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Appendix 1. Wild records of liquidambar

Auckland Region
AK 231349, Auckland City, Mt Albert, *P J de Lange 3251*, 12 Feb 1997, seedlings adjacent to a large adult (Figure 1);
AK 245592, Auckland, Waikumete Cemetery, *P J de Lange 4278*, 2 Feb 2000, ×1 seedling, adult 30m away;
AK 251449, Auckland City, Wakefield Street, *P J de Lange 4295*, 14 Feb 2000, ×1 seedling, adults adjacent;
AK 284809, Auckland, Waikumete Cemetery, *E K Cameron 12279*, 30 Jan 2004, ×1 1.4m sapling, adults adjacent;
AK 284882, Auckland City, Epsom, *E K Cameron 12279*, 8 Feb 2004, ×3 seedlings, adults 20m away;
AK 284969, Auckland, north Henderson (Lincolin), *E K Cameron 12284*, 14 Feb 2004, ×1 seedling under adult, another adult close by;
AK 285546, Auckland, Henderson, Alderman Drive, *E K Cameron 12317*, 14 Feb 2004, frequent seedlings under a row of adults (Figure 3).

Waikato Region
AK 285421, Hamilton City, Hamilton East, *P J de Lange 5899*, 21 Feb 2004, abundant seedlings, adults adjacent.

Bay of Plenty Region
AK 251539, Te Puke, *E K Cameron 10326 & D B Rogan*, 5 Dec 2000, seedlings to 0.7m tall, adults 20m away on other side of road.

Notes towards an Excursion Flora: *Rubus* (Rosaceae), the bush-lawyers

Rhys Gardner

Introduction

Not much interest has been taken in our bush-lawyers since the days of Cockayne (1910) and Allan (1927, 1928), and perhaps rightly so — Nancy Adams' artwork is all that is needed to identify these five good species outdoors (Poole & Adams 1964). But the Flora NZ descriptions (Allan 1961; Webb et al. 1988) need improving, and a start is made on this here utilizing published data (Sampson & McLean 1965; Webb & Simpson 2001) and some notes of my own.

The odd man out of the five is *Rubus parvus*, a large-flowered, bisexual, mat-forming plant of river-valley gravels in the western South Island. Wardle (1991) asserted a lianoid ancestry for *R. parvus*, but in habit, form of the prickles, bisexuality and other features it more nearly resembles small shrubby plants like *R. fernandi-muelleri* of montane New Guinea (van Royen 1969).

So, the synopsis below first distinguishes *R. parvus* from *R. australis*, *R. cissoides*, *R. schmidelioides* and *R. squarrosus*. Then these four, and also the frequently cultivated hybrid, *R.* x*barkeri* (supposedly *R. australis* x *R. parvus*) are keyed out. Newly recorded features are concentrated on, and some information has been omitted, notably the details of the indument. This in general consists of simple pointed hairs and sessile or stalked gland-hairs. Our species are glabrescent on most parts so for their full description new growth is required. Such knowledge might help solve what remains the most vexing alpha-taxonomic problem, of deciding whether a piece of foliage (particularly juvenile) is hybrid or not.

Having examined only the material in AK herbarium I have not been able to refine the Flora NZ distributions. Except for *R. parvus* each species is said to be found on all our three main islands, but their regions of greatest abundance are not clear to me. The most sporadically distributed is the leafless lawyer, *R. squarrosus*, which would appear to be most frequent in rocky places in the lowlands of the eastern South Island. It is found locally in northern New Zealand, for example around the Hokianga, Whangarei and Kaipara Harbours, but is unknown in the Waitakeres. Likewise, *R. schmidelioides* is uncommon in the north (Mangakahia Valley; Hikurangi Swamp), although there is a Cheeseman collection from the Auckland Domain (wild or cultivated ?) and another made by Carse from Mauku.

Unpublished chromosome counts by Peter de Lange (pers. comm.) are $2n=28$ for all five species; the chromosomes are very small but there must be karyotype differences otherwise why would *R.* x*barkeri* be sterile?

