Botanical Society of Otago Newsletter.

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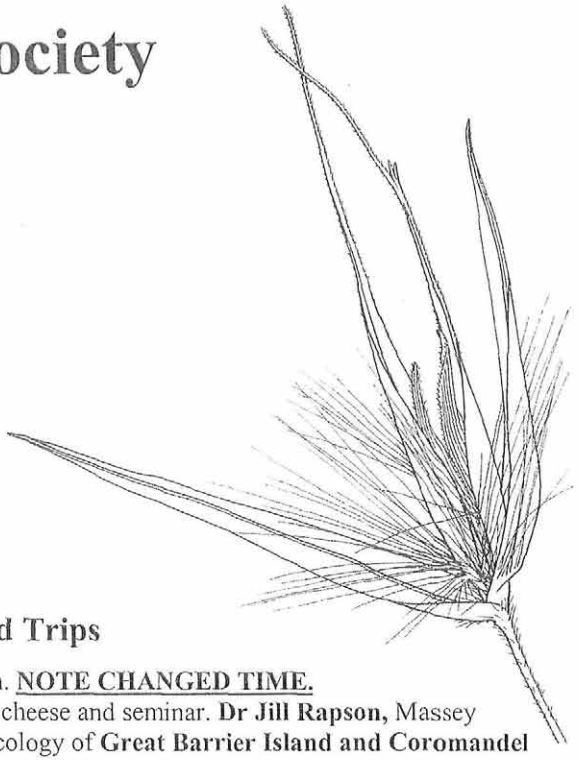
Nov - Dec 2001



BSO Meetings and Field Trips

15th November, Thurs, **5.30 pm.** NOTE CHANGED TIME.
End of year BSO wine & cheese and seminar. **Dr Jill Rapson,** Massey University, talks on the ecology of **Great Barrier Island and Coromandel Peninsula.** Jill is an ecologist with a wide range of interests in plant communities. Great Barrier Island and Coromandel Peninsula share a common volcanic origin, and the current sea strait between them belies their biological affinities. They are important areas, both conservationally and floristically, sharing many unusual species, and containing others at their range limits. This talk will review some of these aspects, consider the human history of both areas, and investigate the current flora and vegetation. Seminar room, Zoology Annexe, Gt King St, car park by Dental School. Side door behind the Glassblowing Unit.

18th November, Sun, **10.30 am – 5pm. Dr Anni Watkins** will lead a full day **workshop on grass collection and identification.** Field trip will be followed by further identification in the laboratory. Meet in the Botany Dept car park, 464 Gt King St. Bring boots, parka, lunch, magnifying glass or lens, grass flora (Vol 5). See diagram inside.

27th December – 7 January. Summer Field trip with Wellington Botanical Society. Based beside breathtaking Lakes Pukaki and Ohau. Ten days of diverse botany with access to alpine, subalpine, tussock grassland, shrubland, *Nothofagus* forest, wetland and lakeshore plant communities. What better way to start the International Year of the Mountains? Registration form (due Nov 18) inside.

20th February, Wed evening. **AGM**. Keep this date free.

Notes from Head Office

This is the penultimate newsletter for the year and thoughts are already turning to the summer trip, which looks as if it will be as wonderful as ever. Places are filling fast, so register promptly. What better way to start the International Year of the Mountains, than botanising in sight of our highest peak.

Your committee has been looking back at the years BSO activities and is looking forward to making plans for next year. Last summer's trip at Borland Lodge was very successful, with the coming together of botanists from diverse locations, backgrounds and interests providing a very stimulating environment for discussion, debate and discovery. Prof Bond's lively and provocative talk on "Divaricating plants – defense against toothless browsers?' drew an appreciative crowd, David Orlovich's fungal foray had some keen participants, as did the trip to Witherow and Birch Islands.
As you can see from the diary at the back, there are several other groups in Dunedin with overlapping interests. Maybe the most useful niche our botanical society can fill is to concentrate on the more specialised aspects of botany, such as the grass workshop coming up this month, and the continuing debates on divarication and on the validity of 'goblin forest'. Don't forget that the newsletter welcomes botanical articles of all descriptions.

Feedback at this stage from members on the future directions they would like to see our society take would be very helpful. Your committee members are only a 'phone call or e-mail away, and our address is at the back of the newsletter.

Meanwhile, enjoy the abundance of botanical activity.

Bastow and Allison

Cover picture

Cortaderia fulvida spikelet x 10. From *Flora of New Zealand, Vol. 5, Gramineae* by E Edgar & HE Connor. Native *Cortaderia* species are tall perennial tussocks collectively known as toetoe. Naturalised species are known as pampas grass.

Back cover: Photocopy of some of the grasses flowering in Dunedin now. Find out more at the Grass Workshop, Sat 18 November.

Note from the treasurer

End of year Bonus – subscriptions paid from now to the end of the year will cover the whole of 2002 as well.

David Orlovich

LETTER TO THE EDITOR

Goblin Forests continue to haunt us .....

Further to my earlier comment:

1. I note that two sentences from my letter on goblin forest sent to you on 15/5/01 (see below) were left off when it was published but no indication was given that the letter was abridged.

2. Dr Wilson's reply, in which he continues to deny the existence of a goblin forest type, is unconvincing and introduces new difficulties, as the summary of some relevant literature below shows:
   a. Cockayne (1919) in describing the New Zealand subantarctic islands refers to: "lands of brown hills, enclosed by thick woods, weird and grotesque - in truth goblin forests, patrolled and sentinelled by uncouth monsters of the deep; such impression may far-off subantarctic islands give at first."
   b. Cockayne (1928) used the term (which he borrowed from local Taranaki usage in which the term referred to a vegetation type) and went on to describe the characteristics of the vegetation type and its composition and distribution. He also noted another location, Hauhungatahi, where the forest was more or less of the same character.
   c. As outlined by the Oxford Companion to the English Language, the usage of capitals and/or quotation marks (which is often inconsistent) can be ascribed to highlighting a special or unusual word which is not the writer's own e.g., in the same way Cockayne (1919) referred to the Taranaki name for herbfield vegetation - "moss". It does not follow that the term refers only to a place.
   d. Others (by no means an exhaustive list) who have used the term goblin forest (in various combinations with capitals or no capitals, single quotation marks or double quotation marks) include Schweinfurth (1962; Mt Egmont), Stevens, McGlone & McCulloch (1988; Southern Alps), Millener (1946; Mt Egmont) and Dawson (1988; wet beech forests in New Zealand).

I have never noted the term gremlin forest in the ecological literature.

Yours sincerely,

Bruce Clarkson (Taranaki born ecologist and researcher of goblin forest)

References:

Cockayne, L. 1919: New Zealand plants and their story. Government Printer.
Cockyane, L. 1928: The vegetation of New Zealand. Englemann (Cramer).
Dawson, J. 1988: Forest vines to snow tussocks. Victoria University Press.
Millener, L. 1946: Auckland Botanical Society newsletter.
Schweinfurth, U. 1962: Erdkunde 16.
Stevens, G. et al.: 1988: Prehistoric New Zealand. Heinemann Reed.

