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## Notes on *Hibbertia* (Dilleniaceae) 8. Seven new species, a new combination and four new subspecies from subgen. *Hemistemma*, mainly from the central coast of New South Wales

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### Abstract

Increased collections from the *Hibbertia*-rich vicinity of Sydney, New South Wales, prompted a survey of rarer species to publicise the need for more information ahead of the rapid urban spread. Many of these species were previously misunderstood or are listed as rare and endangered.

Thirteen new taxa (in bold) are described and discussed in context with the following seventeen taxa within seven different species groups: 1. *H. acicularis* group: ***H. woronorana*** Toelken; 2. *H. humifusa* group: ***H. fumana*** Toelken; 3. *H. pedunculata* group: ***H. intermedia*** (DC.) Toelken; 4. *H. rufa* group: ***H. pilifera*** Toelken, ***H. pustulata*** Toelken, *H. rufa* N.A. Wakef., ***H. surcularis*** Toelken; 5. *H. sericea* group: *H. puberula* subsp. *puberula*, – subsp. ***extensa*** R.T. Mill. and – subsp. ***glabrescens*** Toelken; 6. *H. stricta* group: *H. cistiflora* N.A. Wakef. subsp. *cistiflora*, – subsp. ***quadristaminea*** Toelken, ***H. oxycraspedota*** Toelken & R.T. Mill., *H. stricta* (R.Br. ex DC.) F. Muell. subsp. *stricta*, – subsp. ***furcatula*** Toelken, ***H. sulcinervis*** Toelken; 7. *H. strigosa* group: ***H. strigosa*** Toelken.

**Keywords:** Dilleniaceae, *Hibbertia*, nomenclature, revision, taxonomy, eastern Australia.

### Introduction

Bentham's treatment of *Hibbertia* for *Flora Australiensis* in 1863 cannot provide adequate answers for the many collections accumulated since. Collectors are now also more aware of varying forms in different environments and this is apparent from many newer collections. Some of these distinct taxa had already been recognised by N.A. Wakefield in Victoria and R.D. Hoogland generally in Australia, but only fragments of this information have been published due to their untimely deaths.

It would be preferable to revise the genus in individual species groups in order to achieve a more coherent phylogenetic approach, but increasing demand for names and identification tools of *Hibbertia*, especially near fast developing cities such as Sydney, drives this paper. A number of old and recently collected species were selected for this publication to show that inadequate knowledge of the taxonomy of species of *Hibbertia* is widespread in most groups of the genus, even in, for instance, this botanically well-known region, where most of the early exploration started.

Old names and new taxa are both considered alike. The two species *H. fumana* and *H. intermedia*, which are based on specimens collected about two hundred

years ago, deserve fuller recognition and, in the case of *H. fumana*, this paper hopefully will help to rediscover plants in the wild, as the species has not been recorded since Sieber's collection in 1820s.

The paper also explores the morphological variation in *Hibbertia* of the Sydney region in order to demonstrate how many forms, at present relegated to variations of previously described species, can clearly be delineated and segregated, often as infraspecific taxa. Usually only one species per group was considered (Tab. 1), except where a wider sample was needed to present the new taxa in their wider context, as in the case of the *H. puberula*, *H. rufa* and *H. stricta* groups. A number of species-groups are also here introduced to create awareness of possible subdivisions of, for instance, Bentham's *H. stricta* supercomplex that was (and is) still maintained by subsequent authors. They allow a provisional structuring of the species into groups (Tab. 1), although these groups still require more ongoing research into the eastern Australian species of *Hibbertia*.

Some of the new species are, however, described on the basis of very few specimens and more information of their distribution and range of variation would greatly assist to better understand and clearer delimit these taxa, i.e. species limits might need further adjusting as well, as more material and information becomes available.



A good example of this is the new extensive treatment of the *H. puberula* complex, which was previously described on the basis of few specimens (Toelken 2000). It seemed for a time that the species complex was possibly extinct, because no more plants could be found at known localities. Not only has its taxonomy changed to include two subspecies, but its range has been extended from an apparently coastal species of Sydney to inland localities from Wollemi to Morton National Parks. Numerous specimens of this species are purposely cited here, not only to underpin the taxonomy and increased knowledge of the species, but also to demonstrate the importance of small parks and reserves as refuges for native species in a time of rapid urban spread. Nobody knew that the plants occurred there and only interested volunteers, who have changed and are constantly further changing our knowledge of their variation and distribution, have made it possible that the taxonomy of the *H. puberula* complex is presented in this paper.

In order to put these often rare species into perspective with known species or species-groups a few taxa were included, which do not occur in the immediate vicinity of Sydney. It is thus hoped that this paper will generally encourage more discerning collecting of *Hibbertia* specimens everywhere.

The species-groups, species and subspecies are all alphabetically arranged. The terminology is similar to that used in previous publications and described in detail in Toelken (2010b). This paper is based on herbarium material. Funds for detailed field work were not available. The conservation status of these taxa will require further assessment. For information purposes and to aid this assessment, the frequency as reported by collectors is provided after the descriptions.

### 1. *H. acicularis* (Labill.) F.Muell. group

This species-group is characterized by awned leaves and stalked flowers; its species occur in a wide range of habitats of eastern Australia from Queensland to Tasmania. There are about 18 species in the group and some are extremely localised endemics. They are often restricted to a mountain range or even a single mountain in an 'inselberg' distribution on the eastern and western slopes of the Great Divide. *Hibbertia woronorana* is, for instance, localized to the Woronora River, south of Sydney.

The position of the bract along the flower stalk varies between and within species, so that it cannot be compared to the peduncle in the *H. cistoidea* (Hook.) C.T.White group (Toelken, in prep.), as the flower stalk consists of the penultimate and ultimate internodes (cf. *H. australis* N.A.Wakef. group, in Toelken 2010b). However, in view of the variation of the position of the primary bract, it proved convenient to use measurements of the whole flower stalk (cf. *H. rufa* N.A.Wakef. group, below).

### *Hibbertia woronorana* Toelken, sp. nov.

*Hibbertiae aciculari* (Labill.) F.Muell. *similis sed ramis foliis et calicibus glabris, foliis patentibus brevioribus (5.3–11.3 mm longis), calicibus brevioribus (3.7–4.3 mm longis) differt.*

**Typus:** New South Wales: Woronora River at Heathcote Bridge, R.D.Hoogland 12257 (holo.: MEL; iso.: CANB, K, L, NSW, US – n.v.).

*H. acicularis* auct. non (Labill.) F.Muell.: A.A.Hamilton, Proc. Linn. Soc. New South Wales 40: 628 (1915), as per specimens from Woronora River.

Much-branched shrublets up to 1 m tall, with stiff-woody main branches and stems; distal branches wiry and with decurrent leaf bases, purplish-red, glabrous. *Vestiture* absent except for short tufts in leaf axils and short erect to antrorse simple hairs on the ovary. *Leaves* without or with sparse short axillary (intrapetiolar) tuft of hairs (up to 0.15 mm long) usually hidden by appressed petiole; *petiole* 0.2–0.5 (–0.7) mm long, ± dorsiventrally compressed; *lamina* linear-lanceolate to linear when revolute margins are strongly recurved, (5.3–) 7.0–9.0 (–11.3) × (0.45–) 0.6–0.7 (–0.85) mm, with apex drawn into terminal bristle 0.2–0.6 (–0.85) mm long, abruptly constricted into petiole, above ± flat, below with strongly revolute margins and broader, usually deeply recessed, central vein but the undersurface not visible between them, spreading, often at right angles to stems, glabrous. *Flowers* single, terminal, becoming ± leaf-opposed mainly along main shoots; flower stalk thread-like, (8.8–) 11–13 (–14.7) mm long, with bract on upper third, recurved in bud and in fruit; *buds* narrowly ovoid; *bracts* linear, rarely linear-triangular, 0.6–0.8 (–1.1) × 0.1–0.2 mm, acute or with short bristle, with central vein scarcely visible, glabrous. *Calyx* scarcely accrescent; *outer calyx lobes* narrowly oblong to oblong-elliptic, (3.8–) 4.0–4.3 × 1.2–1.5 mm, rarely slightly shorter than inner ones, acute, without central ridge, glabrous; *inner calyx lobes* oblong-ovate to oblong-elliptic, (3.7–) 4.0–4.3 × 2.2–2.7 mm, abruptly constricted into shortly acute apex, without central ridge, glabrous. *Petals* oblanceolate to oblong-oblanceolate, (3.3–) 3.9–5.0 (–5.4) mm long, emarginate, rarely bilobed. *Stamens* (4) 5 or 6; *filaments* 1.0–1.2 mm long, up to lower third connate; *anthers* narrowly obloid, 1.25–1.4 mm long, abruptly constricted above and below. *Pistils* 2; *ovary* obovoid, tomentose to pubescent, with 2 (–4) ovules, scarcely laterally compressed with style attached to upper edge next to stamens, then straight erect upwards on either side of stamen cluster placing the fine stigma well above the apex of the anthers. *Fruit* usually puberulous. *Seed* unknown. *Flowering:* September–December. **Fig. 1A–C.**

*Distribution and ecology.* Restricted to the mid and lower reaches of the Woronora River, New South Wales (CC). Growing on rocky sandstone slopes in sclerophyll forest comprised of *Angophora costata*, *Corymbia gummifera*, *Eucalyptus punctata* and stringybark sp. in association with *Allocasuarina littoralis*, *Doryanthes*

*excelsa*, *Banksia serrata*, *Dodonaea triquetra*, *Platysace linearifolia*, *Epacris pulchella*, *Hakea dactyloides*, *Grevillea buxifolia*, *Grevillea diffusa*, *Acacia linifolia*, *Xanthosia tridentifera*; in the Dingo Tunnel vicinity and fluvial deposits such as deep sandy bars with *Angophora costata*, *Corymbia gummifera*, *Eucalyptus punctata* on slopes and in association with *Stenocarpus salignus*, *Grevillea longifolia*, *Hakea dactyloides*, *Persoonia levis*, *Stylidium laricifolium*, *Dodonaea triquetra*, *Grevillea diffusa*, *Doryanthes excelsa*, *Platysace linearifolia*, *Pultenaea flexilis*, *Grevillea mucronulata*, *Lepidosperma laterale*, *Dampiera purpurea*, *D. stricta*, *Astroloma pinifolius*, *Xanthosia pilosa*, *X. tridentifera*, *Hypolaena fastigata* in the Broula Pool vicinity and infrequently sandy loam soils of levee banks.

**Conservation status.** Highly restricted small localised populations within Heathcote National Park though locally common at some sites (R.T.Miller & J.Miller 69/18.iii.2007). Extremely vulnerable to disturbances, rare and possibly endangered downstream of the Needles (R.T.Miller & J.Miller 11/1.xi.2008). It could not be relocated in the Como vicinity (R.T. Miller, pers. obs.).

**Diagnostic features.** *Hibbertia woronorana* is superficially very similar to *H. acicularis*, but the whole plant, including the calyx, is glabrous. The shorter leaves are spreading at about right angles to the branches, the calyx is only 3.7–4.3 mm long and anthers are 1.25–1.4 mm long.

**Variation.** The bract does not subtend the calyx, but is usually found in the upper third of the flower stalk. Its position on the stalk varies considerably, even sometimes on the same plant.

Although the filaments are usually connate in the lower third, some were observed to be fused up to two-thirds on some plants. Since this species has 4–6 stamens of subequal length, it seems likely that *H. woronorana* has the same pollination syndrome as the *H. rufa* group (see below). The two species groups are, however, not considered to be closely related, as the non-acicular leaves and the compressed ovaries with laterally attached styles of *H. rufa* clearly show.

**Etymology.** As the species mainly occurs along the Woronora River the suffix ‘-ana’, Latin, was added to indicate ‘position or possession’.

#### *Specimens examined*

NEW SOUTH WALES. CC: *E.Betche* NSW 102275, Woronora River near Como on sandbanks, xii.1893 (NSW); *E.Cheel* NSW 102273, Woronora River, 2.x.1901 (NSW); *A.A.Hamilton* NSW 102274, Heathcote, Woronora River, x.1915 (NSW); *R.D.Hoogland* 12257, at Heathcote Bridge, 13.ix.1972 (MEL); *R.T.Miller & J.Miller* 69/18.iii.2007, Water Board track above Woronora River (AD, NSW); *R.T.Miller & J.Miller* 11/1.xi.2008, Woronora River between Forbes Creek and the Needles (AD).

## 2. *H. humifusa* F.Muell. group

Although species of this group have dense fascicled hairs and especially pronounced intrapetiolar tufts of hair, similar to those of the *H. sericea* group (Toelken 2000: 7), they are distinguished by their more or less stalked flowers not aggregated into inflorescences and decumbent to prostrate growth habit. Unlike the superficially similar species of the *H. pedunculata* group (cf. below), *H. fumana* has stamens in a cluster on one side of the ovaries and the whole plant is fascicled-pubescent to tomentose. Toelken (1995) taxonomically re-assessed *H. humifusa* and its three subspecies, which occur in widely separated populations in Victoria.

### *Hibbertia fumana* Sieber ex Toelken, sp. nov.

*A. H. humifusa* F.Muell. *foliis brevioribus* (1.9–) 2.1–3.1 (–3.3) mm longis, *paginis abaxillaribus foliorum non visibilibus ramisque sine pilis simplicibus differt.*

**Typus:** Australia, near Sydney, “*F.W.Sieber* Nov. Holl. No. 147” (holo.: MEL 31618; iso.: K; NY – n.v.)

*Pleurandra fumana* Sieber ex Benth., Fl. Austral. 1: 27 (1863), nom. inval., pro syn.

*Hibbertia stricta* var. *glabriuscula* Benth. Fl. Austral. 1: 27 (1863), partly as for *Sieber* 147.

Decumbent shrublet, prostrate, with many branches from the base, moderately to much branched; branches, wiry, with raised leaf bases shortly decurrent, shortly fascicled-pubescent. *Vestiture* persistent, consisting of more or less coarse simple hairs over fine fascicled hairs on tubercles; *on branches* more or less densely covered with short subequal multiangulate fascicled hairs (4–7 equal arms) and without simple hairs except for intrapetiolar tufts of hairs in leaf axils; *on leaves above* scattered, short antrorse fine bi- or triforked to simple hairs, sparse becoming denser onto the petiole, few simple hairs along the flanks, all wearing off soon; *on leaves below* dense, with short subequal multiangulate fascicled hairs (4–12 subequal arms) particularly on central vein, overtopped by few simple hairs on the flanks of the revolute margins; *on outer calyx* moderately outside dense, with spreading coarse antrorse simple hairs over erect-spreading multiangulate fascicled hairs (8–15 subequal arms), inside dense, with forked to simple antrorse hairs over most of surface; *on inner calyx lobes* outside dense with spreading multiangular fascicled hairs (2–12 subequal or unequal arms) becoming smaller towards the membranous margins, overtopped by coarse antrorse simple hairs along the central ridge, inside glabrous except for a few simple hairs towards the apex. *Leaves* with intrapetiolar axillary tuft of hairs up to 0.7 mm long; *petiole* 0.2–0.45 mm long; *lamina* narrowly oblong, rarely linear-elliptic, (1.9–) 2.1–3.1 (–3.3) × 0.5–0.8 mm, obtuse, with terminal tuft on a somewhat recurved apex of the central vein, more or less abruptly constricted into petiole, above ± flat and puberulous to glabrescent, below with broadened central vein recessed below the level of revolute margins and protruding into apex, pubescent to puberulous. *Flowers* single, terminal, commonly on main branches; *flower stalk* 2–8 mm long,

recurved and elongating after flowering; *bract* linear to linear-triangular, 1–1.3 mm long, fascicled-pubescent, on lower third of flower stalk. *Calyx* distinctly accrescent, with lobes subequally long; *outer calyx lobes* lanceolate, 4.5–5.7 × 1.3–1.65 mm, acute to acuminate, without ridge, outside strigose-pubescent, inside finely strigose with antrorse forked hairs on much of the surface; *inner calyx lobes* oblong-ovate, 4.5–5.8 × 3.1–3.5 mm, usually cuspidate, outside strigose along the central vein and tomentose towards the margins, inside glabrous with few forked hairs at the apex. *Petals* obovate, 4–5.2 mm long, broadly bilobed. *Stamens* 5 or 6 (7), subequal, clustered on one side of the ovaries; *filaments* 0.4–0.6 mm long, basally connate; *anthers* broadly oblong, 1.3–1.4 mm long, ± abruptly constricted above and below. *Pistils* 2; *ovaries* obovoid but ± laterally compressed, each with 4 ovules, fascicled-tomentose, with style attached to dorsal apex then base recurved to the base and up on either side of the stamens with stigmas exposed above the anthers. *Fruit* and *seeds* unknown. *Flowering*: August. **Fig. 1D.**

*Distribution and ecology.* Without precise locality or ecological data from “near South Heads”, Sydney, New South Wales.

*Conservation status.* Presumed extinct. Known only from a few collections made near Sydney before 1824.

*Diagnostic features.* *H. fumana* has a very similar vestiture, leaves and stalked flowers to *H. humifusa* from Victoria, but differs from the latter by much smaller leaves and the lack of simple hairs along the branches, except for the tufts of hairs in the leaf axils.

*Note.* Although no collecting dates are available for the few specimens of this species, it would seem that G. Caley is the discoverer of this plant, as there is a specimen of his in BM, accompanied by a small collector’s tag inscribed “Aug. 02 near South Heads”. While Robert Brown’s collection “In occidental Sydney 1804” does not provide a definite locality, it is broadly consistent with that of Caley. The Brown specimen was subsequently incorrectly identified as *Pleurandra hirsuta* Hook. (1836) (= *Hibbertia hirsuta* (Hook.) Benth.) based on its superficial resemblance, but is distinguished from this species by its vestiture and presence of a flower stalk and 5–7 stamens.

*Etymology.* Sieber’s suggested name for the plant on the collector’s label was retained as it draws attention to the similarity of the linear hairy leaves to those of the species of the genus *Fumana* (Cistaceae).

#### *Specimens examined*

NEW SOUTH WALES. CC: R. Brown [J.J. Bennett 4873], “In occidental Sydney 1804” (BM); G. Caley s.n., “near South Head”, viii. 1802 (BM).