Synopsis

Relatively small prostrate creeping plants, stems rooting at nodes; flowers bisexual. Stipules constantly present, linear-lanceolate, sometimes slightly foliose. Prickles straight. Leaves apparently simple, margins dentate-serrate, lateral veins spreading at almost right angles to midrib, domatia lacking, midrib armed below; petiole broadly channelled above, rarely armed. Inflorescence of a solitary flower or a cymose pair, axes rarely armed. Sepals ± acuminate to a glabrous flattened or slightly foliose tip (cf. Connor & Penny 1960), reflexed in fruit. Petals white, relatively large

(to 1 cm long). Stigma minute, at x 20 magn. appearing punctate and non-papillose. Ripe fruit ovate, c. 10 x 7 mm (dry state). Endocarp ("seed") reticulate on flanks.....***Rubus parvus***

Climbers, sometimes bushy but not suckering and stems not (or rarely ?) rooting at nodes; flowers unisexual (rarely with organs of the other sex; Moore 1975), the spp. dioecious. Stipules sporadically to regularly present, linear, entire. Prickles curved. Leaves mostly 3- or 5-foliolate, sometimes in *R. squarrosus* reduced to a single leaflet (articulation never apparent) or to a midrib only, margins serrate(-lacerate), lateral veins in adult foliage mostly spreading at c. 45 deg. to midrib, shallow pocket-domatia often present in the axes of the lateral veins and against the basal margins (Sampson & McLean 1965) but occasionally only recognizable by their greater density of hairs, midrib armed below or not. Inflorescence a panicle, axes armed (*R. australis*, *R. schmidelioides*) or not. Sepals obtuse, reflexed in fruit or not. Petals white, or (*R. squarrosus*) yellowish. Stigma relatively large, obliquely capitate with a ventral cleft. Ripe fruit globose, c. 5 mm diam. (dry). Endocarp ("seed") rugose on flanks.....
.....***Rubus australis***, etc.

Key to adult material of native *Rubus* species

Various features of these plants are illustrated in Figs. 1, 2 & 3.

Juvenile plants are thinner-leaved than adults so the leaf-texture characters do not work for them. Their leaves have generally the same shape and toothing as in the adult but may be much narrower *(R. cissoides*, sometimes at least) or broader (*R. schmidelioides*). Juveniles of *R. australis*, and to a lesser degree of *R. schmidelioides*, are distinctive in having a rather persistent indument of relatively long (0.5 mm) and straight, almost bristly, hairs on their stems and leaves.

1 Prostrate mat-forming plants; leaves simple to trifoliolate, margins dentate or serrate-dentate; domatia lacking **2**

Lianes or bushy scramblers; leaves mostly 3- or 5-foliolate, sometimes simple (but never in *R. australis*), or in *R. squarrosus* consisting only of petiole and petiolules, margins ± serrate; prickles curved; domatia often present **3**

2 Leaves simple, almost linear, ± dentate, the teeth c. 2 mm long and spaced 2 mm apart; prickles straight; flowering and seed-set regular.....***R. parvus***

Leaves trifoliolate (rarely simple?), the leaflets lanceolate, ± serrate-dentate; prickles curved; flowering and seed-set irregular (usually absent ?).....***R.*** x***barkeri***

3 Leaflets broadly ovate, to c. 6.5 x 4.5 cm, subcoriaceous, glabrescent, dull above and with the venation slightly sunken, lower surface with the lateral veins and intercostals slightly raised but the finer venation hardly so, margins drying ± flat and coarsely serrate with c. 6 teeth per side; petiole and petiolules terete; stipules usually lacking, to c. 1 mm long if present (newest growth); pedicel-calyx junction in both sexes swollen and rugose; calyx reflexed in fruit; endocarp relatively large, mostly 3 mm or more long, with 3 well-defined dorsal ridges.....***R. australis***