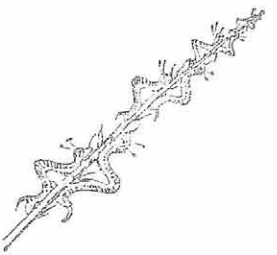
Apology – Gremlins in the computer .....

My apologies to Bruce Clarkson for inadvertently losing the last 3 lines of his letter on supernatural beings in forest, which was published on page 5 of Newsletter 27. They mysteriously disappeared during the cutting and pasting and have now been reinstated, in script, as the last 3 lines in the previous letter. The omission was entirely accidental, and I am sorry to have spoiled such a good ending.

Allison Knight, editor

Fig. *Nasticreechia krorluppia*

From Edward Lear's *Nonsense Botany*.



Goblin Forests - Reply

There are three possibilities as to the status of the term 'Goblin forest'.

1. 'Goblin forest' may be a place name. It seemed likely from Cockayne (1928) that this was the case, and Dr Clarkson has kindly confirmed this with his report that 'Goblin forest' is "local Taranaki usage".
2. 'Goblin forest' may be synonymous with 'elfin woodland', and, since the latter is long and internationally established (Schimper 1903; Allaby 1994; Lincoln *et al.* 1982), 'goblin forest' would then be an error. Dawson (1988), whom Dr Clarkson has quoted approvingly more than once, shews this is the case by stating that 'goblin forest' and 'elfin woodland' are synonymous. ['Elfin woodland' and 'elfin forest' are also synonymous: Allaby 1994; Lincoln *et al.* 1982].
3. 'Goblin forest' may be a forest type found only in New Zealand, distinct from 'elfin woodland'. However, Dawson's (1988) statement above shews this is not true.

It is clear that 'Goblin forest' is a place name ('1' above), and that it would be erroneous to use it as a forest type since it would be at best a later synonym for 'elfin woodland' ('2' and '3). I have pointed this out all along, but I must admit that when I wrote my original article, *Supernatural beings in forests*, I had not realized that the error was so widespread. Surely that is all the more reason to correct it. Ecology as a whole suffers from loose use of terms, and perhaps New Zealand ecology more than most, so such dogs cannot be allowed to lie under the table. [References as in my original paper, BSO Newsletter 26, pp 6-8]

J. Bastow Wilson, Botany Department, University of Otago.

Taraxacology

I welcome the contributions in Issue 28 from Lloyd Esler, at the southern edge of our Society's range. Lloyd does a superb job awakening enthuisasm for nature in the youth of Southland. A whole generation there will be inspired by his efforts. His idea of Science Badges seems to be yet another excellent idea for enthusing them.

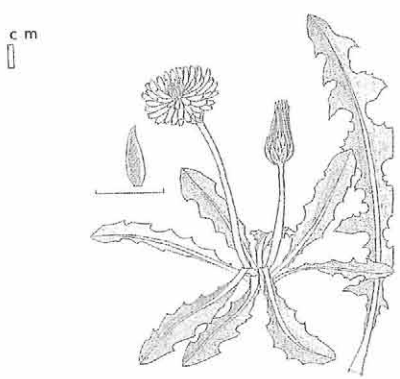
Lloyd mentions a number of badges, but says they decided not to include taraxacology. I ask him to reconsider this. There are more than 1200 species of *Taraxacum* (dandelion) in the world. We have no idea how many of these, or which ones, we have in New Zealand. The Flora of N.Z. admits that we are totally ignorant of this, and lists only two: one native and one exotic. I see this as nothing short of disgraceful. In what other group of plants do we have no idea what species are present in New Zealand?

Taraxacology is an ideal subject for the amateur botanist. Most of our Taraxaca have probably arrived from Britain, and their Taraxaca are well known (Dudman & Richards 1997). University and Landcare botanists would find it difficult to justify such basic research these days, but if Lloyd could inspire just one amateur by instituting a badge for taraxacology he would have done yet another service to botany in New Zealand.

Reference: Dudman, A.A. & Richards, A.J. (1997) *Dandelions of Great Britain and Ireland* [B.S.B.I. Handbook no. 9]. Botanical Society of the British Isles, London.

J. Bastow Wilson, Botany Department, University of Otago.

Taraxacum officinale (dandelion)



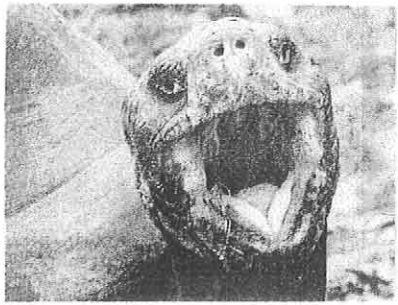
Taraxacum magellanicum (native dandelion)

Illustrations from Hugh Wilson's Field guide: *Stewart Island Plants*, Field Guide Publications, NZ

ARTICLE

Co-evolution: Plant form and toothless browsers on the Galápagos Islands.

By Allison Knight



At first it was just going to be a simple family holiday, a cruise around the Galápagos Islands to celebrate Rob's graduation from Princeton. But then the botanists around me at Otago said that they hoped I would report back to the Botanical Society so I realised that perhaps I should pay some attention to the botany. Lichens were the obvious choice, that being my main passion, so I downloaded the list of the 196 lichens, only 11 of them endemic, that have been recorded from the Galápagos, mostly by Bill Weber, who became a helpful correspondent from Boulder, Colorado.

Ecology and Evolutionary Biology at Princeton

But, once we arrived in Princeton, Rob introduced us to various members of the Department of Ecology and Evolutionary Biology. With the "Divarication – defense against toothless browsers?" debate revived by William Bond at our AGM still turning over in my mind, I couldn't resist asking if any of them knew of any examples of plant modification in response to browsing. Henry Horn, who bills himself as Boy Wonder Emeritus and makes art work out of computer innards, told us of a fir tree that has browse-resistant juvenile leaves and doesn't start developing adult foliage until it reaches a height of around 2 m, above the browse zone. Breaking off the adult foliage to simulate browsing can apparently induce a reversion to juvenile form.

Henry also described plant adaptations to animal dispersal agents. He said that fruits that are dispersed by birds tend to have a laxative effect, so that they are passed rapidly through the gut and dropped before the bird has flown too far away. Indeed, anyone who has hung out washing near a fruiting elder will know that ripe elderberries pass very rapidly through local birds. In contrast, fruits that are dispersed by slower-moving animals tend to exert a binding effect. For example, the seeds of the endemic Galápagos tomato, *Lycopersicon cheesmanii*, take several weeks to pass through the gut of the Galápagos tortoise. It made me wonder whether any New Zealand plants have developed special adaptations to seed dispersal by flightless birds.

The Beak of the Finch

Our generous hosts in Princeton were Rosemary and Peter Grant, who have been doing research on the evolution of Darwin's finches in the Galápagos Islands for over 27 years. They told us something about the radial evolution of the prickly pear cactus, *Opuntia* spp, there. On islands where the finches nest in the cacti and are important pollinators, the spines are much softer than on islands where the cacti are insect-pollinated and heavily browsed. A Pulitzer prize-winning book, '*The Beak of the Finch*'

by Jonathan Weiner, has been written about the Grants' work, which is so meticulous that they have actually been able to document evolution as it happens. Reading this book was one of the highlights of our trip, filling in the gaps, as it did, between Darwin's theory of evolution (itself inspired in part by the curious adaptations of the Galápagos finches) and the current state of knowledge.