### 3. *H. pedunculata* R.Br. ex DC. group

Bentham (1863) included the *H. pedunculata* species-group (characterized by their stalked flowers), together

with the sessile-flowered *H. serpyllifolia* R.Br. ex DC. and *H. vestita* A.Cunn. ex Benth. groups, in § *Vestitae* Benth. In spite of stamens being arranged around the ovary in these three groups, they are included in subgen. *Hemistemma* (Horn 2004, 2009); other species of the subgenus have a cluster of stamens to one side of the ovary. Most species of the *H. pedunculata* group have fascicled and simple hairs, more or less pronounced intrapetiolar axillary tufts of hairs, and the wiry branches usually have a prostrate to decumbent habit. They are recorded — some of the species from all too few specimens — from often widely disjunct localities along the Great Divide from northern New South Wales to central Victoria.

#### *Hibbertia intermedia* (DC.) Toelken, *comb. nov.*

*Pleurandra intermedia* DC., Regn. Veg. Syst. Nat. 1: 420 (1817); Prodr. 1: 72 (1824); Spreng., Syst. Veg. edn 16, 2: 462 (1825); G. Don, Gen. Hist. 1: 64 (1842). — **Type citation:** “in montibus Novae-Hollandiae. Caley” (holo.: G-DC).

*Hibbertia pedunculata* auctt. non R.Br. ex DC.: Benth., Fl. Austral. 1: 32 (1863), p.p.; F. Muell., Key Syst. Vict. Pl. 2: 5 (1885), p.p.; Second. Syst. Cens. 1: 2 (1889), p.p.; Ewart, Fl. Vict. 767 (1930), partly; J.H. Willis, Handb. Pl. Vict. 2: 386 (1973), p.p.; G.J. Harden & J. Everett in G.J. Harden, Fl. New South Wales 1: 300 (1990), p.p.; Toelken in Walsh & Entwisle, Fl. Vict. 3: 304 (1996), p.p.

Shrublets rarely higher than 15 cm, with prostrate or procumbent branches up to 25 cm long; branches wiry, with raised leaf bases decurrent and ± flanged, pubescent to glabrescent. *Vestiture* ± persistent, dense to sparse with mixed longer and shorter mainly simple hairs (rarely biforked) often on distinct tubercles; *on branches* moderately dense to denser between flanges, with mainly long ones over few shorter antrorse simple hairs with basal tubercle; *on leaves above* not persistent, with scattered antrorse, ± appressed short hairs (subequal) on tubercles, particularly on the flanks of revolute margins; *on leaves below* not persistent, with very few hairs similar to upper surface, very rare on central vein, except for persistent terminal tuft; *on bracts* as on leaves but often more spreading; *on outer calyx lobes* outside glabrous or with scattered short hairs without tubercles, mainly on terminal central ridge, inside glabrous, rarely with few scattered hairs towards the apex; *on inner calyx lobes* outside glabrous to very fine hairs on distal central area, inside glabrous. *Leaves* with sparse axillary tufts up to 0.6 mm long and usually continued along both sides of the petiole of leaves, mainly below flowers; *petiole* 0.2–0.7 mm long; *lamina* linear to narrowly oblong, (1.8–) 2.3–3.0 (–4.6) × (0.45–) 0.6–0.8 (–1.1) mm, gradually constricted into the petiole, acute, but with terminal tuft of hairs wearing off and becoming obtuse, above flat, puberulous, soon glabrescent, with tubercles usually recessed, below similarly glabrescent or with papillae on the exposed undersurface between the broad central vein and revolute margins. *Flowers* single, terminal on main and lateral

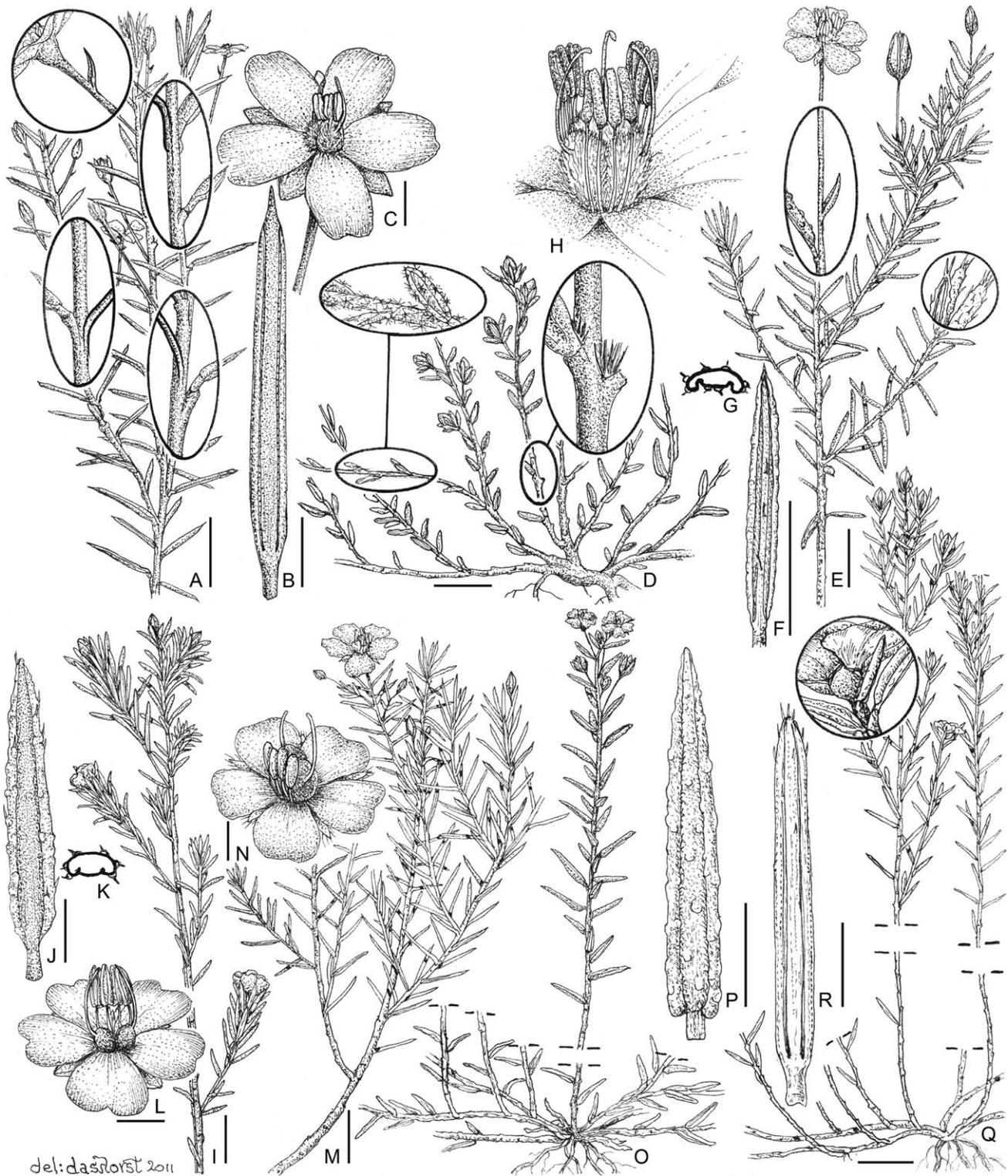


Fig. 1. A–C *Hibbertia woronorana*: A flowering branch; B leaf from below; C flower. D *H. fumana*: flowering plant. E–H *H. intermedia*: E flowering branch; F leaf from below; G transverse section through mid-leaf; H flower with petals removed. I–L *H. pustulata*: I flowering branch; J leaf from below; K transverse section through mid-leaf; L flower. M, N *H. pilifera*: M, flowering branch; N, flower. O, P *H. rufa*: O flowering plant; P leaf from below. Q, R *H. surcularis*: Q flowering plant; R leaf from below. Scale bars: habits (A, D, E, I, M, O, Q) 10 mm; leaves (B, F, J, P, R) 2 mm; flowers (C, L, N) 2.5 mm. — A–C R.T. & J. Miller 69/18.iii.2007; D F.W. Sieber 147 (MEL 311616); E–H R.T. & J. Miller 73/8.iii.2007; I–L S. Bell 216; M, N S. Bell 20; O, P R. Bates 10812; Q, R H.R. Toelken 7979.

**Table 1.** Characters of species in *H. rufa* species-group.

Character	<i>H. surcularis</i>	<i>H. pustulata</i>	<i>H. pilifera</i>	<i>H. rufa</i>
Habit	erect-spreading	decumbent	spreading to decumbent	prostrate or scrambling
Leaves	cuneate base; glabrous	cuneate base; puberulous to denticulate	cuneate base; sparsely sericeous	cordate to truncate base; glabrous (pubescent)
Inflorescence	monads	monads	monads	thyrses, rarely thyrsoids
Flowers	sessile	sessile	stalked	stalked
Bracts	linear-triangular, glabrous	triangular, ciliate	linear-triangular, glabrous	linear, triangular, glabrous (pubescent)
Stamens	4	4	3–5	(3) 4
Filaments	¾ connate	¼ connate	¾ connate	¾ connate

branches, rarely on short shoots, with narrow base or stepped into stalk; flower stalk (as anthopodium) 2–5 mm long, with bract ± at base; *bracts* 1 or 2 (3), linear or linear-triangular, 1.8–2.8 × 0.1–0.2 mm, with scarcely recurved margins, almost membranous, often shortly ciliate, grading into leaves. *Calyx lobes* unequal; *outer calyx lobes* narrowly elliptic, elliptic-lanceolate, 4.5–5.1 × 1.9–2.2 mm, acute, with central ridge more or less developed, puberulous to glabrescent outside, glabrous or sometimes with few hairs on the inside; *inner calyx lobes* elliptic-obovate, 4.4–4.85 × 3.1–3.4 mm, rounded to mucronate, papillate to glabrous. *Petals* obovate, up to 6.8 mm long, bilobed. *Stamens* 7–9 (10) and without staminodes; filaments 1.6–1.8 mm long; *anthers* obloid to broadly obloid, 1.6–1.9 mm long, abruptly constricted above and below, smooth or almost so. *Pistils* 3, 4 (5); ovaries obovoid, hirsute with simple hairs, with 2–4 ovules; *style* attached to the somewhat flattened apex then recurved and upwards to place the incurved stigmas just above the apex of the anthers. *Fruit* and *seeds* not seen. *Flowering*: November–March. **Fig. 1E–H.**

*Distribution and ecology.* Grows on sandstone formations, usually on wet slopes in low heath, scrub or open woodland in New South Wales (CT, CC). Observed at one locality only within the riparian zone of the Grose River growing atop large flat-topped sandstone boulders and rooting at some nodes (R.T. & J. Miller 73).

*Conservation status.* Not common, but occurs mainly in conserved areas.

*Diagnostic features.* Since Bentham (1863) everyone always included *H. intermedia* under *H. pedunculata*, but it is more than a glabrous form of that species. It is distinguished from the latter by glabrous or glabrescent calyx lobes, the outer of which are acute and more or less ridged, and the bract is born at the base of the peduncle, while it subtends the flower in *H. pedunculata*.

*Variation.* Some variation in the leaf shape and especially in the size of the undersurface has been recorded. A few collections from the Maroka Range (Victoria) are

very distinct and it is not clear, whether these should also be included in *H. intermedia*. They are at present mainly distinguished by their obtuse leaves with the undersurface not visible between the central vein and revolute margins, and a greater number of stamens.

*Notes.* *Hibbertia empetrifolia* is superficially similar in the shape of the leaves and the scattered simple hairs, but it has stamens only on one side of the ovaries. This must have confused Candolle (1817) because he inferred that *H. intermedia* is not only ‘intermediate’ between his *Pleurandra empetrifolia* and *P. ericifolia*, but also between the genera *Pleurandra* and *Hibbertia*. However, the type specimen at G-DC leaves no doubt about the identity of the taxon. *Hibbertia intermedia* is distinct from both those species and also from *H. pedunculata*.

#### *Specimens examined*

NEW SOUTH WALES. CT: E.F. Constable NSW 85844, Blackheath, 17.xi.1946 (NSW); A.A. Hamilton NSW 85843, Blackheath, xi.1914 (NSW); A.A. Hamilton NSW 85856, Leura, 23.xi.1912 (NSW); C.L. Wilson 502, Kings Tableland, 25.iii.1957 (NSW 85853/4). CC: R.T. & J. Miller 73, Grose River junction with Burrell Creek, 8.iii.2007 (AD, NSW).

#### 4. *H. rufa* N.A. Wakef. group

The *H. rufa* species-group, which is known from mainly the eastern side of the Great Divide, namely from northern New South Wales (NT) to Tasmania, also includes the following three new similar species: *H. pustulata*, *H. pilifera* and *H. surcularis*. The group is characterized by the combination of usually four stamens and their filaments are more or less, but usually almost entirely connate to form a column (except in *H. pustulata*) at the back of the two glabrous and laterally compressed ovaries, which have the styles dorso-laterally attached. The arrangement of the flower parts indicates a similar pollination syndrome in the four species. The bracts of *H. pustulata* are triangular and membranous, a characteristic of *H. exutiacies* N.A. Wakef. (Toelken in prep.). The latter species has, however, broad, not compressed ovaries with the style attached to their apex.

The four species of the *H. rufa* species-group are found in at least temporarily wet places, swamps or seepage areas. Individual plants often cover large areas, as a more or less branched rhizome spreads continuously above or usually below soil level. The combination of characters that distinguish the individual species are listed in Table 1.

The position of the flowers is of particular interest among the species as it varies from sessile and terminal as monads on main branches in *H. surcularis* and *H. pustulata*, to monads with stalked flowers on lateral branches in *H. pilifera*, and stalked flowers on fascicled lateral branches with bract-like leaves ( $\neq$  additional bracts), thus forming distal thyrses (rarely thyrsoids), on all branches of *H. rufa*. The flower stalk of *H. pilifera* consists of two internodes (cf. *H. acicularis* and *H. cistoidea* groups earlier) and is therefore not comparable to the peduncle of the *H. tomentosa* group (Toelken 2010a), where the bract subtends the calyx. In *H. rufa* the bract is similar to or rarely grades into several bract-like leaves of the subtending short shoot, so that it becomes necessary to distinguish between the primary bract and additional bracts. In this species the flower stalk usually consists of only the ultimate internode, the pedicel.

Many specimens of *H. rufa* have been examined, but little is known about the variation and distribution of the other three species. Since they occur in similar habitats, it would be interesting to know whether these three species are always allopatric and, if so, what their specific ecological requirements are.

#### Key to the species of the *H. rufa* group

1. Flowers clustered distally, each at consecutive nodes and/or if single (rare) then terminal on an axillary short shoot with bract-like leaves; base of leaf lamina truncate to cordate ..... *H. rufa*
- 1: Flowers single, distally on leafy branches (not at consecutive nodes if more than one); base of leaf lamina cuneate
  2. Leaves pustulate abaxially; filaments basally connate ..... *H. pustulata*
  - 2: Leaves smooth or slightly hairy abaxially but without raised bases; filaments mostly connate
    3. Flowers stalked; leaves and calyx with appressed hairs ..... *H. pilifera*
    - 3: Flowers sessile; leaves and calyx glabrous except for minute terminal tuft of hairs ..... *H. surcularis*

#### *Hibbertia pilifera* Toelken, sp. nov.

*A. H. rufa habitu plerumque multo ramoso subterraneo et aërio, ramis et calicibus pilis, basibus laminis foliorum cuneatis et plerumque 5 staminibus; a H. surculari ramis et calicibus piis, lobis calicis sine costis ad apicem, plerumque 5 staminibus floribusque distincte pedunculatis differt.*

**Typus:** New South Wales, Adams Lookout, Bungonia Gorge, *M. Evans* 2519, 10.xi.1966 (holo.: CANB 161485; iso.: CANB 161484; A, K, L, NSW – n.v.).

Spreading shrublets 0.15 m tall, tufted to becoming decumbent, usually  $\pm$  branched above and below soil level, repeatedly rooting; branches wiry with long decurrent leaf bases, tinged pink, sparsely short-sericeous to glabrescent. *Vestiture* rarely persisting for

a long time, on distal branches and calyx, with simple hairs antrorse, appressed on branches, leaves especially on the undersurface, and on the calyx. *Leaves* with or without short tufts of hairs (up to 0.2 mm long) in the leaf axils but usually hidden by appressed petiole; *petiole* 1.5–3.0 (–3.5) mm long, dorsiventrally compressed; *lamina* linear, narrowly oblong-elliptic to -lanceolate, (4.6–) 5.0–7.5 (–8.8)  $\times$  5.4–6.5 (–7.2) mm, with apex drawn into a 0.1–0.25 mm long bristle, but this terminal hair wears off soon,  $\pm$  gradually constricted into petiole, above  $\pm$  flat, glabrous to glabrescent along flanks, below with narrow but strongly revolute margins (glabrescent) and more than twice broader central vein (glabrous), but with no undersurface visible except for a row of papillae along the slit. *Flowers* single, terminal, becoming leaf-opposed along upper main branches; *flower stalk* thread-like, (4.2–) 5.0–8.0 (–10.2) mm long, with bracts on lower third and often grading into 2–5 shorter leaves, recurved in bud and in fruit; *buds* narrowly ovoid; *bracts* linear-triangular, 1.2–1.5  $\times$  c. 0.25 mm, acute, with central vein scarcely visible, glabrescent. *Calyx* scarcely accrescent; *outer calyx lobes* narrowly elliptic-oblong, 4.2–4.4  $\times$  1.4–1.6 mm, as long or scarcely shorter than inner ones, obtuse, without central ridge, pubescent or puberulous especially towards the apex, glabrescent; *inner calyx lobes* oblong-ovate, 4.8–5.0  $\times$  1.8–2.3 mm, rounded or abruptly constricted into a short point, without ridge, glabrescent. *Petals* oblong-obovate to oblong-elliptic, 5.6–6.4 mm long, scarcely emarginate to lobed. *Stamens* 3–5 on one side of ovaries; *filaments* 1.2–1.3 mm long, 0.8–1.0 mm connate; *anthers* obloid, 1.5–1.7 mm long, abruptly constricted above and below. *Pistils* 2; *ovaries* obovoid but  $\pm$  laterally compressed, with 4 ovules, glabrous, with styles attached to the lower half of the dorso-lateral surface and curved up on both sides of the stamen column to place the erect stigmas just above the apex of the anthers. *Fruit* glabrous. *Seeds* not seen. *Flowering:* September–November. **Fig. 1M, N.**

*Distribution and ecology.* Grows in open eucalypt woodland in central New South Wales (CWS, ST). Dry sclerophyll woodland of *Eucalyptus amplifolia*, *E. bosistoana* and *E. eugenoides* (*R. Miller* 23-29).