Leaflets ovate to narrow-ovate or linear; stipules regularly present (but soon lost), usually 3-7 mm long; pedicel-calyx junction not swollen and rugose; calyx reflexed in fruit (*R. cissoides*) or not; endocarp less than 3 mm long, usually with only 1 well-defined dorsal ridge.....**4**

4 Leaflets lanceolate to ovate, to c. 15 x 3(-6) cm, subcoriaceous, upper surface somewhat glossy and venation usually weakly sunken, lower surface with the laterals, intercostals and even much of the finest venation slightly raised, glabrescent, the margins drying ± flat and ± closely serrate (usually more than 10 teeth per side), teeth sometimes almost pungent; petiole and petiolules terete.....***R. cissoides***

Leaflets relatively dull above, finer venation on lower surface mostly level or weakly sunken; margins relatively distantly serrate (c. 3-9 teeth per side), teeth not pungent.....**5**

5 Indument of weak hairs persistent on leaflet undersurface (which in dried material sometimes also has a glaucous appearance, though not waxy); numerous small red prickles persistent on stems and all leaf and inflorescence axes; leaves 3- or 5-foliolate; leaflets lanceolate to ovate, to c. 5.5 x 2.5 cm, chartaceous, upper surface dull to slightly glossy and venation strongly sunken, margins drying strongly recurved, midrib usually armed; petiole and petiolules terete.....***R. schmidelioides***

Indument soon lost from leaflet undersurface (and from rest of plant), prickles relatively large, yellow; leaves usually 3-foliolate, the leaflet blade sometimes (in exposed sites at least) reduced to a broad-ovate laciniate flap or completely lacking, where present ovate, to c. 8 x 3 cm, coriaceous, dull above with venation hardly sunken, margins drying flat, midrib not armed; petiole and petiolules with a narrow (sometimes occluded) adaxial groove.....***R. squarrosus***