One striking example of co-evolution that the Grants have recorded involves changes in the size of the *Tribulus* (puncture vine) seed as the size of the finches' beak changes. This seed is very hard, prickly and relatively large. In times of plenty it is an inefficient means of sustenance, but in times of drought being able to crack it can mean the difference between life and death. In one particularly dry season only the finches with the largest and strongest beaks survived, and nearly all the *Tribulus* seeds were eaten. As the size of the finch beaks has evolved, so has the size of the *Tribulus* seed. But on islands where there are no large-beaked finches the *Tribulus* seed has not increased in size, even though all the plants have suffered the same stressful climatic conditions.

From South America to the Galápagos Islands

So my head was buzzing with new ideas by the time we flew from Quito to the Galápagos Islands, which straddle the equator some 960 km west of Ecuador, the nearest land. There are 14 main islands and over 40 smaller ones. The oldest islands, to the east, are around 5 million years old, and the youngest, to the west and still very active, volcanically, are around 1 million years old, which is very young, in geological and in evolutionary terms. The volcanic origin of the islands means that they have been, and continue to be, thrust up molten from the sea floor as an eastward moving tectonic plate passes over a hot-spot in the earth's mantle.

So how did these remote, oceanic islands come to be populated by a thought-provoking array of plants and animals? When Charles Darwin first set eyes on them in 1835, at the age of 26, the current thinking was that God had created the earth and all the plants and animals on it, and that species, as well as land-forms, were immutable. What we now see as adaptation and co-evolution, the Christian world then saw as examples of the many marvels of creation, such as an extra-long proboscis on a moth so ideally suited to suck nectar from and to pollinate a flower possessing an extra-long nectar tube.

Darwin the Heretic and Experimenter

So what did Darwin see that made him start to think the heretical new thoughts that have so changed the way we see the world? He saw a group of volcanic islands, the youngest of which were so new and sterile that they consisted of little more than raw lava and ash. He saw plants and animals which were strikingly similar to, yet curiously different from, the plants and animals on the nearest landmass, South America, and which also varied from island to island. He began to wonder if the original inhabitants of the Galápagos had arrived from Ecuador, and not by divine intervention, and if, once they had arrived, they had undergone changes.

When Darwin got back to Britain he devoted the rest of his life to testing these new ideas. While animal genera which had undergone adaptive radiation of species, such as

finches and tortoises, provided the initial stimulus, it was experiments with plants that provided much of the key evidence for his controversial book, *The Origin of Species by Means of Natural Selection*, which was published in 1859. Darwin reasoned that if the plants and animals on the Galápagos had arrived there by natural means, and evolved into new species there, rather than being created there by God, it was important to demonstrate how this might happen.

Darwin did many thoughtful experiments on plant dispersal (Allan, 1977). He soaked seeds in seawater, to see how long they could be immersed and stay viable. He noted that the seed in the crop of birds was not subjected to gastric juices, and stayed viable for many hours. He calculated how far a bird could fly or be taken in a storm, perhaps to be washed up dying, or torn up by a bird of prey, thus dispersing seeds to a far island. He also fed grain to mice, then fed the mice to hawks and owls in the zoo, and noted how long it took for seed to appear in the predators' pellets, and how viable it was.

A Disharmonic Flora

Around 20,000 plant species exist on mainland Ecuador, from where 90% of the plants on the Galápagos are thought to have originated. Not all species would be capable of surviving long-distance dispersal over 1000km of ocean. Also, some families of plants are better suited for such travel than others. Thus the Galápagos flora is species poor, having between 600 (Jackson, 2001) and 863 (McMullen, 1999) native vascular plants, with around 28 – 30% being endemic. There is also considerable disharmony, or disproportional representation, in the plant families that made it across the sea, compared with Ecuador. Lichens and ferns, for instance, with their tiny, wind-blown spores, and grasses, with their bird-eaten seeds, are over-represented in the islands, while orchids, which have very light seeds, but often require the presence of specific root-associating fungi and specialised pollinators, are under-represented. Gymnosperms, with their heavy cones, never got there at all.

[For those sceptical that even several hundred plant species could have survived such a long and perilous ocean journey, then taken hold and reproduced on such a sterile volcanic substrate, Porter has calculated that it would only take one colonisation every 7,300-12,100 years to account for the ancestors of all the native Galápagos species (McMullen, 1999). That could be one rare combination of flood and gale and currents carrying across a raft of debris with clinging plants and animals. We saw such rafts of broken off riverbank heading out to sea as we flew over the flooded Guayaquil River.]

Toothless Browsers – like New Zealand

Likewise the land-dwelling fauna of the Galápagos Islands are species poor and disharmonic. The only native land-dwelling mammals are bats and the island-specific rice rats. (Darwin was astute enough to note that bats, like birds, could be blown across the sea to distant islands.) But there are 11 subspecies of giant tortoise, 7 species of lava lizard, 6 of gecko and, of course, 13 species of the famous little finch. There are few native butterflies or bees to pollinate the flowers, which are mainly white or yellow. Having fewer species, and disharmonic representation of families, has opened the way for species to forge new relationships and exploit new niches.

On the Galápagos Islands, as with pre-human New Zealand, evolution of the endemic plants has occurred in the presence of large, toothless browsers, and in the absence of any browsing mammals. The biota also evolved, until relatively recently, in the absence of humans; the first recorded visitor being the bishop of Panama in 1535, when his ship was blown off-course in a storm. He survived to tell the tale by sucking the juice of prickly pear cacti. Early sailors who visited reported that the giant tortoises were so numerous that it would be possible to cross some islands without touching the ground, by stepping on their backs. The browsing pressure must have been intense.

Fig. Giant Galápagos tortoises and Darwin's finches browsing on *Opuntia* sp. prickly pear cacti. *Darwin and the Beagle* by Alan Moorehead, Penguin 1971.

On our visit to the Galápagos, the first toothless browsers that greeted us, as the dinghy from the ex-research vessel Beagle III nudged onto a rocky shore, were the bright red Sally Lightfoot crabs. They pranced boldly round the inter-tidal zone, clipping the bright green seaweed, *Ulva lobata*, with their front nippers, and were a familiar, fearless sight on most islands. After a few days I began to wonder why we never saw any small red crabs, until I learnt that the cryptically-coloured dull grey crabs, that scuttled fearfully away from the stalking rock herons and circling frigate birds, were in fact the juvenile form. The red colour only develops when the crab becomes too big to be easily swallowed.

Competing with the crabs for grazing rights on the seaweed were the amazing marine iguanas. These big, black 'imps of darkness', as Darwin called them, lie basking on the rocks, absorbing heat before and after their forays down to the water to graze on the seaweed, rubbing it off the rocks with their stubby, horny snouts.

On islands where the red algal turf, comprising genera such as *Centroceras*, *Gelidium* and *Spermothamnion*, is grazed, the iguanas have a reddish tinge from the pigment they ingest. Constant grazing by crabs, iguanas, turtles and other creatures keeps the seaweed so well cropped that Darwin thought the marine iguanas must dive off shore for food. In fact the intertidal algae have an exceptionally

high rate of growth, and are known to double their length and increase their weight by up to six times in the space of a fortnight (Jackson, 2001).

