NZNOG Journal

Number 47, September 1993
ISSN 1170-4543
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Editorial

Women and orchids in New Zealand

by Ian St George

As we celebrate a hundred years of women's suffrage, *NOGJ* features prominent woman orchidologists. Many women have been associated with New Zealand orchids over the years, at first mostly as illustrators.

Perhaps the very first was a Parisienne, Eleonore Sophie Rebel. She was a burin engraver of plants, and was involved in the production of the plates of *Thelymitra longifolia* and *Orthoceras novae-zeelandiae* in the botanical atlas of *Flore de la Nouvelle Zelande* 1832, by Pierre-Adolphe Lesson and Achille Richard.

Emily Cheeseman drew and painted orchids, but her painting of *Pterostylis alobula* was attributed to her brother Thomas Cheeseman when it appeared as an engraving in his famous 1872 paper on the fertilisation of *Pterostylis*.

A trio of Victorian women published wonderful books of New Zealand flowers about 1890. Georgina Hetley's *The native flowers of New Zealand* contained some illustrations of orchids, but sketches of others (at Kew) were not developed for the book. Sarah Featon's orchid paintings were intended for a second volume of *The art album of New*

Zealand flora but remain unpublished in the National Museum (Natural History Unit); Emily Cumming Harris intended her drawings of orchids for her fourth book, *New Zealand mountain flora*, alas also never published; the Turnbull Library has the originals.

Ellen Blackwell met Robert Laing on their voyage to New Zealand in 1904. She had a major, but largely unrecognised part in the descriptive and scientific writing of Laing and Blackwell's 1906 *New Zealand plants*. Nobody could believe that a woman could be such a good scientist, so Robert Laing was until very recently accorded almost all the credit for the work, with the hint that some romantic attraction to Ellen compelled him falsely to attribute co-authorship to her. Dick Scott gave her due credit in his *Seven lives on salt river*.

The Kew artist Mathilda Smith drew the orchids for Cheeseman's *Illustrations of the NZ flora* (1914). Again, it was her engraver, John Nugent Fitch, who until recently received the praise for the quality of the illustrations. Bruce Sampson found her original drawings in the Auckland Museum collection and gave her due credit in his *Early New Zealand botanical art*.

Many women became amateur flower painters in the wake of the published artists: Claire Scott, Elizabeth and Lydia Blumhardt in Whangarei and Auckland in the first decade of the twentieth century, Fanny Osborne of Great Barrier Island (studies in the Auckland Museum collection), and Fanny Richardson (studies in Wellington) were among them.

Then came the botanically accurate Jessie Brownlee in Auckland, and the Dunedin schoolmistress Helen Dalrymple - the latter publishing the first regional account of orchids (in Otago). Later Dorothy Jenkin and Sheila Natusch painted Stewart Island orchids.

Ella Campbell was the first professional woman botanist to write about orchids. Her papers on the mycorrhizal fungal associations of the New Zealand saprophytic orchids are classics. She addressed the 1980 International Orchid Conference on native orchids in 1980.

Only two women have formally described a New Zealand orchid: the first was Lucy Moore (*Microtis oligantha*, *Pterostylis brumalis* and *Thelymitra hatchii* in 1969) and the last was Dorothy Cooper (*Pterostylis cardiostigma* in 1983).

The professional botanical artist Nancy Adams (see "Orchid artists" in this issue) worked for forty years in Wellington.

Involvement in botany has been a continuous tradition for women here from the earliest years. Now at least their contribution can be acclaimed: men are no longer so insecure that they have to take all the credit.

A list of the NZ orchids

by Ian St George

It is a year since the *Journal* published a list of the names of New Zealand orchids, and in that time there have been few new revelations. Nonetheless the *Journal* will publish an annual list, to keep members in touch until the wisdom in *Flora of New Zealand* Vol II (1970) is renewed in a new *Flora*. I emphasise that what follows is not an official list: it is simply my understanding of the current names and the changes since the publication of *Flora II*. We have over 100 species.

Acianthus sinclairii (was *Acianthus fornicatus* var. *sinclairii* in *Flora II*)
Acianthus viridis (has been known as *Townsonia viridis* and *T. deflexa)*
Adenochilus gracilis
Aporostylis bifolia
Bulbophyllum pygmaeum
Bulbophyllum tuberculatum
Caladenia alata (in *Flora II* included in *C.carnea* as var. *exigua*. See Hatch E.D. and McCrae D. *NZNOG Newsl.* 1987. 24: p9)
Caladenia catenata (in *Flora II* included in *C.carnea*. See Johns J. and Molloy B. *Native orchids of New Zealand* 1983. p18)
Caladenia carnea (in *Flora II* as *C. carnea* var. *bartlettii*)
*Caladenia minor (*in *Flora II* as *C. carnea* var. *minor)*
Caladenia "green column" (undescribed)
Caladenia lyallii (there may be two species currently included - see Gibbs M. *NZNOG Journal* 1990; 35: 19, and *The NZ orchids: nat. hist. and cultivation* pl. 20)
Caladenia " aff. iridescens" *(*in *Flora II* as *C.carnea* var.*minor* forma *calliniger*. See Hatch E.D. *NZNOG Newsl.* 1985. 16: p1)
Caleana minor (no longer known as *Paracaleana*)
Calochilus herbaceus (in *Flora II* as *C. campestris*. See McCrae D. *NZNOG Newsl.* 1987; 24: p9)
Calochilus paludosus
Calochilus robertsonii
Chiloglottis cornuta
Chiloglottis formicifera (regarded as extinct in New Zealand)
Chiloglottis valida (was included by mistake in *C. gunnii* - now described as a new species - see Jones D.L. New taxa of Australian Orchidaceae. *Aust. Orch. Res. 2.* 1991. 43-4, 154.)
Corybas acuminatus (in *Flora II* as *C. rivularis*. See Clements M. and Hatch E.D. *NZ Journal of Botany* 1985. 23 (3): p491)
Corybas carsei (in *Flora II* included in *C. unguiculatus*. See Irwin J.B. *NZNOG Newsl.* 1987. 23: p8)
Corybas cheesemanii (in *Flora II* included in *C. aconitiflorus*. See Clarkson B. *Veget. of Egmont Nat. Park* 1986. p87)
Corybas cryptanthus
Corybas longipetalus (included in *Flora II* as a variety of *Corybas macranthus* - see Hatch below - *NZNOGJ* 1993; 47)
Corybas macranthus
Corybas oblongus
Corybas rivularis (in *Flora II* as *C. orbiculatus*. See Clements and Hatch *ibid*). Irwin recognises several different forms (see below in *NZNOG Journal* 1993; 47).
Corybas rotundifolius (was included in *C. unguiculatus* and later tagged *C.* "aff. unguiculatus" - see Hatch E.D. *NZNOG Journal* 1991. 38: p4-5).
Corybas trilobus (there may be more than one species currently included in this name - e.g. "*Corybas* aff. trilobus")
Corybas "A" (undescribed; see Irwin J.B. *NZNOG Newsl.* 1989; 32: p1-4; & see *C. rivularis* above)
"*Corybas* aff. trilobus" (possibly a new taxon similar structurally to *C.trilobus*)
Corybas "short tepals" one of the *C. rivularis* complex (see below; see Irwin J.B. *NZNOG Newsletter* 1989. 32: p1-4).
Cryptostylis subulata (not listed in *Flora II*. See Graham D.K.F. *NZ Journal of Bot.* 1976. 14: 275)

Cyrtostylis oblonga (in *Flora II* as *Acianthus reniformis* var. *oblonga*. See Jones D. and Clements M. *Lindleyana* 1987. 2 (3): p156)
Cyrtostylis reniformis (in *Flora II* as *Acianthus reniformis* var. *reniformis*. See Jones and Clements *ibid.*)
Dendrobium cunninghamii
Drymoanthus adversus
Drymoanthus "spotted leaf" (undescribed, but see St George I.M. *NZNOG Journal* 1989. 29: pp8-9)
Earina aestivalis a more robust, darker-flowered plant than *E.mucronata:* (illustrated in *The New Zealand orchids: natural history and cultivation* 1990. t4. f13)
Earina autumnalis
Earina mucronata
Gastrodia cunninghamii
Gastrodia minor
Gastrodia sesamoides
Gastrodia "long column" (in *Flora II* included in *G. sesamoides*. See Wilson H. *Field Guide - Stewart Is. plants* 1982. p294)
Genoplesium nudum (was *Prasophyllum nudum* - see Hatch E.D. *NZNOG Newsl.* 1991. 37: p18).
Genoplesium pumilum (was *Prasophyllum pumilum* - see Hatch E.D. *NZNOG Newsletter* 1991. 37: p18)
Lyperanthus antarcticus (probably not a *Lyperanthus*)
Microtis oligantha
Microtis parviflora
Microtis unifolia
Orthoceras novae-zeelandiae (was regarded as identical with *O. strictum*, but see Clements M.A. *Australian orchid research* 1989. 1: 100)
Prasophyllum colensoi
Prasophyllum "aff. patens" (was regarded as identical with the Australian *P. patens*, but now thought to be an undescribed New Zealand species)
Pterostylis alobula
Pterostylis areolata
Pterostylis australis
Pterostylis banksii
Pterostylis brumalis
Pterostylis cardiostigma (not listed in *Flora II*. See Cooper D. *NZ J. Bot.* 1983. 21 (1): p97)
Pterostylis "aff. cycnocephala" (was regarded as identical with the Australian *P. cycnocephala*, but now thought to be an undescribed New Zealand species)
Pterostylis foliata
Pterostylis furcata (known in New Zealand as *P. micromega*, but appears to be the same as the Australian species described by Lindley in 1830)
Pterostylis graminea
Pterostylis "aff. graminea" (undescribed)
Pterostylis humilis
Pterostylis irsoniana
Pterostylis linearis (treated by Hatch in 1949 as a variety of *P. furcata*, and included in *Flora II* under *P. montana* - now considered to be a valid species)
Pterostylis montana
Pterostylis "aff. montana" (undescribed, but see St George I.M. *NZNOG Newsletter* 1988. 25: 12-14)
Pterostylis nutans (extinct in NZ?)
Pterostylis oliveri
Pterostylis patens (in *Flora II* included in *P. banksii*, but now regarded as distinct)
Pterostylis plumosa (in *Flora II* as *P. barbata*. See Johns and Molloy *ibid.* p45)