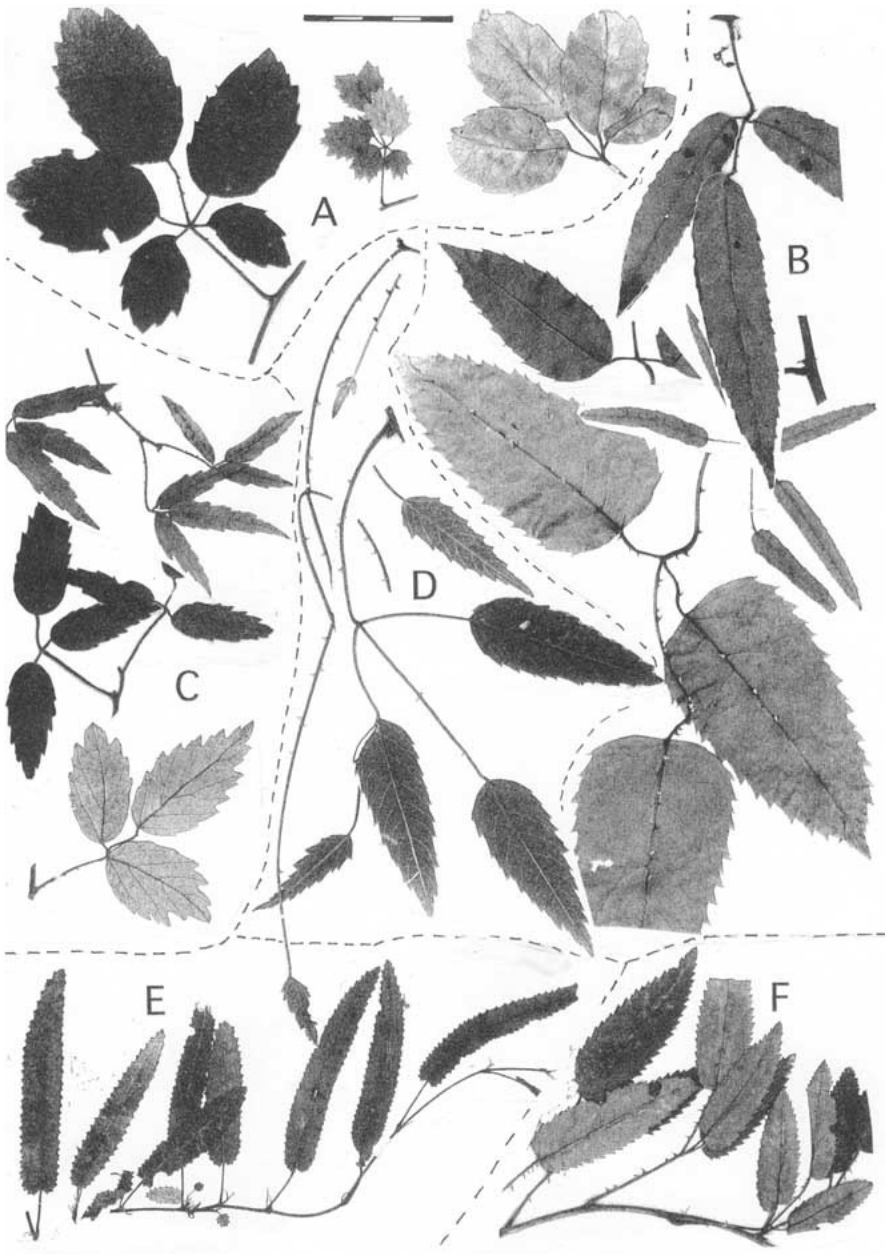

Figure 1. A clutch of lawyers: leaf shapes of *Rubus* spp. From AK specimens. Scale bar (top centre)=5 cm.

A. *R. australis*.
B. *R. cissoides*.
C. *R. schmidelioides*
D. *R. squarrosus*.
E. *R. parvus*.
F. *R.* x *barkeri*.

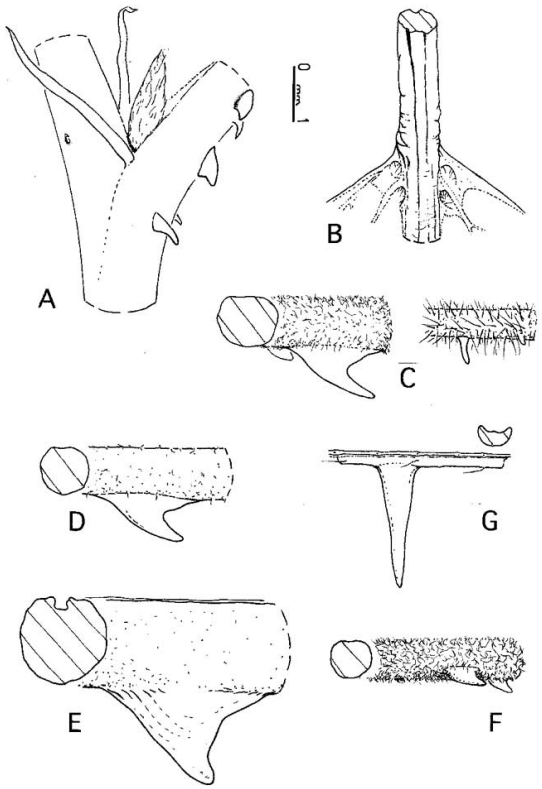

Figure 2. Various features of *Rubus* spp. Scale bar=1 mm.

A. *Rubus schmidelioides*. Node with a pair of stipules, narrow bud with woolly-silky hairs, thorns on midrib underside and stem.

B. *R. squarrosus*. Base of leaflet, underside. Domatia in the axils of the basal nerves and against the leaf base itself, as shallow pockets with some fringing hairs.