*Conservation status.* The species was only noted at two roadside locales and one other site in Bungonia State Conservation Area. *Hibbertia pilifera* is rare and possibly extremely vulnerable (*R. T. Miller*, pers. obs.; *R. Miller* 23-29). It could not be relocated at the type locality (Adams Lookout, vicinity Bungonia Gorge), but the species is cryptic, even when in flower.

*Diagnostic features.* Although superficially similar to *H. rufa* it is easily distinguished by its usually much branched habit above and below soil level, hairy branches and calyx lobes, cuneate bases of the leaf lamina, and 3–5 stamens. *Hibbertia pilifera* differs from *H. surcularis* by its hairy branches and calyx, calyx lobes without ridges towards the apex, 3–5 stamens and distinctly stalked flowers.

*Variation.* The appressed hairs on most parts of the plants will soon wear off, so that vestiture is best observed on distal parts of branches. It is particularly well developed below flowers where it is usually retained for a longer time. Some plants have hairs restricted to the region of several nodes below the flowers and only the occasional hair can be observed on the rest of the plant, but these hairs are usually well developed, i.e. they are not reduced hairs as sometimes found in *H. surcularis*.

The number of stamens varies from three to five but is usually specific to individual plants. Their filaments are usually almost completely connate into an erect column.

*Etymology.* In contrast to the very similar species, *H. rufa*, this species is on most parts of the plant 'hair-bearing', Latin, 'pili-fera' and hence the choice of epithet.

#### *Specimen examined*

NEW SOUTH WALES. CWS: *S.Bell* 20, 21, 22, Black Mountain, NE Scone, ix.2007 (AD, NSW). CT: *R.Miller* 23-29, Bungonia SCA, 15.x.2008 (AD).

#### *Hibbertia pustulata* Toelken, *sp. nov.*

*A H. pilifera et H. surculari foliis costis centralibus tumescentibus, paginis abaxialibus pustulatibus disperses (tuberculi basales pilorum) filisque vix basale connatis differt.*

**Typus:** New South Wales, Mt Hay Road, N Leura, *C.P.Gibson* 56, 13.x.2006 (holo.: AD; iso.: K, MEL, NSW, NY).

Decumbent shrublets up to 0.15 m tall, sparsely branched; branches wiry, with long decurrent leaf bases, brown, glabrous. *Vestiture* not persistent, scattered short antrorse simple hairs on raised tooth-like tubercles which remain after the hairs have worn off, mainly restricted to abaxial surface and especially towards the margins and apex of leaves. *Leaves* without tufts of hairs in the leaf axils; *petiole* 0.2–0.6 mm long, dorsiventrally compressed; *lamina* linear, linear-elliptic to linear-lanceolate, (4.3–) 6.0–7.5 (–8.6) × (0.6–) 0.7–0.8 (–1.0) mm, acute with short tuft of simple hairs, with paler tubercle usually retained, with cuneate base, above flat and glabrous, below with central vein bulging over revolute margins and no tubercles visible between them, puberulous when young and soon wearing off, but retaining scattered paler hair tubercles mainly along the margins and towards the apex. *Flowers* single, terminal, sessile on all branches; *flower stalk* absent; *buds* narrowly ellipsoidal or rarely ovoid; *bract* triangular, 0.7–1.1 × 0.6–0.75 mm, acute to pointed, scale-like, without central ridge, glabrous or often with more or less dense, very short cilia; often subtended by 2 additional bracts or grading into reduced leaves, fleshy and narrowly oblong. *Calyx* scarcely accrescent; *outer calyx lobes* narrowly elliptic-lanceolate, (5.5–) 5.9–6.3 × 2.5–2.6 mm, acute to pointed, with scarcely raised central ridge distally, glabrous; *inner calyx lobes* lanceolate, rarely ovate, (5.6–) 6.0–6.5 × 3.2–3.4 mm,

subequally as long as outer ones, without central ridge, glabrous. *Petals* obovate-spathulate, 7.6–9.3 mm long, distinctly emarginate. *Stamens* 4; *filaments* 1.0–1.2 mm long, free, basally connate; *anthers* narrowly obloid, 2.3–2.5 mm long, abruptly constricted above and below. *Pistils* 2; *ovaries* broadly obovoid but distinctly laterally compressed, with 4–6 ovules, glabrous, with styles attached to lower dorso-lateral surface and curved up on both sides of the anthers to place the erect stigmas above the apex of the anthers. *Fruit* glabrous. *Seeds* not seen. *Flowering:* August–October. **Fig. 11–L.**

*Distribution and ecology.* 'Swamp in creekline' in central New South Wales (CT).

*Conservation status.* The species is recorded and conserved in the Blue Mountains and Wollemi National Parks, but further assessment is needed.

*Diagnostic feature.* *Hibbertia pustulata* is a little known species and differs from other species in the *H. rufa* group by the staminal filaments being scarcely connate basally, and by the scattered raised tubercles or bases of the short hairs on the abaxial surface of leaves. The species is also characterized by an unusually bulging central vein on the abaxial surface, by a cuneate leaf base, and by sessile flowers on all branches. As with other species in the *H. rufa* group, *H. pustulata* has usually four stamens.

*Variation.* One flower on an axillary short shoot was observed on a single specimen (*S.Bell* 216), whereas usually flowers are borne terminally on leafy long shoots.

*Etymology.* Since the pale persistent basal tubercles of the hairs are visible with the naked eye on the margins of the leaves, the epithet 'pustulata', Latin, 'pustulate' was chosen for this species.

#### *Specimens examined*

NEW SOUTH WALES. CT: *S.Bell* 216, SE Wollemi National Park, c. 300 m W Mt Tootie Road, 15.viii.2007 (AD, NSW); *C.P.Gibson* 034, Lacy Tableland, 2.x.1990 (AD); *C.P.Gibson* s.n., Wentworth Falls, 25.iii.2006 (AD, NSW).

#### *Hibbertia rufa* N.A.Wakef.

Victorian Naturalist 72: 119 (1955); J.H.Willis, Handb. Pl. Victoria 2: 388 (1973); G.J.Harden & J.Everett, Fl. New South Wales 1: 301 (1990); Toelken in N.G.Walsh & T.Enwisle, Fl. Victoria 2: 307 (1996); A.M.Gray (2009) 92 Dilleniaceae version 2009.2. in M.F.Duretto (Ed.) Fl. Tasmania Online; A.Fairley & P.Moore, Native Pl. Sydney Region 78 (2010). — **Type:** Victoria, Reedy Creek, 3 miles E Cann River, *J.H.Willis & N.A.Wakefield* s.n. (holo.: MEL 35552; iso.: MEL 658094; NSW 86703).

*Hibbertia stricta* var. *pedunculata* Maiden & E.Betche, Proc. Linn. Soc. New South Wales 24: 640 (1900).

Shrublets rarely up to 0.3 m tall, trailing to scrambling, rarely erect-spreading, with rhizome or branches rooting and/or often suckering; branches wiry and up to 0.5 m long, with leaf bases ± flanged, glabrous rarely puberulous, usually reddish-brown. *Vestiture* scattered

fine short simple hairs occasionally on the branches, on leaves in particular on flanks and terminal, soon wearing off or usually absent except for intrapetiolar tufts of simple hair in distal leaf axils. *Leaves* with short axillary tufts up to 0.2 mm long, *petiole* 0.2–1.3 mm long, dorsiventrally compressed; *lamina* linear-lanceolate to linear-triangular, (1.8–) 4–9 (–10.6) × (0.8–) 1–2 (–2.5) mm, acute to pointed, with one to usually few terminal hairs wearing off soon, with truncate to cordate base, above flat to slightly convex and sometimes ± grooved along the central vein, glabrous or sometimes with few antrorse hairs along the upper flanks but wearing off soon, below with narrow but strongly revolute margins (glabrescent) and more than twice broader central vein (glabrous), but with no undersurface visible except for a row of papillae often along the slit. *Flowers* terminal on short shoots, usually in successive distal leaf axils and forming a terminal thyrse (rarely a thyrroid) on major branches; *flower stalk* filiform, (0.3–) 5–15 (–24.4) mm long (excluding short shoot = pedicel), with bracts at the base, curved downwards in bud and fruit; *buds* narrowly ovoid; *bracts* (primary) linear-lanceolate to elliptic-triangular, 0.5–1.4 × 0.2–0.4 mm, acute, rarely obtuse, glabrous except for often with terminal tuft wearing off soon, scale-like with central vein scarcely visible, subtended by (2) 3 or 4 similar additional bracts (bract-like leaves of short shoot), which are sometimes smaller (less than 0.3 mm) than the primary bract. *Calyx* scarcely accrescent; *outer calyx lobes* narrowly lanceolate-oblong to elliptic-oblong, (2.2–) 3–4.5 (–5.3) × 1.8–2.4 mm, longer to shorter than inner ones, acute, obtuse becoming rounded, without central ridge, glabrous; *inner calyx lobes* broadly elliptic to oblong-obovate, (2.3–) 3.2–5 (–5.6) × (2.0–) 2.2–3.6 mm, rounded or cuspidate, without ridge, glabrous. *Petals* obovate, (3.5–) 5.5–7 (–8.2) × 2.4–) 2.8–4 mm, ± deeply emarginate. *Stamens* (3) 4, on one side of ovary; *filaments* 0.9–1.3 mm long and 0.9–1.1 mm connate; *anthers* obloid, 1.4–1.6 mm long, abruptly constricted above and below. *Pistils* 2; *ovaries* broadly obovoid and laterally compressed, with (2) 4 ovules, glabrous, with styles attached to the lower half of the dorso-lateral surface and curved up on both sides of the stamen column to place the erect stigmas just above the apex of the anthers. *Fruit* glabrous. *Seeds* not seen. *Flowering*: September–November. *Common name*: Brown Guinea-flower (Gray 2009). **Fig. 10, P.**

*Distribution and ecology*. Locally common in moist heath-like vegetation or along streams rarely overtopped by eucalypts in southern New South Wales (CT, SC), eastern Victoria (EG) and rare in Tasmania (TSE).

*Conservation status*. Widespread and present in several conservation areas in southern New South Wales and Victoria, but known only from one locality in north-western Tasmania.

*Diagnostic features*. Prior to its segregation by Wakefield (1955), *H. rufa* was included in the *H. acicularis* complex. *Hibbertia rufa* is, however, easily

distinguished from other species in the *H. acicularis* group by the absence of the typical terminal awn on the leaves, and differs from species in the *H. rufa* group by the following combination of characters (cf. also Table 1): leaf lamina with cordate base, filaments connate and stalked flowers borne on axillary short shoots at successive nodes. Occasionally the thyrse thus formed has only a single flower, or rarely, a flower in terminal position (thyrroid) is also found. The length of the short shoots and the peduncles varies and might in rare cases be almost absent as in, for instance, *J. Crawford & L. Williams CBG 43386* (from New South Wales), *A.C. Beauglehole 34440* (from Victoria) and *W. Fitzgerald MEL 35557* (from Tasmania), but the basal scales at successive nodes are obvious. Wakefield (1955) commented on such depauperate specimens, which are diminutive in every respect. The leaves are, for instance, only (1.5–) 3.0–3.8 (–5.5) mm long.

*Variation*. This is an extremely variable species. Not only is there variation in the sizes of different organs, but the habit varies from suberect tufted plants to plants with long trailing branches up to 50 cm long. The leaf lamina is triangular in some populations, whereas it is almost linear in others; the flower stalk, usually a pedicel, is almost absent in depauperate plants but more commonly 5–15 (–24.4) mm long with subequal to smaller lower bracts. The size of the flower clearly reflects the conditions under which the plants were growing.

While plants from the Central Tableland of New South Wales are usually very vigorous, a specimen from Boyd River near Jenolan Caves (*J. Crawford & L. Williams CBG 43386*) is very small in all respects and grades into the generally smaller plants from Tasmania (Wakefield 1955). Additional specimens completed the range and a recent collection from Tasmania indicated that plants there are generally smaller (Gray 2009).

*Typification*. The holotype sheet (MEL 35552, det. N.A. Wakefield) contains four pieces, each with typical flowers and leaves of the species and is expressly described as “pieces all from a single plant”. The isotype (MEL 658094, also det. N.A. Wakefield) “was recovered from the Victorian Reference Collection”. A note on the holotype by J.H. Willis: “part of the material donated to Sydney Herbarium, 1961” accounts for the isotype NSW 86703 (without det. N.A. Wakefield).

#### *Selection of specimens examined (39 seen)*

NEW SOUTH WALES. **CT**: *L.G. Adams 1478*, 5 miles E Nerriga, 27.x.1965 (CANB; B, E, K, L, MEL, NSW, US – n.v.); *J.D. Briggs 692*, Paddys River Bridge, 2.3 km NW Penrose, 20.x.1980 (NSW; CANB – n.v.); *J. Crawford & L. Williams CBG 43386*, near Boyd River, between Jenolan & Kanangra (CANB); *R. Pullen & J. Story 4983*, c. 2 km W Mt Corang, 26.ix.1973 (NSW).

VICTORIA. **EG**: *A.C. Beauglehole 34440*, W Genoa River, 7.xi.1973 (MEL); *R.D. Hoogland 11917*, c. 2 mls W Genoa, 27.xi.1970 (MEL; CANB – n.v.); *J.H. Willis MEL 35553*, Genoa Creek, 31.x.1969 (MEL).

TASMANIA. **TSE**: *L. Rodway s.n. (sub W. Fitzgerald)*, Georges Bay, x.1892 (HO 3043, MEL 35557).

***Hibbertia surcularis* Toelken, sp. nov.**

*Hibbertia* rufae similis sed habitu surrecto ramoso caudice surculari, basibus cuneatis laminarum, lobis calicis sine costis ad apices, foliorum floribusque terminalibus sessilibus; a *H. pilifera* ramis et calicibus glabris, lobis calicis sine costis ad apices, floribus sessilibus terminalibus et plerumque 4 staminibus differt.

**Typus:** New South Wales, Bark Hut Swamp in Boonoo Boonoo Forest Reserve, H.R. Toelken 7979, 20.x.1989 (holo.: AD; iso.: BRI, CANB, K, B, MO, NSW, PERTH).

*Hibbertia rufa* auctt. non N.A.Wakef.: N.C.W.Beadle, Stud. Fl. N.E. New South Wales 3: 255 (1976), p.p.; G.J.Harden & J. Everett, Fl. New South Wales 1: 301 (1990), p.p.

Shrublet rarely up to 0.3 m tall, erect-spreading, branching (suckering) mainly from underground rhizome; branches filiform to thin-wiry, with distinct decurrent leaf bases, reddish-brown, glabrous. *Vestiture* absent except for one or two short terminal hairs on the acute apex of leaves and calyx lobes. *Leaves* without axillary leaf tufts; *petiole* 2–3.5 (–4.5) mm long, dorsiventrally compressed; *lamina* linear to linear-elliptic, (3.9–) 5.0–8.0 (–10.2) × (0.5–) 0.6–0.8 mm, acute to pointed with 1 or 2 terminal hairs, wearing off soon, gradually tapering into petiole, above ± flat and glabrous, below with strongly revolute margins and much broader central vein ± flush, with undersurface nor teeth visible between the two, glabrous. *Flowers* sessile, terminal, axillary towards the end of main branches, subtended by a ring of 3, 4 bracts; *peduncle* absent; *buds* narrowly ovoid; *bracts* linear-triangular to subulate, 0.9–1.2 × 0.2–0.3 mm, acute, with central vein scarcely visible, glabrous. *Calyx* not accrescent; *outer calyx lobes* elliptic-oblong, (3.6–) 3.8–4.5 (–4.8) × (1.6–) 1.8–2.1 mm, slightly shorter than inner ones, pointed to acute, ridged on upper third, glabrous; *inner calyx lobes* oblong-ovate, (3.7–) 4.0–4.7 (–5.0) × (2.4–) 2.6–3.0 mm, abruptly constricted into a short point, slightly ridged towards the apex, glabrous. *Petals* obovate, 5.6–7.7 mm long, emarginate to slightly lobed. *Stamens* 4; *filaments* 1.0–1.2 mm long, 0.8–1.0 mm connate; *anthers* obloid, 1.6–1.8 mm long, abruptly constricted above and below. *Pistils* 2; *ovaries* obovoid but laterally compressed, with (3–) 4 (–5) ovules, glabrous, with style base attached to the lower dorso-lateral ridge and then curved up on either side of the stamen column to place the erect stigmas just above the apex of the anthers. *Fruit* not seen. *Flowering*: October, November. **Fig. 1Q, R.**

*Distribution and ecology.* Grows in damp or swampy areas in sedge- or heathland, in or surrounded by, eucalypt forests or woodland, often along creeks, in New South Wales (NT).

*Conservation status.* Locally common in conserved areas (J.R.Hosking NSW224543, Toelken 7979).

*Diagnostic features.* *Hibbertia surcularis* has very similar flowers with connate filaments to *H. rufa*, but is

distinguished (cf. Table 1) by its habit of erect branched shrublets interconnected by a suckering subterranean rhizome, by cuneate leaf bases, and terminal sessile flowers. It has a more shrubby habit than the similar *H. pilifera* but differs by its glabrous branches and calyx lobes, usually four stamens and terminal sessile flowers. *Hibbertia pustulata* superficially resembles *H. surcularis*, which differs by its connate filaments and smooth leaves.

*Variation.* The central vein is broad and usually flush with, or rarely slightly recessed to the revolute margins on either side of it. It was never found to bulge or protrude above the margins, as is commonly observed in *H. pustulata*.

*Notes.* The existence of this species with sessile flowers was mentioned in several previous floras (e.g. Harden & Everett 1990), but has never been followed up with the detailed research needed, probably because of a lack of specimens.

*Etymology.* A plant of this species consists of a great number of erect aerial tufts of an ever increasing area as the underground rhizome ‘suckered’, Latin, ‘surcularis’.