Pterostylis puberula (was included in *P. nana*, but now regarded as distinct)
Pterostylis tristis (in *Flora II* as *P. mutica*. See Molloy B. *Proc. 2nd Int. Orch. Conf.* 1985. p2)
Pterostylis rubricaulis (treated as a variety of *P. montana* by Hatch and as a variety of *P. graminea* in *Flora II*, now considered a valid species)
Pterostylis trullifolia
Pterostylis venosa
Pterostylis "Catlins" (a similar plant to *P.* aff. montana" but not described - perhaps Colenso's *P.auriculata*?)
Spiranthes novae-zelandiae (in *Flora II* as *S. sinensis*).
Spiranthes "motutangi" (undescribed)
Thelymitra carnea
Thelymitra cyanea (plants regarded in the past as *T. venosa* are now included in *T. cyanea*; *T. venosa* is considered to have a limited distribution in New South Wales)
Thelymitra decora
Thelymitra formosa
Thelymitra hatchii
Thelymitra ixioides
Thelymitra longifolia
Thelymitra malvina (not listed in *Flora II*. See Clements M.A. *Australian orchid research* 1991. 1: 141)
Thelymitra matthewsii (rediscovered in the far north by Doug McCrae)
Thelymitra pauciflora (there may be two species included under this name - see *NZNOG Journal* 1993; 46: 5)
Thelymitra pulchella
Thelymitra sanscilia (see *Flora II* p 130 - may be reinstated)
Thelymitra tholiformis (considered to be *T. intermedia* by Moore, and included in *T aemula* by Hatch: but see Molloy B.P.J. and Hatch E.D. *NZNOG Journal* 1990. 35: p20-24)
Thelymitra dentata (a sterile hybrid, probably between *T. pauciflora* and *T. pulchella*)
Thelymitra "aff.ixioides" (undescribed)
Thelymitra "aff.longifolia" (undescribed)
Thelymitra "Ahipara" (undescribed)
Thelymitra "darkie" (undescribed)
Thelymitra "rough leaf" (undescribed)
Thelymitra intermedia (now regarded as identical with *Thelymitra pauciflora)*
Yoania australis (not a *Yoania*, but perhaps an endemic New Zealand genus).

Original papers

Corybas longipetalus (Hatch) Hatch *comb. et stat. nov.*

by Dan Hatch, Laingholm

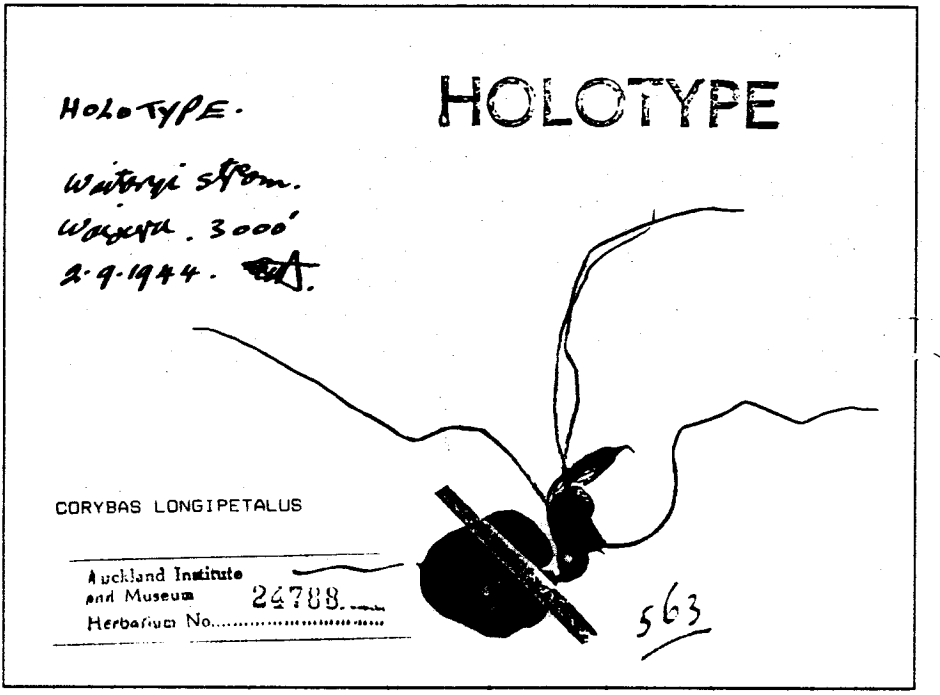
BASIONYM - *Corybas macranthus* var. *longipetalus* Hatch *Trans. Royal Society NZ* 76: p580, t60, fl AB. (1947).

HOLOTYPE - AK 24788 - Waitangi Stream, Waiouru, 2 September 1944, E.D. Hatch.

DISTRIBUTION - stream banks and seepages throughout the tussock country to the east of Ruapehu and across to north Taranaki. I am including Bruce Irwin's "Mount Messenger" form in this species. The differences between them are very slight and seem to be stable.

Of the seven forms of *C. rivularis* isolated by Bruce Irwin, four would appear to be valid species, with a fifth (Mt Messenger) included in *C. longipetalus*.

1: *Corybas rivularis* s.s. (= "Kerikeri"),
2: *Corybas longipetalus* (= "Waiouru"/ "Mt Messenger"),
3: *Corybas* "A",
4: *Corybas* "short tepals",
leaving two forms at present unaccounted for.



Notes on seven forms of *Corybas rivularis*

by Bruce Irwin, Tauranga

With the help of a grant from the Wellington Botanical Society, I was able to explore further the similariries and differences among seven quite distinct forms of *Corybas rivularis*. What follows is the key and illustration from a longer paper on the *C. rivularis* complex (*Bulletin Wellington Botanical Society* 1993; 46: in print) which will appear later this year.

Key to seven forms of *Corybas* in the *rivularis* complex

(1) Leaf virtually sessile ..... (2)

Leaf petiolate (not always obviously so) ..... (5)

(2) Labellum tapering to an acute apex ..... (3)

Labellum tip obtuse, though apiculus present ..... "Mt Messenger"

(3) Flower very narrow, usually red, labellum projecting forward almost horizontally ..... "Kerikeri"

Apex of labellum strongly down-pointing ..... (4)

(4) Labellum more or less rhomboidal, gradually tapered to an acute apex which is well below level of auricles, throat sharply V-shaped ... "Kaimai"

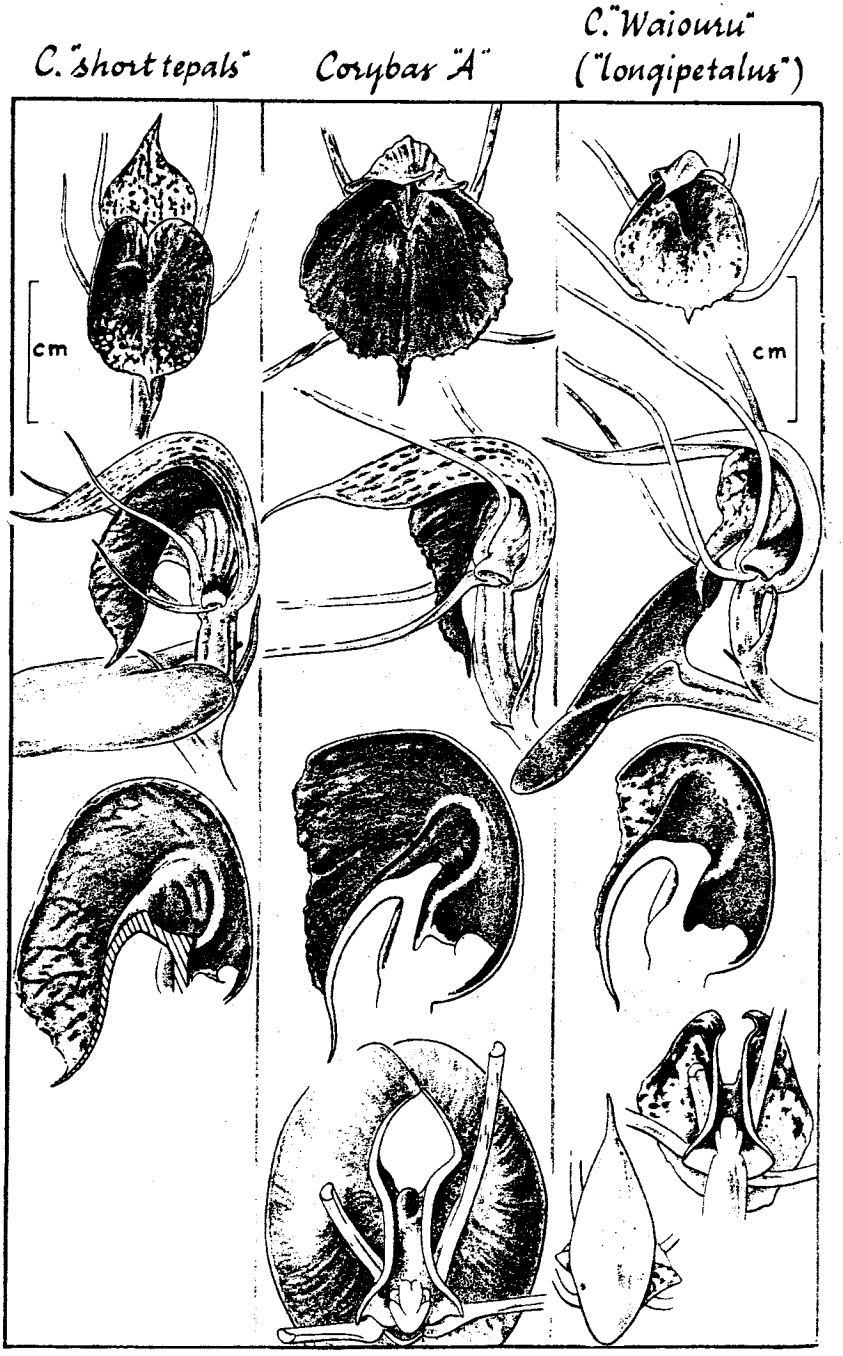
Labellum rather abruptly narrowed to acute apex barely reaching down to level of auricles ..... "rest area"

