

*Pterostylis
alobula*

—by Bruce Irwin



From the editor: Pterostylis thigmonasty

By Ian St George

Cheeseman's classic study of the rapid movement of the lip of *Pterostylis trullifolia* [1: see "Historical reprint" in this issue] was later famously quoted by Darwin [2], who had earlier written extensively on the movements of plants [3, 4].

Plants can move

Many plants move in response to stimuli, and they do it in three main ways [5]: **tropisms** - growth in response to a directional stimulus; **nasties** - movement of a part in response to a stimulus (but the direction of movement is necessarily not related to the direction of the stimulus); and **taxes** - movement in response to a directional stimulus.

The basic **tropisms** are: phototropism - light (including heliotropism - sun); geotropism - gravity; hydrotropism - water; chemotropism - chemicals; thigmotropism - touch; aerotropism - air.

The **nasties**: photonasty - light; thermonasty - temperature; thigmonasty (seismonasty) - touch (shock).

The **taxes**: phototaxis - light; thigmotaxis - heat; chemotaxis - chemicals.

Venus's fly trap (*Dionaea*) closes its trap (actually two modified leaves) rapidly when trigger hairs are touched. The leaves of *Mimosa* collapse when touched. These are examples of thigmonasty. So, possibly, is the movement of the lip of *Pterostylis*.

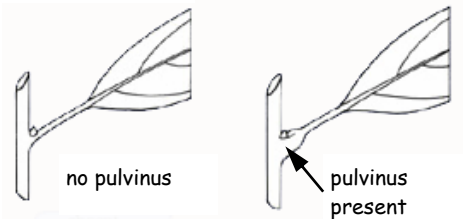
Stimulus and response

These nastic movements are stimulus/response activities. We know them from our own experience: when a plate is hot (*stimulus*) and we touch it (*receptors* in our fingers are sensitive to heat), an electric signal (*impulse*) is generated and travels (*transmission*) from the finger to the brain via nerves; then back to the muscles (*effectors*) which contract and we withdraw the hand

(*response*). So it is with plants: the same stimulus-receptor-impulse-transmission-effector-response sequence, but with some important differences: plants lack muscle and nerve.

Plants do have receptors: for instance cells in the pulvinus (a cushionlike swelling at the base of the petiole – **Fig.1**) of *Crotalaria pallida* are light-sensitive. The plant moves its leaves to be at right angles to the sun's rays (diaheliotropism) to maximise photosynthesis. Cells in the pulvinus of *Mimosa* are touch sensitive [7], and when stimulated cause the leaves to droop quickly (thigmonasty), to "play dead" and thus look unattractive to grazing animals.

Fig. 1: pulvinus



These receptors do produce an electrical signal via a chemical flux of charged particles. Stimulating the trigger hairs inside the jaws of the flytrap produces an electrical depolarization that starts an action potential (see box) that travels at around 10cm/sec through the tissues in the trap lobes [8]. Plants lack the "wiring" of higher animals: they have no electricity-conducting nerves. The action potential appears to travel through all the tissues, some think via plasmodesmata (microscopic membrane pores).

Muscle in higher animals is made up of contractile proteins called actin and myosin: in plants they are present, but not organised as muscles. How then is movement effected? A report of the most recent work on Venus's

Electricity in living tissues

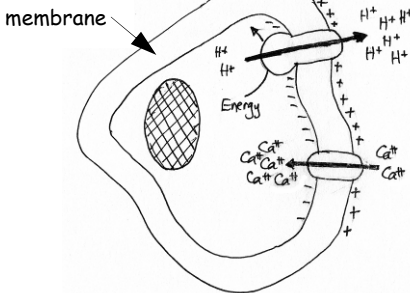
Hydrogen atoms consist of electrons (negatively charged particles) and **protons** (H^+ , positively charged particles called hydrogen ions, the essential matter of **acids**). Living cells (plant and animal) have **cell membranes**. An energy-using **proton pump** pushes protons through the cell membrane to the outside, leaving a **polarisation**—a voltage difference across the cell membrane called the **membrane potential**, with positively charged protons predominating on the outside and negative ions on the inside.

An **action potential** is the beginning of an electrical wave that travels through tissue from cell to cell. It begins in one cell with a **depolarisation**. In response to a stimulus special sodium channels open, Na^+ (sodium ions) pass into the cell from outside, and reverse the membrane potential. Depolarisation is followed by **repolarisation**: sodium channels close, potassium channels open, and potassium ions (K^+) escape from the cell. There is a specialised **calcium channel** for Ca^{++} ions.

In human nerve, the resting membrane potential is about $-70mV$. Depolarisation reverses this to about $+40mV$. The **action potential** travels along the nerve fibre by a series of depolarisation/repolarisation events.

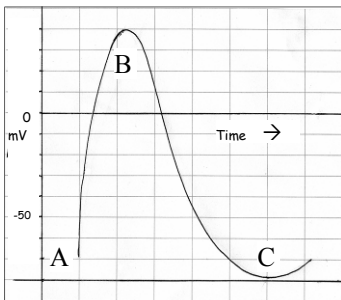
Drugs can **block** these activities, and thus block the transmission of an electrical impulse: **acid buffers** "absorb" protons and reduce the membrane potential; **proton pump inhibitors** inhibit the transfer of protons from inside the cell to the outside, and **calcium channel blockers** inhibit calcium's passage into the cell.

CELL



The **proton pump** uses energy to push protons out of the cell, so creating a potential difference across the cell membrane, the membrane potential.

Positively charged particles like these calcium ions pass into the cell via special channels (in this case, a **calcium channel**).



The wave called an **action potential** has a depolarisation curve (AB) and a repolarisation curve (BC).

flytrap [8, 9] relates three distinct phases of closure — rapid *capture* with interlocking of the marginal tines is followed by *appression* characterised by contact of the trap margins completed within 30 minutes, and *sealing* (to form a digestive sac) within an hour. The action potential set off by the trigger hairs acts on some “fast-response” tissues which increase rapidly in turgor by inflow of water; later a second set of slower responses follows hormonal, electrical or pressure/stretch stimuli. The precise role of calcium and hydrogen ions is uncertain, but traps can be inactivated with calcium channel blockers, proton pump inhibitors and buffering acidification (see box).

What of *Pterostylis*?

Little work has been reported, but flower parts, including the labella, of orchids are modified leaves, so the labellum of most of our pterostylises is likely to move in similar ways to the rapid movement of modified leaves in other plants.

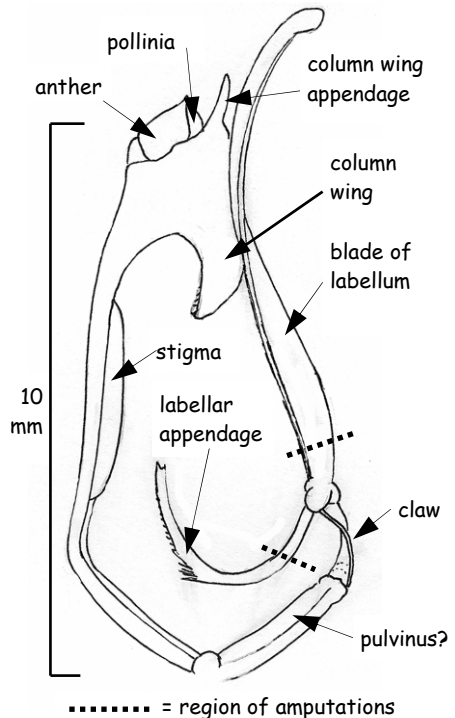
Sargent witnessed the visit of a gnat to the Australian *P. vittata*, and this led him to believe the sensitivity of the labellum lay in its penicillate appendage, which was also the attractant for insects [10]. Coleman observed a mosquito pollinating flowers of what is now recognised as *P. x ingens* and *P. falcata* at Healesville near Adelaide [11]. She noted the insect emerged from the flower before the return of the labellum to its normal (“set”) position, with the pollinia stuck to the dorsum of the thorax (scutum); if the labellar appendage were the attractant, she argued it “did not long hold (the insect’s) attention after the springing of the labellum.”

Hyett noted the slow movement of the labellum of *P. nutans* and found the labellar blade to be insensitive - the only thing that would cause it to tip was slight pressure on the appendage [12]. (The flower of *P. nutans* “nods” forward, so the labellar appendage cannot act as a counterweight to the blade). Tony Bishop wrote “Pollination is almost cer-

tainly by pseudocopulation, although it is not known what part of the flower produces the scent attracting the pollinator” [13], but Bartereau and Jackes observed only females of two fly and two mosquito species pollinating *P. procera* [14]; they referred to the “elaborate counter-balance system” of the labellum, and confirmed the pollinia are attached to the scutum, so the insect must make its exit facing the labellar blade; repeated experimental manipulations of the labella of unpollinated flowers showed a time to resetting of 4-8 hours.

Cady [pers. comm.] noted the extreme sensitivity of some taxa in the “rufa” section of *Pterostylis* (touching even the marginal cilia

Fig. 2: *Pterostylis alobula*: column and labellum in “closed” position



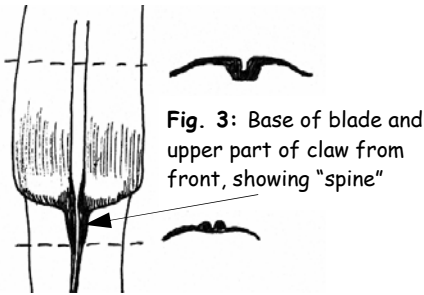


Fig. 3: Base of blade and upper part of claw from front, showing "spine"

Eric Scanlen wrote, after reading a draft of this editorial, "Jerky movement of the whole plant (giving relative movement to the labellum from its own inertia) triggers them when I'm carefully clearing the sticks and grass. Even shouting triggered *P. irwinii*. A bug landing on the labellum triggers it after either a delay of a second or two, or a further stimulus from the bug starting to walk. Just tickling the labellum is enough usually. How the super-sensitive species such as *P. porrecta* don't get triggered in the wind, defeats me. It suggests that the *type* of vibration is important. Perhaps normal wind movement is filtered out but bug landing or any threat to the sexual parts is recognised and will trigger the pulvinus? Just tilting *P. agathicola* or *P. graminea* (and *P. alobula* too I thought) backwards, however carefully, triggers them! So difficult to photograph. Backwards tilting could trigger the defence mechanism against rain. I've never seen *any* *Pterostylis* reset although I've waited 20 minutes for *P. alobula* and *P. brumalis* without success. The most sensitive I have struck were *P. porrecta* and *P. irwinii* but *P. agathicola* and *P. alobula* would come a close second. Peter de Lange's *P. "Sphagnum"* from sphagnum moss at the edges of the Opuatia bog is totally insensitive to plant movement. I guess the sensitivity is proportional to the weight of the preferred pollinator. *P. porrecta* has a fungus gnat the size of a sandfly."

of the blade caused the labellum to spring); the multiflowered *P. tunstallii* and *P. longifolia* showed similar sensitivity and very rapid closure; the labellum of *P. coccinea* reset after 2 hours in shade (8-10am); that of *P. longifolia* after 48 minutes in shade and 35 minutes in sun; *P. pulchella* 80 minutes and *P. curta* 74 minutes (both during the evening and under lights).

The blade and appendage of the labellum in most of the NZ *pterostylis*es are two ends of a balance that has as its fulcrum the "delicate ribbon-like membrane" [1] that is the "claw" (a modified petiole or leafstalk) (**Figs. 2-5**). The ribbon-like claw is actually curved in cross-section, convex forward (like a strip of stiff metal tape-measure), as well as curved forward. Running vertically through it like a spine is a double structure formed by extensions of some very thick fleshy tissue to either side of the base of the blade (**Fig.3**). At its lower end the claw attaches to a band of tissue fused to the bases of the lateral sepals. The secrets of *Pterostylis* thigmonasty must lie in that claw. I would hypothesise that

- the claw has movement receptors;
- it has a pulvinus;
- electrical impulses will be detectable;
- movement can be blocked by acid buffers or calcium channel blockers or proton pump inhibitors;
- movement is caused by a change in tissue turgor in the spine.

Some of these questions only a well-equipped laboratory could answer, but there are many others that an interested amateur could explore in the different *Pterostylis* taxa. What springs the trap: vibration? movement (s) forward? or back? How sensitive is it? How fast is the trap? How long between stimulus and closure? how long to resetting? How fast is the resetting? Will it reset if the appendage is re-stimulated after closure? How many times will it repeat the process? Does temperature affect it? light? fertilisation?