The Plants are Still Evolving

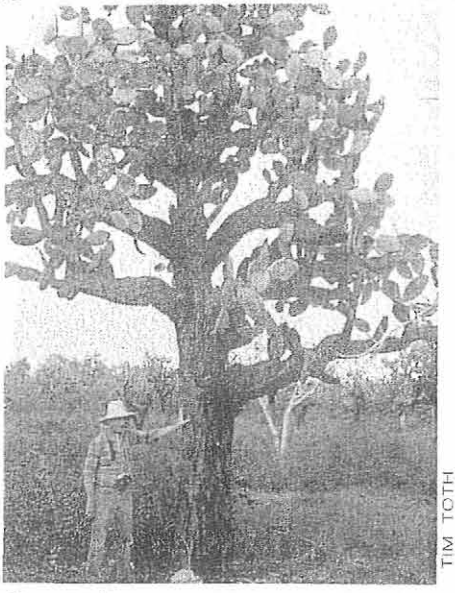
The high rate of endemism in the Galápagos flora indicates a high rate of evolution, and the discrepancy between estimates of number of species is in part because the flora is still evolving. In the relatively short time, geologically, that the Galápagos Islands have been colonised, 18 plant groups have undergone extensive adaptive radiation. The genus with the highest number of endemics is the *Scalesia* daisy, with 16 taxa. Michael Jackson describes this genus as 'the plant kingdom's equivalent of Darwin's finches' Unfortunately, these palatable plants, from the same family as the sunflower, evolved in the absence of browsing mammals. The introduction of burros, horses, cattle and goats in particular has driven some species of *Scalesia* to the verge of extinction, and put others in the rare and threatened category. Staff and volunteers at the Darwin Research station, on Santa Cruz Island, are working hard to save the remaining *Scalesia*.

The next most extensive example of adaptive radiation is in the genus *Opuntia*, in the family *Cactaceae*, where there are 14 endemic taxa. On islands where the *Opuntia* cacti are (or were) browsed by the toothless giant tortoises the cacti have developed an amazing thick trunk, which lifts the fleshy pads above tortoise-browsing level. On islands where there have never been tortoises, and the main browsers are the large land iguanas, the trunks are thicker and shorter, just enough to lift the succulents pads above the iguanas. And on islands where there have never been large reptilian browsers the *Opuntia* just sprawl on the ground as in their ancestral form. In this situation the *Opuntia* tend to reproduce mainly by vegetative means, with new plants sprouting from fallen pads. But on islands where browsing pressure is high, reproduction is mainly by seed.

Fig. Island-specific *Opuntia* sp cacti (Jackson 2001)

MONICA J. JACKSON

Shrubby prickly pear cactus, North Seymour



TIM TOTH

Giant prickly pear cactus, Santa Fé Island.

Each Island a Petri Dish

That is the most amazing thing about the Galápagos Islands, the variation in species, and in combinations of species, from island to island. Each island is like a little Petri dish, all in the same equatorial ocean incubator, yet each seeded with a different combination of related, yet subtly differing, organisms. Several have, or had, giant tortoises, but the sub-species are largely island specific. Many have, or had, land iguanas, as well as or instead of tortoises. Some have neither reptilian browser. Likewise the combinations of finches, of lava lizards, the little rice-rats, as well as of *Scalesia* daises, *Opuntia* cacti and others of the plant genera that have led to the evolution of 3 or more endemic species, tend to be island-specific. This giant evolutionary experiment is ongoing, greatly accelerated by the arrival of humans. Giant reptiles have been driven extinct on some islands, and have been introduced to others where the plants evolved in their absence. Browsing mammals have been added and removed in various combinations.

Past Climatic Pressures and Evolution

Climatic effects on the ocean 'incubator' have added their own evolutionary pressures over the last 5 million years. Global temperatures have, on average, become cooler over this time. Periodicity of oscillations between glacial and interglacial states has changed from around 20 thousand years to around 100 thousand years. While glacial climates would not have put ice on the Galápagos Islands, the increased water tied up in ice world-wide would have lowered the sea level, exposing land-bridges between some islands. The climate would have been colder and drier. Grant has shown that significant features of the evolutionary radiation of Darwin's finches correspond approximately with the times of greatest climatic change. (Grant, 2001, Jackson, 2001)

Climatic Stress PLUS Browsing Pressure

Climatic stress producing evolutionary pressure is still a marked feature of the Galápagos ecosystems. In the dry season there is almost no groundwater. Annual rainfall can vary from over 3000 mm in an El Niño driven season, as in 1983, to less than 60 mm in a severe drought year, as in 1985, when 90% or more of individuals in certain plant and animal species died. Grant has also shown that, under present day conditions, when the climatic stress is equal, the addition of browsing stress can be what pushes a plant towards speciation, as with the big-beaked finches foraging on the tough *Tribulus* seeds. This fits with the dramatic, large-trunked *Opuntia* cacti occurring on the islands with the biggest browsers, and the sprawling Opuntia, least changed from the ancestral form, occurring on islands without any large reptilian browsers. It is tempting to speculate that short spines and thorns are more effective defense against the soft palate of mammals than the tough, horny palate of browsing birds and reptiles.

Suddenly, it seemed I had found answer to something that had been puzzling me. Matt McGlone had pointed out that moas had been in New Zealand for around 80 million years, yet divarication had only evolved in around the last 5 million years, during periods of great climatic stress; therefore he felt that climatic stress was more implicated than browsing stress. Yet what the Galápagos experiments of nature show quite clearly is that it is the combination of climatic stress PLUS browsing stress that

pushes evolution the fastest. Neither alone is as effective. The seaweeds on the Galápagos shores are exceptionally highly grazed, but are not subjected to as much climatic stress as the land plants, and have not become endemic. Neither have the mangroves nor most other unpalatable native plants, which have suffered the same extreme climatic pressures as *Opuntia* and *Scalesia*, but have escaped the heavy grazing.

Insight for the future

A recent Insight Review article by MD Rausher in Nature begins with the sentence "Co-evolution between plants and their natural enemies is generally believed to have generated much of the Earth's biological diversity". The Galápagos Islands are a living demonstration of this, with the added factors of climatic stress and geographical isolation thrown in to make them an evolutionary hot-spot.

What can New Zealand learn from this? It seems to me that Matt McGlone and William Bond could well both be partly right; that climatic stress AND toothless browsers were both important factors in the evolution of our endemic flora. Perhaps it is time they shook hands and collaborated and constructed a more balanced scenario. It could have important implications for the management of our conservation areas.

P.S. Lichens are fascinating – evolution in the making is riveting.