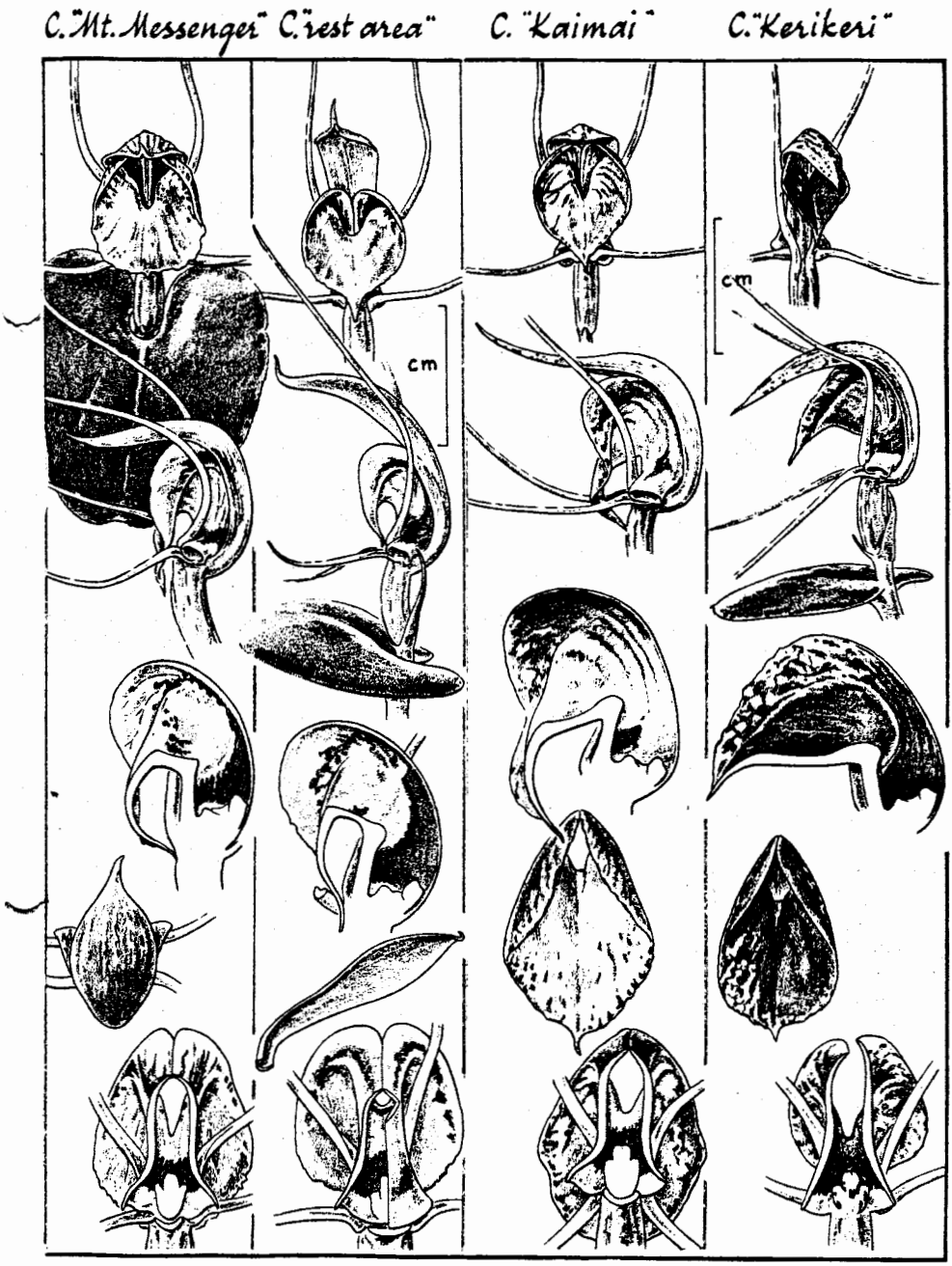
(5) Lateral sepals < twice length of dorsal sepal ..... "short tepals"

Lateral sepals > twice length of dorsal sepal ..... (6)

(6) Flower large, wide, usually dark red. Entrance to column cavity very high on labellum which is very sharply deflexed at this point. A prominent beadlike callus further restricts access at flexure ..... "A"

Flower smaller, less highly coloured. Longitudinal section of labellum shows two distinct bends though the lower surface is more or less continuously curved ..... "Waiouru"


C. "short tepals"
Corybas "A"
C. "Waiouru"
("longipetalus")
cm
cm


C."Mt. Messenger" C."rest area" C. "Kaimai" C."Kerikeri"
cm
cm

A possible pollinator of *Calochilus robertsonii*

by Cath Wilson, Auckland

At Iwitahi in December 1992 I was photographing *Calochilus robertsonii* when I noticed a large, and to me unfamiliar insect perched head down on the underside of the labellum of an almost open flower. During the next twenty minutes my photographic antics disturbed it enough to send it crawling around the flower, onto the plant stem and finally back to the labellum in the position I saw it first: as in the illustration.

I was curious as to whether the insect was capable of being a pollinator, so showed my photos to Olwyn Green, an entomologist with MAF, Auckland. Olwyn identified it as a female pollen fly, *Dilophus nigrostigma* Walker, a native of New Zealand and the Chatham Islands.[1]

This fly has a wide distribution from Northland to Stewart Island. The flying season extends from October to March but is chiefly in November (29%) and December (60%).[1] This coincides nicely with the flowering time of the known populations of *C. robertsonii*.

As the common name "pollen fly" suggests, it is quite capable of pollinating these flowers as its particularly long mouth parts are well adapted to reaching pollen deep inside the flower. As yet there are no recorded associations with Orchidaceae.[1]

This particular species of *Dilophus* is considerably larger than others found in NZ. with the female a little larger than the male. The body length of the female is up to 10mm; it has a brown-orange thorax and a pale brown abdomen; the male is basically black.

In Australia where there are nine named species of *Calochilus*,[2] the only recorded insect pollination is by Scoliid wasps, not believed to be present in NZ. *C. campestris* in particular is recorded as being visited in attempted copulation by the male Scoliid wasp *Campsomensis tasmaniensis*.[3] One Australian orchidologist has stated that *C. robertsonii* is "probably pollinated by male Scoliid wasps".[4]

C. robertsonii is a variable species in Australia, especially in flower size and the colour of the labellum hairs - white, black, mauve, purple, coppery or greenish.[2] This could well be the result of insect cross-pollination. Orchids common to both NZ and Australia may be insect-dependent to varying degrees, but may be pollinated by different insects.[5]

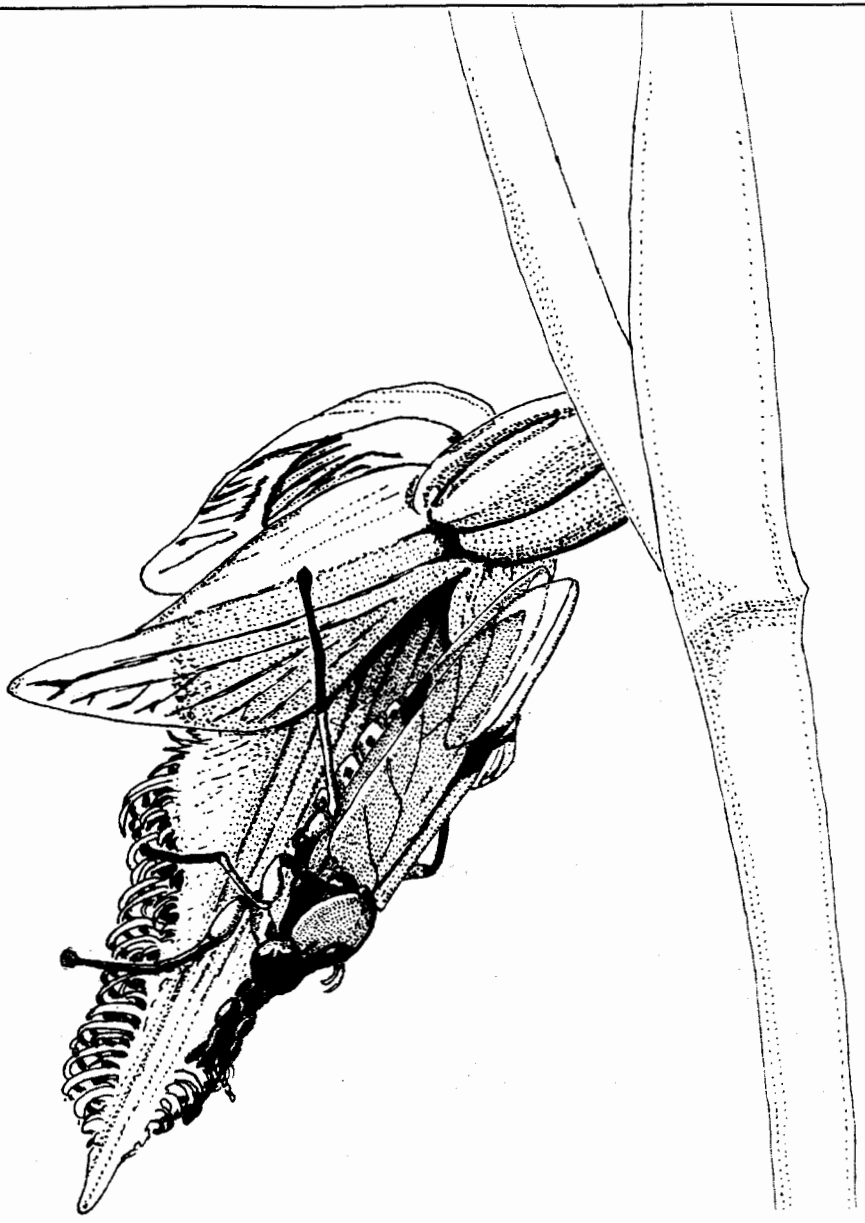
I can find no written record of a visit by an insect to *C. robertsonii* but likewise I find no definite statement that it is totally self-pollinating. Molloy lists it among those that are predominantly self-pollinating, but he also points out that *Calochilus* species seem to be highly adapted for insect pollination.[6]

In NZ we may be well content that *C. robertsonii* is capable of self-pollination, but that does not mean it is not also pollinated by insects. We should observe this orchid and the other *Calochilus* species for possible visits by the pollen fly, and note any variations in the orchid in future.