Table 1: Labellar movements in *Pterostylis alobula* timed in minutes

plant No.	Time to 1 st reset after 1 st closure	Unresponsive time after 1 st reset until 2 nd	Time to 2 nd reset after 2 nd closure	Unresponsive time after 2 nd reset until 3 rd	Time to 3 rd reset after 3 rd closure	Unresponsive time after 3 rd reset until 4 th	Time to 4 th reset after 4 th closure
1	29	6	39	10	41	10	35
2	37	4	24	11	40	5	40
3	28	6	25	5	25	7	28
4	20	0	24	2	21	5	120
5	46	6	25	11	44	29	40
6	18	7	23	5	25	7	30
7	27	15	28	72	27	50	
8	18	6	21	8	25	6	30
9	28	3	27	4	25	4	33
10	26	4	26	5	20	6	30
11	34	2	28	7	31	8	30
Mean ±	28.3±8.4	4.4±2.2*	26.4±4.7	6.8±3.1*	29.5±8.4	6.4±1.8**	32.9±4.5**

* plant 7 excluded; ** plants 5 and 7 excluded (these appeared to be postmature flowers).

NB "closure" indicates backward movement of the blade of the labellum against the column; "reset" indicates forward movement of the blade to its "set" position.

Methods & results

I picked 11 stems of *P. alobula* on 16 June and placed each in a test tube of tapwater.

1. Stimuli

- I stimulated the labella of entire specimens that had been resting overnight by pushing the tip of the blade back about 2mm. Closure was immediate with a single push. Later, once the labellum had reset, there was a period of unresponsiveness during which no amount of stimulation would cause closure.
- I cut a window in the side of the dorsal sepal and petal (see colour pages), let the labellum reset, and stimulated the appendage. The stimulus response pattern was the same as above. *An insect in the base of the flower will push the labellar appendage down and back; the appendage can act as a lever to provide backward movement of the blade.*

- I placed the flowers so the stem was horizontal and restimulated: the blade still closed fully. *Closure is independent of gravity.*

2. Timings

- I stimulated the labella of 11 specimens, measured the time to resetting, re-stimulated by 3 backward pushes on the tip of the blade and re-timed. The results for four cycles are shown in Table 1. *The labellum resets half an hour after closure, has an unresponsive period of five or six minutes (perhaps to allow an insect to escape), and is then again relatively sensitive.*
- 24 hours later I repeated this experiment with 4 plants, this time waiting after resetting until closure could be sprung by a single touch: the labella could be sprung with a single touch to the tip of the blade 10, 15, 18 and 22 (average 16) minutes after resetting. *After resetting there is a gradual re-*

turn to full sensitivity in a quarter of an hour, including the fully unresponsive period.

3. Surgical interventions

- Specimen 1: I amputated the labellum blade and appendage 2mm behind and in front of the attachment of the claw (**Fig.1**) while the labellum “closed” shortly after the surgery, then reset after several hours: it could then again be sprung, to “close”, and reset again after a period. *The receptor and movement mechanism are in the claw.*
- Specimen 2: I cut through the midrib of the claw with a fine needle just above the claw’s attachment to the putative pulvinus. The labellum did not reset. *An intact midrib of the claw is necessary for resetting.*

4. Drug intervention

- I introduced 3 drops (0.06ml) of a 20mg/L solution (about 10x the strength used in human therapeutics) of the proton pump inhibitor omeprazole into a flower using a hypodermic syringe and needle, to bathe the area of the claw and pulvinus. I introduced a similar volume of water into a control flower. The procedures caused closure in both specimens. The drugged flower did not reset; the control flower reset after some hours. *Inhibition of the proton pump prevents resetting.*

Conclusions: what happens in *P. alobula*?

Backward movement of the blade springs the labellum (forward movement alone will not do it, unless followed by a backwards over-reaction). An insect travelling down behind the blade can push it forward but not back, so may not spring the labellum until it reaches the base of the flower. (There would be little point in springing the labellum when the insect was still near the top).

In full closure only the top of the trap is closed, leaving plenty of room for the insect to turn about, as it must, deep in the flower (**Fig.2**); the insect pushes down on the labellar appendage that forms the posterior arm of the balance – if the labellum has not closed until now, this stimulus will spring it.

Backward movement of the blade or downward movement of the labellar appendage mechanically

Fig. 4: *P. alobula*, labellum in the “set” position, claw curved forward, acting as fulcrum for the balance between blade and appendage of the labellum (see also colour pages)

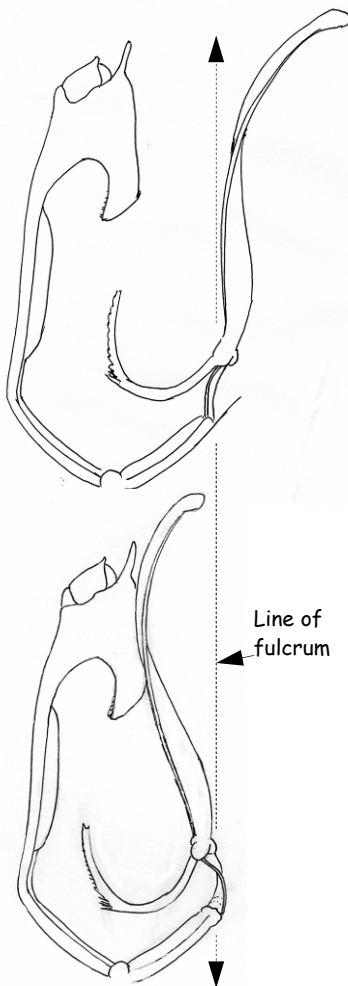


Fig. 5: *P. alobula*, labellum in the “closed” position, the weight of both blade and appendage helping to keep it there. See also colour pp.

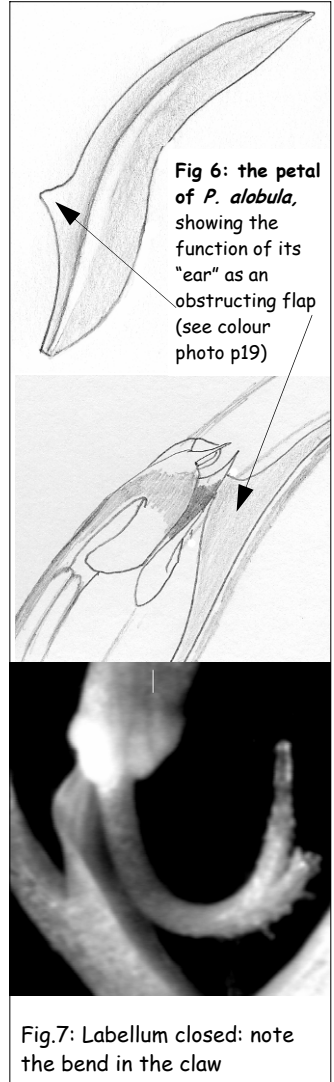
“clicks” the transversely convex-forward claw inside-out (as if it were one of those little clockspring clickers), the curve forward of the claw becomes a bend backward (about a third of the length of the claw down from its attachment to the blade: **Fig.7**), and the blade of the labellum is thrown rapidly back toward the column. In upright flowers the appendage performs a second function – whereas in the set position it acted as counter-balance to the blade, now as the blade quickly moves behind the claw fulcrum, the combined weight of blade and appendage on the same side of the fulcrum adds to the backward pressure of the blade against the column (**Figs. 4, 5**). (The swellings at the base of the midrib of the blade of *P. irsoniana*, *P. tanyoda* and *P. tristis*—and those to either side of the midrib at the base of *P. alobula*—may act as weights to assist this process). Nonetheless, the movement cannot simply rely on the mechanical bend of the claw plus gravity: something actively moves it and holds it firmly against the column.

The appendage then performs its third function, that of a ladder leading to the stigma. When *Pterostylis* pollinators have been observed, the pollinia are stuck to the back of the thorax, so the insect must ascend gripping the underside of the appendage (*P. alobula* is fimbriated only on the underside, presumably to add traction, perhaps to add to its attraction). It deposits pollen on the stigma, continues on up between the column-wings (the stripes on the dorsal sepal and petals acting as guides), hits the sticky rostellum with the back of its thorax, collects a new lot of pollen from the anther, then either waits for the top of the blade of the labellum to reset forward again or crawls up into the hood of the dorsal sepal to escape. While the insect is waiting it is obstructed from re-entering the flower centrally by the sharp, upward pointing column wing appendages (think of the entrance to an eel trap or a crayfish pot), and at the sides by a flap, the backward-facing “ear” of the lateral petal: **Fig.6 and colour pages**. I bet you always wondered what that was for.

The insect has five minutes to crawl out (while the blade is unresponsive—no point in throwing this insect back in!) to find another flower. A second insect could descend further into the flower during that unresponsive phase.

The flower is thus a vessel with separate entrance and exit: the wall behind the entrance (labellum set) comprises the column wings and the ears of the petals; the wall in front of the exit is these plus the (closed) labellum.

How does it work? I suspect the initial backward movement is purely mechanical—like a spring trap being set off—it is just too fast to be explained by osmotic fluid flows alone. Receptors in the claw quickly detect the move-



ment of blade and claw and set off a depolarisation; an action potential is transmitted from the pulvinus (at the base of the claw? Or is it the thickened base of the blade?) and travels to the midrib of the claw. Fluid then flows into the midrib from the thick (“rapid response”?) tissues

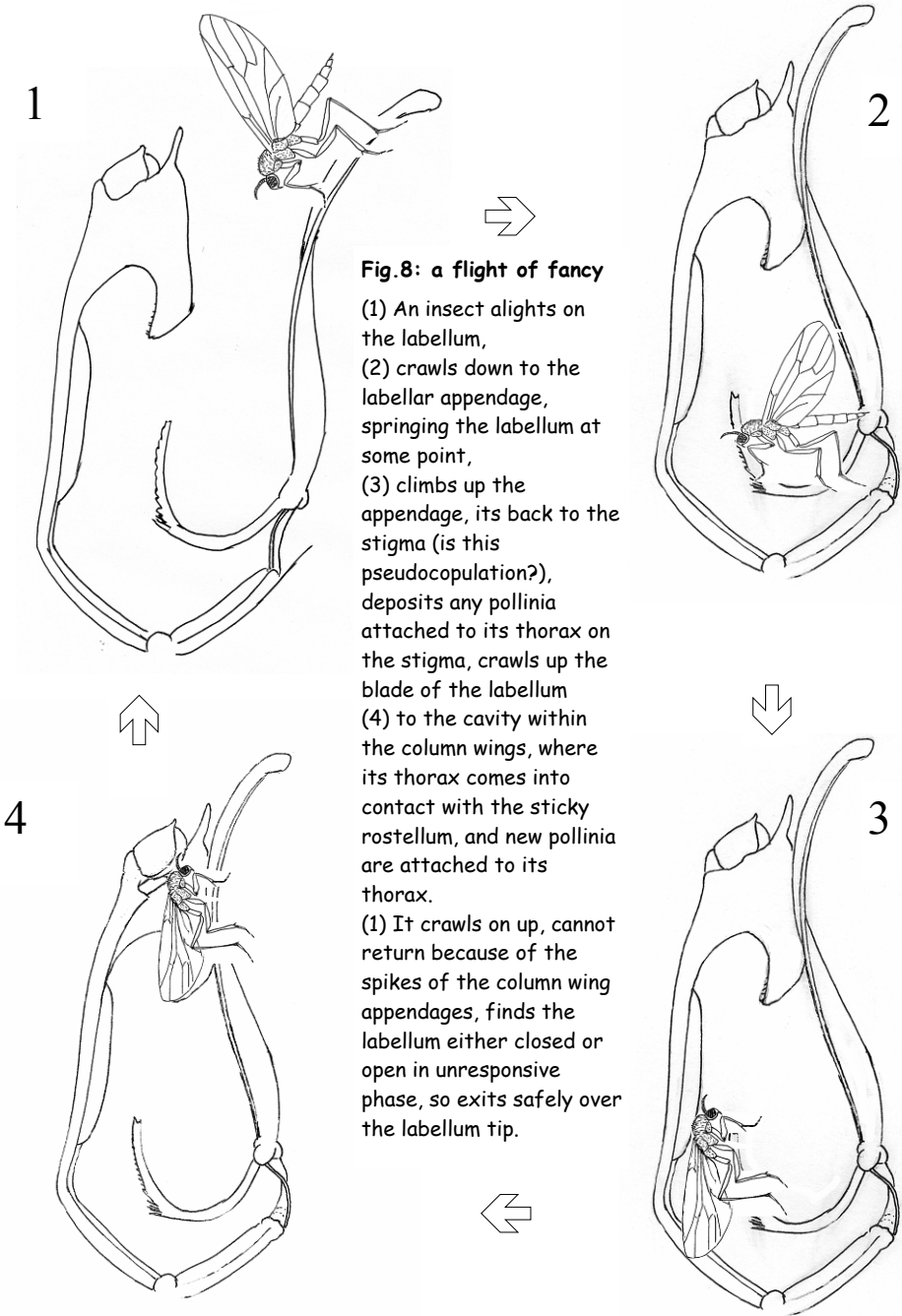


Fig.8: a flight of fancy
 (1) An insect alights on the labellum,
 (2) crawls down to the labellar appendage, springing the labellum at some point,
 (3) climbs up the appendage, its back to the stigma (is this pseudocopulation?), deposits any pollinia attached to its thorax on the stigma, crawls up the blade of the labellum (4) to the cavity within the column wings, where its thorax comes into contact with the sticky rostellum, and new pollinia are attached to its thorax.
 (1) It crawls on up, cannot return because of the spikes of the column wing appendages, finds the labellum either closed or open in unresponsive phase, so exits safely over the labellum tip.

at the base of the blade, causing an increase in the turgor of the midrib, the stiffening and change in its shape pushing the claw against the column.

