeding. This makes it a good species on which to study evolutionary

origins of endophytes in grasses indigenous to the Southern Hemisphere. Chris and colleagues in Kentucky identified several new species of *Neotyphodium* endophyte including that in *E. ovatus* in New Zealand – *Neotyphodium aotearoae*. Interestingly, *E. ovatus* in Australia was found to have two endophytes – *N. aotearoae* and an *Epichloe* hybrid they named *N. australiense*. A third new endophyte was identified in several species of South African grasses from the genus *Melica* – this was a hybrid of the New Zealand endophyte *N. aotearoae* and an *Epichloe* endophyte. *Epichloe* are not known to be indigenous to the Southern Hemisphere, thus the presence of *Epichloe* genes in the hybrid endophytes highlights the occurrence of gene flow between Northern and Southern hemisphere endophytes.

Chris describes endophytes as a "cryptic form of biodiversity". The lack of external signs of their presence in the plant means their presence was only recently discovered in *E. ovatus*. The mode of transmission through seed means the endophyte is easily lost through improper storage – and we often don't realise it's gone. Once it disappears how do we get it back? Scientists are now realising that endophytes are found in many other plants. They can convey huge benefits to their hosts – it is important to understand and preserve these hidden organisms.

Shirley Nichols

NEW MEMBERS

Welcome to our latest new member Nicole Sutton

ON THE INTERNET

With our field trip to Maungatautari coming up, check out http://www.maungatrust.org/ - the website for the Maungatautari Ecological Island Trust.

Also, for those interested in the Great Barrier trip see http://www.greatbarrier.co.nz/

The new website of the New Zealand Native Plant Conservation Network
http://www.nzpcn.org.nz/

Project Crimson
http://www.projectcrimson.org.nz/Welcome.html

New Zealand's Carnivorous Plants – website by Bruce Salmon, author of "Carnivorous Plants of New Zealand".
http://www.geocities.com/nz_cp/index.html

MAUNGATAUTARI FIELD TRIP
SUNDAY OCTOBER 5TH

Lead by Bruce Clarkson
A joint field trip with the Rotorua Botanical Sociey

Meet 8:45am at Landcare carpark, Gate 10, Silverdale Rd
or
10am at the Dean property – at the end of Luck at Last Rd

GREAT BARRIER ISLAND FIELD TRIP
NOVEMBER 7TH-9TH

Led by Karen Denyer

Bookings essential!
This trip is subject to numbers so please let Karen know if you are interested.

Karens suggestion is to spend one day exploring Mt Hirakimata (Hobson) – great views and great botanising (Great Barrier Island K*unzea* and *Olearia* endemics) – and a second day visiting Kaitoke swamp (easy boardwalk access) and the hot pools.

Transport to and from the island is either by ferry or air.
To catch the ferry over and fly back is about $130.
Return ferry $75
Ferry trip to the island would be on Friday afternoon/evening, return trip on Monday

Estimated cost about $250 for 2 days on the island – fly/ferry to/from the island, 2 nights accommodation, and transport on the island
Budget option of $150 for campers willing to ferry back on Monday.
(food plus transport to Auckland is extra).

Cheaper accommodation is also available for those wanting to camp.

Please contact Karen at

07 - 856 0555 x 9989 (wk)

07 - 823 0405 (evenings)

karen.denyer@ew.govtnz

Also don't forget that spaces are limited for the Te Kopia geothermal fieldtrip in November – spaces are filling up so get in touch if you want to come along.

LONG TAILED BATS IN HAMILTON

The Waikato Times has reported that native long-tailed bats have taken up residence in the city. According to a DoC spokesperson they are in the Hamilton Gardens and near the University but their roosting sites aren't known. Local residents have reported the bats for several years, and Landcare and DoC staff have now detected them using sound equipment to pick up their high frequency noises.

NEW ZEALAND NATIVE PLANT CONSERVATION NETWORK

In the last newsletter we published information on this recently established organisation. We have received the Networks first newsletter. If you didn't receive a copy by e-mail and would like one sent to you please contact us.

WAIKATO BOTANICAL SOCIETY
PROGRAM 2003

5 October **Joint Rotorua / Waikato Botanical Societies trip to Maungatautari** led by the famous Bruce Clarkson (University of Waikato). Botanise mountain forests and rocky outcrops.
Meet at Landcare carpark at 8:45am, or 10am at the Dean property, end of Luck at Last Road.

7/8 November **Weekend trip to Great Barrier Island, Hauraki Gulf.**
Visit the spectacular bluffs of Windy Canyon, see island endemics (*Kunzea sinclarii* and *Oleria allomii*), explore the Kaitoke Swamp and soak in the hot pools. Optional hike to Mt Hirakimata (Hobson). Cost to be finalised but likely to be around $250 for ferry, accomodation, on-island transport. Food and transport to Auckland extra. Bookings essential.
Contact Karen Denyer (Environment Waikato) (07) 856 0555 xt 9989, (07) 823 0405 evenings. Trip subject to numbers and weather.

22 November You asked for it! **A field trip to a geothermal area.** Bruce Burns (Landcare Research 858 3728 BurnsB@landcareresearch.co.nz) will lead a trip to Te Kopia where the orchid *Calochilus robertsonii* should be flowering. For safety purposes, this trip will be limited to 10-15 people.
Meet Landcare carpark, 9 am.

7 December The famous Waikato Botanical Society end of year rally. The food was really good last year so we think everyone should come along. No botanical knowledge necessary (the vice-president was beaten by a 10 yr old kid last year, so don't let a lack of knowledge put you off). We might even have a prize for the lowest score this year! Anyway its heaps of fun and not too physical. Venue and time to be advised.

For enquiries about events
Please direct enquiries about trips to trip leaders
For general enquiries about talks contact publicity officer Don McLean
on (07) 838 4466 ext. 7824 (daytime)