My thanks to Olwyn Green and Ian St George for their superb drawings.

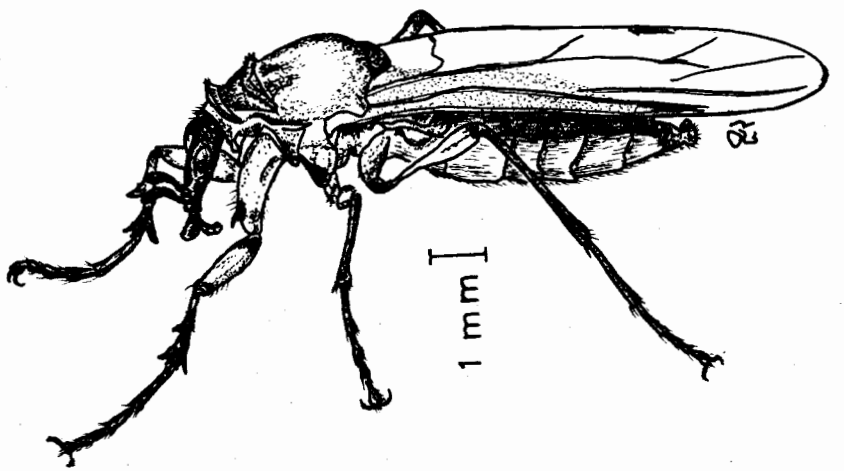
References

1. Harrison RA. *Bibionidae (Insecta Diptera). Fauna of New Zealand* 1990; 20: 15-17.
2. Jones DL. *Native orchids of Australia.* Reed, 1988. pp46, 310, 313.
3. Hatch ED. The New Zealand forms of *Calochilus* R.Br. *TRSNZ* 1949; 77: 247.



A female *Dilophus nigrostigma* on *Calochilus robertsonii*, Iwitahi, December 1992, from a photograph by Cath Wilson; drawn by Ian St George.

4. Peakall R. Pollination of Western Australian orchids. In *The orchids of Western Australia*, 1989. p58.
5. Godley EJ. Flower biology in New Zealand. *NZJBot* 1979; 17: 441-66.
6. Molloy BPJ. Pollination systems of New Zealand orchids. In *The New Zealand orchids: natural history and cultivation*. NZ Native Orchid Group, Dunedin, 1990. pp39, 50.



The female pollen fly *Dilophus nigrostigma*, drawn by Olwyn Green.

Focus on orchids - part 3

by Gordon Watson, Invercargill

Exposing with flash. Electronic flash is an excellent light source when photographing orchids, especially when in low light situations, as in the bush or out on dull days. Its great advantage is that you have complete control of the light. Remember the points about available light also apply to flash light. Again use a plastic diffusing sheet or a white handkerchief (preferably an old one that has been washed many times) to give that soft lighting. Bounce lighting will give you a similar result taking care to use a light or white coloured reflector to avoid a colour cast. Avoid using the flash unit directly on the hot shoe of your camera as this direct light tends to be hard and flat. Best reslults are obtained from a single unit by using it off the camera with a synchronising cord - even handheld. The perfect setup is a bracket with twin flash units (about 2 ft apart) attached to the camera. Set the light ratio 1:2 to give that pleasant modelling effect. If this ratio cannot be mechanically adjusted simply alter the flash-to-subject distance of one unit. You may be tempted to buy a ringflash unit, but while this is a very handy attachment giving a flat frontal lighting,

unit, but while this is a very handy attachment giving a flat frontal lighting, it cannot be used for any other directional lighting. Have you tried using flash in bright sunshine? This is a very practical method of reducing or even eliminating harsh shadows. Here is a quick solution - set shutter speed to flash - meter your orchid - set aperture to the daylight setting - then open up two stops - set flash to auto and shoot. Depending on your subject one stop may suffice.

Equipment. When buying a new camera, take your time before making a decision. There are no bad cameras. Make sure you are comfortable with its handling and operation. Remember that the most expensive camera does not guarantee the best photos. A camera is just a piece of equipment (all be it marvellous) to transfer an image onto a piece of film and the quality of the resulting photo depends on the quality of the glass in front and the quality of the guy behind the camera. On a new camera just spend as much money as you can comfortably afford.

A lens-hood is well worth using at all times to prevent unwanted light entering the lens.

Which film? Select one of the modern types, use it intensely, get the desired results, and stick with it. I use a professional type - it costs me a little extra but I am rewarded with better colours and definition. Try it.

Do you carry a spare set of camera batteries? you should.

Beware of dust and dirt. On your film and in your camera they can create troubles. So keep it clean! Occasionally run the vacuum cleaner round the camera body, open the back and lower the blind, then gently clean out all the foreigners.

I hope I have been of some assistance to you photographers, but could I suggest that if you are seriously interested, perhaps you should join a local camera club where you will meet friends with similar aims, and you will learn more about the art of photography.

Enjoy it.

Help wanted

❃ Ken Wilson responds: "There seem to be no records of *Corybas macranthus* north of Warkworth - and if there are, I should like to hear of them."

❃ Dan Hatch responds: "*All* the *Corybas* elongate in fruit - I have seen them. The degree of elongation however depends on the flowering season. Late flowerers are sometrimes forced to dry off the capsule before the peduncle has had time to grow to its full extent. Consequently early flowerers - *C. cheesemanii* and *C. trilobus* for example - are most likely to have very tall peduncles."

By chance I came across a paper by H.M.R. Rupp (Forms and habits of certain orchids. Victorian Naturalist 1929; XLVI (May): 3-4) in which he discussed this. An excerpt is reproduced below (but what was the Pterostylis Allisonii that H.B. Matthews observed?):

2.—Elongation of Flowering-stem After Fertilization.

This is a very interesting habit among some of our terrestrials. It has been recorded in all our Australian species of *Corysanthes*, but is more consistent in some than in others. The elongated stem is often coloured a rich red. The New Zealand species, only one of which occurs in Australia, also have the habit, and one elongates the leaf-stem. This latter point cannot be explained by the most popular theory of stem-elongation, viz., that it is a device for elevating the ovary from its position close to the ground, in order that the wind may more effectually scatter the seed. I confess that this theory does not satisfy me, and that I regard it merely as an obvious hypothesis, "not proven." My reasons are these: (i.) There are hundreds of other plants which flower as close to the ground as *Corysanthes*, yet succeed in dispersing their seed satisfactorily without elevating the ovary. (ii.) These plants are more dependent upon seed for propagating their species than is *Corysanthes*, which so largely uses the vegetative method; if elevation of the ovary were necessary, we should expect to find it more marked in plants which do not use the vegetative method. (iii.) The habit is very inconstant in all but one or two of our species of *Corysanthes;* I have often seen the ripe capsules of *C. pruinosa* and occasionally of *C. bicalcarata* (which seems to produce seed rarely) without stem-elongation. (iv.) *C. dilatata* in the southern States often grows high up on fern-tree trunks in sheltered bush forests, where wind scarcely penetrates; yet in this position the orchid almost invariably elongates the stem.

Moreover, stem-elongation is not restricted to orchids which have flowers approximately squat on the ground. In *Chiloglottis* it is practised by the well-stalked species, and not only by such forms as *C. Gunnii*. I have also observed it among the smaller species of *Prasophyllum*. I cut off a stem of *P. intricatum* close to the soil, when the flowers were well matured. The stem subsequently grew up eight inches from the level where it had been cut. Mr. H. B. Matthews, a New Zealand observer, states that *Pterostylis Allisonii* also has the habit. It would be of interest to know whether it occurs in the squat form of *P. cucullata* in our southern States. Mr. Matthews has suggested that the habit may perhaps in part be accounted for by surplus energy stored in the current year's tuber.

Notes

❀ Andrew Paget, of Paget's Orchids (PO Box 238, Mt Evelyn, Victoria 3796, Australia) is keen to obtain seed of NZ orchids for flasking: if anyone can help, please write. *I have his 1993 flask list if anybody would like to see it - Ed.*

❀ Mr J Truter (PO Box 5085, Benoni South, 1502 South Africa) writes in the hope of finding NZ orchid enthusiasts interested in swapping NZ for S.African indigenous species. Write to the editor if you would like to see the letter.

❀ Dan Hatch writes, "re Allan Ducker's Waitakere *Bulbophyllum* (March *Journal*): *B. pygmaeum* is often found here on rewarewa and kauri, but these have *solitary* flowers and usually flower in the spring and summer. His plant with 2-3 flowers is almost certainly *B. tuberculatum*."