That process would be slowly reversed in resetting. A decrease in turgor straightens the claw and eventually overcomes the closure pressure (the stiffness of the spine plus the combined weight of blade and appendage), the “set” shape of the claw reforms and carries the blade forward to reset. Of course these “active” movements may have quite different explanations: they do need thorough scrutiny.

Once the labellum is reset it cannot immediately be reclosed because the midrib of the claw is holding it set and rendering it unresponsive. Fluid may gradually re-enter the midrib until (after 5 minutes or so) the midrib is turgid enough to allow closure again.

It is tempting to surmise the thigmonastic activity relies on high concentrations of protons outside cells (which can be blocked by proton pump inhibitors), but relying on an incomplete experiment on a single plant would be unwise.

It is worth mentioning that the claw of the labellum of *Caleana* is similarly shaped, but springing bends it forward toward its transverse convexity, the opposite to what happens in *Pterostylis*.

What we need for Part 2 of this study are your observations of other pterostylises in the field (please use the form herewith). Then we need a postgraduate student to do some histology and physiology. After that there are many other questions on *Pterostylis* pollination to be answered.

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Postscript

On 1-2 August I studied 5 *Pterostylis trullifolia* flowers.

The times from closure to reset were much more variable and longer than those for *P. alobula*: 67.8±25.3 minutes (12 observations on 5 plants). The unresponsive period was similar: 5.7±1.2 minutes (6 observations on 5 plants).

Field guide to the New Zealand orchids

2001 edition

by Ian St George, Bruce Irwin, Dan Hatch and Eric Scanlen

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- Friday 7 Dec. 7.30pm Allan Ducker: new videos
8.30pm Eric Scanlen: New 3-D images,
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- Saturday 8 Dec. 9am Max Gibbs: On *Gastrodia* "city", a
roundabout orchid in Hamilton.
9.45am Carlos Lehnebach: Chilean orchids.
10.30am TEA
10.45am Ian St George: "Read my lip": fast
movement in *Pterostylis*.
11.30am Bruce Irwin: Some unnamed species.
12.15pm LUNCH
1pm THE FIRST FIELD FORAY
7.30pm Peter de Lange and John Sawyer:
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For information on accommodation and other arrangements, please contact
Trevor Nicholls, 33 Hinekura St, Taupo (nicholls@reap.org.nz).



Original papers

Strange what you find in the bush when out orchid hunting. Off and on through winter Bruce (Irwin) had been talking about *Prasophyllum* aff. *patens* at Pureora. Just before Christmas he gave Gael (Donaghy) a ring to say he had a flower. Needless to say she was immediately off round to see it and pestered him for details of where it came from. After a while he dragged out an old battered notebook with an ancient map and tales of how the roads had now changed. This was dutifully copied to a fresh sheet.

Come the weekend, and it was away at the crack of dawn for Pureora. We turned off the main road at Pureora on to the forest road and marked off the junctions as we went, many now unlabeled. Finally we turned off onto a track which seemed right and soon became much rougher. It suddenly dived off to the side and got much worse, and as there was a hunter's vehicle parked there, we also parked.

The impatient male was soon off down the track. 200 m from the vehicle a tree was across the track and just as he was attempting to push through it, spotted a cowering corgi tied up almost under foot! Yelling back a comment got a reply "Corybas what?" - one track mind! Seemed strange for a corgi to be taken out hunting? Oh well, we continued on. The map still seemed to be making sense and just as He spotted the line of pines on the Peninsula that Bruce had described He spied a camera bag in the middle of a bridge, some 50 m from the destination point?! Seems Bruce's memory

was still pretty good! Again a yell at the other half of the team, distracted by new territory for orchids, brought an obscure reply and a hasty catch up. Who would leave a camera there except another orchid hunter? But who? At this point we started making loud noises about crazy people leaving cameras lying around etc. To no avail, no reply from the woods (or swamp) about, in spite of strong echoes. Several minutes later as we headed down through the trees still talking loudly, there was crashing through the bushes ahead. Finally we got a hesitant reply from a rather timid individual, apparently frightened of a couple of dope growers searching out an intruder into their patch!

The intrepid photographer had come from Taranaki in search of the same treasure. He had been there an hour or so and had sorted out all the best plants to photograph. Since we had still been uncertain of being in the right place, our camera gear was still in the vehicle. So while one went off to collect the gear the other splashed around on the swamp getting perilously close to a wet backside seeking out the illusive orchids. Well over 100 were seen, often in amazingly deep water, scattered throughout the area. In due course two plants in relatively shallow water (only ankle deep) were selected for photography. We then joined our new companion for a foray to other parts of the forest before departing our different ways, and deciding it was too late to head for Erua to seek out *Spiranthes*, we headed home.

Orchid keys 2: *Caladenia*

By Graeme Jane, Tauranga.

The number of the New Zealand *Caladenia* species recognised has changed greatly since Volume II of the *Flora* [1], and there is still considerable debate over how many taxa there are and what names to use for them. The sands seem to shift with almost every issue of the *Journal*. I have chosen to use the list of Dan Hatch [2] as the basis for the current species recognised (shown in bold below) and have added in the current tag names listed by Ian St George [3].

The *Flora* recognised only two species: *C. lyallii* and *C. carnea*, the latter species is now recognised as being Australian and, even there, segregated into several taxa. In this former *C. carnea* the *Flora* recognised three varieties that are now considered distinct species (*C. alata*, *C. atradenia* and *C. bartlettii*), var *minor* has been divided into two distinct species - *C. chlorostyla* and *C. nothofageti*. In addition a pink form first recognised by Colenso has been reinstated (Hatch 1999). But this is by no means the end of the story. *C. lyallii* is quite variable and St George suggests there may be two or three taxa included, one of which seems akin to the Tasmanian *C. alpina*. Within the pink species akin to *C. bartlettii* and *C. variegata* (or perhaps a pink *C. chlorostyla*) two other taxa have been recognised by St George (2000).

References

1. Hatch E. D. *NZNOG Journal* 73 :16-17. (1999)
2. Moore L. B. and Edgar E. *Flora of New Zealand* Volume II: 108-111 (1970)
3. St George I. *NZNOG Journal* 77: 30. (2000).

1 Leaf 4-8 mm wide	lyallii 2
Leaf usually < 4 mm wide	carnea (agg)
2 No calli on lateral lobe margins, labellum tilted out	lyallii ss.
Calli on lateral lobe margins, labellum held upright	aff. lyallii
3 Mid-lobe of labellum with marginal calli almost to its tip	4
Mid-lobe of labellum with marginal calli if present, at the base only	8
4 Labellar calli yellow, absent from surface of mid-lobe; labellum-tip pale	5
Labellar calli dark red-brown, in 2 rows on surface of mid-lobe, almost to its dark tip	atradenia
5 Flowers pink	7
Flowers white or green	minor (agg) 6
6 Flowers white	nothofageti
Flowers apple green	chlorostyla
7 Lamellar part of midlobe of labellum with 2 rows of calli and scattered additional calli	variegata
Lamellar part of midlobe of labellum with 2 rows of calli only	aff. carnea
8 Mid-lobe of labellum with orange tip; often recurved	alata
Mid-lobe of labellum lacking orange tip	9
9 Sepals rounded, sometimes minutely apiculate; rather broad	bartlettii
Lateral sepals sharply pointed, quite narrow	aff. fuscata



Notes, letters, questions, comments

This is the place to report your finds, ask your questions, comment on orchideous matters. Write: it's your journal, and this, especially, is your page.

Dan Hatch wrote a brief piece for the Auckland Bot. Soc. *Journal* (April 1991), "In October 1947, Frank Bartlett sent me a specimen of *Pterostylis* from Eaves Bush, Orewa. This looked like a *banksii* in bud but had a cordate stigma. There was only one specimen and there didn't seem to be any other plants in the area. There was nothing I could do with it so I tagged the specimen *banksii* var. *cordata* and tossed it to one side. Mrs Young's recent discovery of *P. cardiostigma* near Warkworth jogged my memory. It would seem that *cardiostigma* is not a newcomer to the mid-north." (Dorothy Cooper described *Pterostylis cardiostigma* in 1983—*Ed.*)

Introduced wekas were eating the endemic *Corybas dienemus* on Macquarie Island until their eradication in 1988 (Keith Springer: *Macquarie Island, Subantarctic neighbour. Forest & Bird* 300: 28; 2001).

Pat Enright found (6 July) an attractive **achlorophyllous** *Acianthus sinclairii* from near Wellington (see colour pages). The whole plant lacked any green pigment, allowing the anthocyanin pigments to show through as a purple blush under the leaf, and as vivid purple markings on the labella. The plant was as robust as its green neighbours, suggesting *Acianthus* can survive happily on the nutrients from its mycorrhizal fungi alone—*Ed.*

The only flower of *Pterostylis tasmanica* I ever dissected was one I found bitten off, presumably by a rabbit. It had 4 pollinia in the anther and 2 on the stigma. The species is said to be self-pollinating, but it must at least sometimes be insect-pollinated—*Ed.*

The small, grass-leaved *Pterostylis* aff. *banksii* from north of Wellington seems similar to those found elsewhere (see The Column page 14 and Fig. 3) and may be a new

taxon: see colour pages—*Ed.*

The last population of *Spiranthes novae-zelandiae* in Wellington Conservancy (at Paraparaumu Airport) is being threatened by development. John Sawyer of DoC's Wellington office is asking for the site to be included in the Kapiti Coast District Plan to give time to protect the site legally, to manipulate the site, or successfully translocate the species to other wetlands at Nga Manu Sanctuary and onto Mana Island. Because the site is so modified, and with the likelihood of adjacent development further affecting the watertable there is concern about the site's viability for maintaining the orchid population. If members with experience of *Spiranthes* can make any recommendations for site management, please contact John Sawyer, Biodiversity, Department of Conservation, P.O. Box 5086, Wellington, DD 04 470 8427, jsawyer@doc.govt.nz.

The Department of Conservation has now published a booklet and free factsheet about the **mistletoes of Wellington**. The report includes photographs, distribution maps and information about conservation management of sites supporting mistletoes. All eight of Wellington's mistletoe species are included in the report (including the three beech mistletoes, the other leafy mistletoes and the three dwarf mistletoes). The factsheet (free) and report (cost is \$20) is available from Wellington Conservancy office (address above).

Pat Enright wrote that the "trident" form of *Pterostylis trullifolia* is quite common in the patches of *P. trullifolia* he was looking at on 5 August in the Fensham Reserve (near Carterton). Has it been seen elsewhere in New Zealand?

New Zealand seeds—their morphology, ecology and use as indicators: a symposium to be held at Lincoln University, Canterbury, 29 November 2001, organised by Landcare Research and the NZ Botanical Society. Contact A. McGlinchy, PO Box 69, Lincoln 8152: mcglinchya@landcare.cri.nz.

DoC has recently developed a new system for **classifying organisms according to their risk of extinction**. For vascular plants it will update existing lists, and (importantly for orchids) will include undescribed taxa that are either threatened, or are poorly known but potentially threatened.