References

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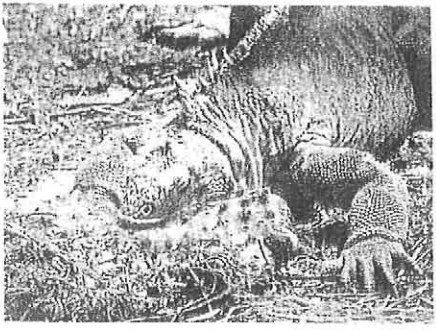
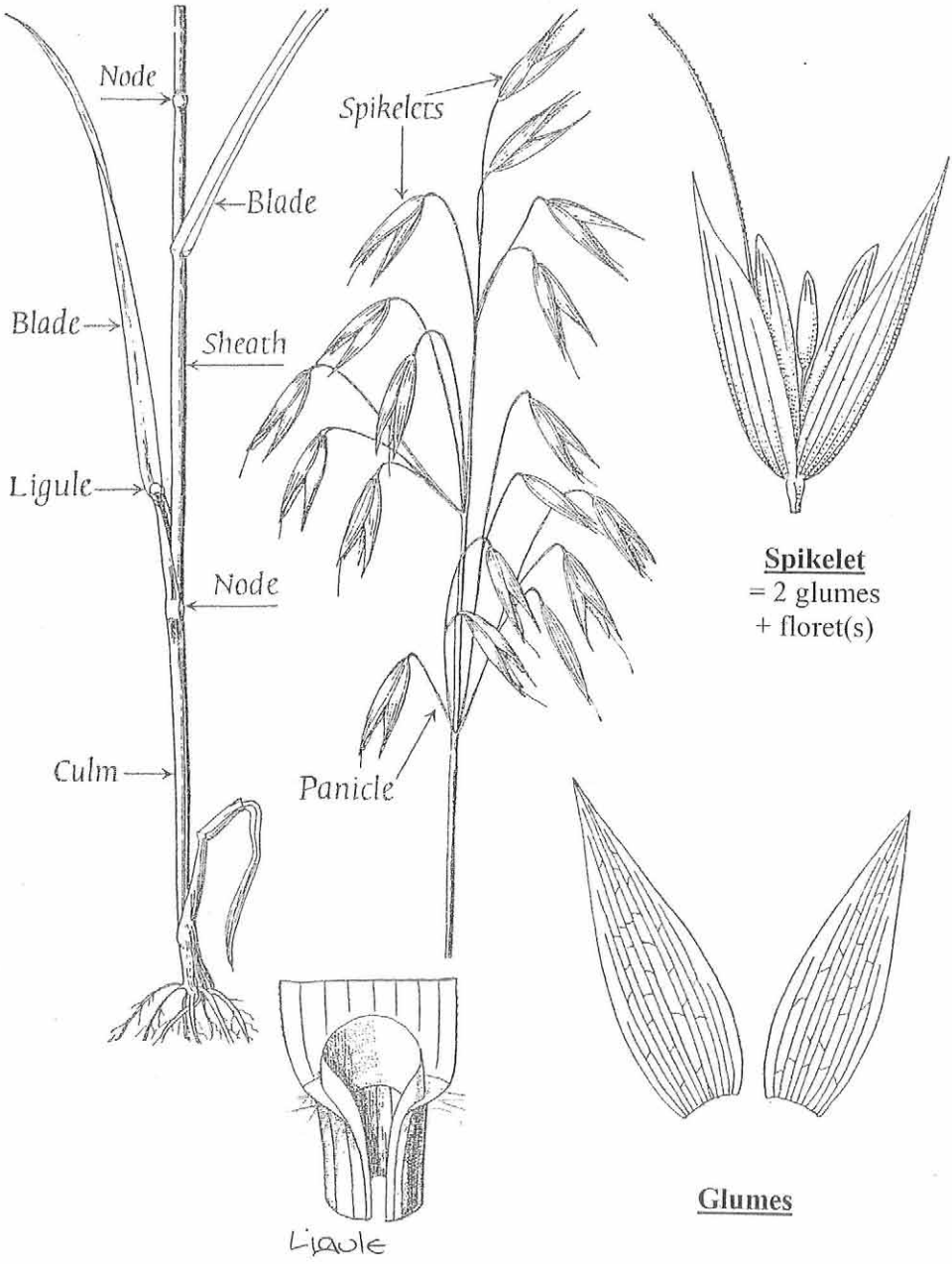


Fig. Land iguana eating prickly pear cactus pad. (Jackson 2001)

REPORTS

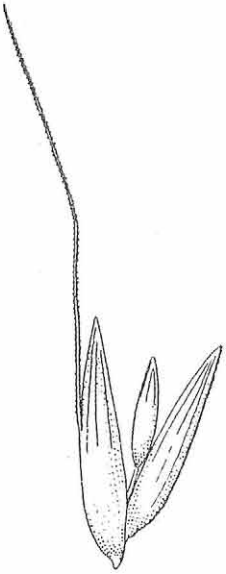
Meeting Reports

The last three meetings have continued the wide-ranging theme of botany outside Otago, with 3 splendid and very different talks: Alan Mark on his seven weeks with local ecologists in Tibet, Mongolia and the Russian Caucasus Mountains; Barbara Anderson on the plants she met on her journey through Patagonia, and Sue Benettt on the weeding of the steep, volcanic slopes of Raoul island, the northern-most piece of New Zealand territory. If you didn't go you missed some very interesting talks and colourful slides full of exotic, mind-broadening botany.

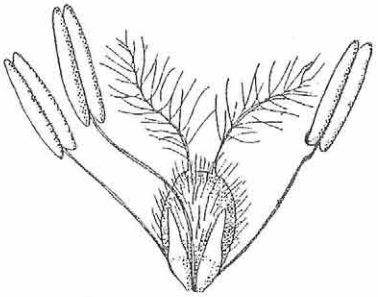


Parts of a grass, for the Grass Workshop, from Hubbard, CE. *Grasses*. Penguin 1984.

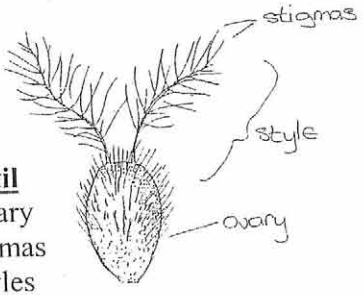
Parts of a grass floret



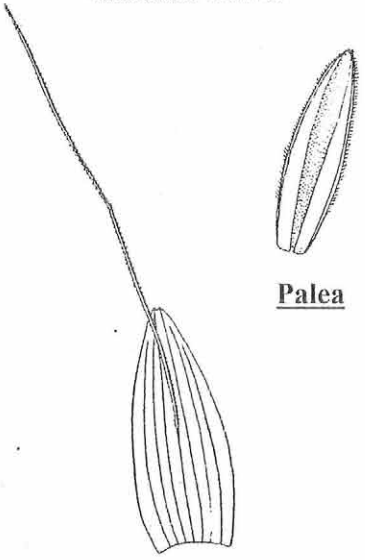
Floret
= lemma
+ palea
+bisexual flower



Bisexual Flower
= pistil + stamens + lodicals



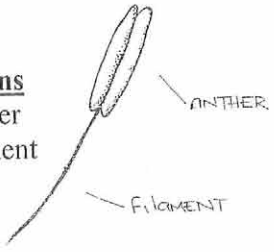
Pistil
= ovary
+ stigmas
+ styles



Palea

Lemma

Stamens
= anther
+ filament



Lodicals
= perianth

Plant profile: *Calypogeia sphagnicola* (Arn & Perss.) Warnst. & Loeske.