❀ Willie Shaw wrote with a list of orchids from Te Urewera National Park: *Acianthus sinclairii*, *Adenochilus gracilis*, *Aporostylis bifolia*, *Bulbophyllum pygmaeum*, *Caladenia catenata*, *Chiloglottis cornuta*, *Corybas acuminatus*, *C. macranthus*, *C. oblongus*, *C. rivularis*, *C. trilobus*, *Corybas* "aff. trilobus", *Dendrobium cunninghamii*, *Drymoanthus adversus*, *Earina autumnalis*, *E. mucronata*, *Genoplesium nudum*, *Microtis unifolia*, *Orthoceras novae-zeelandiae*, *Prasophyllum colensoi*, *Pterostylis australis*, *P. banksii*, *P. cardiostigma*, *P. graminea* , *P. montana*, *P. patens*, *P. trullifolia*, *P. venosa*, *Thelymitra cyanea*, *T. hatchii*, *T. longifolia*.

❀ Dan Hatch wrote with the orchids from the **Threatened plant lists 1993** [published in the NZ Bot Soc *Newsletter* 1993; 32 (June): 14]:

Extinct: *Chiloglottis formicifera*, *Pterostylis nutans*.

Endangered: *Caleana minor*, *Corybas carsei*, *Pterostylis micromega (furcata)*, *Pterostylis nana (puberula)*, *Thelymitra matthewsii*.

Vulnerable: *Chiloglottis valida*, *Prasophyllum* "aff. patens".

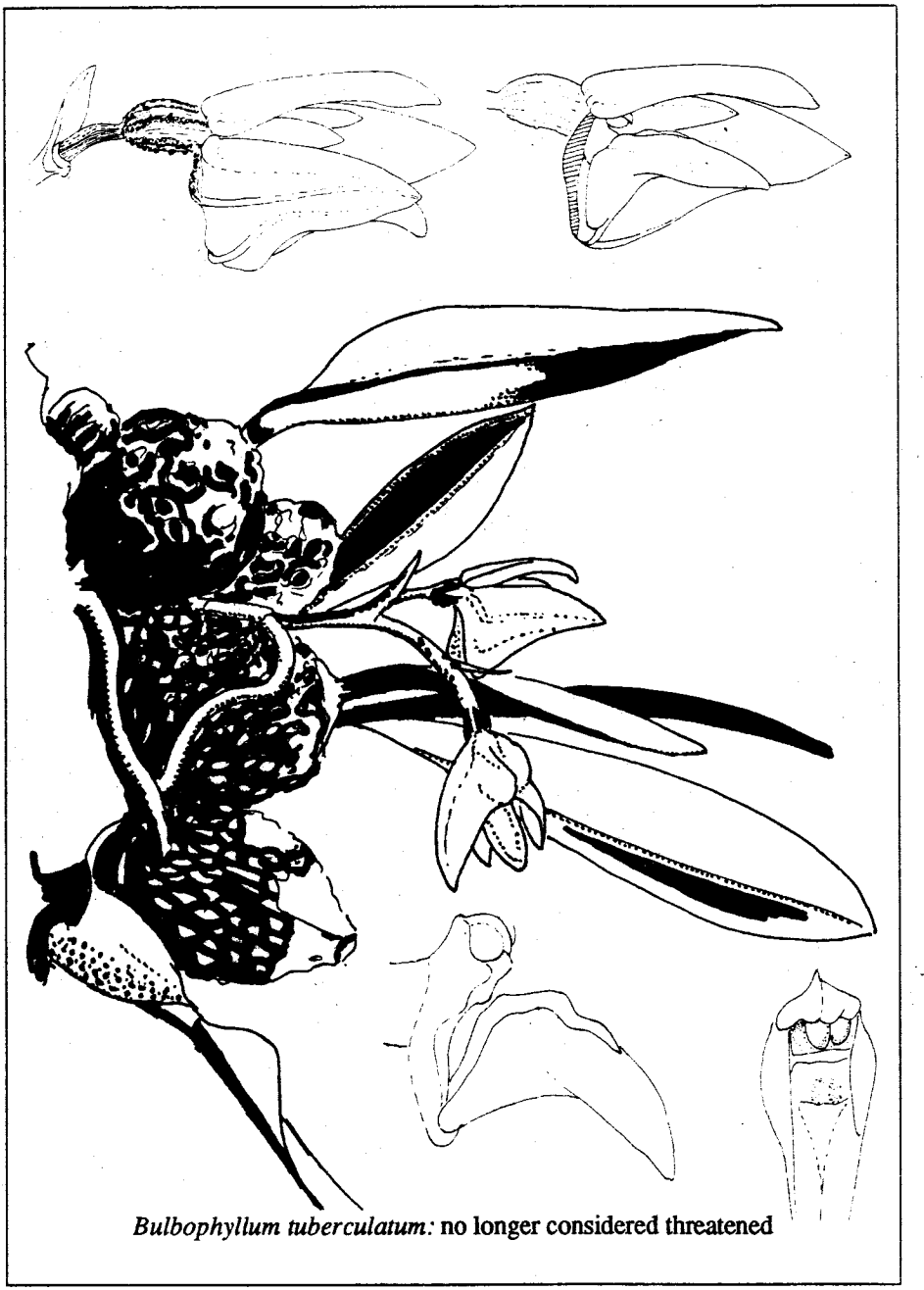
Rare: *Calochilus paludosus*, *Cryptostylis subulata*, *Pterostylis plumosa*, *Thelymitra malvina*, *Thelymitra tholiformis*.

Insufficiently known: *Caladenia* "aff. iridescens", *Calochilus herbaceus*, *Spiranthes* "Motutangi", *Thelymitra* "Ahipara", *Thelymitra* rough leaf".

Local watchlist (species which may become threatened): *Calochilus robertsonii*, *Corybas cryptanthus*, *Corybas rotundifolius*, *Pterostylis linearis*, *Yoania australis*.

Species no longer considered threatened: *Bulbophyllum tuberculatum*, *Corybas* "short tepals", *Earina aestivalis*.

❀ Tim Funnell wrote, "I came upon a basket full of *Earina autumnalis* at a plant nursery in the Hawke's Bay. I put it in my shadehouse (80% shade) and watched it deteriorate. I then shifted the plant, in desperation, to the south side of our flat where it got no direct sunlight and over the last two years I have seen 12-15 new growths, half of which have flowered. It would seem that *E. autumnalis* does not like direct sunlight, or is it just my plant?"



Bulbophyllum tuberculatum: no longer considered threatened

❀ Ken Wilson wrote (10 July), "...regarding the white form of *Corybas cheesemanii*. Marjorie Newhook has found another small colony flowering in midjune, this time right at the northern end of the Waitakeres. I went and and had a look and they are even whiter than the others - I had to go right down with a glass to see any tinge of green at all. Normal coloured flowers within 10-12 inches of these white ones. It was Marjorie who found the first colony back in '89: both times she was looking for fungi - is there a lesson in that?"

❀ Pat Enwright wrote (23 July), "Last weekend a friend and myself were doing a bit of botanising around the Pyramids on the Otago Peninsula. We were searching a boulder pile below the northeast face of the big Pyramid where Rory found *Drymoanthus* "spotted leaf". There were 10-12 plants growing on rocks that were best described as being the second tier. They would be reasonably shaded from the sun yet still getting plenty of light and moisture from the sea fogs down there. The roots trail away down to the base of the rock heap." *GM Thomson reported it on rocks around the Otago Harbour last century, but this is the only report of rupestral growth in recent times - Ed.*

Taranaki *Corybas* crawl

Come to north Taranaki on 18-19 September 1993 and see our *Corybas*. Enjoy a weekend such as Audrey Eagle described in the March issue of the *Journal*. A native orchid weekend is to be held with a base at Wai-iti Beach Motor Camp, 40km north of New Plymouth. The turnoff to Wai-iti Beach will be signposted with a NZNOG emblem, as will the Uruti turnoff where the *Corybas* are. Clothing and footwear for wet conditions will be necessary. Saturday evening dinner will be provided at $10 per person.
Enquiries to Ernie Corbett, 10 Protea Place, Bell Block (phone 06-7550563 evenings), or to Ian Rutherford, 35 Grenville St, New Plymouth (phone 06-7510153)

Orchid artists

Nancy Mary Adams (1926-)

Nancy Adams came from botanical forebears - three great-grandfathers were amateur botanists, and drawing was always a part of her family activity.

She began drawing when she was three - pink and green from her paintbox for drawing hollyhocks. She was educated at Wellington Girls' College and Victoria University. Later when she applied for a job at Botany Division D.S.I.R. she was asked to name the trees outside the window. She was told that she was "the sort of girl Dr Allan is looking for".

She worked for H.H. Allan for sixteen years, and helped Lucy Moore with seaweeds, illustrated Connors's *Poisonous plants of New Zealand* in 1951, drew for journal articles and for Lucy Moore and Ruth Mason's Post-primary Bulletins. She later became Assistant Curator of Botany at the National Museum.[1]

In 1964 she was awarded the Loder Cup for her work for National Parks, and in 1985 she delivered the Banks Lecture to the Royal New Zealand Institute of Horticulture - her subject: "Botanical illustration in New Zealand - the Kew connection".[2]

She retired in 1987, and the National Museum honoured her with a special retrospective exhibition of fifty-one paintings, sketches, drawings, cards and covers. She has recently completed a book on seaweeds, and has been working on a biography of the explorer-artist John Buchanan.

Nancy Adams's botanical illustrations appear in many books and other publications. Her own books include *Plants of the New Zealand coast* (1963, with Lucy Moore), *Trees and shrubs of New Zealand* (1964, with A.L. Poole), *Mountain flowers of New Zealand* (1965), *New Zealand native trees - 1* (1967), *New Zealand alpine plants* (1973, with A.F. Mark), *Wildflowers in New Zealand* (1980), and *New Zealand native trees - 2* (1983).[1]

She has published some illustrations of native orchids - a watercolour of *Pterostylis patens* in *Egmont National Park Handbook* 1970, and watercolours and line drawings of *P. irsoniana* and *P. tristis*, *Lyperanthus antarcticus*, *Caladenia lyallii*, *Aporostylis bifolia*, and *Prasophyllum colensoi* in Mark and Adams 1979.