***Specimens examined***

NEW SOUTH WALES. **NT:** P.G.Kodala 201, P.D.Hind & T.A.James, Grass Tree Swamp, near junction of Racecourse Trail and Spokes Trail, Werrikimbe National Park, 8.xi.1992 (AD, CANB, NSW, UNSW- n.v.); R.G.Coveny 16577 & A.J.Whalen, Basket Swamp picnic area, 9 km from Mount Lindesay Highway, 14.x.1993 (AD; BRI, CANB, MEL, NSW- n.v.); R.D.Hoogland 11824, near Mulligans Hut, Gibraltar Range National Park, 22.xi.1970 (CANB, K; L, NSW – n.v.); J.R.Hosking NSW224543, Werrikimbe National Park, 10.x.1987 (NSW; NE – n.v.); C.Stuart 267, Sandy Creek, Nov. (MEL 1003812/3/5).

**5. *H. sericea* (R.Br. ex DC.) Benth. group**

When *H. puberula* Toelken was described in a taxonomic revision of the *H. sericea* species-group (Toelken 2000) the research was based on a few specimens collected before 1954, which provided the impression of a very rare and endangered, or possibly extinct, species. In the meantime many additional collections have demonstrated that plants of this species complex are never common, but have a much wider range than was originally known. They are no longer recorded only from populations along the Central Coast of New South Wales, but recent accessions extend their distribution inland north of Sydney as far as Wollemi National Park and south to Morton National Park. Collections of material from many plants from a few bigger populations provide a much needed wider insight into the variation of the species. Thus, the unusual form recorded from Bankstown Airport could now be assessed in a broader morphological context. All specimens examined are cited here, not only to show on what large foundation the following taxonomic changes are based, but also to publish these records to demonstrate the

conservation value of natural vegetation in small local parks and reserves, where these not-previously recorded plants were found. These are last vestiges from the rapidly expanding urban development.

*Hibbertia puberula* is placed in the *H. sericea* group as it shares with those species the slightly recurved distal margins of the outer calyx. The distinctive feature of the *H. puberula* complex is the erect obloid ovary with an almost horizontal upper surface on the side of which the style is attached, usually at the apex, but in most of the specimens from Morton National Park it is more or less lateral. The ovary is covered with normally few, very short, simple hairs. At times these hairs are also mainly restricted to areas along the margins of the ovaries (Toelken 2000, fig. 7G), but they are rarely quite glabrous. *Hibbertia puberula* is unusual in the *H. sericea* group, because of the larger number of normally subequal stamens. Usually more than ten stamens (except in subsp. *extensa*) occur in a dense cluster, with the base of the filaments distinctly connate to one side of the ovaries. These, and the frequently long simple hairs (strigose to hirsute) on the calyx it shares with, and gives *H. puberula* superficial similarity to a group of species, which Bentham (1863) included in *H. stricta* var. *hirtiflora* Benth., but is here placed into the *H. strigosa* group (cf. below). *Hibbertia puberula* is, however, distinguished by recurved distal margins of the outer calyx and obloid ovaries (obovoid in the *H. strigosa* group), which are usually puberulous with scattered short simple hairs (usually hirsute and densely covered with fascicled hairs in the *H. strigosa* group). The following re-assessment and enlarged description of *H. puberula* with the aid of many more specimens reveals a very variable species complex with a number of local forms.

#### ***Hibbertia puberula* Toelken**

J. Adelaide Bot. Gard. 19: 27 (2000). — **Typus:** New South Wales, Yowie Bay, *A.A.Hamilton s.n.*, 14.xi.1908 (holo.: NSW 101955 (sheet two); iso.: NSW 101955 (sheet one), CANB).

Shrublets up to 0.25 m tall, decumbent or rarely suberect, much to sparsely branched or spreading; branches wiry to stiff from a woody stem or base, with decurrent leaf bases more or less flanged, pubescent to hirsute mainly between flanges, rarely glabrescent or glabrous. *Vestiture* often not persistent, with spreading longer over shorter simple hairs on all parts of the plant; *on branches* with few to many (rarely glabrous) mainly longer hairs (but varying very much in actual length) over much shorter ones, often predominantly in the grooves between flanges of the leaf bases, becoming appressed and wearing off soon; *on leaves above* with scattered spreading antrorse simple hairs becoming longer towards the margins, often wearing off; *on leaves below* with few scattered hairs as above on the revolute margins but not on the central vein, wearing off; *on bracts* with finer but similar hairs to leaves; *on outer calyx lobes*

outside moderate to dense, with erect short hooked hairs overtopped by longer tubercled straight hairs up to 1.3 mm long, often becoming bristle-like particularly on the margins and the base and receptacle, persisting, inside dense, with fine, often silky appressed antrorse hairs; *on inner calyx lobes* outside and inside usually similar to the outer lobes, but hairs finer and decreasing in number and size towards the glabrous, membranous margins. *Leaves* usually with dense intrapetiolar tuft spilling over into grooves between flanges; *petiole* 0–0.6 mm long, ± flattened; *lamina* linear-lanceolate to oblong-lanceolate or oblong-elliptic, (1.2–) 2.8–5 (–7.6) × (0.5–) 0.7–1 (–1.2) mm, ± abruptly constricted into petiole, acute and usually with a terminal tuft of hairs wearing off soon, often becoming obtuse, above ± flat and sparsely pilose to glabrescent, below revolute margins and recessed to bulging broader central vein obscuring the undersurface, sparsely pilose to glabrous on the margins. *Flowers* single and terminal, rarely in clusters of up to three from subtending axils; *pedicel* 0–3 mm long; *bracts* linear-elliptic to elliptic-lanceolate, (2.9–) 3.2–3.8 (–4.2) × (0.4–) 0.6–0.8 (–0.9) mm, leaf-like but flattened with central vein ± visible, short pilose, rarely glabrous. *Calyx* distinctly accrescent; *outer calyx lobes* lanceolate to ovate, (5.3–) 6–8 (–11.7) × (1.6–) 2–3 (–4.2) mm, frequently longer than inner lobes, acute to beaked, usually with raised ridge and recurved distal margins, hirsute, strigose, rarely pubescent to glabrescent; *inner calyx lobes* oblong-ovate to oblong-elliptic, (4.6–) 5–8 (–11.6) × (2.1–) 2.5–3.5 (–3.7) mm, acute to cuspidate and with lateral membranous margins rarely up to the apex when obtuse and mucronate, hirsute to finely pilose, decreasing towards the margins. *Petals* broadly obovate to oblanceolate, or rarely oblong-oblanceolate, 5.5–10.6 mm long, ± bilobed. *Stamens* (4–) 10–14 (–18); *filaments* (0.6–) 1.4–1.7 (–1.9) mm long, up to one-third connate basally; *anthers* obloid, (0.8–) 1.4–1.8 (–2.1) mm long, subequal, rarely unequal, abruptly constricted above and below. *Pistils* 2; ovaries erect-obloid and usually horizontally truncate, (4–) 6 (–8) ovules, puberulous, rarely shortly pubescent, with style attached apically, rarely laterally, then curved back- and upwards on either side of the anthers with style well above or rarely at the apex of anthers. *Fruit* puberulous to glabrescent with simple hairs. *Seeds* oblong-obovoid to almost obloid, 1.6–1.8 × (1.2–) 1.3–1.4 mm, brown; *aril* with fleshy base surmounted by one-sided membranous cup covering one-third to half of seed.

*Notes.* The extra specimens now available introduced a much wider range of variation in the *H. puberula* complex. Specimens from the Central Coast can frequently be recognized by almost sessile leaves, broadly ovoid to ellipsoidal buds with apices of the calyx erect to incurved, and often more than one flower is born terminally on branches, while plants from more inland localities have usually petiolate leaves, slender ovoid to ellipsoidal buds with more or less recurved apices of the calyx and a single terminal flower on branches. None

of these characters can be decisively used to distinguish these forms.

The terminal flower clusters are formed by axillary growth from one or two leaves below the bract of the terminal flower and, in keeping with other species of the *H. sericea* group with fascicled hairs (Toelken 2000, fig. 1), immediately develop a terminal flower after usually two nodes with distinct internodes between, so that it becomes a more or less corymbiform cluster. (This is also a distinction from *H. stricta* s.l., which has usually spikiiform (pyramidal) terminal clusters). Similar, but loosely branched cymbiform terminal inflorescences have been observed on only one collection (Turpentine Road, Flat Rock Creek, R.T. & J.Miller 22/30.x.2010).

The most southern population of *H. puberula*, as represented by this and other mass collections, as well as R.D.Hoogland 11702 and E.Gaubas NBG4784, is a particularly interesting extension of the species, as most of the flowers, though large, show a distinct reduction of hairs on the calyx and, more significantly, the styles tend to be laterally attached to the ovaries, similar to those of *H. cistiflora* in the *H. stricta* group. However, this phenomenon, indicative of a convergent development, can be observed in different stages on different plants, varying from an apically attached style curving down and backwards to being attached laterally.

The calyx lobes of most of the specimens identified as belonging to the *H. puberula* complex are hirsute to strigose (cf. Toelken 2000, fig.7E, F) on the outer surface, but in a few specimens both the shorter hooked hairs as well as the straight overtopping longer ones are very short or absent on plants from a few different localities (cf. variation under subsp. *glabrescens*). Among these, the plants from Bankstown Airport are smaller with thread-like branches and have consistently smaller calyx lobes, which are up to 2.7 mm broad, so that they are here described as subsp. *glabrescens*. The calyx of some flowers of subsp. *puberula* from Voyager Point (R.T.Miller & C.P.Gibson 52/20.x.2006) are of similar size, but hirsute and with a distinct terminal ridge on the outer calyx lobes. Furthermore, the flowering calyx of one plant must always be compared with other specimens at a similar stage, as the calyx (accrescent) elongates after flowering. Specimens from Lucas Heights are an extreme example, as the outer calyx lobes of a flower are 7.2 mm long and those of a fruit on the same specimen (R.T.Miller 3/16.x.2007) are 11.6 mm long.

Of all the variation observed, *H. puberula* subsp. *extensa* is very unusual, as its androecium of commonly six stamens was previously unknown in *H. puberula*, which has ten or more stamens. There is a distinct gap between the two types of stamen numbers, as, unlike specimens of the typical subspecies from Simmos Beach Recreation Reserve (R.T.Miller 24–32/2.xi.2007), which has a range of stamens from 15–18, no specimen has as yet been recorded to complete the range from (4–) 6 or 7 stamens of the subsp. *extensa*. However, the wide

variation recorded for the typical subspecies suggests this new form should be recognized at subspecific level. The anthers of subsp. *extensa* also tend to be smaller like those of the subsp. *glabrescens*, and their cuneate base into the filaments is rarely observed in the other subspecies.

#### Key to subspecies of the *H. puberula* complex

1. Stamens (4–) 6 or 7; lateral branches usually spreading up to about right angles to the main axis ..... *H. puberula* subsp. *extensa*
- 1: Stamens (9) 10–14 (–18); irregularly and commonly untidily branched
  2. Anthers (1.3–) 1.4–2.1 mm long; outer calyx lobes distinctly ridged toward the apex, strigose to hirsute or if pubescent to glabrescent then (2.5–) 2.6–3.0 (–3.8) mm broad when flowering ..... *H. puberula* subsp. *puberula*
  - 2: Anthers 0.9–1.3 mm long; outer calyx lobes 1.6–2.1 mm broad when flowering, scarcely ridged towards the apex, puberulous to glabrescent ..... *H. puberula* subsp. *glabrescens*

#### *Hibbertia puberula* subsp. *puberula*

Branches wiry to stiff-woody from woody stems. *Leaf lamina* mainly lanceolate. *Outer calyx lobes* lanceolate to ovate, (7.3–) 7.8–9.3 (–11.6) × (2.5–) 2.6–3.0 (–3.8) mm, acute to beaked with strongly recurved margins and distinctly raised central ridge towards the apex, strigose or hirsute to rarely puberulous; *inner calyx lobes* broadly elliptic to oblong-ovate, (6.9–) 7.3–7.8 (–10.1) × (2.8–) 3.15–3.3 (–3.7) mm, with innermost two acute to ± cuspidate above broad membranous margins, hirsute to strigose, rarely pubescent along the central ridge becoming smaller to glabrous towards the margins. *Stamens* (9–) 10–14 (–18); *anthers* (1.3–) 1.4–2.1 mm long. *Flowering*: October–December (January).

*Distribution and ecology*. Occurs in a wide range of habitats, but usually low heath, on sandy soil or rarely in clay, with or without rocks underneath; known in New South Wales mainly from near Sydney (CC), but also from and near Morton National Park (SC, ST).

*Conservation status*. This subspecies occurs locally occasional to frequent and is conserved in a number of parks (cf. Specimens examined), i.e. it seems to be adequately conserved.

*Variation*. The few previous collections available have been disconcertingly variable, but mass collections from a few localities revealed that individual populations are often very variable in the size and number of hairs on various organs. Buds vary from almost spherical to narrow-ellipsoidal to -ovoid with lanceolate to ovate outer calyx lobes, each with an incurved, erect or recurved apex and more or less densely covered with spreading, straight and smaller hooked hairs of varying length.

Flowers have usually 12–14 stamens in this subspecies, but the number varies locally from 9 or 10 at Wollemi National Park to 18 in one specimen

from Yeramba Lagoon (C.P.Gibson & R.T.Miller 50/14.x.1993). Specimens from Simmos Beach Recreation Reserve show a few flowers with 15 to 17 stamens, while other flowers of similar plants of the same population have 12 to 14 (R.T.Miller 24–32/2.xi.2007). The filaments are up to one-third basally connate. Usually the anthers are described as subequal and forming a range from the slightly smaller to larger ones, but occasionally one or two distinctly larger ones were observed.

The typical obloid ovaries are surmounted by a horizontal style base and, while the style is usually attached at the apex, it is sometimes more or less dipping to a lateral position in a number of populations, mainly from Morton National Park. This must not be confused with fruiting specimens, where the bulging developing seeds often displace the position of the style attachment. While the ovaries are usually puberulous, they may vary from pubescent (R.T.Miller 111–113/20.xi.2007) to almost glabrous (R.T.Miller 33–43/12.x.2007).

#### *Additional specimens examined*

NEW SOUTH WALES. CC: C.P.Gibson 28/11.x.1990, Picnic Point at Blackwall (AD, NSW); C.P.Gibson 51/1.x.2006, eastern side of Yeramba Lagoon (AD, NSW); C.P. & H.K.J.Gibson 95, Stony Waterhole, Wollemi National Park, 23.xi.2009, (AD, NSW); C.P. & H.K.J.Gibson 96, downstream from Stony Waterhole, Wollemi National Park, 23.xi.2009, (AD, NSW); C.P.Gibson & R.T.Miller 27/23.x.1990, Mickey's Point (AD, NSW); C.P.Gibson & R.T.Miller 31/29.x.2005, near Kings Waterhole, Mellon Creek (AD, NSW); C.P.Gibson & R.T.Miller 44/ 25.xi.1988, Voyager Point (AD); Picnic Point, western side of Yeramba Lagoon (AD, NSW); C.P.Gibson & R.T.Miller 52/20.x.2006, Voyager Point (AD, NSW); R.Johnstone 2689 & A.E.Orme, Warrimoo, 1.2 km along bush track from (locked) gate at the end of Greens Road, 6.xii.2009 (AD, NSW); R.T.Miller s.n., Blackwall, Georges River, plateau top adjacent to Henry Lawson Drive, 1.xi.2006 (AD, NSW); R.T.Miller 1–5/12.x.2007, Simmos Beach Recreation Reserve (AD, NSW); R.T.Miller 1–3/16.x.2007, Lucas Heights (AD, NSW); R.T.Miller 4–12/12.x.2007, Peter Meadows Reserve (AD, NSW); R.T.Miller 12/12.x.2010, 72.7 km S of Picton Road, E side of Hume Hwy, along Optic Fibre cable track (AD); R.T.Miller 24–32/2.xi.2007, Simmos Beach Recreation Reserve (AD, NSW); R.T.Miller 33–43/12.x.2007, The Basin Reserve, Kentlyn (AD, NSW); R.T.Miller 46–58/2.xi.2007, The Basin Reserve, Kentlyn (AD, NSW); R.T.Miller 59–64/2.xi.2007, Freres Crossing Reserve, Kentlyn (AD, NSW); R.T.Miller 76/9.i.2007, Heathcote Road (AD); R.T.Miller 80, 82, 83/23.x.2008, Crownland off Sackville Road (AD); R.T.Miller 88, Marley Head, Royal National Park, 14.x.2007 (AD); R.T.Miller 111–113/20.xi.2007, Little Forest, Lucas Heights (AD, NSW) R.T.Miller & C.P.Gibson s.n., Picnic Point, Yeramba Lagoon. 12.x.2006 (AD, NSW); R.T. & J.Miller 19a, b/9.xi.2010, near Lucas Heights, near walk marker 7 (AD, NSW); R.T. & J.Miller 50A–T/8.xii.2010, The Basin Reserve, Kentlyn (AD); R.T. & J.Miller 51A–N/8.xii.2010, Old Kent Road, Kentlyn (AD); R.T.Miller & J.Peters s.n., Voyager Point, 1.x.1996 (AD, NSW); A.E.Orme 732 & 733, Warrimoo, 250 m along SE fork of Greens Road firetrail. The fork is 1.5 km from the beginning of Greens Road and Waratah Road, 7.xi.2009, (AD, NSW). SC: R.T. & J.Miller 13A–D/30.x.2010, Turpentine Road, near Flat Rock Creek, 30.x.2010 (AD, NSW); R.T. & J.Miller 16–22/30.x.2010, Turpentine Road, Flat Rock Creek, (AD, NSW); R.T. &

J.Miller 21A, B/30.x.2010, Turpentine Road, c. 100 m E Flat Rock Creek (AD, NSW); R.T. & J.Miller 23, 24/30.x.2010, near Wandean Road, power-line easement, (AD, NSW) R.T. & J.Miller 29A–E/7.xi.2010, eastern side of Flat Rock Creek Dam, Mundamia (AD); R.T. & J.Miller 28A–C/7.xi.2010, Triplarina, S Mundamia Road, (AD, NSW); R.T. & J.Miller 70/10.x.2010, Wandean Road, powerline easement (AD); R.T. & J.Miller 72/10.x.2010, Wandean Road (AD). CT: E.Gaubas NBG4784, Marulan to Berrima, 1.xii.1950 (CANB). ST: R.D.Hoogland 11702, between Sassafras and Tianjara Falls, 26.xi.1969 (NSW; CANB, n.v.); R.T. & J.Miller 15A–M/30.x.2010, Tianjara Falls car park (AD, NSW).