By John Steel

Order: Jungermanniales
Family: Calypogeiaceae

Next time you are wandering across a *Sphagnum* bog – okay, okay, maybe it's not something you do every day – so if you ever find yourself wandering across a *Sphagnum* bog, go down on your knees and have a close look among the *Sphagnum* crowns and if you are very lucky you may just find clumps of fine leafy strands mixed in amongst them. Take out your ever- present eyeglass, have a closer look and it may just be this little gem. Its name comes from the Greek, *kalyx* = flower cup + *hypo* = under + *ge* = earth, (referring to the perigynium or underground pocket in which the sporophyte matures) and *sphagnos* + moss and the Latin, *cola* = dwelling.

Up to two centimetres long and sometimes reaching the considerable width of two millimetres, it's not something that will leap out at you. If you do find it, contain your excitement and give yourself a pat on the back. I have chosen this pretty, little hepatic to highlight Rudi Schuster's work (Schuster 2000; see book review this issue) and also because it was described from specimens found on Swampy Summit here in Dunedin. Its distribution is not well documented so any reports of further finds would be welcome.

Reference: Schuster, R.M. (2000). Austral Hepaticae part I. *Beiheft zur Nova Hedwigia* 118:1-524.

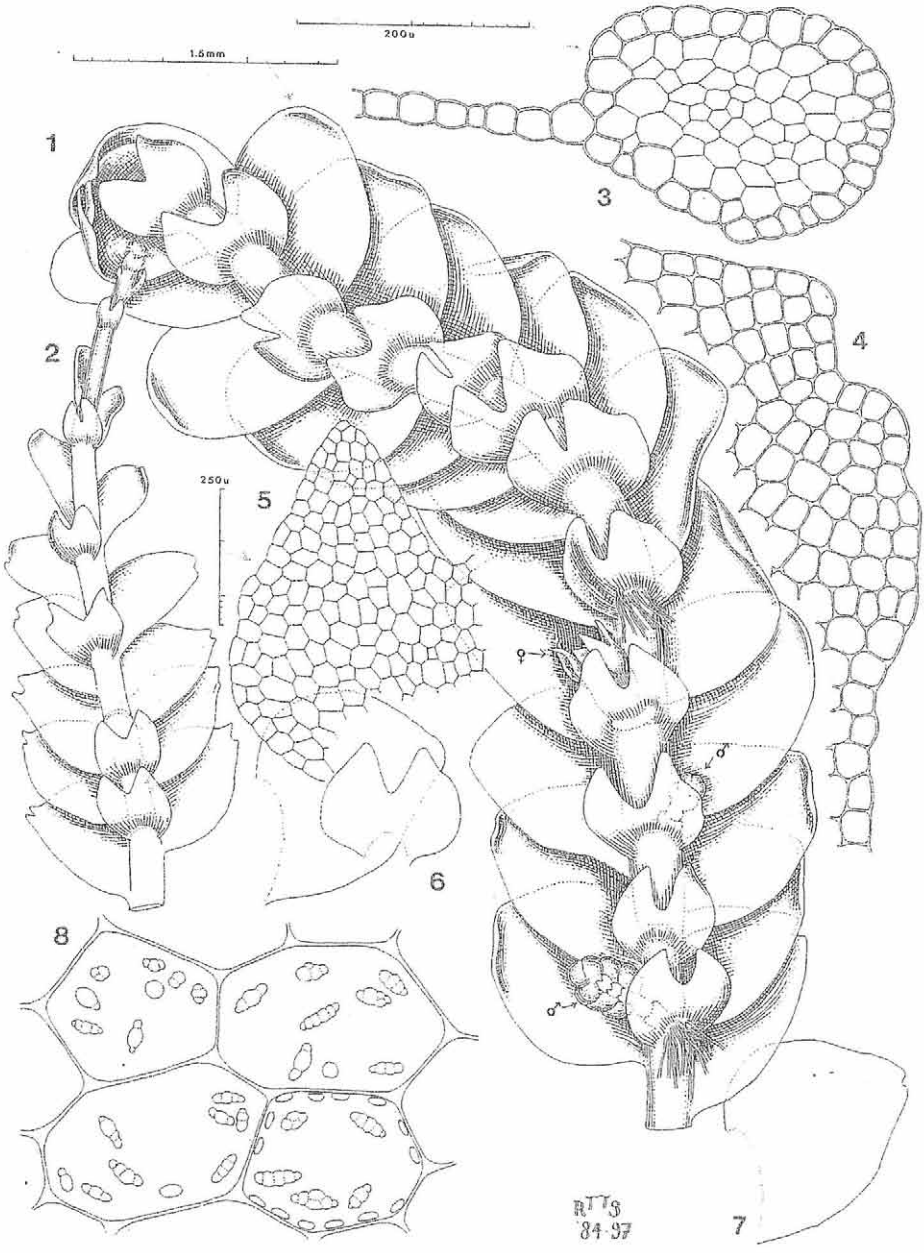
BOOKS

Book reviews – *by John Steel*

Schuster, R.M. (2000). Austral Hepaticae part I. *Beheft zur Nova Hedwigia 118:1-524.*

P/back. J. Cramer, Stuttgart. $US150 + $US10 p&p.

Rudi Schuster is one of the world's few, leading authorities on liverworts and has a prodigious publication record. He has long been a respected authority on New Zealand liverworts and this book is a most welcome and necessary addition to our knowledge. The taxonomy of the hepatic flora of New Zealand has a long way to go and much of the published information is difficult to access, often appearing in journals not available here, so having it all in one place is a pleasing advance on the current state of affairs.



Calypogeia sphagnicola (Arn. & Perss.) Wstf. & Lske. 1. Large shoot, ventral aspect, with ♂ and ♀ branches (X 25; 1.5 mm scale). 2. Apex of gemmiparous shoot, ventral aspect (X 25; 1.5 mm scale). 3. Stem cross-section (X 160; 200 µm scale). 4. Leaf-lobe apex (X 160; 200 µm scale). 5. Half of underleaf (X 76; 250 µm scale). 6. Leaf + underleaf (X 25; 1.5 mm scale). 7. Leaf (X 25; 1.5 mm scale). 8. Median leaf cells with oil-bodies and, lower right, chloroplasts. [All from plants from Mt. Swampy, Dunedin, S. I., N.Z.; RMS.] Schuster, 2000.

Schuster examines those genera occurring in the present landmasses that once formed Gondwana, *i.e.* South America, Australia, New Zealand, Africa, India and Antarctica. There are approximately one hundred and fifty genera with six hundred species of liverwort and hornwort in New Zealand (Glenny, 1998) and this volume covers twenty-nine of these genera. It begins with a brief explanation of the hepatic classification used and is followed by the keys, which fill the remainder of the book. Most species are illustrated, and these illustrations are superb in their detail. (See this issue's Plant Profile.) A representative example from each genus is illustrated allowing comparison and highlighting those interesting features which may aid clarification of those taxa not shewn.