Nancy Adams has been one of New Zealand's major botanical artists for nearly forty years.

References

1. *Nancy M. Adams, botanical artist.* Brochure for a retrospective exhibition 31 October - 6 December 1987, Special Exhibitions Gallery, National Museum, Wellington.
2. Adams N.M. The Banks Lecture 1985 - Botanical Illustration in New Zealand. The Kew Connection. *Annual Journal of the Royal New Zealand Institute of Horticulture* 1985. 13: 4-12.

Pterostylis patens; drawing by Nancy Adams, Ngatoro, January 1986.

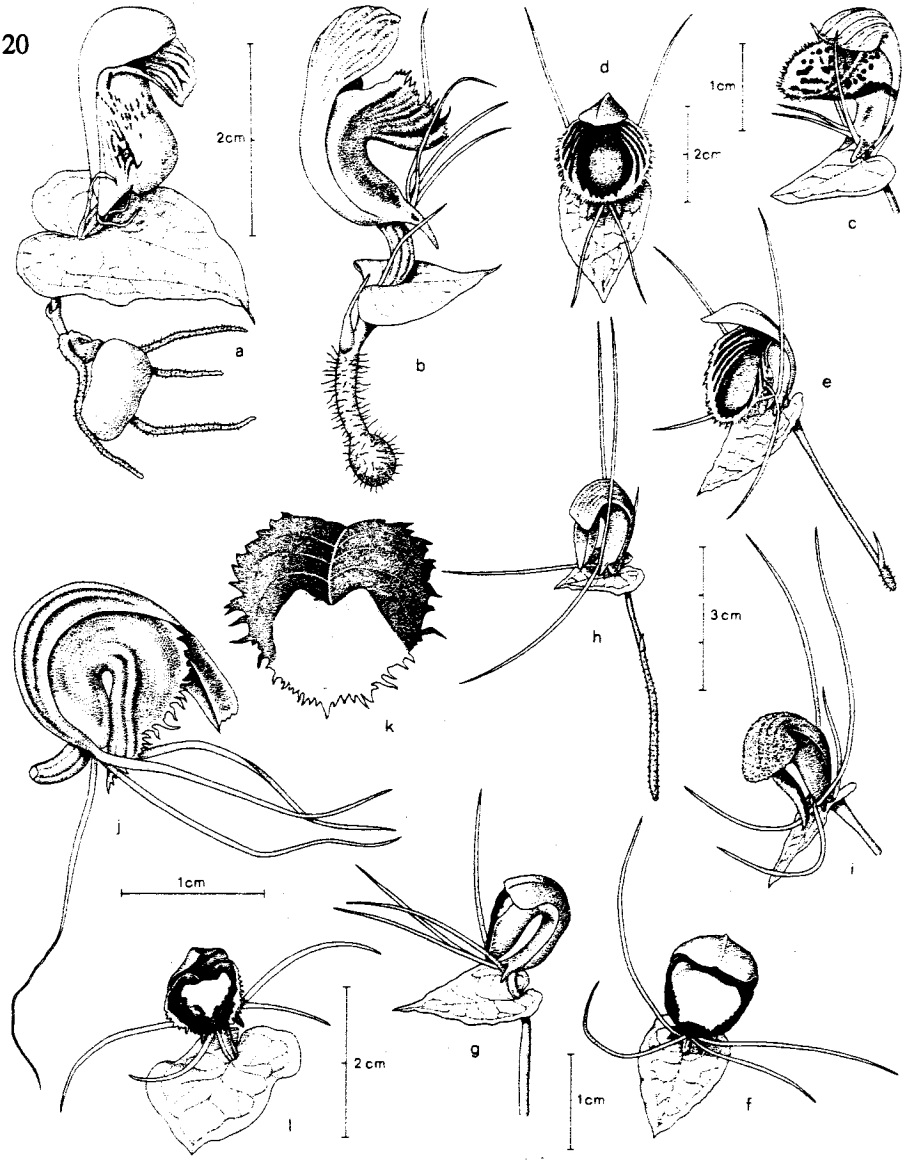


Fig. 50. *Corybas*, whole plants or flowers. a. *Corybas fornicatus* (Bl.) Reichb.f. b. *Corybas carinatus* (J.J. Sm.) Schltr., c. *Corybas calopeplos* J. Dransf. & G. Smith, d.-e. *Corybas holttumii* J. Dransf. & G. Smith, f.-g. *Corybas comptus* J. Dransf. & G. Smith, h. *Corybas ridleyanus* Schltr., i. *Corybas villosus* J. Dransf. & G. Smith, j.-k. *Corybas geminigibbus* J.J. Sm., l. *Corybas selangorensis* J. Dransf. & G. Smith. (After J. Dransf. *et al.* and J.J. Smith).

Close relations of New Zealand orchids

- a group of Malaysian *Corybas* beautifully illustrated by Gunnar Seidenfaden, from Seidenfaden G. and Wood J.J. *The orchids of peninsular Malaysia and Singapore*, Olsen and Olsen, Fredensborg, 1992. p118.

Australian notes

❀ John Donovan (ANOS Victorian *Bulletin* May 1993; p6) wrote (and who could disagree with him?) -

"Conservation, like peace, cannot be forced upon humanity. Laws cannot enforce it, power cannot enforce it. Conservation like peace awakens in the universal soul and in the individual personality.

"When it is found within, it is expressed in actions - in life. The expression affects, through thought, action, and deeds, the attitudes and motives of others and raises the consciousness of all....

"The visual joys of the newly opened living flower, the splash of the living whale, the flight and sound of the living bird - are we to lose these joys, these delights?....

"If our motives are selfless, are for the preservation, the conservation, of life forms then we can advance. Many heads are better than one, ideas are born of inspiration, they come from all sides and all sources. But a selfless motive means, often, compromise and patience and a steady growth."

THE SECOND AUSTRALASIAN NATIVE ORCHID SHOW
17-19 September 1993
at the University of Southern Queensland, Toowoomba.
Enquiries to the secretary, NOST, POB 2141, Toowoomba 4350.

Historical reprint

Pollination of *Spiranthes australis* Lindl.

by Edith Coleman (reprinted from *Victorian Naturalist* 1931; XLVII: 204-209; 1933; L: 61-65)

Edith Coleman continued R.D. FitzGerald's work on the pollination of Australian orchids, and published thirteen papers in *Victorian Naturalist* between 1927 and 1934. She was the first woman in Australia to publish the results of such work, and to describe and name orchids. Her Australian observations on the pollination of species common to both countries may not be true here - *Spiranthes sinensis* may (or may not) be common to both countries, and it appears to be predominantly self-pollinating here, according to Molloy (Chapter in *The NZ orchids: natural history and cultivation.* NZNOG, Dunedin, 1990).

POLLINATION OF *SPIRANTHES AUSTRALIS* Lindl.

BY EDITH COLEMAN.

In dealing with the pollination of *Spiranthes australis* one must go back to the time of Darwin, who, nearly a century ago laid a great stone in the foundation of our knowledge of the subject. Not all biologists are in accord with Darwin's purely mechanistic theory of evolution, but, as a result of his patient researches, certain facts bearing on the present paper have become firmly established, i.e., that crosses, either occasionally or perpetually, between individuals of the same species, are beneficial; that, in the case of plants, existing species have been evolved from more primitive forms, mainly through the intervention of insects, and that, as a consequence, we find in them the most elaborate precautions against self-pollination and the most ingenious contrivances to secure cross-pollination. To-day, in the words of Grant Allen, half the flora of the earth has taken the imprint of the dislikes and necessities of the ubiquitous insect.

As long ago as 1793 Sprengel had propounded the theory that a flower is a piece of mechanism for converting insects into pollinating agents. Many of his statements were afterwards verified by Darwin, who went further, and showed the benefits derived from cross-pollination, as a result of insect intervention (*Fertilisation of Orchids*).

It may here be explained that fertilisation and pollination are separate processes. Before a flower can be fertilised it must be pollinated with pollen from its own androecium or from that of another flower. Pollination, the transference of pollen to the stigma of a flower, does not necessarily connote fertilisation. Even though the pollen grains may germinate, and their tubes, penetrating the stigma, enter the micropyles of the ovules, fertilisation is not complete until the generative cell of the pollen grain has united with the oosphere of the ovum.

We know that Darwin modified some of his early views, but to-day the faithfulness of his researches is apparent to the student of Australian orchidaceae who studies his description of the pollination of *Spiranthes autumnalis* (*Fertilisation of Orchids*, p. 106). In spite of the geographical isolation of our only representative of the genus, Darwin's description of the pollinary mechanism in the European species, published nearly seventy years ago, might have been written to-day of *Spiranthes australis*. Though specific differences are recognised, so closely are the two species related that Darwin anticipated a similar mechanism in *Spiranthes australis*. Fitzgerald, who could find no trace in the Australian species of certain parts essential for the intervention of insects, was

of the opinion that *Spiranthes australis* is self-pollinated. In commenting upon this Darwin adds, "It would, however, be desirable to ascertain whether insects ever visit the flowers, which it may be presumed secrete nectar since glands are present, and any such insects should be examined to make certain that pollen does not adhere to some part of their bodies."

Dr. R. S. Rogers, in his interesting paper on *Spiranthes australis* (*Trans Royal Soc., of S.A.*, Vol. xlvi.), also notes the very great similarity of structure in the European and Australian species. He concludes, "Whether *Spiranthes australis* is self-pollinated or otherwise is a matter which cannot be regarded as settled."

In spite of an exceptional fertility, which one does not usually associate with insect-pollinated flowers, I hope to show that the Australian species is entirely dependent for pollination upon the intervention of insects and that self-pollination is not possible. Apart from its pollinary mechanism, so wonderfully adapted to facilitate insect-agency, with which I will presently deal, the observations on which I base my conclusions may be noted:—

1. Cut flowering spikes, in close bud, which were protected from either day or night-flying insects produced no capsules, and the pollinia of every flower remained *in situ*.