#### *Hibbertia puberula* subsp. *extensa* R.T.Mill., subsp. nov.

*A subspeciebus aliis staminibus (4–) 6, 7 et antheris 0.8–1.2 mm longis ramisque lateralibus circiter orthogoniis expansis differt.*

**Typus:** New South Wales, south of Appin Road, upper George River catchment, R.T.Miller 102 & A.Henderson, 8.x.2007 (holo.: AD; iso.: NSW).

Branches stiff-woody and lateral ones spreading up to about right angles. *Leaf lamina* mainly lanceolate. *Outer calyx lobes* ovate, (6.1–) 66–72 (–7.9) × 3.1–3.5 (–3.8) mm, acute to beaked with ± strongly recurved margins and distinctly raised ridge towards the apex, strigose to hirsute; *inner calyx lobes* elliptic rarely oblong-ovate, (4.2–) 4.5–4.8 (–5) × 2.9–3.2 (–3.4) mm, with innermost two abruptly constricted into minute terminal point continuous with broad membranous margins, hirsute to strigose with hairs becoming smaller towards the margins. *Stamens* (4–) 6 (7); *anthers* 0.8–1.2 mm long. *Flowering:* October, November (March, April). **Fig. 2Y–BB.**

*Distribution and ecology.* Grows often in shallow soil on rock shelves or localized in upland swamps with heath on upper headwaters of the Georges River and in rock-plate heath on the Wangandery Tableland, New South Wales (CC).

*Conservation status.* Apparently rare and localized (R.T. & J.Miller 109/12.x.2007).

*Variation.* In spite of their often isolated occurrence very little variation was observed in the material examined. The specimens from south of Appin had usually 6 stamens, whereas several flowers from the Wangandery Tableland had 7. The subspecies has generally very long straight hairs on the calyx and some of them are up to 1.3 mm long. Not only are the stamens shorter in this subspecies, but also the styles are short and robust and often just reach the apex of the anthers. These robust specimens are easily distinguished from superficially very similar plants with spreading branches of the typical subspecies from Lucas Heights (R.T.Miller 111–113/20.xi.2007) by the number and size of the anthers. While most of the specimens of this subspecies occur in a restricted area from Appin to Wedderburn, a collection from Sackville Road (R.T.Miller 81/23.x.2008) seems to indicate that the taxon has a much wider geographic range. This preceding specimen exhibits in addition to

six stamens also the robust spreading branching of the plants from the southern localities in spite of records of more slender forms of the typical subspecies nearby.

*Etymology.* The epithet ‘*extensa*’, Latin, ‘stretched out, extended’ refers to the impression created by the lateral branches spreading at about right angles to the main branches.

#### *Specimens examined*

NEW SOUTH WALES. CC: *R.T.Miller s.n.*, c. 3.5–4 km SE Appin township (AD); *R.T.Miller 67/18.iii.2007*, near Sarahs Knob via Woronora Dam Road (AD, NSW); *R.T.Miller 68/21.iii.2007*, Appin Road (AD, NSW); *R.T.Miller 71/iv.2007*, near Sarahs Knob (AD, NSW); *R.T. Miller 81/23.x.2008*, Crownland off Sackville Road (AD, NSW); *R.T. & J.Miller 103–108/16.x.2007*, S Appin Road (AD, NSW); *R.T. & J.Miller 109/12.x.2007*, S Appin Road (AD, NSW); *R.T. & J.Miller 44A–C/17.xi.2010*, S Appin Road (AD); *R.T. Miller, J.Miller* and M. Krough *52A–G/ 8.xii.2010*, Wedderburn, NSW Sports & Aircraft Club, walking tracks (AD). CT: *R.T. & J.Miller 1/12.xi.2005*, Wanganderry Tableland (AD, NSW).

#### *Hibbertia puberula* subsp. *glabrescens* Toelken, subsp. nov.

*A subspecies typica ramis filiformibus floribusque constanter parvioribus calice plerumque glabrecenti et usque ad 2.7 mm lato differt.*

**Typus:** New South Wales, Bankstown Airport, *G.M.Cunningham s.n.*, 13.xii.2006 (holo.: AD200524; iso.: CANB, K, MEL, NSW).

*Hibbertia* sp. *Bankstown* (*R.T.Miller & C.P.Gibson s.n. 18.x.2006*) N.S.W. Herbarium in Australian Plant Census database (2011). *Hibbertia* sp. nov. (*Bankstown Airport*) C.P.Gibson, *Bushland Bulletin* 59: 4, 6 (2009).

Branches thread-like wiry from short stiff-woody stems. *Leaf lamina* mainly elliptic-oblong. *Outer calyx lobes* linear-lanceolate, (5.3–) 5.5–6.1 (–6.3) × 1.6–2.1 mm, not beaked and with scarcely recurved margins and faint central ridge towards the apex, glabrescent or sparsely pubescent; *inner calyx lobes* narrowly oblong-ovate, (4.6–) 4.8–5.2 (–5.6) × 2.1–2.3 (–2.7) mm, innermost two abruptly constricted into minute terminal mucro continuous with broad membranous margins, glabrous or glabrescent along central ridge. *Stamens* 12–14; *anthers* 0.9–1.3 mm long. *Flowering:* October, November (December). **Fig. 2CC–EE.**

*Distribution and ecology.* Subspecies *glabrescens* is known only from Tertiary alluvial soil along Airport Creek on Bankstown Airport and not from areas where subsequent fill has been deposited in between (Gibson 2007a, b). The plant assemblage is attributable to “Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion and is listed as an Endangered Ecological Community under the Threatened Species Conservation Act 1995” (NSW Scientific Committee 2010).

*Conservation status.* *Hibbertia puberula* subsp. *glabrescens* is endemic to New South Wales and is currently known to occur in only one population at Bankstown Airport in Sydney’s southern suburbs. The population comprises fewer than 100 individuals (NSW

Scientific Committee 2010) in an area of remnant vegetation periodically mown or slashed and is listed as ‘Critically Endangered’ under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and the N.S.W. *Threatened Species Conservation Act 1995* (TSSC 2009a, b).

*Variation.* The plants at Bankstown Airport are comparatively uniform, as one would expect for such a small and extremely localized population. However, the plants and especially also the calyx lobes are rarely entirely glabrous. Although specimens of some plants of the typical subspecies, especially from nearby Simmos Beach Reserve (*R.T.Miller 24–32/2.xi.2007*), as well as those from the much further south population along Turpentine Road near Sassafras (e.g. *R.T. & J.Miller AD15A–M*), show a variation from a hirsute or strigose through to glabrescent tomentum of the calyx lobes, they are always more robust plants and in particular, the calyx lobes are larger and especially broader. Some specimens of the mass collection *R.T.Miller 16–22/12.x.2007* are very similar to subsp. *glabrescens*, but can be distinguished by the shape of the calyx or by their strigose to hirsute calyx (*C.P.Gibson & R.T.Miller 27/23.x.1990*). Furthermore specimens from Bankstown Airport collected in subsequent years (since 2006) have not shown any significant change in morphology. Thus we must assume that a taxon has established itself here that is suited to the unusual ecological conditions artificially maintained by the Bankstown Airport management since about 1940.

*Etymology.* Since all organs of this subspecies have very few small and delicate hairs which usually wear off soon, the epithet ‘*glabrescens*’, Latin, ‘glabrescent’ seemed appropriate.

#### *Specimens examined*

NEW SOUTH WALES. CC: Bankstown Airport, *C.P.Gibson 49/6.x.2006* (AD); *R.Johnstone 2646 & G.Errington, 6.xi.2009* (AD, K, NSW); *R.T.Miller & C.P.Gibson 1–4/18.x.2006* (AD).

#### 6. *H. stricta* (R.Br. ex DC.) F.Muell. group

The *H. stricta* species-group (segregated from Bentham’s *H. stricta* supercomplex: cf. Toelken 2010b) is represented here by four, often misinterpreted species. This group occurs mainly in New South Wales, Victoria and South Australia. Species are defined by the following combination of characters: very short or absent intrapetiolar tufts of hairs; usually strongly bulging central vein of leaves so that the undersurface is not visible; sessile flowers each subtended usually by one to several bracts; and usually less than 8 stamens, of which the central one/s are often distinctly longer. In contrast to the species of the *H. strigosa* species-group (cf. below) the hairs on the calyx are short and do not vary much in size.

The broad concepts of species adopted here are similar to the interpretation Wakefield (1955) presented,

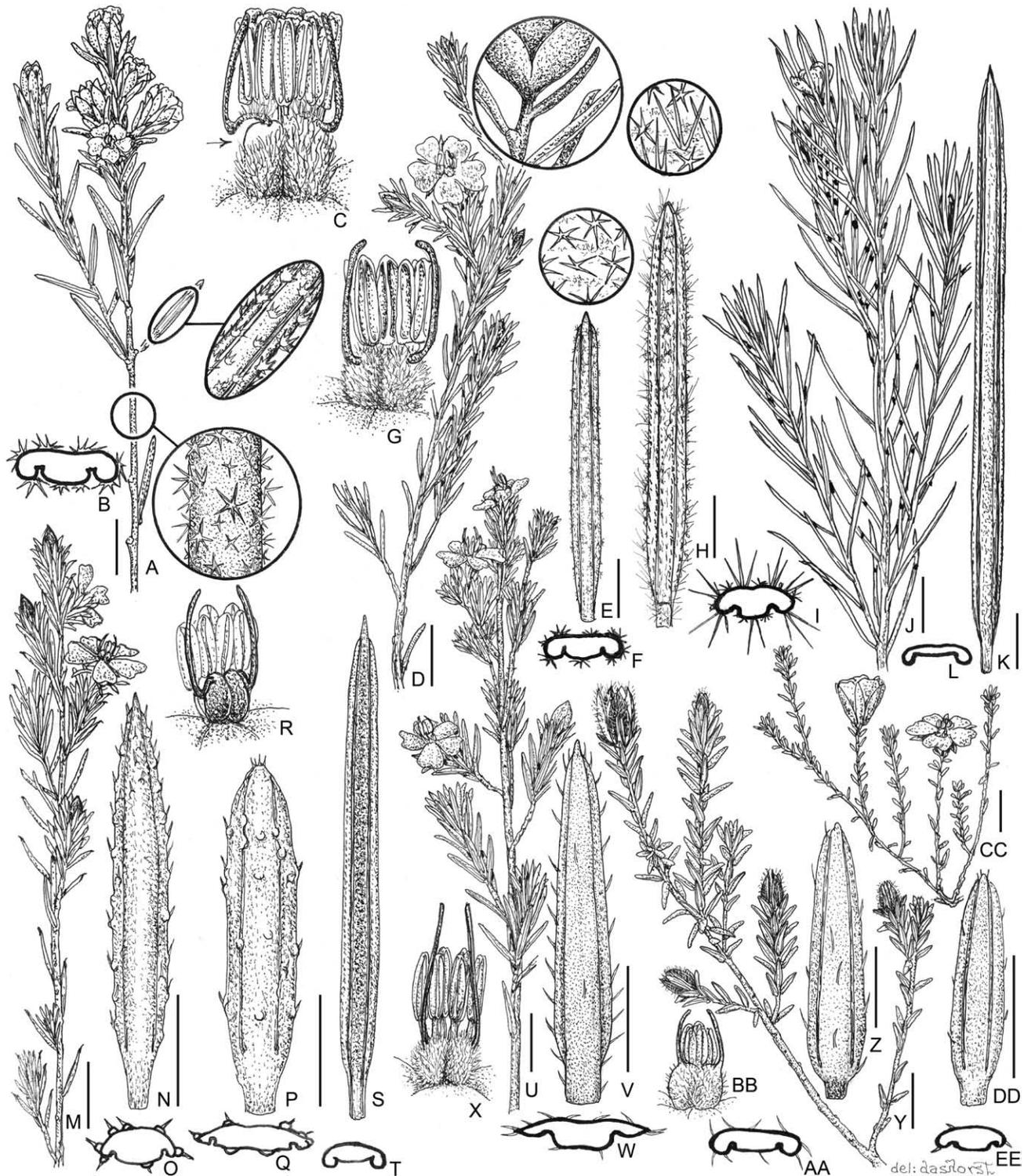


Fig. 2 A–C *Hibbertia strigosa*: A. flowering branch; B, transverse section through mid-leaf; C flower with petals removed. D–G *H. stricta* subsp. *stricta*: D flowering branch; E leaf from below; F transverse section through mid-leaf; G flower with petals removed. H, I *H. stricta* subsp. *furcatula*: H leaf from below; I transverse section through mid-leaf. J–L *H. sulcinervis*: J flowering branch; K leaf from below; L transverse section through mid-leaf. M–O *H. cistiflora* subsp. *cistiflora*: M flowering branch; N leaf from below; O transverse section through mid-leaf. P, Q *H. cistiflora* subsp. *quadristaminea*: P leaf from below; Q transverse section through mid-leaf. S, T *H. cistiflora* subsp. *rostrata*: S leaf from below, T transverse section through mid-leaf. U–X *H. oxycraspedota*: U flowering branch, V leaf from below; W transverse section through mid-leaf; X flower with petals removed. Y–BB *H. puberula* subsp. *extensa*: Y flowering branch; Z leaf from below; AA transverse section through mid-leaf; BB flowers with petals and calyx removed. CC–EE *H. puberula* subsp. *pubescens*: CC flowering branch; DD leaf from below; EE transverse section through mid-leaf. Scale bars: habits (A, D, J, M, U, Y, CC) 10 mm; leaves (E, H, K, N, P, S, V, Z, DD) 2 mm. — A–C R. Bates 11140; D–G K. O’Ryan 50 & R. Windsor; H, I A. Fairley s.n.; J–L R. G. Coveny NSW102007; M–O R. D. Hoogland 12240; P–R H. R. Toelken 9522; S, T F. Robbins sub A. C. Beaglehole 3679; U–X R. T. & J. Miller 78/3.viii.2005; Y–BB R. T. & J. Miller 108/16.x.2007; CC–EE G. M. Cunningham AD200524.

except that more taxa are included by Toelken (2010b) and in this paper. The combination of the individual characters in different species and their juxtaposition in Table 2 will hopefully provide a clearer image of the species concerned.

Wakefield (1955) also referred to the *H. calycina* complex (Toelken, in prep.), but this is not included as *H. calycina* is now considered to belong in the *H. strigosa* group, because it differs from the *H. stricta* group by the presence of long simple, or rarely forked hairs usually overtopping the short fascicled hairs on branches, leaves and particularly on the outer calyx lobes. It also has 8–12 usually subequal stamens and the ovaries are hirsute (cf. *H. strigosa* group). *H. riparia*, which is often united with *H. stricta* (cf. Toelken 2010b), is more similar to *H. calycina*, but it is characterized by 5 to 7 subequal stamens and pronounced intrapetiolar tufts of simple hairs which are decurrent along the sides of the leaf bases. *H. riparia* occurs in Tasmania, southern Victoria and South Australia

#### Key to species and subspecies here referred to the *H. stricta* species-group

The primary bract often grades through a range of additional bracts into the subtending leaves, so that the bracts cannot be clearly distinguished from the leaves. The bracts in the *H. cistiflora* complex are therefore defined as those which resemble the uppermost bract (primary) and have an acute apex up to as long as the basal sheath is wide. In the *H. stricta* complex the bracts are distinguished from leaves only by their position subtending the flower, their relative size and the absence of revolute margins.

1. Ovary hairy; hairs on leaves without obviously raised tubercles
  2. Branches and calyx with simple hairs usually overtopping fascicled hairs, pubescent to hirsute ..... *H. calycina*
  - 2: Branches and calyx with a range of only fascicled hairs, tomentose to hirsute, glabrescent or glabrous
    3. Calyx with scattered fascicled hairs (2–8 arms), rarely glabrescent
      4. Hairs on central upper leaf surface c. 0.1 mm long, with usually 3–5 arms; central vein of leaves touching revolute margins ..... *H. stricta* subsp. *stricta*
      - 4: Hairs on central upper leaf surface c. 0.25 mm long, with (1) 2 or 3 arms; central vein of leaves usually not touching revolute margins ..... *H. stricta* subsp. *furcatula*
    - 3: Calyx glabrous or with few hairs at the apex with a single arm
      5. Central vein of leaves distinctly recessed between revolute margins; flanks of leaves margins rounded ..... *H. sulcinervis*
      - 5: Central vein of leaves bulging and overtopping revolute margins; flanks not as above ..... *H. oxycraspedota*
- 1: Ovary glabrous; hairs on leaves with persistent tubercles
  6. Central vein protruding beyond apex of leaves up to 0.6 mm; Grampians, Victoria ..... *H. cistiflora* subsp. *rostrata*
  - 6: Central vein not visibly overtopping leaf apex; New South Wales, central coast and tableland

7. Stamens 6; leaves, at least below, with scattered tubercles ..... *H. cistiflora* subsp. *cistiflora*
- 7: Stamens 4 (5); leaves smooth or with tubercles along the margins and towards the apex ..... *H. cistiflora* subsp. *quadristaminea*

#### *Hibbertia cistiflora* N.A. Wakef.

Victorian Naturalist 72: 119 (1955); N.C.W. Beadle et al., Vasc. Pl. Sydney edn 2: 230 (1972); H.J. Willis, Handb. Victorian Pl. 2: 388 (1973); Hoogland, Austral. Syst. Bot. Soc. Newsletter 34: 4 (1983); G.J. Harden & J. Everett in G.J. Harden (ed.), Fl. New South Wales 1: 301 (1990); R. Carolin & M. Tindale, Fl. Sydney Region rev. edn.: 274 (1994); Toelken in N.G. Walsh & Entwisle (eds) 2: 307 (1996). — *Pleurandra cistiflora* Sieber ex Spreng., Linn. Syst. Veg. edn 16 4(2) (Cur. Post.): 191 (Jan.–June 1827), nom. illeg. non *P. cistiflora* Reichb. (1825); G. Don, Gen. Hist. 1: 74 (1831); Steud., Nomencl. Bot. edn 2, 2: 354 (1841); Heyh., Nomencl. Bot. Hort. 2: 539 (1846). — **Typus:** “Nov. Holl.,” *F.W. Sieber 148* (holo.: MEL1003802; iso.: G, K).

*Pleurandra cistiflora* Reichb., Iconogr. Bot. Exot. 1, t. 79 (1825) & xvii, 57 (Jan.–June 1827). — **Typus:** ?Iconogr. Bot. Exot. 1, t. 79.