The column: Eric Scanlen

1. Helicopter survey for *Pterostylis micromega*

Nick Singers dropped on a fine formula for surveying his large wetlands in the Tongariro Conservancy for *Pterostylis micromega*. Enrol: 1. Hughie, for fine weather, 2. Mountain Air's Hughes 500D helicopter for swift transport and 3. the NZ Native Orchid Group to slosh around in swamps in exchange for transport subsidy and accommodation. *P. micromega* is on the "critically endangered" list [J76 p18] but suspicions lingered that it might be thriving unseen in remote wetlands. Where we went, the suspicions were wrong but proving it was the rub.

The helicopter was ideal for getting 4 people out to likely places then landing them in dense wire-rush, (*Empodisma minus*) where the bog assured a firm base. Pilots Keith and Scott McKenzie could stop on a sixpence by going into a steep turn before dropping in but caused a few anxious moments for the uninitiated. Who's never heard of a sixpence? DoC keepers, Dave Rothschild, Robyn Whyman and Nick joined the fray, complete with RTs and cell 'phones to keep in touch.

But the initial shake-down survey on Wed. afternoon 3 January was only from the road. Nick took us into a well known area of *P. paludosa* and promptly demonstrated how to find a *P. micromega*, in bud plus several

rosettes of juvenile leaves, in damp *Baumea rubiginosa* sedges. This looked too easy. Soon Allan Ducker, in shorts and Warehouse slip-ons, found two more (**Fig. 1**) on the fringe of mini islands in a *Baumea* choked stream. Graham Marshall spotted some juvenile rosettes nearby. Robbie Graham found two, in bud, further downstream also in *Baumea*, looking grey because of frost damaged tops. The party was well pleased with their shake-down success and looked forward to finding many more *P. micromega* from the helicopter. Such was not to be.

On Thursday it was all on. The two in the back seats of the helicopter, sat pinioned by all four day-packs but it was only for as long as it took to do up the safety belt before they were on site and clambering out again. The Column's party of Bill Liddy, Allan, John Groom and Dave Rothschild started in a likely grey patch surrounded by pine forest. The Column, apprehensive of webbed-toe syndrome, was high stepping in long gumboots but the others were going wet in sneakers, bare feet or boots. Whoops of joy were tempered when occasional finds were seen to be "common old" *P. paludosa*, straight, erect stems, (unlike the Te Kauwhata's liana-like taxon). It favoured the waterline around little floating islands and

showed up sparsely in every area surveyed but where was *P. micromega*? After about two hours of swamp sloshing, Dave called Keith to take us out, then the Column spotted two *Thelymitra hatchii* — right between, it should be added, two marshy rows of fresh footprints — and one floret had opened! Out flopped the camera gear for this elusive mauve which he had never before seen open! In dropped the helicopter so the Column opted to be 5th man and hastily arranged his subject with a piece of umbrella fern for background but the chopper came straight back and blew it all to smithereens!! Keith saw the problem in a trice and withdrew to pick up the other strays whilst the Column collected his bits and finally got his shots.

The other teams too were finding scattered *P. paludosa* in bud (with a long floral bract well below the ovary) but no *P. micromega* (with a short floral bract enclosing, or close to the ovary). Scattered *Thelymitra pulchella* opened in the afternoon, some with a curiously cleft post anther lobe (**Fig. 2**), sometimes like two extra column arms. *T. hatchii* with white or creamy cilia (not the usual yellow) showed up in one or two other places but the habitat seemed not entirely to its liking. Tall *Prasophyllum colensoi* was there too but still in bud and sparse. The three parties converged for lunch on a cushy *Empodisma minus* bog to exchange notes, sun-cream and disappointments.

That afternoon and Friday morning, new grey *Baumea* areas were becoming hard to find. One such beech girt plot, with a stream on the swamp/beech forest divide, yielded *P. graminea* (**Fig. 3**) but as usual, no *P. micromega*. A flight around Hauhangatahi to a sluggish Waimarino river yielded only one grey *Baumea* area near Erua. Swamp flow exited through flax (*Phormium tenax*) where we stopped looking. Always the swamp growth was too dense to give the sparse orchids much chance. A last effort was made on a treacherous stretch in the Tawhai catchment where flax sticks went out of sight in the muck with only a slight push. The raft

of sedges let everyone down at some stage as speed increased in a last ditch but fruitless hunt for the elusive *P. micromega*.

Then, over the airwaves crackled a message from Nick, to meet at the National Park Wetland where David McConachie had found dozens of *P. micromega*, across the stream from Anne Fraser's find [J59 p25] of 3 Feb.96. Some flowers on cranked stems had been toppled by a recent flood.. The remainder of the field party (down to 12 by now), lofted there by Scott, had to refrain from stomping through a delicate habitat of silt deposits from floods on the sluggish stream bank. The unusually rare habitat even included a stand of flax (why did we give up at Erua?) on the fringe of the beech forest. Anne's colony was still there. Possibly its seeds had populated this extended site because it was well and fruitlessly searched in 1996. More searching revealed none of the resident *Prasophyllum* aff. *patens* which are reed-like and difficult to detect before flowers open. Some early blue/mauve *Thelymitra cyanea*, (**Fig. 4**) all had white columns and full floret flowers but unstriped broad labella. cf. Ian St George's in J72, p33 and Catherine Beard's article J59, p29. In contrast, their unstriped labella were narrow and their broad tepaled perianths had striped labella. Not much is reliably consistent in native orchids, is it?

Allan, Gary and the Column were sure that Wed.'s buds in the lahar mounds would be open on Sat. evening so went for a scramble there, never once thinking of getting out of the dinner preparation(?) Wrong again. The buds were still buds but the chance to wallow again in prime *P. micromega* habitat was too much to resist. Allan (with lime green T shirt, his scratched legs now in besmirched purple tights) and Gary, soon located more rosettes but the Column, search as he would, couldn't find one, much to his chagrin. A closer look at the habitat revealed silt around the colonies here too; silt deposited downstream of narrows in the *Baumea* choked fens. The narrows, common amongst the lahar mounds,

were steeper hence had faster flood flows picking up silt and depositing it at the next fen; hence *P. micromega* habitat. Any advance on Allan's hypothesis?

Nick Singer's debrief on Friday evening echoed the NZNOG field party's thoughts:

1. the lack of *P. micromega*, apart from one known and one new area, was valuable information which unfortunately confirmed the critically endangered status of this orchid.

2. the combination of DoC's and NZNOG's resources was sound and could well be exploited further.

Apart from target No. 1, *P. micromega*, there were other highlights and disappointments on this field trip of field trips. The Turoa *Townsonia deflexa* (was *Acianthus viridis*) was only in leaf this season. A grand red mistletoe (*Peraxilla tetrapetala*) was in flower at eye level by a tent-site near our Whakapapa Lodge and got well photographed. Allan videoed it with white-eyes (*Zosterops lateralis*) picking amongst the flowers but not opening them. The tent occupant threatened to charge a fee! Allan also captured (and the Column missed this rarity!) a huge yellow form of the scarlet mistletoe *Peraxilla colensoi*, high in the trees at the Rotokura Lakes. The Column did get a *Thelymitra* "Whakapapa" with red edged spurs there on 6 Jan. but Bruce, the gremlins darkened the photo's! With *Thelymitra* opening in the afternoon heat, the Column opted for Erua despite pleas to visit short anthered *Prasophyllum colensoi* at Turoa. So a feeding frenzy of 5 photographers descended upon several open, lilac *T. hatchii* (Fig. 5) and *T. formosa* (Fig. 6) at Erua. The Column apologises unreservedly for the things he said to the lot that kept rushing in ahead of him at every bloom and caused him to accidentally step on the best spike of *T. hatchii*. It stood up again but the lowest of 4 blooms was a ruin. Gary was quick to transfer the term "Big Foot" [J77 p25] to its irked author.

Sunday's home going saw the 6 remaining stalwarts split into two parties. Gary,

Margaret Menzies and Ernie Corbett did the Waihaha Track — and spotted a mutated, "eyeless" *Calochilus robertsonii* but mistook it for *C. paludosus*. Word has it that it suffered flash bleach in this Waihaha bruhaha. Gary's great shots showed an odd bulbous anther cap and flap-like rostellum but everything else said, *C. robertsonii*. Allan, Anne and the Column, trekked in from the Desert Rd. to the old Waihohonu Hut, in stifling heat to score open *Thelymitra cyanea* (with full floret), *T. decora* (with elongated warts on the back of the post-anther lobe), *T. pulchella*, *T. longifolia* and the little alpine *Prasophyllum colensoi*. They began a systematic but fruitless search for Peter de Lange's swampy terrace and *Waireia stenopetala* [J67 p24]. The hunt was necessarily curtailed in the face of approaching "fine weather" thunder-storms, typical of a hot day in the central plateau. The hailstones in the first were clear, those in the second were milky but with lightning sizzling all around, the hike out along that low ridge was a nervous, frozen hustle in stark contrast to the sweltering inward trip.

Acknowledgement Many thanks to Nick and DoC for a well thought out and valuable survey; to Mountain Air for breath-taking helicopter transport; to Robbie and Sue Graham for delivering the stores and organising those dinners; to the whole team for their unquenchable enthusiasm in the hunt and for the Lodge chores carried out so willingly and for their most helpful peer reviews of this report.

Figure subscripsts: colour pages overleaf

Fig. 1. *Pterostylis micromega* in *Empodisma minus* and *Baumea rubiginosa*.

Fig. 2. *Thelymitra pulchella* with forked post anther lobe. Tawhai Wetland.

Fig. 3. *P. graminea* from Tawhai catchment. Like a short leaved, ½ sized *P. banksii*.

Fig. 4. *Thelymitra cyanea* with broad unstriped labellum. National Park Wetland.

Fig. 5. *Thelymitra hatchii* from Erua with pale cilia

Fig. 6. *Thelymitra formosa* from Erua with yellow cilia.

Fig. 7. *Pterostylis* "brumobula", Shenstone Blk. 3/9/00.

Note the Caladenia leaf in the moss. A *Corybas cryptanthus* in flower was also found under the same turf of moss.

Fig. 8. *P.* "brumobula" from above showing the typical "cobra hood" of *P. brumalis*.



**The
Column
Figs.
(legend
p.17):**

- | | |
|---------|---|
| 1 | 2 |
| 7 3 | 4 |
| 8 | 5 |
| and 6 ➔ | |



Above: *Pterostylis alobula* (see editorial): labellum set at left, closed at centre, showing the "ears" of the lateral petals at right.

← ↓ *Acianthus sinclairii*:
achlorophyllous form (see p.14)

Pterostylis aff. *banksii* from
Whenuatapu (see p.14) ↓



2. Obtusa group, *Microtis arenaria* and *Corybas* “pygmy” woopsies

Pterostylis “Poynter” [J79 pp17,19] is none other than *P. brumalis*. As soon as he saw it in Journal 79, Dan Hatch rang the Column. It hadn’t featured in Dan and Frank Bartlett’s 1949 plant list for Silverdale so the Column didn’t consider it. “We found it after the list was published,” said Dan. “The dorsal sepal straightens out when it is pressed,” he explained to an embarrassed Column. So scratch *P. “Poynter”* from your list. Lottie Poynter e-mailed, at the behest of Jean Smith (nee Bartlett) and identified their ex property, where the orchid was found, as in Pine Valley Rd. Silverdale.

Microtis arenaria was first spotted on Te Paki’s Rubbish Dump Hill by Catherine Beard but she failed to identify properly either the orchid or the area. In her species lists [J58 p41 line 8] Catherine recorded, from the first of “four areas in the far north”, “*Microtis unifolia*, the one with a very cleft labellum.” She recorded it in line 3 also, from Motutangi, where Allan Ducker first spotted it in NZ on the same expedition.

The Column has identified three of Catherine’s four bulleted areas in J58 p41, from the species located. The first would be RD Hill, the second may be the swamp south of RDH, the third is the Shenstone Block and the fourth is the Earth Wall Track.

Gael Donaghy [J77 p27] was notified immediately of her possible relegation to second place. Strangely she evinced no distress so forgot to mention it the following day at Wharekawa and Catherine e-mailed her blasé disinterest. How could they?