2. Cut spikes, with lower flowers fully open and tightly closed buds at the top, were also protected. To prevent confusion, these were separated with a white thread. The lower flowers (which opened under natural conditions) produced capsules; in a few of them the pollinia were removed. The top flowers (which opened under protection) produced no capsules.

3. Cut spikes, with tightly closed buds and no open flowers, were protected until the flowers were fully open. They were then exposed at night only. A few capsules were produced.

4. In many flowers, examined as growing under natural conditions, pollinia were found *in situ*. In others they were entirely absent.

5. Fresh pollen was noted on the stigmas of some flowers which had their own pollinia intact.

6. The pollinia were still intact in many flowers which had formed seed-capsules.

7. The presence of ants (on which no pollen was seen) and two large glands at the base of the labellum suggested the secretion of nectar, and dissection showed it to be persent.

8. On flowers of *Spiranthes australis* I have on three occasions taken a small bee bearing pollinia (identified by Mr. Rayment as one of the *Halictus*) and have frequently seen larger bees visiting the flowers.

These, however, did not work the flowers in the systematic manner which their spiral arrangement, as suggested by Darwin, might be expected to facilitate, nor were they in sufficient numbers to account satisfactorily for the large number of seed-capsules. In future papers I hope to show that certain orchids are pollinated by moths. From the presence of nectar, and the fact that the paler-coloured flowers appear more fertile than the darker ones, I think we may find that *Spiranthes australis* is more generally pollinated by night-flying insects than by bees. On this point, however, I write with no certainty. One would need to undertake fuller investigation, under natural conditions, to settle this satisfactorily.

Further, I conclude that the flowers of *Spiranthes australis* are protandrous, the androecium maturing considerably earlier than the gynœcium, and that the oldest flowers are pollinated with pollen from younger flowers. Experimenting with freshly opened flowers, I found that the pollinia were readily removed, but like Fitzgerald, I experienced a difficulty in withdrawing them from older flowers, and when the pollinary mechanism was more closely examined the reason was apparent.

As in the European species, so faithfully described by Darwin, there is a prominent, split rostellum, with the narrow-elliptical disc, to which the pollinia are attached, lodged securely in its fork. The disc is covered with a transparent membrane through which a longitudinal furrow can be clearly seen. In young flowers the opening is very narrow: the horizontal column lies close to the labellum, both stigma and anther resting on its "keel," with the pollinia well forward, quite beyond reach of the stigma, thus avoiding self-pollination.

The rostellum lies so close to the labellum that, if at this stage a needle be inserted in the narrow opening, it cannot fail to touch the furrow of the disc, causing the instant rupture of its covering membrane. This may be clearly seen and the widening fissure may be followed along its whole length. The viscid disc now lies naked in the fork of the rostellum and the needle may be withdrawn, with the pollinia firmly glued to it by the rapidly drying viscid matter of the disc, leaving the membranous "prongs" of the forked rostellum fully exposed.

It will thus be seen that the pollinia of young flowers will be withdrawn without any possibility of touching the stigma. Should an insect, bearing pollinia, visit one of these young flowers, the pollinia could not enter the very narrow opening, but would be pushed backward, though the proboscis would almost certainly withdraw pollinia.

In many orchids we note either a movement of the column or labellum, or an altered angle in the position of the pollinia to ensure their removal and retention in the best position for deposition on the stigma of the next flower visited.

In *Spiranthes australis* the candicles of the pollinia go through no movement of depression, but remain as withdrawn, parallel with the needle. In the older flowers, however, the column itself rises and recedes from the labellum, thus deepening the opening into the flower. At the same time the wings of the clinandrium become dilated and exert pressure on the lobes of the labellum, thus widening the opening. These two mechanical processes have now enlarged the passage sufficiently to allow the entrance of any "visiting" pollinia, and, as the raised column has brought the stigma at right angles to the labellum, a needle, or proboscis, inserted in the now larger passage, will touch the stigmatic surface instead of the furrow of the disc. In this case there can be no rupture of the membrane covering the disc, consequently the pollinia, if present, are not released, but remain *in situ*. But, should the proboscis bear pollinia (which it must be remembered have not changed in position, but remain parallel with it) some of the pollen cannot fail to strike the stigma, which is now mature, and its viscid surface most tenacious.

Thus we see that from the position of the pollinia with regard to the stigma, self pollination is not possible in young flowers, even if male and female elements matured simultaneously; that a recently expanded flower, while parting readily with its pollinia, cannot be pollinated. It must wait until the passage between the labellum and column has become large enough to admit pollen withdrawn from a younger flower, at a period when its own stigma is mature, and its viscid secretion sufficiently tenacious to hold the pollen. As we find many of the older flowers with their pollinia removed it may safely be assumed that they were withdrawn at an earlier stage, and that any fresh pollen on their stigmas has been brought from younger flowers.

The pollination of *Spiranthes australis* is thus seen to depend upon:—

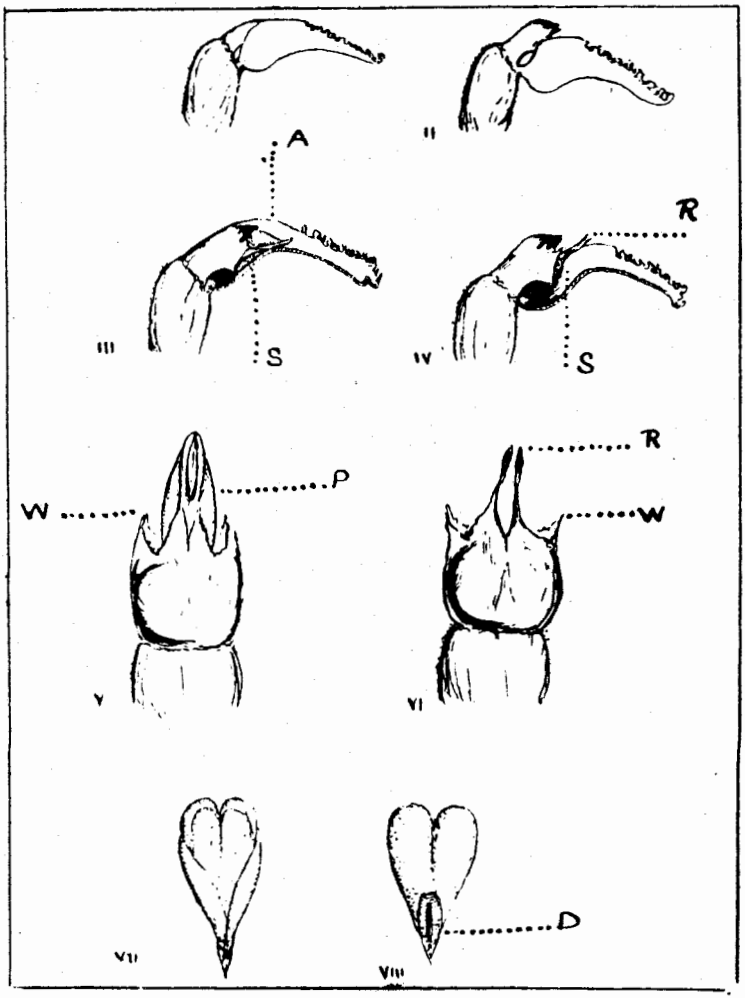
1. The narrow opening in young flowers.

2. The rising column and the pressure exerted by the widening wings of the clinandrium, which enlarge the passage in the older flowers, at the same time bringing the stigma at right angles to the labellum.

3. The horizontal position of pollinia brought from young flowers, which cannot fail to touch the stigma of the older flower which lies directly in front of them.

All of this I think shows that *Spiranthes australis* is as wonderfully adapted for cross-pollination as the European species, and that its pollinary mechanism, in all essential points, agrees with that so beautifully described by Darwin seventy years ago.

Though Fitzgerald stated that he could find no trace of a rostellum, his illustrations of the column of the New South Wales species (Figs. 1, 3, and 7) show what appears to be a rostellum



Column, labellum and pollinia of *Spiranthes australis* Lindl. (all much enlarged).

—an upright prolongation of the third of the confluent stigmas. It is possible that he dealt with a different species, as Dr. Rogers suggests, though the perianth segments, foliage and root system of the plant he depicts agree with some specimens of our Victorian species, many of which show extreme departure from type, not warranting separation without an undue multiplication of species and varieties.

KEY TO ILLUSTRATIONS.

Fig. I.—Showing position of column and labellum in young flower.

Fig. II.—Position of column and labellum in older flower.

Fig. III.—Column and half labellum of young flower. Half the labellum along its whole length has been removed to show the position of stigma and anther which rest on "keel" of labellum. The rostellum lies so close to the labellum that the passage is too small for anything larger than a needle (or proboscis) to enter, and this must necessarily touch the furrow on the disc.

Fig. IV.—Older flower with half labellum removed lengthwise, showing the raised column, with the stigma at right angles to the labellum, and the greatly enlarged passage. The pollinia have been removed and the "fork" of the split rostellum is shown.

Fig. V.—Front view of column showing position of the pollinia with the "boat-shaped" disc "seating" in the forked rostellum. The longitudinal furrow of the disc is seen through the transparent, membranous, capsule which covers it (young flower).

Fig. VI.—The furrow of the disc has been touched with a needle and the covering membrane ruptured, allowing the withdrawal of the disc with pollinia attached. The forked rostellum, into which the disc fitted, is now more clearly seen, also the dilated wings of the clinandruim.

Fig. VII.—Posterior view of pollinia.

Fig. VIII.—Anterior view of pollinia showing disc and furrow.

(All much enlarged.)