*Hibbertia stricta* (R.Br. ex DC.) F. Muell. var. *glabriuscula* auct. non Benth.: Benth. Fl. Austral. 1: 27 (1863), p.p. as for the synonymy of *Pleurandra cistiflora*.

Shrublets to 0.3 m tall, little branched, erect, decumbent to slightly scrambling; branches wiry-woody becoming stiff-woody, up to 0.5 m long, with pronounced decurrent leaf bases ± flanged, glabrous. *Vestiture* mainly restricted to persistent tubercles but when young ± topped with fascicled hairs with 1 or 2 arms, scattered over leaves or on flanks of revolute leaf margins, rarely few non-persistent scattered simple hairs without tubercle on upper surface of leaves. *Leaves* without intrapetiolar tuft of hairs; *petiole* 0.2–1 mm long, ± flattened, often sharp-edged; *lamina* linear-elliptic to linear-lanceolate, (1.6–) 4–10 (–14.5) × 0.8–1.2 mm, bluntly acute, ± constricted into broad petiole, above flat to slightly concave and with scattered tubercles or glabrous except for a row of tubercles (rarely with 1 or 2 arms but wearing off soon) on flanks of the revolute margins, below slightly bulging central vein, but scarcely overtopping much narrower, and rarely dorsiventrally compressed, revolute margins, without undersurface being visible, tuberculate or glabrous, often clustered at the end of branches, distal ones spreading but subtending ones erect to almost appressed unless young actively growing plants. *Flowers* single, terminal on main and lateral branches; *peduncle* absent; *buds* ellipsoidal to ovoid; *primary bract* and usually 3 or 4 *additional bracts* usually not grading into subtending leaves, triangular to linear-triangular, 1.0–1.3 × 0.3–0.5 mm, acute to pointed, fleshy to scarious and without ridge or revolute margins, glabrous or with few hairs. *Calyx* not accrescent; *outer calyx lobes* oblong-elliptic to oblong-lanceolate, 4.5–5.1 × 1.9–2.2 mm, often longer than inner ones, acute to pointed, with or without central ridge but often folded apically, outside and inside glabrous; *inner calyx lobes* ovate to ovate-oblong, 4.2–4.5 × 2.3–2.6 mm, acute to cuspidate, and sometimes

**Table 2.** Characters of three species of the *H. stricta* species-group from the vicinity of Sydney.

Characters	<i>H. oxycraspedota</i>	<i>H. stricta</i> sens. str.	<i>H. cistiflora</i> subsp. <i>cistiflora</i>	<i>H. cistiflora</i> subsp. <i>quadriramiflora</i>
Central leaf vein	bulging and overtopping revolute margins	bulging to flush with revolute margins	bulging to overtopping revolute margins	bulging to flush with revolute margins
Flanks of revolute leaf margins	sharp-edged	rounded	rounded or sharp-edged below flowers	± sharp-edged
Vestiture on stem	pubescent to glabrescent	pubescent, glabrescent	glabrous	glabrous
Vestiture on leaves	puberulous, with fascicled hairs with 1 (–3) arms	puberulous to glabrescent, with fascicled hairs with 3–5 arms	tubercles above and below, hairs with 1 or 2 arms but caducous	tubercles on flanks of margins
Vestiture on calyx	glabrous	pubescent	glabrous	glabrous
Intrapetiolar hairs	absent	up to 0.4 mm long	absent	absent
Bracts	(3) 4 oblong-triangular, scarious without revolute margins	1 linear to linear-elliptic, leaf-like with revolute margins	3–6 triangular-ovate scarious plus 3–5 linear, foliose with revolute margins	3 or 4, triangular-ovate scarious without revolute margins
Outer calyx lobes	smooth or apex ridged glabrous rarely few hairs	ridged pubescent, glabrescent	smooth, folded to hooded, glabrous	smooth, folded to hooded, glabrous
Anthers	6 (7) subequal 1.4–1.5 mm long	6 unequal, 2.3–2.5 mm, and 2.7–3.0 mm long	6 (7), subequal 1.8–2.1 mm long	4 (5), subequal 1.6–1.9 mm long
Ovary	pubescent ±lateral style attachment	tomentose apical style attachment	glabrous lateral style attachment	glabrous lateral style attachment

apically ridged, inside and outside glabrous. *Petals* broadly obovate, 4.5–12.4 mm long, bilobed. *Stamens* (7) 6 (5) or 4, subequal, in one cluster, *filaments* 0.4–0.8 (–1.2) mm long, usually scarcely, but sometimes up to half their length basally connate; *anthers* oblong-ovoid, 1.4–1.6 mm long, abruptly constricted above and below. *Pistils* 2; *ovaries* obovoid but ± laterally compressed, with 4 lateral ovules, glabrous; *style* dorso-laterally attached and curved up and erect to both sides of the anthers. *Fruit* obloid, glabrous. *Seeds* obloid-obovoid, 1.7–2.2 (–2.4) × 1.1–1.4, brown; aril with fleshy base surmounted by a ± lobed membranous cup covering the lower third to half of the seeds, often ± laterally attached.

**Diagnostic features.** *H. cistiflora* is easily distinguished from other species in the broad *H. stricta* complex by its glabrous ovaries with more or less laterally attached styles. Similar ovaries and styles have also been observed in the *H. acicularis* group, but those species are easily distinguished from this one by their sharply pointed leaf apices. Species of the *H. rufa* group have similar ovaries and are distinguished by their largely connate filaments.

**Nomenclatural note.** When Wakefield (1955) transferred the name of *Pleurandra cistiflora* to *Hibbertia*, he was only aware of the name published by Sprengel (1827) and did not refer to the earlier one by Reichenbach (1825). The two are, however, regarded as synonymous. Since Reichenbach did not mention in his protologue that

this species is based on a Sieber collection, although it most likely was, Hoogland (1983) argued that it is based on a different type to that of the name Sprengel (1827) published. Sprengel’s name is therefore an illegitimate later homonym, and Wakefield’s new combination based on Sprengel’s name in *Hibbertia* becomes a new name (Article 58, ICBN, McNeill et al. 2006). *Hibbertia cistiflora* N.A. Wakef. establishes its priority in *Hibbertia* and Reichenbach’s name, the oldest for this taxon, can no longer be validly transferred into this genus.

***Hibbertia cistiflora* subsp. *cistiflora***

Shrublets with spreading to decumbent, rarely scrambling branches up to 1.4 m long. *Leaf lamina* (1.7–) 2.5–5 (–8.6) mm long, acute becoming obtuse with central vein scarcely protruding, above and below covered with scattered tubercles surmounted by fascicled hairs with 1 to 3 branches when young. *Flowers* terminal on main and lateral branches; *bracts* 1 or 2, surrounded by 3–5 linear-lanceolate additional ones. *Outer calyx lobes* ridged towards apex; *stamens* 6 or rarely 7 or 5; *anthers* 2–2.2 mm long. *Flowering*: mainly August–October but also occasional during the year. **Fig. 2M–O.**

**Distribution and ecology.** Recorded at Belrose, N.S.W., from ecotonal vegetation grading from heath comprised of *Angophora hispida*, *Banksia ericifolia*, *Allocasuarina distyla*, *Hakea laevipes*, *Leptospermum flavescens*, *Calytrix tetragona*, *Darwinia, fascicularis* and *Kunzea*

*capitata* to open forest-woodland of *Eucalyptus haemastoma*, *Corymbia gummifera* and *Banksia serrata* with shrubby understorey of above shrubs and *Leptospermum squarrosus*, *Hakea teretifolia*, *Petrophile pulchella*, *Persoonia pinifolius*, *P. lanceolata*, *Phebalium squamulosum*, Elsewhere recorded growing on sandy soil and/or sandstone in heath or shrubby vegetation in New South Wales (NC, CC).

**Conservation status.** This subspecies has been widely recorded.

**Variation.** Aside from the usual differences in the size of leaves and flowers with changing environmental conditions, it is the general appearance of plants in the field that greatly varies (*E.M.McBarron 17603*). Young plants are often spreading-erect but soon become decumbent or scrambling in surrounding shrubs and branches up 1.4 m have been recorded (*E.F.Constable NSW 26692*). The leaves on branches are usually not spreading and may become almost appressed, except that the distal leaves subtending the terminal flower are then spreading at a right angle to the branches. This gives the branch apex a tufted appearance and is accentuated on older branches where only a few distal leaves remain. Older plants have therefore a noticeably different appearance from younger ones or plants grown under favourable conditions.

The hair tubercles on the leaves are usually well developed on the flanks of the revolute margins, where often hairs with one or two branches are retained for a longer time, but tubercles are also prominent on the lower leaf surface. In some specimens the tubercles are less prominent on the lower leaf surface but usually some are observed, unlike in subsp. *quadristaminea*.

**Selection of specimens examined (45 specimens seen)**

NEW SOUTH WALES. NC: *J.Crawford CBG 43768*, Hawks Nest, ix.1972 (CANB). CC: *W.F.Blakely NSW 102093*, French Forest, vii.1911 (NSW); *W.F.Blakely NSW 102106*, Hornsby, vii.1916 (CANB, NSW); *J.L.Boorman NSW 102103*, Willoughby, vii.1917 (CANB, NSW); *E.F.Constable NSW 26692*, Mangrove Mountain, 5.vii.1951 (CANB, NSW); *R.D.Hoogland 12240*, 1 mile NE Mt White, 9.x.1972 (CANB); *L.Leichhardt NSW 102104*, North Shore, 24.vii.1842 (NSW); *E.M.McBarron 17603*, Woy Woy, Lookout, 25.viii.1969 (NSW); *R.Miller, J.Miller, A. & A.Peters s.n.*, Peats Ridge, Old Pacific Hwy, 26.iv.2010 (AD, NSW); *R.Miller, J.Miller & R.Peters 4a-d/28.viii.2010*, W Belrose substation, near Ralston /Elm Ave (AD, NSW); *R.Miller 138-144/23.x.2008*, Canoelands (AD); *J.Pulley 527*, Davidson Park, St Ives, 21.viii.1970 (CANB); *H.Salasoo 709*, Wahroonga, 11.viii.1951(NSW).

***Hibbertia cistiflora* subsp. *quadristaminea* Toelken, subsp. nov.**

*A subsp. aliis floribus 4 (5) antheris subequalis et tuberculis pilorum ad margines revolutos foliorum restrictis; a H. serpyllifolia 4 (5) antheris caespis dorsali differt.*

**Typus:** New South Wales, 2 miles SW Mt Wilson, *R.D.Hoogland 12245*, 10.ix.1972 (holo.: NSW 224327; iso.: MEL 572184; CANB, G, HBG; K, L, UC, US – n. v.).

*Hibbertia cistiflora* N.A.Wakef., Victorian Naturalist 72: 119 (1955), p.p.; N.C.W.Beadle et al., Vasc. Pl. Sydney edn 2: 230 (1972), p.p.; Hoogland, Austral. Syst. Bot. Soc. Newsletter 34: 4 (1983), p.p.; G.J.Harden & J.Everett in G.J.Harden (ed.) Fl. New South Wales 1: 301 (1990), p.p.; R.Carolin & M.Tindale, Fl. Sydney Region rev. edn.: 274 (1994), p.p.

Shrublets usually straggly, with erect-spreading to decumbent branches up to 0.4 m long. *Leaf lamina* (1.6–) 3–7.5 (–10.6) mm long, acute, above and below smooth except for a row of tubercles along the flanks of the revolute margins or rarely with a few tubercles towards the apex of the central vein. *Flowers* terminal on main and lateral branches; *bracts* 3 or 4, ovate, with 1 or 2 linear additional ones. *Outer calyx lobes* not ridged but often folded towards the apex; *stamens* 4, rarely 5; *anthers* 1.6–1.8 mm long. *Flowering.* August–October. **Fig. 2P, Q.**

**Distribution and ecology.** Grows sometimes locally common on dry sandy or gravelly slopes (of sandstone origin), but also often associated with seepage areas, with low heath often under open woodland of New South Wales (CT).

**Conservation status.** Locally common and conserved in the Blue Mountains National Park.

**Diagnostic features.** This taxon is often wrongly identified in herbaria as *H. serpyllifolia*, but subsp. *quadristaminea* has few stamens only in one dorsal cluster; it is also mistaken as *H. cistiflora* subsp. *cistiflora* but easily distinguished by the absence of fascicled as well as simple hairs on the stems. Subsp. *quadristaminea* is also distinguished from *H. stricta* s.s. and *H. oxycraspedota* by its glabrous ovary and usually 4 stamens (cf. Table 2).

**Notes.** Very few flowers with more than four stamens have been observed. They are normally stiffly erect and reminiscent of *H. rufa*, but lack the connate filaments. Nevertheless, the presentation of the stamens in both taxa is so similar that one is tempted to assume a similar pollination syndrome, in spite of very dry exposed habitats recorded for subsp. *quadristaminea*, while all species of the *H. rufa* group (cf. earlier) are found in swampy environments.

Wakefield (1955) and subsequent authors included this subspecies in the broader concept of *H. cistiflora*.

**Etymology:** The epithet ‘quadri-staminea’, Latin, ‘four-stamened’ refers to the flowers with predominantly four stamens in this subspecies.

**Selection of specimen examined (39 seen)**

NEW SOUTH WALES. CT: *C.Burgess CBG 5965*, Clarence, 10.x.1961 (CANB, BRI); *E.F.Constable NSW 48923*, Mt Blackheath, 21.x.1959 (CANB, NSW, BRI); *A.A.Hamilton NSW 102117*, Leura, 28.ix.1912 (NSW); *R.D.Hoogland 12247*, Mt Irvine, 11.ix.1972 (MEL, NSW; CANB, HBG, K, L, UC – n.v.); *R.D.Hoogland 12251*, NW side of Mt Banks, 11.ix.1972 (NSW; BRI, CANB, HBG, K, L, UC – n.v.); *R.D.Hoogland 12256*, between Linden and Woodford,

12.ix.1972 (CANB; HBG, K, L, NSW – n.v.); *L.A.S.Johnson NSW 102118*, Narrow Neck Peninsula, 29.ix.1945 (NSW); *H.K.C.Mair NSW 102122*, Mt Banks, 28.viii.1959 (NSW); *J.Rodway NSW 102123*, between Mt Tomah and Mt York, 18.x.1936 (NSW); *I.R.Telford 2924*, Blackheath, 28.ix.1971 (CANB); *H.R.Toelken 9522*, track above car park near Mini Hahafalls, 16.ix.2008 (AD, NSW).

***Hibbertia cistiflora* subsp. *rostrata* Toelken**

J. Adelaide Bot. Gard. 16: 60 (1995); Toelken in N.G. Walsh & Entwisle (eds), *Fl. Victoria* 3: 307 (1996). — **Type:** Victoria, c. 3 miles [4.8 km] S Goat Track, *R.D.Hoogland 11889*, 20.x.1970 (holo.:CANB; iso.: K, MEL, NSW; B, HBG, L, UC, US – n.v.).

Shrublets with spreading to scrambling branches rarely up to 1.5 m long. *Leaf lamina* (4–) 6–12 (–14.5) mm long, with pale beak (0.1–) 0.2–0.5 mm long consisting of the protruding central vein, smooth or with few tubercles towards the apex, rarely covered with blister-like tubercles. *Flowers* terminal on main and commonly on sessile lateral branches; *bracts* 3 or 4 surrounded by 2 or 3 additional ones subtending terminal flowers; 3–5 plus 2–4 additional ones below axillary flowers. *Outer calyx lobes* ridged towards apex; *stamens* 6; *anthers* 1.4–1.6 mm long. *Flowering:* mainly September–November. **Fig. 2S, T.**

**Distribution and ecology.** Endemic to the Grampians, Victoria (GR), where it grows on coarse sandy soil in heath to shrubby vegetation near summits or on ridgetops.

**Conservation status.** Conserved in Grampians National Park.

**Notes.** Populations from individual peaks vary with respect to the number of tubercles on the leaves (e.g. almost blister-like in *A.C.Beauglehole 30708*), the number of sessile axillary flowers and the number of bracts subtending them. The apices of the outer calyx lobes also vary from folded to hooded. All specimens examined of this subspecies are characterized by their pronounced apical beak of their leaves.

The large gap between the distribution of the two eastern subspecies and subsp. *rostrata* is also observed between *H. fumana* and *H. humifusa* (cf. *H. humifusa* group).

The leaves of a putative hybrid between this subspecies and *H. sericea*, a very rare phenomenon in *Hibbertia*, described by Toelken (2000, p. 39), are covered with long simple hairs over fascicled hairs, similar to those in *H. sericea*. However, unlike leaves of that species they are narrowly oblong with a very broad central vein obscuring the undersurface as in subsp. *rostrata*.

**Selection of specimen examined (46 seen)**

VICTORIA. **GR:** *R.Bates 6517*, Mt William, 11.xi.1985 (AD); *A.C.Beauglehole 30708*, Asses Ears, 22.v.1969 (AD, CANB, MEL); *T.B.Muir 2595*, Mt Rosea, 10.x.1962 (AD, MEL).

***Hibbertia oxycraspedota* Toelken & R.T.Mill., sp. nov.**

*A. H. cistiflora ovariiis breve sericeis et marginibus petiolorum et laminarum foliorum complanatis et conflatis, veina centrali perprotuberanti; a H. stricta marginibus petiolorum et laminarum foliorum complanatis et conflatis, antheris subequalibus differt.*

**Typus:** New South Wales: Mt Westmacott, Heathcote National Park, *R.T. & J. Miller 78*, 3.viii.2005 (holo.: AD; iso.: NSW).

*Hibbertia stricta* (R.Br. ex DC.) F.Muell. var. *glabriuscula* Benth., *Fl. Austral.* 1: 27 (1863), non *H. stricta* var. *glabriuscula* sensu J.M.Black (1926, 1952) (South Australia), nec *H. glabriuscula* Wheeler (1994) (Western Australia), nec *H. riparia* var. *glabriuscula* Hooker (1834) (Tasmania) (cf. *H. devitata* in Toelken 2010b). — **Typus:** “Fl. Novae Holl.” *F.W.Sieber 150* (lecto. – selected here: K; iso.: MEL31619, MEL31620 (cf. typification).