***Rubus* spp. Young petioles showing shape in cross-section, indument and thorns. Petiole apex to left, adaxial surface up.**

C. *R. australis*. Left, adult foliage; right, juvenile foliage, showing bristly hairs and small, almost straight thorns.
D. *R. cissoides*.
E. *R. squarrosus*. Showing midrib's narrow adaxial groove.
F. *R. schmidelioides*.
G. *Rubus parvus*. TLS of leaf, showing long straight thorn on midrib below. Upper right, TS of petiole, showing broad adaxial groove.

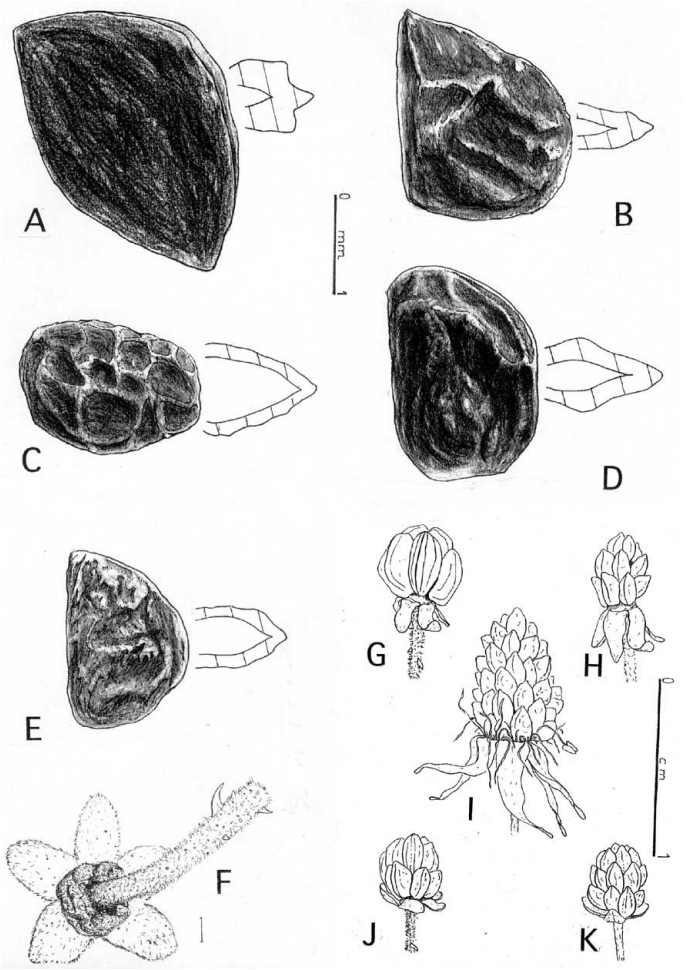

Figure 3. Seeds, flower and fruits of *Rubus* spp.

A-E. Seeds of *Rubus* in side view, and with outline of median TS. Scale bar=1 mm.
A. *R. australis*.
B. *R. cissoides*.
C. *R. parvus*.
D. *R. schmidelioides*.
E. *R. squarrosus*.

F. *R. australis*. Flower from below, showing swellings at base of sepals. Scale bar= 1 mm.

Ripe fruits of *Rubus*, showing sepals reflexed or not. Scale bar=1cm.
G. *R. australis*.
H. *R. cissoides*.
I. *R. parvus* (note remains of stamens).
J. *R. schmidelioides*.
K. *R. squarrosus*.

Acknowledgement
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Habitat, habitat, habitat: Titirangi border home for *Drymoanthus adversus* (Orchidaceae)

Rhys Gardner

In forest on the east side of the Big Muddy estuary, in a spot warmed only by the mid-afternoon sun, this little epiphyte is growing in fair abundance on the trunks of two shoreline trees.

The species is plentiful enough north and south of Auckland, for example at Maunganui Bluff and in the Hunua Ranges, but for the Waitakere Ranges I know of only one previous collection (AK, Hatch, 1945, "Laingholm") and the sighting of it on fallen branches of an old kahikatea (*Dacrycarpus dacrydioides*) near the Cascades (Jones 1994).