Corybas “pygmy” and *C. “triju”* are too close to separate. Gael pointed out little buds emerging from 3mm wide cupped leaves on *C. “triju”*, similar to *C. “pygmy”*’s modus

operandi, in Geoff Stacey’s incredible Wharekawa Garden on 2 July. The mature flowers were still tiny for a *Corybas*, drawing some wry comments from Bruce Irwin. *C. “triju”* is the common taxon of the *C. trilobus* aggregate in the Auckland (ER9) Region. Its June/July flowering in ER 9 may be a little later than in Nelson and *C. “pygmy”* has flowers on all the early leaves (only half of them for *C. “triju”*) but their joint traits of a little collar around the leaf axil [J73 p12], early flowering and a mass of large unflowered leaves springing up later, said to the “committee”, that these are too close to separate. *Corybas* “pygmy” was tagged in J73 p11 so takes precedence over *C. “triju”* tagged in J76:37. It is nice to have an excuse to spread not only the tagging but also its unpopularity with orchidologists and herbarium managers, displeased at having to reclassify their records.

Pterostylis “brumobula” took a beating on that fine, frosty 2 July. Geoff had them flowering profusely in his garden where frost is unheard of because of the Firth of Thames across the road. But the freshly opened specimens had all the attributes of *P. alobula*. Only the mature flowers develop the droop snoot dorsal sepal and the platformed lateral petals à la *P. brumalis*. Gael, Graeme Jane, Bruce and the Column also inspected in situ specimens high in the Auckland Regional Council’s bush inland from Geoff’s garden via Ross Higgin’s farm but here they were less advanced and indistinguishable from *P. alobula*. Specimens at the Kauri and Shenstone Blocks, Te Paki are usually more clearly defined than this and have tricked many into thinking they were *P. brumalis* [A. Ducker, J58 p36, the Column J62 p15, Anne Fraser J65 p20 and others too wily to put pen to paper] yet every time someone had put a lens on the sinus to the lateral sepals, it had been Veed whereas *P. brumalis* has a jug spout. Fig. 2 in J77 p15, from 3-9-00 which looks decidedly alobula-ish, was in Allan’s

colony and was second choice for the camera because its labellum hadn't triggered. The other prime contender, (**Fig. 7&8**, what do you think?) in the same and only known Shenstone colony, look more *brumalus*-ish but had triggered. Some more work is needed on this anomaly but for the present, *P. "brumobula"* looks more *obula* than *brum*.

Pterostylis graminea was in peak flower on 2 July in the ARC's bush and Geoff showed the party one that had opened on 19 May! So early! This is the taxon "like a miniature *P. Banksii*" (JD Hooker), with the dorsal sepal extending well beyond the lateral petals, grass-like leaves and insect pollinated as evidenced by the touchy labellum triggering at the slightest touch. [J59 p14 with fungus gnat]. Our Field Guide gives September to January flowering. In the warm eastern slopes of the Hunua Ranges, Geoff assured us that flowering starts in May and peaks in July. *P. agathicola* and *P. trullifolia* were also flowering aplenty. Geoff showed us a twin budded "trull" as Graeme called the latter. Geoff bagged up the 17th trapped opossum on this day and related how these Aussie pests had been browsing principally off the ground-orchids. Opossum recovery (since the ARC's 1994 1080 drop), has been devastating and shows the folly of inadequate follow up of a successful clearance. *P. graminea* had been severely hit but is recovering under Geoff's ministrations in this small corner of the Regional Park.

Earina autumnalis. About 10 flowers were open on 2 July at Wharekawa, on a clump at knee level. Mostly there were two flowers per stem but some had only one. These are first year flower stems that flower well out of season. Geoff tells us that these stems will flower, not next February but the following one then they should flower for about 5 years in a row on the same stem.

Genoplesium nudum in capsule in the ARC

bush, got the Column ticked off again for his big feet. Geoff's keen eye had spotted a colony of this slender species not reported before in the Hunuas and not featuring in Gardner and Dakin's list [1]. *G. nudum* is certainly due for a visit next Autumn.

Pterostylis brumalis was in flower throughout the kauri area D/S of Mangatangi Dam where the party (sans Geoff) next sought out the obtusa group. Opossums (or what other browser?) are also a problem here in this part of the ARC's vast Regional Park but, curiously, *P. brumalis* was much more prevalent than ever before! The normally commonplace *P. alobula* and *P. trullifolia* were evident only as leaves and bare stems. So, it seems that opossums eat the flowers on the latter two but not *P. brumalis*. Try **that** character in your key to the species! The normally plentiful *P. agathicola* was not up yet, in this cooler clime, 10k further from the sea than at Ross Higgin's place.

Reference

1 Gardner, RO & Dakin, AJ. *Native vascular flora of the Hunua Ranges Auckland* Ak. Bot. Soc. 1989.

INDEX FOR JOURNALS 21 TO 80 NOW AVAILABLE.

This is a mini encyclopedia of all aspects of NZ orchids covered in the Journal. Send Eric Scanlen (4 Sunny Park Ave, Papakura) your order and \$5 to cover costs, at least one month before your Journal is due (1 November for the next issue) and your up-to-date index will arrive with the next Journal—Eric will be updating the index as each Journal is printed. NZ species, related species, orchid sites, authors, key-words and feature articles are all covered separately.



Other islands' orchids—

Borneo: Sabah and Sarawak

abridged from a paper by Rimi Repin, Sabah Parks, Kota Kinabalu, that first appeared in *Conservation and propagation of endangered wild orchids of the world*. K. Kondo (ed). 1999.

Introduction

Borneo is the third largest island of the world. The island is politically shared by three countries; East Malaysia with two states, namely Sabah and Sarawak lying from the northwest to the northern tip of Borneo. Brunei Darussalam lies in the northwest, and the Indonesian province of Kalimantan forms the southern and much of the eastern part. The island is mostly geomorphologically young. Coastal swampy plains give way to hilly lowlands and mountains in the interior. The central and northern parts of Borneo are the most mountainous, with the highest peak, Mt Kinabalu, rising to 4093m, in Sabah. The varied topography and geology give rise to a landscape of great diversity of forest types. The most species-rich communities are lowland evergreen rain forests; there are also montane rain forests, the mangroves area and inland swamp forests. Sabah has some small areas of peat swamp.

Ecological notes

Orchids are found in nearly every habitat in Borneo from the coastal mangrove swamps almost to the summit area of Mt. Kinabalu. However, the distribution and number of species varies remarkably with habitat. For instance, the mangrove forest, peat forest and the subalpine forest on Mt Kinabalu are poor in orchids species diversity though they can be rich in numbers of plants. In contrast, some of the forests on ultramafic soils are exceedingly rich both in orchid species and other plants. The species richness is estimated to be between 20000 and 25000 vascular plant species in Borneo. The largest family represented is the Orchidaceae. Borneo has 2500-3000 species of orchids in 149 genera, nearly 10%

of the world's orchid flora. About 40% of Bornean orchids are endemic. Mt Kinabalu alone has over 700 species of orchids out of a total of over 4000 species of vascular plants.

Threats to orchid species

Habitat loss Over 200 species of orchids of Sabah and Sarawak fall into the rare, endangered or vulnerable categories of the IUCN Species Survival Commission. The greatest threats are the destruction of habitat due to man's activities. For example logging, an extensive timber exploitation of the rich dipterocarp flora has drastically increased since the 1960s. As well as logging, agriculture has contributed to the destruction of forest habitat. Both states have relatively small areas of soil suited to agriculture. El niño phenomena caused serious droughts from June 1982 to April 1983 and most recently in 1998, with marked effects on the vegetation in many parts of Borneo. Fires caused by man destroyed over 10000km² of forest in Sabah. Such fires probably caused complete loss of orchid species in those areas.

Over-collecting The exploitation and collecting of orchids from the wild appears to be one of the biggest concerns nowadays. Commercial exploitation is generally indiscriminate, any species that is attractive being collected. Most of the targeted species are usually endemic or rare throughout their geographic range. The exploitation of wild orchids for commerce can place heavy pressure on populations if a species is restricted in its habitat or is rare. This may be the case with the *Paphiopedilum* sp. which only grow on ultramafic substrates. CITES has not prevented these plants from getting into Europe, the USA and Japan where there is a large demand for them.

***In situ* conservation of orchid species in their habitats**

Sabah Sabah has six State parks covering about 2811km² or 3.8% of total land area. The State parks are managed by a statutory body, the Sabah Parks Board of Trustees, under The Ministry of Environment, Tourism development, Science and Technology.

The Crocker Range Park being the largest area (1399km²) is an important water catchment for much of the population of Sabah. This area ranges from 300m to a continuous line of peaks over 1300m. The lower slope of the Crocker Range is threatened by illegal logging and shifting cultivation. With considerable areas of moss forest, it is rich in orchid species.

The Mt. Kinabalu State Park, with its 4101m granitic massif lies in an area of 753.7km². It has many forest types in various vegetation zones at different altitudes, with a variety of different soils adding to the diversity of vegetation, with unique floras occurring on the ultrabasic soil in particular.

Sarawak In Sarawak, the Forest Department is responsible for designating and managing the Permanent Forest Estate, which currently covers about 60000km² (48% out of the total 124499km² of the land area). This includes production forests for timber and protection forests. Totally protected areas (ten National Parks, four Nature Reserves and three Wildlife Sanctuaries) currently cover just 2.2% of the land area. There are, however, proposals for an additional 12 areas to be designated as National Parks and proposals for six more Wildlife Sanctuaries and six Nature Reserves including more peat swamps and mangroves areas.

***Ex situ* conservation of orchid species in collections**

In **Sabah**, the first orchid collection centre was established at the Forest Research Centre in 1977 with about 200 species of lowland orchids. This was followed by the Agriculture Department under the Ministry of the Environment in 1981. It is known as Tenom Or-

chid Centre. Poring Conservation Orchid centre has about 5800 collections of orchids. This centre has currently developed a tissue culture laboratory in order to propagate rare and endangered orchid species. It is hoped to establish seedlings back into a habitat similar to that from which they had been stripped. The Tenom Orchid Centre has been focusing on taxonomic studies on the orchid flora of Borneo. This project is a collaborative project with Royal Botanic Gardens, Kew, Singapore Botanic Gardens and Bogor Botanic Garden. Sabah Parks has another two separate gardens which accommodate many different kinds of threatened and endemic plants. These include orchid species, carnivorous plants, ferns and many other flowering plants. The Mountain Garden at Kinabalu Park was set up in 1981 has a large collection of highland species. The Lowland Garden at Tawau Hill Park is a newly set up garden for lowland species.

In **Sarawak** a similar orchid garden has been established at Semenggoh Forest Reserves, in the 1980s. It has over 200 lowland species, several rare and endangered. Another orchid centre at Kuching Town has been set up and was opened to the public in 2000. This centre has both wild and hybrid orchids.

Conclusion

It is obvious that the need for orchid conservation in both states has been given quite satisfactory recognition by the government. The implementation of both *in situ* and *ex situ* conservation has become more interactive with public awareness of the rich diversity of orchid flora. However, the states should increase the totally protected forest areas from 5% - 10% in view of the large amount of land not suitable for agriculture, and this should be of lowland forests with particular emphasis on the unique forest types which are often rich in orchids. The need for conservation cannot be fully realised without a knowledge of the species that exist in Sabah and Sarawak. In this respect, full support from the government, the institutions and the public is needed.

Profile of a threatened NZ orchid: 8

Reproduced with permission —from Dopson SR et al. *The conservation requirements of New Zealand's nationally threatened vascular plants*. Biodiversity Recovery Unit, Dept of Conservation, Wellington, 1999.

Pterostylis porrecta D.L.Jones, Molloy et M.A.Clem.

- Family:** Orchidaceae
- Endemic to:** North and South Islands.
- Common name:** Greenhood.
- Ranking:** Unranked, Vulnerable recommended. **In cultivation:** No.
- Descriptor:** Terrestrial, narrow-leaved, greenhood orchid up to 20 cm tall, with solitary flowers whose lateral sepals are strongly decurved so that they point downwards.
- Conservancy:** EC/HB, NM [*also WN: this was written before the discovery of the Porirua colony — Ed*].

Habitat: Uncertain. Known at present from two localities in modified primary and secondary conifer/broadleaved-hardwood forest, usually in shaded sites. At the North Island site, the orchid grows on soils derived from calcareous alluvium, while the South Island site alluvial soils are derived both from limestone and ultramafic substrata.