Shrublet up to 0.4 m tall, more or less branched, spreading to decumbent; branches thin but stiff-woody, with pronounced decurrent leaf bases, ± shortly hairy to glabrescent. *Vestiture* persistent for some time, with few small subequal fascicled hairs on pronounced persistent basal tubercle; *on branches* sparse to usually moderately dense, to glabrescent, with spreading fine multiangulate fascicled hairs ((1) 2–5 (–9) subequal or unequal arms); *on leaves above* sparse, with scattered fascicled hairs (with 1 or 2 subequal antrorse arms) on pronounced persistent basal tubercle becoming larger towards and on the sharp edge of the flanks of the revolute margins; *on leaves below* with fewer and often shorter antrorse hairs as above; *on bracts and calyx* glabrous or rarely with few short simple hairs (rarely forked) without tubercles towards the apex. *Leaves* without intrapetiolar tuft of hairs; *petiole* 0.2–0.5 (–0.8) mm long, flattened, sharp-edged; *lamina* linear-triangular or -lanceolate, (4.6–) 5.4–6.5 (–7.2) × (0.4–) 0.5–0.8 (–1.1) mm, acute with short hairs, usually scarcely constricted into broadened petiole, above flat and puberulous to glabrescent, below with bulging central vein overtopping (partly overlaying) dorsiventrally compressed revolute margins, without undersurface being visible, glabrescent. *Flowers* single, terminal mainly on main branches but also on axillary short shoots; *peduncle/pedicel* absent; *buds* ellipsoidal; *bracts* 1 to several grading into the subtending leaves, linear to linear-triangular, 2.8–3.4 × 0.4–0.5 (–0.6) mm, bluntly acute to obtuse, scarcely ridged, glabrous or with few faint hair tubercles at the apex. *Calyx* not accrescent; *outer calyx lobes* lanceolate, (4.8–) 5.2–5.8 × (1.3–) 1.5–1.8 mm, often slightly shorter than inner ones, acute, without central ridge, outside glabrous or with few appressed hairs towards the apex, inside glabrous; *inner calyx lobes* ovate, 5.1–5.8 × (2.0–) 2.3–2.8 mm, acute, with membranous margins, glabrous. *Petals* obovate, 5.2–6.3 mm long, bilobed. *Stamens* (5–) 7 (very rarely 3–4), subequal, in one cluster; *filaments* 0.6–0.9 (–1.1) mm long, basally connate; *anthers* obloid, (1.9–) 2.0–2.2 mm long, abruptly constricted above and below. *Pistils* 2; *ovaries* obovoid but slightly laterally compressed, with 4 lateral ovules, shortly ± sericeous or

with short antrorse appressed hairs, style dorso-laterally attached and erect with stigmas just above the apex of the anthers. *Fruit and seeds* not seen. *Flowering*: August–October, but also some records throughout the year. **Fig. 2U–X.**

*Distribution and ecology.* Grows on sandy soil on sandstone but often on seepage areas in New South Wales (CC).

*Conservation status.* Locally frequent in Budawang National Park (H.R.Toelken 8418).

*Diagnostic features.* *Hibbertia oxycraspedota* was usually included in the very similar *H. cistiflora*, because of the reduced fascicled hairs on leaves and especially the laterally compressed ovaries and more or less laterally attached styles. However, unlike *H. cistiflora*, the margins of the petiole and leaf lamina are sharp-edged, the leaf lamina is usually shorter, the bulging central vein of leaves is overlaying parts of the flattened revolute margins (so that there is no groove between the two), the usually six or seven stamens have shorter anthers (1.4–1.5 mm long), and the ovary is usually densely covered with antrorse appressed hairs. *Hibbertia oxycraspedota* has also similar hairy ovaries to *H. stricta* s.s. (cf. Table 2) but is mainly distinguished by its broad central vein overtopping the revolute ungrooved margins, the sharp-edged leaf lamina and petiole, and the centrifugal stamens are scarcely longer, but their anthers are not significantly longer than in *H. stricta* s.s.

*Variation.* Hair presence, particularly on the branches, varies from almost absent to moderately dense on other specimens.

The habit varies from commonly erect with tufts of leaves terminal on all branches to spreading (usually in young plants) with leaves covering all branches, but these leaves are more or less appressed and tufted distally.

The number of stamens is usually 6 or 7, but occasional flowers with 3 or 4 stamens can be observed. One collection, *R.T. & J.Miller 18a–g/30.x.2010*, has most flowers with 3 or 4 stamens and beaked outer calyx lobes, but other plants of that general location are normal (*R.T. & J.Miller 71/30.x.2010*).

*Typification.* When Bentham (1863) published *H. stricta* var. *glabriuscula* he included in “the commonest forms” specimens of *Sieber 150, 151, 147 and 148*, but conceded that only the first two agreed most closely with his concept. Among the first two *Sieber* collections, plants of *Sieber 150* are less glabrous so that the specimen of that collection at Kew Herbarium, annotated by Bentham in red pencil, was selected as the lectotype.

*Etymology.* The epithet ‘oxy-crasped-ota’, Latinised Greek, ‘possession of sharp-edged or sharp-margined’ leaves refers to the pronounced dorsiventrally compressed petiole and revolute margins of the basal leaf lamina characteristic of the species.

### *Specimens examined*

NEW SOUTH WALES. **CC:** *C.Barnard CANB 6065*, Sublime Pt, ix.1941 (CANB); *R.Coveny 6634 & J.Powell*, Uloomla Track, Royal National Park, 21.viii.1975 (NSW); *A.Fairley s.n.*, Dharawal Nat. Park, 22.ix.2001 (AD, NSW); *R.D.Hoogland 12216*, along Appin Road, 5.ix.1972 (CANB, NSW; E, HBG, L, UC – n.v.); *R.T.Miller 74*, French Forest, 10.iii.2007 (AD, NSW); *R.T.Miller s.n.*, Madden Plains, E old Princes Highway, 6.vi.2007 (AD); *R.T. & J. Miller 35A, B/3.x.2010*, Madden Falls (AD, NSW); *R.T. & J.Miller 18a–g/30.x.2010*, Wandean Road (AD, NSW); *R.T. & J.Miller 25h–l/30.x.2010*, Wandean Road (AD); *R.T. & J.Miller 71/30.x.2010*, Wandean Road (AD); *I.R.Telford 2981*, Princes Highway–Darks Forest Road, S Helensburgh, 30.ix.1971 (CANB). **SC:** *L.G.Adams & K.Paijmans 3780*, 5 km SSE Mt Tianjara, 26.iii.1981 (CANB); *E.F.Constable NSW 45265*, Turpentine Range, c. 15 miles S Nowra, 27.x.1957 (NSW); *J.Pickard 1667*, 1.35 km ESE Nerriga, 5.ix.1971 (NSW); *R.Pullen 4853*, c. 1.6 km N Pigeon House Mountains, W Ulladulla, 29.vi.1973 (CANB); *R.Pullen 4971 & J.Story*, N. side of Mt Corang, 26.ix.1973 (NSW; CANB – n.v.); *J.Pulley CBG 8008198*, Little Forest Plateau, NW Milton, 21.vi.1973 (CANB); *J.Pulley 176*, near Great Natural Bridge, 21.ix.1971 (CANB); *H.R.Toelken 8413*, Wog Wog camping area, 31.x.1993 (AD, NSW); *H.R.Toelken 8418*, below summit of Mt Corang, 31.x.1993 (AD, NSW).

### *Hibbertia stricta* (R.Br. ex DC.) F.Muell. sens. str.

Pl. Indig. Col. Vict. 1: 15 (1862), p.p.; Benth. Fl. Austral. 1: 27 (1863), p.p.; F.Muell., Syst. Cens. 1: 1 (1882), p.p.; F.M.Bail., Syn. Queensl. Fl. 4 (1887), p.p.; N.C.W.Beadle et al., Vasc. Pl. Sydney edn 2: 230 (1972), p.p.; H.J.Willis, Handb. Victorian Pl. 2: 388 (1973), p.p. — *Pleurandra stricta* R.Br. ex DC., Syst. Nat. 1: 422 (1817); DC., Prodr. 1: 73 (1824); Spreng., Syst. Veg. edn 16, 4(2) (Cur. Post.): 191 (1827); G.Don, Gen. Hist. 1: 74 (1831), as ‘striata’; Schldl., Linnaea 20: 625 (1847), p.p. — *Pleurandra riparia* DC. var. *stricta* (R.Br. ex DC.) Hook.f., Fl. Tasm. 1: 17 (1855), p.p. — **Typus:** New South Wales, near Port Jackson, *R.Brown [J.J.Bennett 4877]* (holo.: G-DC; iso.: BM, K?, MEL35934, MEL35942).

*Hibbertia riparia* auctt. non (DC.) Hoogland: Hoogland, Kew Bull. 29: 155 (1974), p.p., quoad *H. stricta*; Jessop in Jessop & Toelken (eds), Fl. S.Austral. 1: 357 (1986), p.p.; G.J.Harden & J.Everett in G.J.Harden (ed.), Fl. New South Wales 1: 301 (1990), p.p.; R.Carolin & M.Tindale, Fl. Sydney Region rev. edn.: 274 (1994), p.p.; Toelken in N.G.Walsh, & Entwisle (eds), Fl. Victoria 3: 312 (1996), p.p.

Shrublet rarely up to 0.6 m tall, with several erect branches moderately to densely branched; branches wiry becoming stiff-woody, with decurrent leaf bases often becoming flanged, puberulous to pubescent, rarely shortly hirsute. *Vestiture* persistent to glabrescent, with slightly larger over smaller fascicled hairs on branches, bracts, calyx and on leaves, often reduced to ones with single arms; *on branches* moderately to dense, rarely sparse, larger (with usually (3–) 5–9 subequal arms) over smaller fascicled hairs (1–4 subequal arms) mainly between leaf bases; *on leaves above* sparse to dense, with mainly larger ((1) 2–5 subequal arms, becoming more towards the margins) over few smaller fascicled hairs (1–3 usually subequal arms); *on leaves below* similar to above but usually somewhat larger and denser; *on bracts* similar to leaves but often with arms

± antrorse and marginal one become cilia-like; *on outer calyx lobes* outside dense to scattered larger fascicled hairs on tubercles (6–8 subequal, rarely unequal arms) sometimes concentrated along the centre over smaller ones (3–5 subequal to uneven arms), inside dense to sparse, with fine antrorse fascicled hairs without tubercles on the upper half; *on inner calyx lobes* outside usually dense, with larger fascicled hairs over smaller ones and all becoming gradually shorter towards the membranous margins, inside with few fine forked hairs at the apex. *Leaves* with intrapetiolar tuft of hairs 0–0.2 mm long; *petiole* 0.2–1.1 mm long, with rounded margins often indistinct from lamina; *lamina* linear, (2.3–) 6–12 (–23.5) × (0.2–) 0.4–0.6 (–0.8) mm, acute or pointed, often becoming obtuse, gradually and usually scarcely constricted into petiole, above flat to somewhat rounded, puberulous, pubescent to glabrescent, below with central vein bulging and often overtopping scarcely narrower revolute margins, without undersurface being visible, puberulous, pubescent, shortly hirsute to glabrescent. *Flowers* single, terminal mainly on distal main branches or axillary branches or short shoots; *peduncle and pedicel* absent; *buds* narrowly ovoid to ellipsoidal; *primary bract* linear-triangular, (1.9–) 2.2–3 (–3.4) × 0.2–0.3 (–0.4) mm, acute, fleshy, pubescent to glabrescent; additional bracts similar but merging into linear leaves. *Calyx* not accrescent; *outer calyx lobes* ovate to lanceolate, (4.3–) 4.8–5.5 (–6) × (1–) 1.2–1.5 mm, often longer than inner ones, acute to beaked, with central ridge down to centre, outside puberulous to pubescent or shortly hirsute, rarely glabrescent, inside puberulous to pubescent on the upper half; *inner calyx lobes* ovate to oblong-ovate or elliptic, (4.3–) 4.5–5 (–5.5) × (1.8–) 2–2.3 mm, sometimes slightly ridged, outside puberulous to pubescent along the central ridge, inside glabrous. *Petals* cuneate-obovate, 4.5–7.3 mm long, emarginate to bilobed. *Stamens* 6 or 7, with central one distinctly longer, *filaments* 0.8–1.5 mm long; *anther* obloid-obovoid, 1–1.5 (–1.8) mm long or longer one 1.8–2.5 mm long, abruptly constricted above and below. *Pistils* 2: *ovaries* broadly obovoid, scarcely laterally constricted, with 4 lateral ovules, tomentose; *style* attached terminally or sometimes laterally to the ovaries, then the styles down- and backwards before straight upwards on both sides of the anthers and with stigmas well above the apex of the anthers. *Fruit* tomentose to puberulous. *Seeds* obloid to obloid-obovoid, 1.8–2.1 × 1–1.3 mm, black; aril with fleshy base surmounted by a membranous cup with 1–3 irregular spreading lobes, often longer than the base and clasping the lower third of seeds.

*Diagnostic features.* *Hibbertia stricta* cannot be distinguished from each of the species included in the *H. stricta* group by a single character, but rather by a combination of a number of different characters (Table 2). Similarly, it differs by multiple character states from other groups of species segregated from Bentham's very broad concept (Toelken, in prep.). The most reliable

characters being: leaves usually with broad bulging central vein, only fascicled hairs on branches and calyx, sessile flowers usually with several bracts merging into subtending leaves, outer calyx ridged at least on the distal half, ovary tomentose.

*H. devitata* Toelken (2010b) differs from *H. stricta* s.s. by its distinctive leaves with an excessively bulging central vein so that it starts overlaying the revolute margins. The anthers are also rarely more than 1.8 mm long, while in *H. stricta* they are usually longer.

*Taxonomic notes.* The very broad delineation of *H. stricta* by Bentham (1863) seems to be largely based on the extraordinary agglomeration of synonyms of previously published species under that name by Mueller (1862). This in turn might have been influenced by the treatment J.D. Hooker (1855) provided of the Tasmanian representatives of this group. Mueller, however, included *H. empetrifolia*, now in the *H. aspera* group, and *H. enervia* (cf. Toelken 2004), now relegated to the *H. fasciculata* group (Toelken, in prep.). Bentham's broad concept was maintained in Australian literature except for a fleeting start to a reassessment of some taxa by Wakefield (1955). Hoogland (1974), however, rearranged a similar synonymy to Bentham's, but now under *H. riparia*. He made these changes following Hooker (1855), who was the first to include *H. stricta* under *H. riparia*. Since *H. riparia* and *H. stricta* were established in the same publication, Hooker's choice has priority (article 11.5, ICBN, McNeill et al. 2006).

The interpretation of *H. stricta* s.s. has not only varied because of Bentham's very broad concept, but also, because different type specimens were distributed to various herbaria. Robert Brown's manuscript description of *Pleurandra stricta* is based on the specimen: "In campis arenosia prope Sullivan Bay nr Port Phillip" (e.g. MEL 695599), which, on the basis of its stalked flowers, is now referable to *H. australis* (cf. Toelken 2010b). But Brown's manuscript description states "Flores terminales solitarii sessiles erecti". However, when and why the type specimen was changed is not known, as de Candolle (1817) clearly describes in the protologue "flores ad ramorum apices solitarii sessiles" and "Hab. In Nova-Hollandia prope Port Jackson" (e.g. G(DC), MEL 35934, MEL 35942). The specimen MEL 35942 and a specimen in the British Museum are annotated "R. Brown [J.J. Bennett 4877] in arenosis inter Sydney + Botany Bay" and the latter (in BM) bears the manuscript name "*Pleurandra arenaria*", a name that was never taken up. All these latter specimens, i.e. including the holotype from the Sydney area, agree in all respects with the protologue and represent quite a different species to the one Brown originally described. This interpretation of *H. stricta* s.s. is adopted here.

#### *Hibbertia stricta* subsp. *stricta*

*Pleurandra microphylla* Sieber ex Spreng., Syst. Veg. edn 16, 4(2) (Cur. Post.): 191 (1827); G. Don, Gen. Hist. 1: 74 (1831); A. DC., Linnaea 25: 577 (1853); non *Hibbertia microphylla* Steud. (1845) (Western Australia), nec

*Pleurandra riparia* var. *microphylla* J.D.Hook. (1855) (Tasmania). — **Typus**: “Fl. Novae Holl.”, *F.W.Sieber 143* (holo.: W – n.v.; iso.: G, K).

Leaves usually with short and coarse fascicled hairs with arms up to 0.1 mm long, deciduous and with a tubercle, above along the centre hairs with 3–5 arms or if less then arms very short and reduced, rarely completely absent, below with revolute margins touching often bulging central vein and undersurface not visible between them. *Flowering*: August–November. **Fig. 2D–G.**

*Distribution and ecology.* Grows on sandy soil of often old sand dunes or derived from sand stone, in heath mainly in low-lying areas along the coast of New South Wales (CC, SC).

*Conservation status.* Locally frequent in conserved areas (e.g. *H.R.Toelken 9514*).

*Variation.* *Hibbertia stricta* shows much variation even of the fascicled hairs, which have usually equally long arms. In var. *stricta* they are usually subtended by a tubercle, which does not rise as abruptly as those of *H. cistiflora*. The uneven leaf surface, particularly on the flanks of the revolute margins on older leaves where the hairs have worn off, is always noticeable. Furthermore, the number of arms of individual hairs varies considerably and in many forms it is smaller, but then the arms are shorter. Among these there are often hairs with a single arm, but since it is situated on a tubercle it is here interpreted as a fascicled hair in contrast to those simple hairs (e.g. as on *H. calycina*), which have a different texture and no basal tubercle.

Similar to younger plants of *H. cistiflora*, branches of *H. stricta* are covered with leaves, but on older plants the leaves are clustered at the apex. These leaves are more or less similarly spreading or more erect on the same plant unlike the tufted effect with much more spreading distal leaves in *H. cistiflora*. The width of the central vein also varies in relation to the width of the revolute margins and is the amount of bulging, but rarely is it starting to overlie the revolute margins, as it is typical of leaves of *H. devitata*.

The outer calyx lobes are usually acuminate and longer than the inner ones in the Central Coast Region, while they are acute and about as long as the inner ones along the Southern Coast. Along similar regions some local variation of terminal to a more or less lateral style attachment was observed, but all the above variants could not be clearly distinguished.