This volume brings together and updates what is known about this, oft ignored, part of our extensive, and elusive, cryptogamic flora. Extensive references are cited but there is no reference list which, I assume, will be included in the final volume. When I spoke to Dr. Schuster on his last visit to Dunedin in 1996, he expressed doubt that his flora would ever be completed. Looking at this remarkable product from a lifetime's work, it would be sad indeed were this to prove so. At first sight, this volume may appear expensive, but when one considers the quality and sheer volume of the information contained, it has to be well worth the money. It can be obtained direct from the publishers by e-mail to lubrecht@frontiernet.net who will advise details of payment, including credit card.

Reference: Glenny, D. (1998). A revised checklist of New Zealand liverworts and hornworts. *Tuhinga* 10:119-149.

Dawson, J.; Lucas, R. (2000). *Nature guide to the New Zealand forest.*

312 pp. Soft covered. Random House New Zealand, Auckland. $44.95.

This is an excellent, general introduction to New Zealand forests. It opens with a brief discussion of the flora and fauna to be found there and is followed by six chapters, colour-coded for easy access. The first, and largest, deals with the trees and shrubs and begins with several pages of colour photographs for identifying them by their leaves. These are very clear and the best I've seen for New Zealand plants, though for me, I find the occasional mixing of scientific and common names somewhat irksome. Then follows descriptions of the individual species, each accompanied by good quality photographs. Many of these shew complete plants and are too small to be effective, the close-ups, however, are excellent in their detail. Similar chapters follow; firstly, vines, epiphytes and mistletoes and secondly, the forest floor. This latter is less comprehensive, understandably, but includes examples of the many varieties of species of vascular plants, fungi and a few mosses, liverworts and lichens. The final three chapters cover the birds, the lizards, frogs and bats, and the insects and other invertebrates, respectively. The first two are comprehensive, the last one, not unexpectedly, less so, covering a few of the more common species.

This is a follow-on from their 1993 (Dawson, J.; Lucas, R. 1993) volume and has many of the excellent photographs used there. The smaller photographs in this volume, however, do less justice to Lucas's work when compared to the larger copies in the earlier book. This is a very practical guide and will be a boon to naturalists of any bent, though I can't see the small, habit photographs of complete trees being very helpful. The small brickbats aside, it will be a worthwhile purchase for those wanting to make their bush experiences more rewarding.

Reference: Dawson, J.; Lucas, R. (1993). *Lifestyles of New Zealand forest plants.* Victoria University Press, Wellington.

Lumbsch, H.T.; McCarthy, P.M.; Malcolm, W.M. (2001): *Key to the genera of Australian lichens : apothecial crusts.*

64 pp. Softcover. Australian Biological Resources Study, Canberra. $A31.

The white, yellow, brown or black coloured patches that cover the rocks, tree bark and other apparently bare surfaces are familiar, I'm sure, to all of us but few will take the time to look at them in detail. These are the crustose lichens and a glance through this book may just encourage closer inspection and a realisation of the beauty and intricate structures of this fascinating part of our flora.

Although specifically for Australia, there are many genera and species of these lichens common to both countries and so this little book is highly relevant to our own flora. It fits well with the *New Zealand lichens. Checklist, key and glossary* (Malcolm, W.M.; Galloway, D.J. 1997). The key appears comprehensive and can be followed using Malcolm and Galloway's glossary. It is well laid out and easy to use. Each page has three excellent colour photographs of species representative of the genera covered and at least eighty New Zealand examples are shewn.

This will be a handy little reference for us here and can be obtained by contacting Patrick McCarthy by e-mail at Patrick.McCarthy@ea.gov.au

Reference: Malcolm, W.M.; Galloway, D.J. (1997), *New Zealand lichens. Checklist, key and glossary*, Museum of New Zealand Te Papa Tongarewa, Wellington.

BSO Members Discount: Many botanical books, including those published by CSIRO, Australia, are available from Manaaki Whenua Press, at 20% off, to BSO Members. This includes post and packing. If you are a member of BSO, say so when you order.
Email: MWPress@landcare.cri.nz.
Online ordering website: http://www.mwpress.co.nz.
Post: Manaaki Whenua Press, PO Box 40, Lincoln 8152, NZ.
Telephone: +64 3 325 6700, Fax +64 3 325 2127

NEWS

INTERNATIONAL YEAR OF THE MOUNTAINS: 2002

Next year, 2002 has been declared **The International Year of the Mountains** and is being promoted internationally by FAO and the World Conservation Union (IUCN). It has received considerable publicity and promotion, particularly in the Mountain Research and Development Journal (see Vol. 21; pp89-91, Feb. 2001) and many countries are organising mountain land conferences to mark the occasion.

The Hellaby Indigenous Grasslands Research Trust, in collaboration with the University of Otago and the Federated Mountain Clubs are organising a conference to celebrate this event for New Zealand. It will be held at Otago University over the weekend of March 8–10 next year, with the general theme of mountain land values and issues. Further details next newsletter or from Alan Mark, Hellaby Trust & Botany Department, University of Otago, Box 56, Dunedin; Ph. 03 479 7573; Fax 03 479 7583; email amark@otago.ac.nz

Recent Staff Changes at The Dunedin Botanic Garden

New staff

Stephen Bishop	Collection Curator for Conservatory Plants, Herb Garden, Otaru Teien and Lister Garden
Shirley Stuart	Collection Curator for the Native Plant Collection
Daniel Joubert	Collections Supervisor
Clare Fraser	Information Services Officer.
Davina Hunt	Learning Experiences Outside the Classroom (LEOTC) programme. for more info see: http://www.edgazette.govt.nz/78_9/

Staff Changes

Mick Reece -	Manager for Community and Recreation Services
Alan Matchett -	Team Leader for Botanic Garden and Cemeteries
Alice Lloyd-Fitt -	Propagation Services Officer

BOTANICAL DIARY.

Seed Symposium, 29 Nov, 2001: **New Zealand Seeds – their morphology, ecology and use as indicators**. This symposium, organised by Landcare Research and the New Zealand Botanical Society, will be held at **Lincoln University** on Thurs 29th Nov. It will mark the launch of **"Seeds of New Zealand – Gymnosperms and Dicotyledons"** by Colin Webb and Margaret Simpson. There will be other associated events around the day. **Contact**: A McGlinchy, Landcare Research, Box 69, Lincoln.
Email: mcglinchy@landcare.cri.nz

Botanical Society Summer Field Trip, 27 Dec – 7 Jan, **Twizel** area. Keep these dates free. Otago members are welcome to join the Wellington Botanical Society on their summer field trip. Based at Lakes Pukaki and Ohau, which should provide good access to alpine plants at surrounding skifields and alpine areas, with some interesting shore lines, valleys, wetlands and tussock grasslands to investigate Registration due Nov 18, forms on back page. Be prompt if you want a bed. Send to Julia White, Wellington Botanical Society, Box 10-412, Wellington, email: alanwhite@the.net.nz

Canterbury Bot Soc Summer camp, 6-13 Jan 2002. **Northwest Nelson.** Based at Victoria University Geology Field Station, Onekaka, Golden Bay. Secretary: Roger Keey, (03) 364 2409, email: wtrc@cape.canterbury.ac.nz

More Dates for your Diary, BSO events in boxes

15 Nov, Thurs, **5.30 pm**.(Note changed time!) **Dr Jill Rapson,** Massey University, talks on **Barrier Islands and Coromandel almost-island.** Seminar room, Zoology Annexe, Gt King St, car park by Dental School. Side door behind the Glassblowing Unit. Supper.