Threats: The two known populations are small and very vulnerable to unscrupulous plant collectors. Plants have been illegally removed in the past from the only known North Island site. Other threats have yet to be identified, as facets of this orchid's ecology, and its distribution are still poorly known. It may be that as this species is only known from lowland forest remnants, that it has declined through the destruction of these habitats in the past. *Pterostylis porrecta* was apparently first discovered in the mid-1980s, and aside from these few records it is otherwise not represented in New Zealand herbaria. This suggests that it may always have been a sparsely distributed species. Currently it has been recommended that this species be listed as "Vulnerable" on account of the lack of autecological information for the species and the small number of plants known (Jones et al. 1997).

Work undertaken to date

Pterostylis porrecta was formally described in 1997: prior to this it was widely known as *Pterostylis* aff. *graminea* (Cameron et al. 1995, St George et al. 1996). Although a very distinctive species, it is still only known from the two populations, despite wider ad hoc searches.

Priority sites for survey

Uncertain. The limited information available suggests that this species could occur anywhere in lowland sites on soils derived from base-rich substrates, e.g. the Roding Catchment, Nelson.

Monitoring: objectives and priority sites

Jones et al. (1997) advocate a need to monitor the species at the two known sites. Very little is known about the species, and until further autecological information is obtained, determining

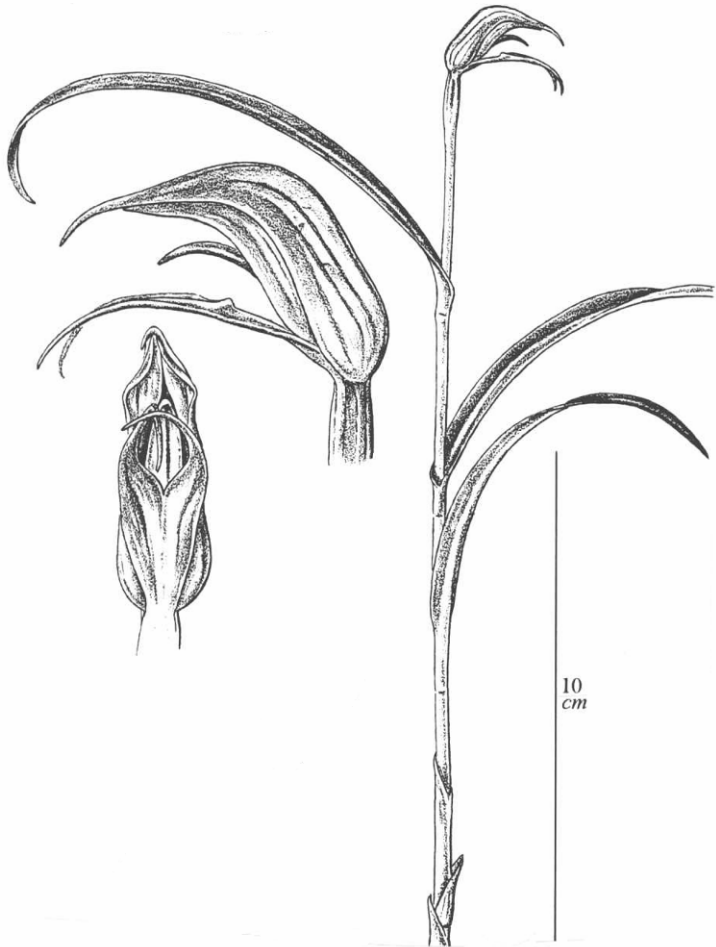
appropriate management measures may prove difficult.

Research questions

What are the exact habitat requirements of *P. porrecta*? Is it a naturally sparse species? What are the population dynamics of *P. porrecta*?

Management needs

As an extremely local orchid this species is especially vulnerable to plant collectors. It is important that the locations of this species in the wild are regularly inspected to ensure that the populations are protected from this threat and other, natural stochastic factors, e.g., flooding and erosion.



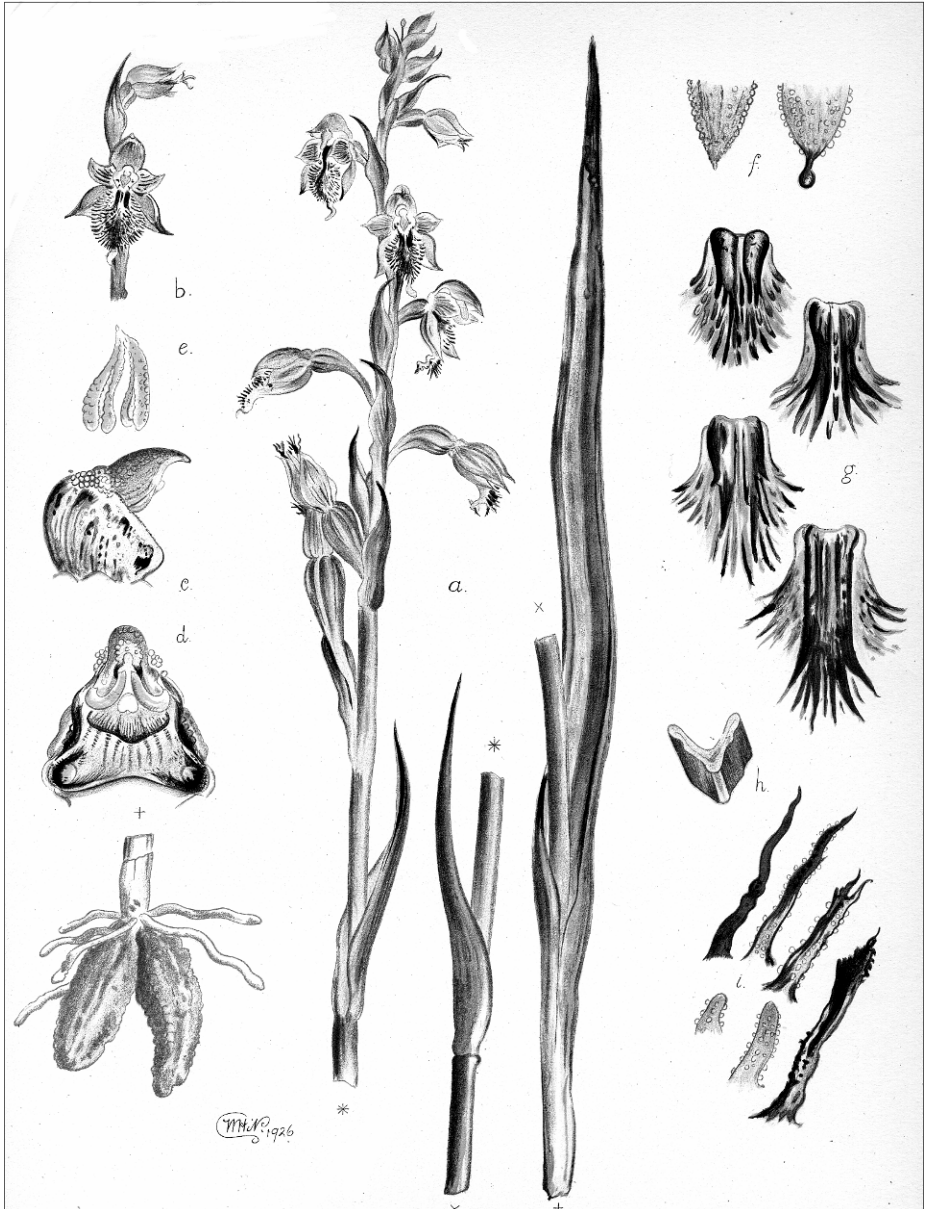
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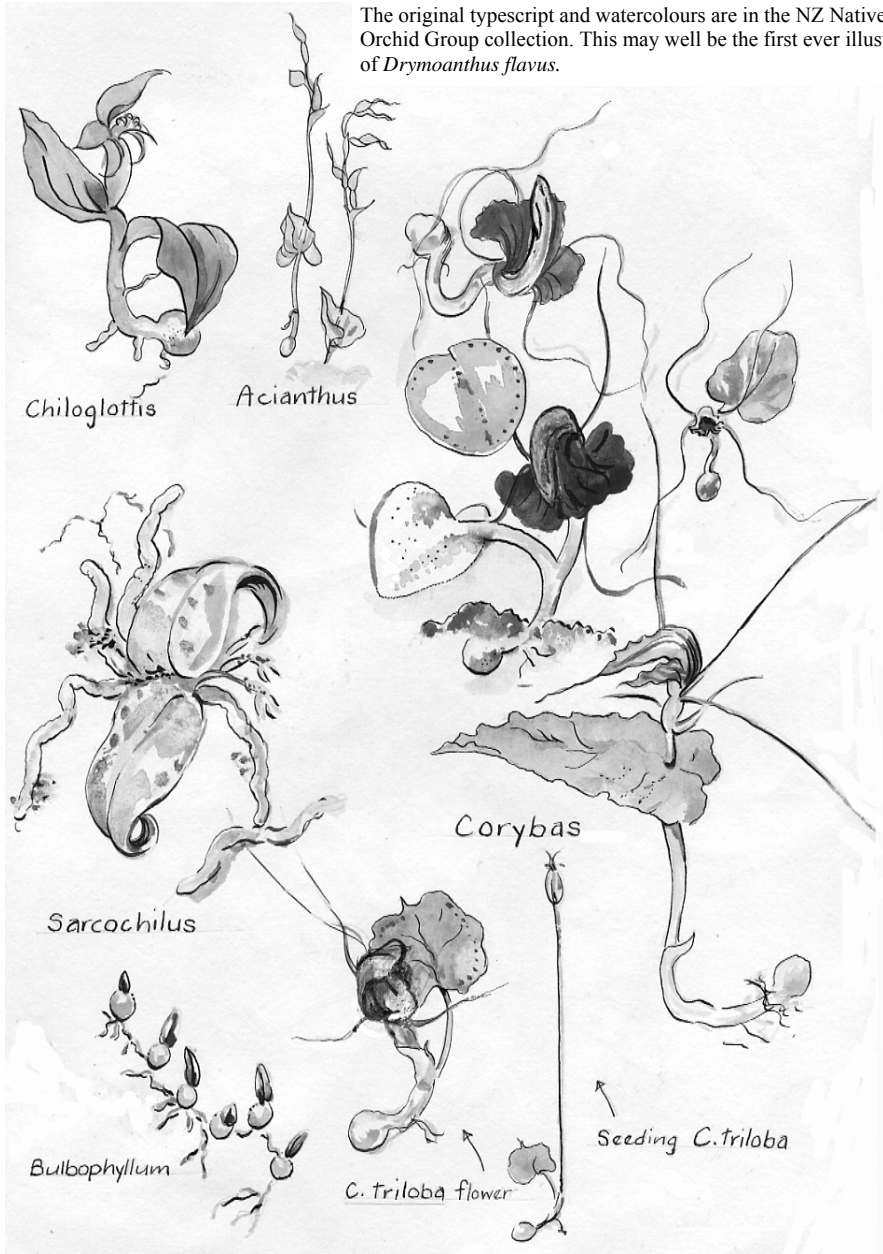
Close relations: orchids like ours

Calochilus campestris—from WH Nicholls: *Orchids of Australia* Vol.1.
for long thought to be the identity of the rare *Calochilus* found in Northland.



Historical reprints: 1 — watercolours of some Stewart Is. orchids, from the original “rough” of Sheila Natusch’s *A bunch of wild orchids*, printed in 1968.

The original typescript and watercolours are in the NZ Native Orchid Group collection. This may well be the first ever illustration of *Drymoanthus flavus*.



Historical reprints: 2

Thomas Frederic Cheeseman's "On the Fertilization of the New Zealand forms of *Pterostylis*.
Trans. N.Z.I. 1872; 5: 352-7.

PERHAPS the most interesting study connected with the structural peculiarities of Orchids is that of the varying means by which, in the majority of the species, fertilization by insect agency is secured. The wonderful co-adaptation of all the parts of the flower to effect this end, the degree in which organs have become modified to uses widely different from their normal functions, and the general fertility of contrivance exhibited, can never fail to excite our admiration and surprise.

Although none of the New Zealand Orchideae exhibit a mode of fertilization, founded on such complexity of structure and specialization of parts, as occurs in some of the tropical American and Asiatic genera; and although probably none equal in this respect the British species of *Orchis* and *Ophrys* yet several kinds present interesting and noteworthy peculiarities. These are so strongly marked in *Pterostylis*, that I have ventured to draw up the following account of my observations on that genus. I have been the more induced to do this from the fact that Mr. Darwin's book "On the Fertilization of Orchids," which is deservedly considered to be the standard work on the subject, does not contain an account of a similar method of fertilization; nor is any species described, included in the sub-order Arethuseae to which *Pterostylis* belongs.