*Notes.* The identity of *Pleurandra microphylla* caused some uncertainty, because Sprengel (1827) referred to Sieber, but did not cite the number of the collection on which it is based. A. de Candolle (1853) corrected this by placing it in *H. stricta*, based on *F.W.Sieber 143* (not *F.W.Sieber 151*, which is a glabrescent specimen of *H. stricta* subsp. *stricta*). *Pleurandra microphylla* is more hairy, as indicated in the original description of

the species. The specific epithet ‘*microphylla*’ does not contribute to the identification, as, for instance, a Sieber specimen identified as *P. microphylla* (MEL 1003805), is actually a small-leaved form of *H. cistiflora* similar to *F.W.Sieber 148*. Wakefield (1955) also reached a similar conclusion, but then associated this depauperate specimen of *H. stricta* (*P. microphylla*) with the western form, much of which is here considered to be *H. devitata*. The latter is easily distinguished by its excessively bulging central vein of the leaves.

#### *Selection of specimens examined (46 seen)*

NEW SOUTH WALES. **CC**: *E.Cheel NSW 101882*, Bondi, 28.viii.1898 (NSW); *R.G.Coveny NSW 101869*, Kangaroo Creek, Royal National Park, 2.viii.1966 (NSW); *Froggatt NSW229713*, Botany Bay, 28.ix.1894 (AD, MEL; NSW – n.v.); *C.P.Gibson & R.T.Miller 47/1.xi.2006*, Picnic Point, eastern Yeramba Lagoon (AD, NSW); *C.P.Gibson 48/5.x.2006*, Picnic Point, eastern Yeramba Lagoon (AD); *F.W.Sieber 151*, “Nov. Holland.” (MEL35936); *C.L.Wilson 487*, South Coogee sand hills, 21.iii.1957 (NSW). **SC**: *E.Gauban NBG4791*, Jervis Bay, 16.ix.1951 (BRI, CANB); *R.D.Hoogland 12267*, S Lake Wollumboola along Nowra–Currarong road, 14.ix.1972 (BRI, NSW; CANB, E, HBG, K, L – n.v.); *K.O’Ryan 50 & R.Windsor*, 15 km E Tiantjara Falls, 13.viii.1984 (AD, CANB – n.v.); *J.Pulley NBG 43380*, Ulladulla, 13.1.1969 (CANB); *J.Taylor 1251*, *J.Rymer & R.Jackson*, Bowen Island, 4.xii.1980 (CANB); *H.R.Toelken 9514*, Cape Jervis, 200m from gates, 5.ix.2008 (AD, NSW).

#### *Hibbertia stricta* subsp. *furcatula* Toelken, subsp. nov.

*A subspecies typica pilis fasciculatis in paginis superis foliorum circiter 0.2 mm longis et (1) 2 vel 3 furcatis nervisque centralibus foliorum non continguis margines revoluta differt.*

**Typus**: New South Wales, Dilkara Court, Menai, A. Fairley s.n., i.2005 (holo.: AD; iso.: MEL, NSW).

*Hibbertia* sp. *Menai* (A.T.Fairley 15 Dec. 2004) N.S.W. Herbarium in PlantNet Flora of New South Wales Online (2005).

Leaves with fascicled hairs with fine arms c. 0.2 mm long, persistent and without a tubercle, above usually bifurcate, rarely trifurcate along the centre of the upper surface, below with distinct gap showing the hairy undersurface between revolute margins and the central vein. *Flowering*: September–December (February). **Fig. 2H, I.**

*Distribution and ecology.* Grows in gravelly loam or clay soil in heath under open woodland on the central coast of New South Wales (CC, SC).

*Conservation status.* Apparently rare, but one population conserved in Royal National Park (*H.R.Toelken 9506*).

*Variation.* Plants show similar variation to the typical subspecies, but the hairs are always relatively long and erect-spreading.

*Etymology.* The epithet ‘*furcatula*’, Latin, ‘little fork’ is derived from the fine forked fascicled hairs along the centre of the upper surface of the leaves which are characteristic of this subspecies.

*Specimens examined*

NEW SOUTH WALES. CC: *J.H.Camfield NSW 101887*, Oatley, xi.1901 (NSW); *J.H.Camfield NSW 101892*, Loftus, i.1894 (NSW); *J.J.Fletcher NSW 101888*, Como, 6.iii.1887 (NSW); *H.R.Toelken 9506*, Chinamans Helipad, Royal National Park, 4.ix.2008 (AD, NSW). SC: *E.F.Constable NSW 16620*, Nowra North, 8.xii.1950 (NSW); *E.F.Constable NSW 51016*, west of Nowra on Bamerang road, 26.ii.1960 (NSW).

*Hibbertia sulcinervis* Toelken, *sp. nov.*

*H. strictae affinis sed foliis longioribus ((7.4–) 10–20 (–34.5) mm longis) et nervis sulcatis caliceque glabro; a H. cistiflora ovario pubescente vel hirsute et nervis foliorum sulcatis; a H. oxycraspedota marginibus foliorum et petiolis rotundatis nervisque foliorum sulcatis differt.*

**Typus:** New South Wales, Nortons Basin, *R.G.Coveny NSW102007*, 18.xii.1965 (holo: NSW).

Shrubs up to 0.6 m tall, with a number of erect, moderately branched, stiff main branches; branches stiff-woody, with pronounced  $\pm$  flanged leaf bases, puberulous or glabrous on leaf bases. *Vestiture* persistent to glabrescent, fascicled hairs often reduced to a single arm or pale tubercle; *on branches* persistent, moderately dense to glabrescent or usually glabrous on raised leaf bases, with subequal short fascicled hairs (with (1–) 3–5 subequal arms) and with short intrapetiolar tuft; *on leaves above and below* glabrous and without hair bases as in *H. stricta* but with few fascicled hair with 1–3 arms on the margins of the petiole; *on bracts* persistent, minute scattered fascicled hairs with 1 (2) arms mainly along the margins; *on outer and inner calyx lobes* glabrous but often with papillae on pointed apex of outer ones. *Leaves* with short intrapetiolar tufts 0.2–0.3 mm long; *petiole* (0.5–) 0.8–1.6 mm long, with incurved edges; *lamina* linear, (7.4–) 10–20 (–34.5)  $\times$  0.8–1.1 (–1.3) mm, acute to pointed and with short hairs when young, scarcely constricted into petiole, above flat and glabrous, below broad central vein distinctly recessed between bulging revolute margins with few scattered hairs (with 1 deciduous arm without tubercle) when young without undersurface being visible. *Flowers* terminal distally on main and axillary branches or short shoots; *pedicel* up to 2 mm long; *buds* narrowly ovoid or ellipsoidal; *primary bract* linear-triangular to linear-elliptic, (1.2–) 1.6–2.3  $\times$  0.2–0.3 mm, acute, fleshy and without basal sheath, caducous; *additional bracts* similar but merging into linear leaves. *Calyx* not accrescent; *outer calyx lobes* lanceolate, 4.5–5.5 (–6)  $\times$  1.8–2.2 mm, sometimes slightly longer than inner ones, with faint central ridge down to at least the centre, outside and inside glabrous or with few deciduous small hairs; *inner calyx lobes* elliptic-ovate to elliptic, 4.5–5.3 (–5.5)  $\times$  2.2–2.8 mm, scarious with membranous margin, without ridge, outside and inside glabrous. *Petals* cuneate-obovate, 4.2–5.8 (–7.4) mm long, emarginate. *Stamens* 6 or 7, with central one longer, in one cluster; *filaments* 0.9–1.1 mm long, basally connate; *anthers* 1.5–1.7 mm long or longer one 1.8–2.2 mm long, abruptly constricted

above and below. *Pistils* 2; *ovaries* broadly obovoid but somewhat laterally compressed, with 4 lateral ovules, shortly hirsute; *style*  $\pm$  laterally attached, then recurved and erect on both sides of the anthers, with stigmas well above the apex of the anthers. *Fruit* and *seeds* unknown. *Flowering:* September–December. **Fig. 2J–L.**

*Distribution and ecology.* Ecology unknown, except for its occurrence at Norton Basin along the Nepean River, New South Wales (CC).

*Conservation status.* Only two collections of this species are known, from 1898 and 1965. It is possibly extinct.

*Diagnostic features.* *H. sulcinervis* is distinguished from *H. stricta* by its long leaves ((7.4–) 10–20 (–34.5) mm long) each with an obviously recessed central vein and without showing the undersurface. In addition, it has glabrous or almost glabrous calyces (sometimes with few short hairs at the apex of the outer calyx lobes). The hairy ovary and strongly recessed central vein of leaves distinguishes it from *H. cistiflora*. It differs from *H. oxycraspedota* by the rounded margins of the leaves and their recessed central vein.

*Variation.* In spite of its recessed central vein the undersurface of the leaves was not seen in the two dried specimens examined.

In contrast to the very similar *H. stricta* the leaves of *H. sulcinervis* do not show pale spots (not tubercles as in *H. cistiflora*) where hairs had been attached to the surface. However, occasionally some unevenness of the margins of the leaves could indicate that these hair bases might be observed in fresh material or in a larger range of material of the species.

*Etymology.* The epithet ‘sulcinervis’, Latin, ‘with grooved nerves’ refers to the characteristic central vein of the leaves, which is distinctly recessed below the revolute margins to form a well-defined groove.

*Specimen examined*

NEW SOUTH WALES. CC: *W.Forsyth NSW 102009*, Nepean River, ix.1898 (NSW).

**7. *H. strigosa* Toelken group**

Specimens identified by Bentham (1863) as *H. stricta* var. *hirtiflora* Benth. are here largely referred to the *H. strigosa* group. It is mainly found west of the Great Dividing Range in Queensland, New South Wales and northern Victoria.

Species resemble those of the *H. stricta* group, as they also have sessile flowers subtended by several bracts. But they are distinguished by long, usually coarse, forked to simple hairs, which are more or less appressed (strigose) to the calyx and often overtopping short fascicled hairs, well developed intrapetiolar tufts of hair in the leaf axils, especially below the flowers, and usually more than 10 stamens with narrow subequal anthers.

The long hairs on the calyx often leads to confusion with the *H. sericea* group (cf. earlier), which is, however,

easily distinguished by the recurved distal margins and terminal ridge of the outer calyx lobes, together with single terminal flowers, or, if the flowers are distally clustered, then usually in a corymbiform inflorescence; this is in contrast to the spikiform arrangement common in the *H. strigosa* and *H. stricta* groups. Flowers of species of the *H. strigosa* group also resemble those of the *H. cistoidea* group (Toelken, in prep.), but are sessile and usually with several bracts; the outer calyx lobes of *H. strigosa* and relatives are usually lanceolate and generally more than 10 slender stamens are present.

***Hibbertia strigosa* Toelken, sp. nov.**

*A H. calycina absentia pilorum simplicum in ramis, lobis calicis longioribus (6.8–9.2 mm) cristisque ad basim differt.*

**Typus:** Victoria, 5.5 miles NNW Myrtleford, A.C. Beaglehole 43777 & D.G.Cameron, 7.xii.1973 (holo.: MEL119617; iso.: CANB288725, NSW241887).

*Hibbertia calycina* (DC.) N.A.Wakef., Victorian Naturalist 72: 122 (1955), p.p.; Willis, Handb. Pl. Victoria 2: 389 (1973), p.p.; Toelken in N.G.Walsh & T.Entwisle (eds), Fl. Victoria 2: 307 (1996), p.p..

Shrubs up to 0.5 m tall, more or less untidily branched, erect to spreading; branches slightly ridged to sparsely flanged from the decurrent leaf bases, fascicled-tomentose. *Vestiture* ± persistent, with moderately to sparsely dense little-branched fascicled hairs, rarely glabrescent and with long simple to forked hairs on the calyx; *on branches* sparsely to moderately dense with short erect-spreading fascicled hairs (4–6 subequal to unequal arms) overtopping fewer even smaller ones (2–3 usually unequal arms), rarely with few simple hairs decurrent from the leaf axils along groove on either side of leaf bases; *on leaves above* sparse to glabrescent, with short antrorse-appressed fascicled hairs ((1) 2 or 3 often unequal arms) becoming longer and usually tuberculate towards the margins; *on leaves below* sparse and scattered on revolute margins, with antrorse-appressed, usually tuberculate fascicled hairs ((1) 2 or 3 usually unequal arms), glabrous or only tubercles on the central vein; *on bracts* dense but similar to leaves except marginal fascicled hairs are spreading-ciliate; *on outer calyx lobes* outside dense, with fine long simple hairs along the centre becoming shorter and usually biforked towards the margins and usually overtopping few small erect-spreading fascicled hairs (4–6 subequal arms) towards the base, inside moderately dense, with fine shorter antrorse-appressed, usually biforked hairs on the upper half to third; *on inner calyx lobes* outside dense, with fine long simple hairs along the central ridge becoming shorter and commonly biforked to glabrescent on the membranous margins, inside, sparse to glabrous, with few short antrorse-appressed simple hairs, rarely forked towards the apex. *Leaves* with tufts of simple hairs in leaf axils but also continued on base of upper (adaxial) leaf surface; *petiole* 0.2–0.6 mm long, often indistinct; *lamina* linear, rarely linear-lanceolate, (5.4–) 10–16 (–23) × (0.6–) 0.8–1.2 (–1.4)

mm, scarcely tapering into petiole, acute to pointed, above flat to slightly convex puberulous, below with central vein usually twice broader than the revolute margins at mid-leaf and recessed to flush, puberulous to glabrescent. *Flowers* single and terminal to clustered into distal spikiform inflorescence, sessile or subsessile on main and short lateral branches; *buds* narrowly ovoid; *primary bract* linear-triangular, 3.6–4.4 × 0.3–0.45 mm, shorter than calyx, acute, leaf-like with revolute margins, pubescent below, above sparsely so, caducous to deciduous; up to 5 additional bracts merging into leaves. *Calyx lobes* similar; *outer calyx lobes* oblong-lanceolate, (6.8–)7.5–8.5 (–9.2) × 3.1–3.5 mm, subequal to slightly longer than inner ones, acute, stiffly ridged from the base but often obscured by strigose tomentum, inside sparsely hairy on upper third to half; *inner calyx lobes* oblong-lanceolate to -elliptic, (7–) 8.2–8.9 × 3.6–4.3 mm, acute, usually stiffly ridged from base, outside shortly strigose, inside with few hairs on the upper margin. *Petals* broadly obovate, 9–11.8 mm long, emarginate to bilobed. *Stamens* (9–) 12–14 (–16), in dorsal cluster; *filaments* slender, 3–3.4 mm long, with one somewhat longer; *anthers* slender, obloid, 2.1–2.4 mm long, subequal, straight, scarcely constricted above and below. *Pistils* 2; *ovaries* obloid-obovoid, each with 6 (–8) ovules above one another, strigose with few arms to fascicled hairs; *style* base attached to apex of ovary and curved sideways on side of stamens and covered with scattered fascicled hairs, with styles straight erect next to stamens and with stigma well above them. *Fruits* erect. *Seeds* ovoid, 2–2.4 × 1.8–2 mm, brown to black; *aril* with fleshy base surmounted by membranous cup, slightly lobed to one side and covering the lower third to half of the seed. *Flowering*: October–December. **Fig. 2A–C.**

*Distribution.* Grows on sandy loams or sandy soils in open woodland of south-west New South Wales (SWS) and north-eastern Victoria (EHL), where it is reported from *Eucalyptus sieberi* open forest with *Acacia obliquinervia*, *Cassinia longifolia*, *Monotoca scoparia*, *Joycea pallida*, *Persoonia confertiflora*, *Pultenaea scabra* and *Davesia latifolia* (N.G.Walsh 5614).

*Conservation status.* Locally common (N.G.Walsh 5614).

*Diagnostic features.* *Hibbertia strigosa* is very similar to *H. calycina*, but unlike that species, it has no simple hairs on the stems, which are covered with small fascicled hairs and the calyx lobes are longer. The calyx lobes exhibit a pronounced ridged central vein towards the base of each lobe, in contrast to the *H. sericea*, *H. stricta* and *H. cistoidea* groups, where the veins, if present, are more defined on the upper half of the lobes.

*Variation.* Although plants in general have spreading pointed leaves and appear pungent, they are not awned as in the case of *H. acicularis* group. This is particularly impressive in young plants, which have at times

exceptionally long leaves. The hairs on the leaves are always antrorse but in plants from Victoria they have short arms, which sometimes wear off. Some plants in New South Wales are more densely hairy and also the arms are longer (e.g. *N.T.Burbidge* 488).

*Notes.* A “strong off-sweet odour” was recorded by *R.Bates* 11140, 11170.

*Etymology.* The epithet ‘strigosa’, Latin, ‘strigose’ refers to the type of tomentum with long stiff antrorse and more or less appressed hairs on the calyx.

#### *Specimens examined*

NEW SOUTH WALES. **SWS:** *R.Bates* 11140, wooded slopes N Albury, 19.x.1987 (AD); *R.Bates* 11170, Carabost, 20.x.1987 (AD); *H.Beattie* MEL 31629, near Albury, s.dat. (MEL); *N.T.Burbidge* 488, Walbundrie, 13.5 miles SE Burrumbuloh, 7.xii.1946 (CANB); *E.J.McBarron* 1989, Monument Hill, Albury, 12.ix.1948 (NSW); *E.J.McBarron* 2997, Nail Cann Hill, Albury, 22.i.1949 (NSW).

VICTORIA. **EHL:** *A.C.Beauglehole* 43590, 6 miles N Beechworth, 23.xi.1973 (CANB, MEL); *A.C.Beauglehole* 88573 & *H.M.Curtis*, Baranduda Range, Regional Park, 15.ix.1987 (MEL); *A.C.Beauglehole* 91272 & *C.C.Taylor*, Lockhart Creek Education Centre, 9.xi.1987 (MEL); *E.M.Canning* 473, 33.8 km Springhurst to Beechworth along Cemetery Road, 28.xii.1967 (CANB); *E.M.Canning* 479, along Forest Road towards Chiltern & Wooragee, 28.xii.1967 (CANB); *E.M.Canning* 4473, towards Carboor, opposite Carnavon homestead, 8.x.1978 (CANB); *N.Henley* MEL 31610, Ovens River, 1891 (MEL); *N.McKibbin* MEL 31712, Hume River, Wodonga, x.1887 (MEL); *A.Meebold* 21642, Tallangatta, xii.1936 (CANB); *F.Mueller* MEL 31609, hills between the Ovens and Broken rivers, 16.ii.1850 (MEL); *N.G.Walsh* 5614, Insolvent Track, 1.9 km N from Mt Ray Rd; upper south slopes of Mt Difficult, 25.x.2002 (AD); *J.H.Willis* MEL 502148, Crown Land W of Annuello, 18.ix.1971 (CANB).

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