17 Nov, Sat, 8.30 am. DNFC trip. **Gabriels Gully – Joy McCullough.** Bus $15

18 Nov, Sun, **10.30 am. Dr Anni Watkins** will lead a full day **workshop on grasses.** Meet in the Botany Dept carpark, 464 Gt King St. More details on front cover and inside.

20 Nov, Tues, 7.45 pm. F&B meeting. **Anna Carr & James Higham: Ecotoursim in New Zealand: Challenges and Prospects.**

21 Nov, Wed, 7.30 pm. Friends of the Botanic Garden: **Steve Newell**, seed collector: **Travel with a difference.**

24 Nov, Sat. F&B field trip. **See "Star" Community Noticeboard**

27 Nov, Tues, 7. pm. Otago Institute AGM. **Assoc. Prof. John Tagg: 25 years of sheer BLIS: Adapting germ warfare to the prevention of bacterial infection.**

1 Dec, Sat, 10 am. DNFC trip. **Racemans Track – George Goodyear.** Car pool $5.

2 Dec, Sun, 7.30 am F&B field trip. **Rock & Pillar: cushion bog and alpine plants.** Shared 4WD. Essential to contact Janet Ledingham, 467 2960

15-16 Dec, Sat, 10 am at Middlemarch. DNFC trip. **Rock & Pillar Range – Beth Bain.** Accommodation & 4WD approx $55. Car pool to Middlemarch. Register by Nov 26.

27 Dec-7 Jan **Summer Field Trip**. Wellington and Otago Botanical Societies. 5 plant-filled days based at Lake Pukaki and 5 at Lake Ohau. Don't miss it. Register by Nov 18.

University of Otago Botany Dept Seminars are on Wednesdays during teaching semesters at 12 noon, upstairs in the Union St Lecture Theatre (formerly Botany School Annexe), in the red-brown bldg, Cnr Union St West & Great King St.

Dunedin Naturalists' Field Club (DNFC) Meetings are on the first Monday of the month, in the Red Lecture Theatre, Scott Building, Medical School, Great King St. Their field trips leave from the Citibus Depot, Princes St. Visitors are welcome. Contact: Beth Blain, President, 455 0189, email: bethbain@ihug.co.nz

Dunedin Forest and Bird (F&B) meetings are on Tuesday, at 7.45 pm in the Hutton Theatre, Otago Museum. Field trips leave from Otago Museum Gt King St entrance, 9am, Saturday. Secretary: Paul Star 478 0315

Friends of the Botanic Garden meet on the third Wednesday of the month at 7.30 pm in the Education Centre, Lovelock Ave. Secretary: Mrs Betty Wolf, 488 1550

Otago Institute (OI) contact: Michelle McConnell, secretary, phone 479 5729
email: michelle.mcconnell@stonelaw.otago.ac.nz
New web page: http://otagoinstitute.otago.ac.nz/

Times and other details may change. Check with the group involved first to be certain.

Botanical Society of Otago: whom to contact

Submissions for the diary and new members, subscriptions or donations to:
Trish Fleming
c/o Botany Dept., University of Otago, P. O. Box. 56, Dunedin
Phone (03) 479 7579
email trish@planta.otago.ac.nz

Submissions for the newsletter email Allison Knight: botsocotago@botany.otago.ac.nz

Ideas for activities to:
Bastow Wilson,
c/o Botany Dept., University of Otago, P. O. Box. 56, Dunedin
e-mail bastow@otago.ac.nz
Phone (03) 479 7572 work, 473 9300 home.

For information on activities:
the trip leader
or Trish (contact above),
or Bastow,
or see our webpage: http://www.botany.otago.ac.nz/bso

This Newsletter was published on the 5th November 2001. ISSN 0113-0854

Don't forget the Grass Workshop on collecting and Identifying Grasses- Nov 18.

Wellington/Otago Botsoc Summer Trip

Based Beside Lakes Pukaki and Ohau
10 days of diverse botany flanked by the Southern Alps

Venue 1: Thursday 27th December to Wednesday 2nd January
Lake View Homestay on shore of Lake Pukaki.
9 km NW of Twizel, opposite Pukaki Downs Station
Seclusion, tranquility, stunning scenery, swimming, security.
Plenty of good campsites on the lawn. Ten beds available inside.

Venue 2: Wednesday 2nd January to Monday 7th January
Glen Mary Ski Huts on shore of Lake Ohau, between L Middleton and L Ohau Lodge. Overlooks lake and mountains.
Beds inside for 20+, Camping sites in the tussock.

Reference Books:
Alpine Plants of New Zealand. Alan Mark and Nancy Adams
Wild Plants of Mt Cook National Park. Hugh Wilson
Wetland Plants in New Zealand. Peter Johnson and Pat Brooke
Moir's Guide Book – Northern Section

Maps: Tasman H37, Lake Tekapo I37, Burke Pass I38, Ohau H38, Omarama H39.

Food: Bring your own bread, butter/marg, biscuits, scroggin, fresh fruit. Everything else supplied.

Travel to Camp: Those who have spare seats, or who would like an expenses shared lift from the North Island please contact Barbara Clark, ph 04 233 8202, email kevin.clark@clear.net.nz
South Island transport offers/needs please contact Allison Knight, ph 03 487 8265, email jgknight@es.co.nz

Transport at Camp: Please indicate on the registration form any spare passenger capacity or any transport needs for daily trips.

REGISTRATION:
Please complete the registration form on the inside back page and send it to:
Julia White, 17 South Karori Road, Karori, Wellington 6005 Phone: (04) 938 5102, email juliawhite@paradise.net.nz together with a cheque for $100, as a deposit, made out to Wellington Botanical Society, to arrive by 18 November 2001. Be in quick if you want a bed.

REGISTRATION FORM Bot. Soc. Summer Field Trip, 27 Dec – 7 Jan

Name:.....

Address:.....
.....

Phone:.....
Fax:.....
Email:.....

Preferred Accommodation:

At Lake Pukaki

- I would like to sleep inside @ $15 a night for .....nights.
- I would like to camp in my own tent @ $7 per night for .....nights.

At Lake Ohau

- I would like to sleep inside @ $12 per night, for.....nights.
- I would like to camp in my own tent @ $6 per night, for.....nights.

Transport:

- I can provide transport for ... extra people from camps to trip sites for .....days
- I have arranged my own transport with .....
- I would like transport from base camps to trip sites for .....days.

Special Requirements: Please indicate any special food, health, or other requirements.

.....

Membership form: Botanical Society of Otago, 2002

Title:
Name: _____
Address: _____
_____
_____
E-mail: _____
O.U. internal mail address_____
Phone: wk( ) _____ home ( )_____

Please **e-mail /internal mail/ post** my newsletter to me.

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$15 Family (2 adults + children) / **$10 waged** (salary)
/ **$5 Student** (unwaged). Donations are welcome

Cheques to "Botanical Society of Otago"
Post to: BSO,c/- Botany Dept, Otago University, Box 56, Dunedin, New Zealand

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UNIVERSITY OF OTAGO