The genus *Pterostylis* is represented in New Zealand by seven species. Of these, six (*P. banksii*, *P. graminea*, *P. micromega*, *P. foliata*, *P. trullifolia*, and *P. puberula*.) constitute a closely connected series of forms, and seem to present no differences of importance in their fertilization. The seventh species (*P. squamata*) belongs to another section of the genus, and (judging from descriptions) differs in several respects from the others. It is stated in the "Handbook" to have been discovered near Auckland by the late Dr. Sinclair, but I have not been fortunate enough to find it, nor has the plant been seen by any New Zealand botanist of late years. I shall now proceed to describe the mode of fertilization in *P. trullifolia*, the species on which my observations are the most complete. The accompanying illustration (Pl. XX.), containing magnified drawings of the most important parts of the flower, will perhaps cause my meaning to be more easily understood.

The upper sepal and petals connive: and form a kind of hood, inclosing and arching over the column. The lateral sepals are placed in front of this hood, and being united for fully half their length, partially close the entrance to it. The column (see figs. C, and D., and *c.* in fig. B.) is bent backwards at the base, so as to lie close to the upper sepal, with which for some distance it is united; it then becomes erect, and towards the summit is furnished with two broad membranous wings, each of which is extended downwards into a blunt lobe, and upwards into an erect horn-like appendage. The stigma (*s.* in Figs. C. and D.) is a bilobed prominence about the middle of the column. The anther (*a.*, Figs. C. and D.) is terminal, hinged on to the summit of the column, two-celled, the cells opening while the flower is still unexpanded. The pollinia (*p.*, Figs. D. and E.) are four in number, two in each cell, linear in shape. They lie loose in their cells, having no caudicles, and do not become attached to the rostellum. The rostellum (*r.*, in Fig. D.) is an erect, somewhat triangular projection, placed immediately below the anther. Its anterior surface is slightly concave, and consists of a thick mass of highly viscid matter, portions of which can easily be detached.

The lip, consisting of a linear, somewhat fleshy lamina, with a curious curved appendage at its base, is clawed on to the bottom of the lateral sepals by a delicate ribbon-like membrane. It is extremely sensitive, so that, although in its natural position it has its apex exerted between the free points of the lateral sepals (see *l.*, Fig. B.), yet the slightest touch is sufficient to cause it to move quickly up to the column, when it occupies the position shown in Fig. C. On this movement

of the lip the fertilization of the plant depends.

If we take a flower, and gently touch the lip, so as to cause it to perform the motion just described, and then examine the position of the parts, we see that each side of the flower lip is narrowed inwards in a curved line parallel to the position now occupied by the margins of the lip, so that the posterior part of the flower forms a chamber, to which the lip, resting against the wing-like appendages of the column, is a tolerably close fitting door.

Now let us suppose that an insect were to enter a freshly opened flower. The only entrance is between the tips of the lateral sepals, and here the apex of the lip is placed exactly where our visitor would probably alight. At first the weight of the insect would most likely counteract the natural tendency of the lip to move inwards, but as the insect crawls further into the flower, this would have less effect, until at length the irritability of the lip would enable it to overcome the resistance offered, and to spring back to the column. If no capture is made the lip soon regains its former position, but if the insect is imprisoned it remains firmly appressed to the column while its prey continues to move about. For the prisoner there is now only one mode of escape. This is by crawling up the column, passing over the stigma and viscid rostellum, and finally emerging from between the appendages of the column, directly in front of the anther. This passage, however, is so narrow and confined that it would not be possible for an insect to pass through without brushing against the rostellum, and detaching portions of its viscid surface. If the insect were now to touch the anther, and it is difficult to see how it can escape without doing so, one or more of the pollen-masses, lying loose in their cells, would become glued to the viscid matter on the insect's back, and consequently be withdrawn from the flower. To understand the mode of fertilization we have now only to suppose that the insect, with the pollinia attached to it, visits another flower, and is again imprisoned, when it is evident that in its efforts to escape it would pass over and in front of the stigma, which is sufficiently adhesive, when touched, to draw off a portion of a pollen-mass, or even a whole one, from the back of the insect.

After careful and repeated examinations of living plants, I adopted this view of the fertilization of *P. trullifolia* as the only one explaining the various facts I had collected; but, in order to satisfy myself that the lip really plays the important part I had supposed, I selected twelve flowers which were just expanding and removed that organ from the whole of them. After a week or two, when they had closed and commenced to wither, I gathered them and examined their stigmas and pollinia. Not one flower was fertilized, and not a single pollen-mass had been removed.

On several occasions I have artificially inclosed small insects in the flower. Most escaped by crawling up the column and passing between the appendages, and some, but not all, carried pollen-masses away with them. It can hardly be expected, however, that insects selected at random would remove the pollinia with the same ease and certainty as the species to whose requirements the flower has no doubt been profoundly modified by natural selection, acting during long periods of time.

Although I have often watched the flowers I have never seen insects directly enter them. It occurred to me, however, that I should be more successful if I were to examine every plant noticed with the lip drawn back against the column. Acting on this idea I soon found three, each inclosing a small dipterous insect. Two of these had no traces of pollen on them, and the flowers were not fertilized. The third was dead, apparently not having been able to find the passage out of its prison. It had the remains of two pollinia attached to its back. The stigma of the flower was also plentifully covered with pollen, which had evidently been conveyed from another plant, for all four pollen-masses were intact and undisturbed in their cells.

The fact of this insect being unable to effect its escape led me to examine a considerable number of flowers which had commenced to wither, and in which the sepals and petals had closed together, with the view of ascertaining if this circumstance was of frequent occurrence. The

results were important. Out of 110 specimens examined seventeen contained dead insects, and nine of these insects bore traces of having had pollen attached to them. Some had followed the passage between the wings of the column until they had reached the anther, and then becoming glued to the pollen-masses had not been able to drag them out of their cells, thus perishing on the threshold of their prison. Many of the flowers which did not inclose insects exhibited signs, besides the removal of the pollinia, of having been visited by them, from the presence of hairs, etc., adhering to the stigma and rostellum; and in one instance the antenna of some insect was found glued to the rostellum, proving that its owner had escaped by crawling through the passage in front of that organ.

All the insects proved to be Diptera, and all are probably referable to one species. I am not, however, entomologist enough to be able to indicate its name. What inducement there is to visit the plants I cannot conjecture, for even with the most careful examination I have not been able to detect the presence of any nectar, or nectar-secreting organs.

The comparatively large number of insects retained in the flowers examined appears at first sight to show a serious imperfection in the contrivances for insuring fertilization, as it is evident that it is a loss to the plant when its visitor cannot escape and carry away the pollinia. On a closer examination, however, it probably only proves how carefully the passage for the exit of the insect has been modified to suit the relative size of the species by which the plant is fertilized, for if the passage had been of a size sufficient to allow the largest individuals to escape with ease the smaller ones would perhaps have been able to pass through without touching the rostellum; and consequently would not remove the pollinia.

It seldom happens that all the pollinia are removed. Out of 110 withered flowers twenty-eight had all the pollinia remaining in their anther cells, twenty-nine had lost one, thirty-four two, thirteen had three withdrawn, while only six had all four removed. Seventy-one of the flowers were fertilized, but it must not be forgotten that a large number of unfertilized ones drop off before commencing to wither, so that the proportion fertilized is really much less than this. Probably not one quarter of the flowers ever produce capsules.

Of the other species of *Pterostylis*, *P. banksii*, *P. graminea*, and *P. puberula* are fertilized in exactly the same manner. There are, of course, slight differences in the size and arrangement of the parts of the flower, but it is hardly worth while describing these in detail here. In *P. puberula* nectar appears to be often present on the outside of the lateral sepals, near the point of their coalescence, serving, no doubt, to attract insects to the flower. *P. banksii* also has two minute papillae at the base of the column, which may secrete nectar, but I have never observed any. The insect which fertilizes this species is nearly twice the size of that which performs the same office for *P. trullifolia*. I have seen an insect enter the flower of *P. graminea* and become entrapped by the lip. With *P. micromega* I am imperfectly acquainted, but believe the fertilization to be on the same plan. Of *P. foliata* I have only seen dried specimens, but as the structure of the flower is in the main the same as in *P. trullifolia* I have no doubt that it will prove to be fertilized in a similar way.

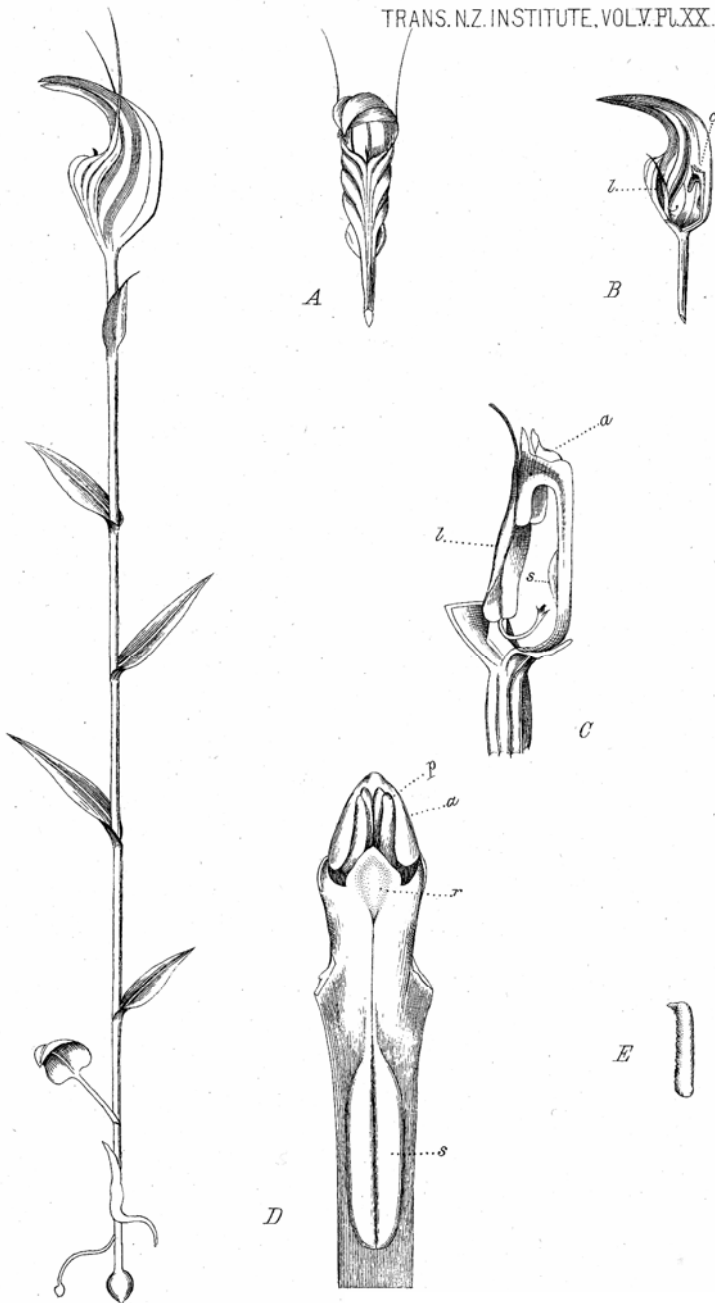
It seems hardly necessary to draw attention to the fact that the elaborate structure displayed in this genus is solely used to insure the pollen of one flower being placed on the stigma of a different one. It is not too much to say that the pollinia can never reach the stigma of the same flower, except, perhaps, by a combination of circumstances extremely unlikely to happen. As all our New Zealand species have solitary flowers, the cross effected is not only between different flowers but between different plants.

DESCRIPTION OF PLATE

Pterostylis trullifolia, Hook. f. Natural size. A. Front view of flower. B. Lateral view of flower.

The sepals and petals on one side removed to show the position of the column and lip.

TRANS. N.Z. INSTITUTE, VOL.V. PL. XX.



T.F. Cheeseman del. J.B. lith.

FERTILIZATION of N.Z. sp. of

NOTES - Ed.

This is the classic description that was later quoted by Darwin in the second edition of his work on orchid pollination. There have been few further reports of direct observations of *Pterostylis* pollination. In Cheeseman's day *P. trullifolia* also included *P. alobula* and *P. brumalis*; the drawing is of what we now call *P. alobula*. The attribution ("TF Cheeseman del. J.B. lith.") states in Latin "drawn by TF Cheeseman and lithographed by John Buchanan"; in fact the litho. was a copy of a watercolour by Cheeseman's sister Ellen, now in the Auckland Museum's collection. *P. banksii* probably included all the large *Pterostylis*—including *P. australis* and *P. montana*. What Cheeseman called *P. squamata* we now regard as *P. tasmanica*. We now regard *P. puberula* and *P. foliata* as predominantly self-pollinating.