FURTHER NOTES ON THE POLLINATION OF *SPIRANTHES SINENSIS* (PERS.) AMES

By Edith Coleman

It has been shown (*Victorian Naturalist,* April, 1931) that *Spiranthes sinensis* (australis) is wonderfully adapted to facilitate pollination of the most beneficial type, for as anther and stigma mature at different periods, an interchange of pollen between flowers of individual plants is assured.

In the same paper I mentioned having taken, on three occasions, a small bee bearing pollinia which had been withdrawn from flowers of *Spiranthes sinensis.* The bee was identified by Mr. T. Rayment as an *Halictus* sp.

In January of this year I again witnessed visits of this bee to *Spiranthes,* but was not successful in capturing them. I did, however, take four honey-bees (identified by Mr. H. Hacker as *Apis mellifera*), all of which carried pollinia. One of these is figured in the accompanying illustration, drawn by Mr. E. Jarvis. It bore five complete pollinaria attached to the basal maxillary portion of its proboscis. In Fig. C four of these are shown protruding from the oral cavity.

Mr. Jarvis tells me that the honey bee, *Apis mellifera,* does not belong to any definite race, but there are hybrids between the Italian and black bees. A pure bred Italian bee has at least three yellow bands, while the pure Ligurian bee is buff, or leather-coloured, without any bands. The specimen illustrated is very beautifully and symmetrically banded.

I had previously received from Miss J. Henderson, of Holbrook, New South Wales, a specimen which confirmed my opinion that there are no structural differences between the Victorian and southern New South Wales forms of *Spiranthes sinensis,* and that one might expect them to be pollinated by the same insects. I wrote to Miss Henderson, asking her to keep her plants under observation, and, if possible, to capture any visiting insects.

To my very great pleasure she responded shortly afterwards with a small bee bearing six complete pollinaria attached to its proboscis, taken, by a strange coincidence, on the same day when I had observed two of the *Halictus* sp. visiting our Healesville patches of *Spiranthes.* Four out of five flowers on the spike enclosed with Miss Henderson's bee, had their pollinaria removed. A portion of a pollinium adhered to one stigma. In the fifth flower the pollinia were intact.

Miss Henderson wrote (January 10): "I am sending you the only insect I have seen visiting *Spiranthes.* It darted to the flower without a moment's hesitation, and put its proboscis into it. There are several dozen of the orchids growing closely together. The whole patch is not more than two to three yards square. The only

Spiranthes sinensis (Pers.) Ames

other *Spiranthes* I have seen were two or three growing in a soak on another bank. They do not seem to be very common here. I hope I have found the right insect for you."

Although Miss Henderson's insect was not the bee I expected to see, it gave me an even pleasanter surprise, for, in the yellow pollinia, it bore evidence that there are at least three species of bee engaged in pollinating our Australian *Spiranthes*.

Miss Henderson's bee was identified by Mr. H. Hacker as *Coclioxys albolineata* Cockerell. Fig. F on the plate.

Mr. Jarvis tells me that this species has been collected at Mackay, Kuranda and Brisbane. All the members of *Coelioxys* are parasitic on species of *Megachile*.

Unfortunately, over-damp conditions, during their transit to Queensland, had caused a fungus to develop on the bees. The mycelium had spread over portions of the body and the ventral surface of the head. In removing the fungus the form of the pollen-mass was lost and is only indicated in Figs. D and E. The glands, however, remained intact on the proboscis (Fig. G) and are, I think, further evidence that the best type of cross-pollination is secured, for, were the bee to visit flower after flower on the same spike, removing the pollinia from each, one might reasonably expect to find on a stigma, or some other segment of the flower, an occasional pollinarium (this includes the gland), which, owing to the closeness of the visits, had been rubbed off a proboscis before the gland had set.

This I have never seen. The pollinia are always detached from the gland when deposited. The swiftness of Miss Henderson's bee agrees with that of the *Halictus* sp. which I have taken in two widely separated localities. The larger bee, on the other hand, works the flowers in a less hurried manner, and one has no difficulty in taking it. I have even seen two of them on the same flowering spike. In Healesville we noticed that they ignored the abundant flowers of Austral Centaury (*Erythraea australis*), which are of the same colouring as *Spiranthes*.

From the large percentage of pollen-removals it seems strange that the bees are not more often seen. I have sat among hundreds of flowering plants, only to witness three visits within an hour. This suggests either that one bee is responsible for the pollination of many flowers, or that the bees work at a time when few botanists are afield.

I noted that the bees do not visit the flowers in the spiral manner one might anticipate from their arrangement on the spike. In observing the pollination of another orchid I accidentally stumbled on the fact that the visits of the insects were made in the very early morning hours. This year I have seen *Apis mellifera* working in the garden before 7 a.m., even on cold, dull mornings.

As one or two capsules were set on spikes of *Spiranthes* which I exposed at night only, I assumed that they had been visited by night-flying insects, but I think I may safely say that these, too, were pollinated by bees in the early hours, for I did not think it necessary to protect the flowers until 6.30 each morning.

It is interesting to compare the pollinary mechanism in *Spiranthes* with that of other orchids, in many of which one notes an altered angle in the position of the pollinia after removal, due to the contraction, in drying, of either caudicle or gland.

This depression of the pollinia facilitates their reception on the stigma of the next flower visited. (*Victorian Naturalist*, April, 1931, for illustration.)

In *Spiranthes* the pollinia undergo no movement of depression, but remain, as withdrawn, parallel with the proboscis of the bee. A receding and rising movement of the column, in older flowers, brings the stigma into the receptive position. This receding of the column from the labellum is the most remarkable feature in the pollinary mechanism of *Spiranthes*. It enlarges the passage into older flowers to allow the insertion of "visiting" pollen—withdrawn from younger flowers.

Only in a young flower can the pollinia be readily withdrawn, and this is beautifully performed without any possibility of their touching its own stigma: for, at this stage, the column is horizontal, and lies close to the labellum, with both stigma and anther resting on its keel, and the pollinia well forward, quite beyond reach of the stigma. To ensure pollination, pollinia withdrawn from a young flower must be carried to an older one, in which the receded column has enlarged the opening sufficiently to allow their entrance.

Nature shuns monotony as consistently as she is said to abhor a vacuum. Nor does she permit us to lose our curiosity by discovering all of her secrets. By withholding something to reward our eagerness round each bend in the road she keeps us ever seeking.

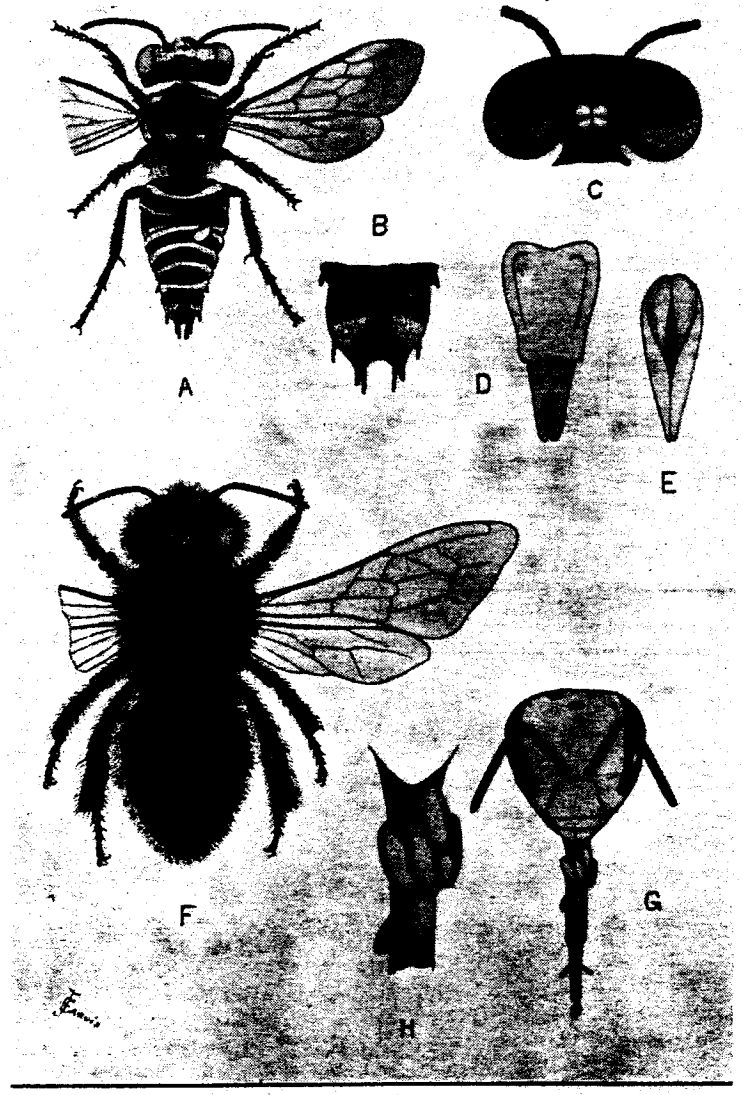
And so, to-day, we find the pollinia of orchids removed on the head, or the end of an insect's abdomen, or, as in the present instance, on its proboscis. To-morrow . . . what may we find?

I am greatly indebted to Miss Henderson for the interesting specimen of *Coelioxys*: to Mr. H. Hacker for identifying the specimens, and to Mr. E. Jarvis, who so kindly supplied the beautiful plate.

EXPLANATION OF PLATE

A. ***Apis mellifera*** Lin. × 5.
B. Dorsal view of anal segment of same. × 15.
C. Ventral aspect of head of same, showing pollinaria in oral cavity. × 11.
D. Anterior view of pollinaria. × 25.

E. Posterior view of same. × 25.
F. *Coelioxys albolineata* Cockerell. × 5.
G. Face and proboscis of same, showing pollen discs. × 9.
H. Maxillary portion of proboscis with viscid discs adhering. × 20.



Two Pollinating Agents of *Spiranthes sinensis* (Pers.) Ames

Printed at the Wellington School of Medicine