Australian notes: David McConachie

Kilsyth South Spider Orchid (an endangered spider orchid does have friends)

By Helen Moss from ANOS Victoria *Bulletin* Vol. 34 No. 1 July 2001

Can we save one of the rarest plants on Earth? (Yes, we can, but will we?)

Quiet celebration amongst a few die-hard conservationists in Melbourne's outer east recently marked slow, but now inexorable, progress towards saving one of the world's rarest plants. On the 15th of February, the Kilsyth South Spider Orchid, *Caladenia* sp. aff. *venusta*, was gazetted as threatened under Victoria's Flora and Fauna Guarantee Act 1988.

The listing in itself does not save the species, but it is a significant step along what has been a long and tortuous trail from the edge of an anonymous extinction to the orchid's recognition as a valid new species and as a rare and precious component of our biological heritage.

The Kilsyth South Spider Orchid was discovered in October 1991, by members of the Montrose Environment Group who had just attended a working bee in a Trust for Nature reserve and decided to see what was flowering further up the street. On a private allotment they spotted a small cluster of moderately large, cream-coloured spider-orchids which none of the members present could identify.

Orchid expert Geoff Carr was informed of the find and visited the site. He declared the spider-orchid to be a species new to science. Jeff Jeanes, the Melbourne Herbarium's authority on orchids, confirmed this conclusion through reference to preserved specimens and a site visit. Although the discovery was exciting to those who knew of it, no-one else was informed for fear that the orchid enthusiasts who had just illegally removed orchids from the bushland reserve a matter of metres away would make a return visit to the area.

Since the allotment on which the orchids were found was undeveloped, there seemed to be no great need to take any action other than to monitor the site. Thorough continual monitoring was conducted by local ecologist Dr Graeme Lorimer. Other surrounding properties were searched, but no more plants of this new species were located.

At first, there were thought to be 16 plants of the orchid, but within a couple of years, the number noted rose to 18. Now there are known to be 24 plants of this spider orchid in existence. Attempts to propagate the orchid have not been successful, so the only population of the orchid is scattered over an area of much less than an acre on the one property. This patch is extraordinarily rich in orchid species.

Between 1991 and 1999, attempts were made to interest government in purchasing the site, but to no avail. In 1997, Maroondah City Council released the comprehensive Sites of Biological Significance in Maroondah study (Lorimer et al.) which accorded the spider-orchid National significance. The allotment on which it occurs, along with neighbouring properties of high biological value, was classed as State significant. All major sites of biological significance documented in the study have been given some protection in Maroondah's new Planning Scheme.

The calm was shattered in 1999, when the owners of the property applied to clear vegetation for house and driveway construction. Council rejected the application because of the presence of the orchid and the significance of the vegetation

in general. The owners appealed to the Victorian Civil and Administrative Tribunal to overturn Council's decision. The VCAT hearing commenced on the 25th of June 1999, with both Council and the Knox Environment Society (with a solicitor from the Environment Defenders Office) defending the decision to reject the application. Geoff Carr had been employed by Council to undertake a study of the site and also appeared as a witness for Council. VCAT handed down a decision in favour of Council on the 25th of September 1999. This was a landmark case, because the owners had bought the property with a reasonable expectation of building a house there, but were told that they could not do so because of environmental values that were only recognised after their purchase.

The drama did not end there. Vegetation damage has been occurring repeatedly, and Council officers who appealed to the property owners to prevent the damage have been threatened with physical violence. Prior to the VCAT hearing, several Flax-lilies among the orchids were torn out by the roots, presumably mistaken for the orchids. Photos of the spider-orchid became public during the hearing, so they can now be recognised by those people doing the damage.

Council has approached the owners to see whether they would be prepared to sell the property if funds were available to purchase it. Council has offered a major contribution towards possible purchase.

Numerous letters to the Minister of Conservation and Environment seeking urgent action to save the vegetation, and the orchid, through site acquisition, fell on deaf ears. The Minister asserts that Maroondah City Council can take care of the matter. This does not seem reasonable when the same Minister has just listed the species as threatened statewide, the orchid is considered to be of National significance and the vegetation in which it occurs is of State significance. The spider-orchid has also been nominated for listing under the

Commonwealth *Environmental Protection and Biodiversity Conservation Act* as critically endangered.

Council applied for a Natural Heritage Trust grant in 1999 for half the cost of purchasing the site, but was unsuccessful. Montrose Environment Group tried again in 2000, with similar results. Council was, however, successful in gaining a \$25,000 Federation Grant, but are in danger of having to return the grant because there is simply not enough money available to fund the rest of the purchase. While Council is prepared to make a substantial contribution, the state government has consistently declined to provide any financial assistance.

An additional issue is the fact that the property containing the spider orchid abuts a very similar undeveloped property which harbours high quality vegetation of the same type. This allotment, in turn, abuts a much larger bushland reserve. If both privately owned blocks could be purchased, a large, viable area of almost intact Silver-leaved Stringybark - Peppermint forest could be protected in perpetuity. Maroondah City Council would need almost \$600,000 to secure the future of these properties.

On Tuesday the 13th of February, a petition requesting that the Victorian Government save the Kilsyth South Spider Orchid by funding the purchase of its habitat was delivered to local member, the Hon. Lorraine Elliott. Although there were more than 1,700 signatures on the petition, some 400 signatories did not live in Victoria, so their names were crossed off. This was unfortunate, given that the extinction of a species is a worldwide event.

Now the spider-orchid has received official recognition through listing under the Flora and Fauna Guarantee Act, it is hoped that the Victorian Government will be a little more sympathetic to its plight - before it is too late and the last 24 plants of *Caladenia sp. aff. venusta* disappear from the face of the earth.



From NativeOrchids@eGroups.com

A contributor wondered if **flowering orchids are ever seen in the snow**. He got several responses:

1. *C. fasciculatum* emerges quite early in southern Oregon.... The flowering period is long and plants may be seen blooming into late May. I have seen emerged plants (with rolled leaves) in snow several times over the last 3 years but have only seen CYFA flowering in the snow at the highest elevation site I am tracking. When this happened, the plants were frostbitten and died back. They emerged the following year, but did not flower.

2. I have seen *Pseudorchis albida* in the High Tatra of Slovakia flower through a late snow cover. Early snows in northern New England (and I expect Canada and Alaska) come when late plants of *Spiranthes* spp. are still in flower. Certainly in the high Rocky Mts. of western NA snow can come during flowering season for things like *Calypso bulbosa* var. *americana*.

3. Back in 1960 or 1961 I was in Berchtesgaden Germany, there was snow on the ground and the surrounding hills. While I was on a walking and climbing trip in the hills, many of the native orchids were pushing through the snow cover, some were actually already in flower.... It was quite beautiful.

4. In the early 1990s I photographed and observed *Cypripedium fasciculatum* in the Sierra Nevada Mountains of California during a light snow storm.... In 1996 here in the Santa Rita Mountains of Arizona late snows killed back blooming plants of *Corallorhiza wisteriana*.

5. I just put some pictures of *Gymnadenia conopsea* covered with snow on my WEB site. These pictures were taken near the top of the Col du Lautaret, France on 11 July 2000. This is in the middle of summer and only 3

days before the cyclists of the Tour de France had to climb this mountain. It had been a cloudy day with lots of rain. Near the top of the Col it suddenly started to snow heavily. In less than 30 minutes, the soil was covered with at least 5 cm of snow. The *Gymnadenia* were flowering abundantly at that time. Have a look at them at <http://www.orchidaceae.org/gallery.html>.

Jonathan P. Tyler FLS wrote, "I have recently found someone willing to fund my dream, which is **to paint the entire British Orchid family** in their full habitats, also including in these 63 paintings the vast majority (47) of the British butterflies resting or nectaring nearby. For an idea of the type of illustrations these will be, please see previous orchid illustrations on my website (<http://www.jonathantylor.co.uk>) in the 'Orchids' section."

A **lkaline soils?** This was the subject of a recent discussion:

1. It is generally recognized that *Cypripedium acaule* enjoys acidic soils. Despite this, the largest colony I have ever seen (numbering well over 2,000 specimens) was located within meters of a disused limestone quarry.... I suspect the detritus above the limestone was thick enough and acidic enough to keep the roots happy. The soil above hosted American chestnut suckers, as well as huckleberries, so I suspect the pH was quite low.

2. The one and only time that I have seen a colony of *Cyp. acaule* in a calcareous situation was on Manitoulin Island in Ontario (Misery Bay Preserve.) They were growing in an area completely surrounded by alvar (limestone pavement), however, they were under a of stand fairly mature jack pine

(*Pinus banksiana*). If there is anything as acidic on this planet as granite or a peat bog it has to be conifer needle duff. Intrigued, I dug into the needle duff (without disturbing the *Cyp. acaule* of course!) After poking around with a stick, I found the alvar about 10-15 cm under the conifer needle duff. This was further down than the rhizome of the plant which would have been just below the surface of the needle duff. Therefore the entire "acidic" *Cyp. acaule* was growing in its favourite acidic habitat, but that habitat was sitting on a very calcareous ground.

The first *O. sphegodes* I ever found: "Early Spider Orchid is one our first species of the year in the UK.

"I had travelled down to the coastal cliffs of Dorset on a miserable April day in 1975, and with my Nikon was minutely searching the exposed coastal grassland sward. I was completely alone apart from a herd of scraggy beef cattle, the members of which wandered around munching nonchalantly.

"Finally, after over an hour's searching, I found one! Success - but what a poor specimen it was! I decided to mark the plant with a white stone and search for a better spike to photograph. After another 20 minutes fruitlessly studying the ground, my nose dripping rain, I decided to return to the original plant.

"As I approached the white stone, a cow wandered casually into my line of vision. It was heading straight for the orchid. I hurried, preparing to shoo the bothersome bovine away. But as I - now feverishly - descended on the spot, the damned beast put its head down, cropped the orchid, chewed, and turned towards me with the sort of vindictive expression I thought only my mother-in-law was capable of!

"For months afterwards I fantasised about the beef sausages the offending beast had eventually provided the British public. It was another two seasons before I was finally able to shoot *O. sphegodes*!"

A contributor wrote, "About 6 or 7 years ago we found 3 **bee orchids** in a small conservation area we manage. The area is disused industrial land and it was the first time I'd ever seen these plants anywhere near here so I got quite excited about it. Unfortunately some kind person dug them up and I thought we had seen the last of them. Fortunately they reappeared and, over the next few years we found odd plants here and there but no more than half a dozen or so in any one year.

"Last year however they went absolutely mad. We found them all over the place, on recently mown grass verges, in hedgebanks, waste ground etc. We must have found several hundred of them scattered all over the Industrial Estate - or Park as they now insist on calling it. I'm hoping for a similar show this year after all the rain we've had but did anyone else notice anything similar?"

Dave Atkinson (PhD researcher, Staffordshire University) replied, "The problem with *O. apifera* is that it is actually polycarpic, not monocarpic as was previously thought. This means that the same tuber can lie dormant up to a number of years and then flower, giving the casual observer the impression that is a first year coloniser. The seeds may have germinated years ago but development halted as it entered the dormant phase.

"The population dynamics of this plant are erratic and require a long term study to fully understand (20+ years). My research did involve an area of industrial land with this species (now developed) and only 6 were found in the 1st year while in the following year over 40 were seen. This species favours this type of habitat, since competition is low. But do not be alarmed if few appear next year, as this is a result of dormancy, induced by stress of reproduction, herbivory and/or climate. But consideration should be made for changing associated species assemblage through time (succession)."

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Editor: Ian St George, 22 Orchard St, Wadestown, Wellington, phone 04 4994227, fax 3894178, istge@mzcgp.org.nz. **Conservation officer:** Peter de Lange, Department of Conservation, PO Box 68908 Newton, Auckland, phone 09 307 9279, email pjdelange@xtra.co.nz. **ANOS liaison:** David McConachie, 15 Battersea Place, Palmerston North, phone 06 3586559, email pleione@ihug.co.nz. **Field trips:** Eric Scanlen, 4 Sunny Park Ave, Papakura, Ph. 09 2984868, email eamscanlen@xtra.co.nz.
