



New combinations in the *Hibbertia vestita* (Dilleniaceae) species group from New South Wales

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Abstract: *Hibbertia ericifolia* and *H. florida* in the informally named *H. vestita* species group from eastern Australia are critically re-evaluated. Evidence is presented to show that *H. ericifolia* subsp. *acutifolia* and *H. florida* subsp. *angustinervis* are better placed at species rank, and these are formally described here as *H. acutifolia* (Toelken) T.Hammer and *H. angustinervis* (Toelken) T.Hammer. *Hibbertia florida* and *H. ericifolia* and the related *H. intermedia* are compared to the new species and updated descriptions are given.

Keywords: Dilleniaceae, *Hibbertia*, new combinations, New South Wales, taxonomy

Introduction

While completing *Hibbertia* (Dilleniaceae) treatments for the *Flora of Australia* (Hammer & Thiele 2022–), a couple of species came to my attention that needed further revision. These are *H. ericifolia* Hook.f. and *H. florida* Toelken within the informally named *H. vestita* species group (previously *Hibbertia* §*Vestitae* Benth.). This unranked infrageneric taxon was erected by Bentham (1863) for species that have stamens arranged all around typically three hairy, 4–6 ovulate carpels (Fig. 1A, F) and small narrow leaves with revolute margins (Fig. 1B, C, E). Bentham recognised three species in §*Vestitae*: *Hibbertia pedunculata* R.Br. ex DC., *H. serpyllifolia* R.Br. ex DC. and *H. vestita* A.Cunn. ex Benth. *Hibbertia pedunculata* was distinguished from the other two by having long pedicels (as ‘peduncles’), and *H. vestita* was distinguished from *H. serpyllifolia* by having staminodes and more stamens.

Toelken (2013) revised the taxonomy of §*Vestitae* (as the ‘*H. vestita* species group’), recognising 22 species, 15 of which were newly described. In addition to these new species, he revised Bentham’s taxonomy by reinstating *H. ericifolia* and included a treatment for the similar species *H. intermedia* (DC.) Toelken (previously *Pleurandra intermedia* DC.; Toelken & Miller 2012) within the group. *Hibbertia ericifolia* and *H. intermedia* were treated by Bentham (1863) as synonyms of *H. serpyllifolia* and *H. pedunculata*, respectively. In his treatment, Toelken (2013) considered *H. serpyllifolia* to be restricted to east-central Queensland [e.g. Byfield National Park (N.P.)] and *H. pedunculata* to be mostly restricted to the Central Coast region of New South Wales (e.g. Sydney).

Toelken (2013) recognised two subspecies of *H. ericifolia*, the autonym and the newly described *H. ericifolia* subsp. *acutifolia* Toelken, which was segregated from the typical subspecies by having “lanceolate to spatulate” primary bracts and a leaf apex that is “pointed to acute” (e.g. Toelken 2013: 36, 42). *Hibbertia florida* was newly described by Toelken (2013) from specimens previously included under *H. pedunculata*. He erected two subspecies from disjunct areas, the typical subspecies from the Nandewar Range (e.g. Mount Kaputar N.P.), and subsp. *angustinervis* from Warrumbungle Range (e.g. Warrumbungle N.P.). Toelken (2013) segregated these subspecies based on differences in habit, abaxial leaf surface, and position of the primary bract.

In the present study, I critically re-evaluate the taxonomy of *H. ericifolia* and *H. florida* with respect to their infraspecific taxa and close relatives, with the goal of making species boundaries in this group clearer and more consistent.

Methods

The study is based on specimens held at AD and on loan to AD from BRI, CANB, HO, MEL and NSW. Specimens examined in this study include those that were originally examined and determined by Toelken (2013), and in some cases these have been redetermined. Type specimens indicated by “image!” were viewed through JSTOR Global Plants (<https://plants.jstor.org/>) or the online databases of the *Muséum national d’Histoire naturelle* (Paris, France; <https://science.mnhn.fr/institution/mnhn/collection/p/item/search>), the *Naturalis Biodiversity Center* (Leiden, the Netherlands; <https://bioportal.naturalis.nl>) and the *Smithsonian*

Institution (Washington, District of Columbia, USA; <https://collections.nmnh.si.edu/search/botany/>). Morphological terms for different parts of the petiole (i.e., hypopetiole and epipetiole) follow Thiele & Hammer (2024).

Results and Discussion

Leaf characters

Leaves are highly variable across *Hibbertia* (Stebbins & Hoogland 1976; Rury & Dickison 1977), with many characters being considered important in species diagnosis (e.g. Thiele 2024; Toelken 2024). All species of *Hibbertia* are hypostomatous, i.e. with stomates restricted to the abaxial lamina (Horn 2007; see Fig. 7A in Burrows 2001). In many small-leaved species, the leaf lamina on both sides of the midrib recurves in early development to meet the midrib on the abaxial surface. In some species, the margins do not quite meet the midrib so that the abaxial lamina surface is externally visible within narrow but open grooves on either side of the midrib (e.g. Fig. 1C), while in others the abaxial lamina is completely obscured because the margins tightly abut the midrib (e.g. Fig. 2E); the stomates in this case line the inside of a lacuna either side of the midrib, visible only by dissection. The surfaces within the grooves or lacunae may be glabrous or covered in hairs or papillae, and the lateral edges of the midrib and margin may have flanges or tooth-like tubercles (e.g. see Fig. 1 in Toelken 2013, as “teeth”). Toelken (2013: 32) hypothesised that these tooth-like tubercles are stumps of hairs that do not fully develop.

A recent example of the importance of these characters was presented by Thiele (2024) in his revision of *Hibbertia acerosa* (R.Br. ex DC.) Benth., which resulted in the erection of three new species. In the revision, *H. acerosa* and *H. simkiniae* K.R.Thiele were segregated from *H. juniperina* K.R.Thiele and *H. callida* K.R.Thiele, based on the lateral edges of the abaxial midrib being smooth and not tuberculate (vs. having tooth-like tubercles), while *H. acerosa* can be segregated from *H. simkiniae* by having a glabrous surface on the abaxial leaf lamina (vs. having minute hairs within the lacunae). Thiele (2024) speculated that such morphological characters of the abaxial leaf, while often microscopic, are critical to the regulation of water relations and photosynthesis, and are usually genetically fixed and taxonomically critically important.

Within the *H. vestita* species group, Toelken (2013) also discussed the importance of leaf characters and used some of them as diagnosing characters in his species concepts (e.g. *H. stichodonta* Toelken), but appears to have overlooked them in others.

Hibbertia ericifolia

As currently circumscribed, *H. ericifolia* is difficult to differentiate from *H. intermedia*, which occurs in the

Blue Mountains. Toelken (2013: 42) considered that “*Hibbertia ericifolia* is so morphologically diverse that it can only be recognised by the combination of sessile flowers without staminodes and usually 8–16 stamens.” This is problematic given that some specimens of *H. ericifolia* have pedicels (as “flower stalk”) 2–5 mm long (Toelken 2013: 41), while *H. intermedia* is described as having a pedicel (2–) 3–5 mm long (Toelken 2013: 53). The pedicel in both species is typically short or not discernible in bud to early flower, but elongates as the flower matures and fruits form (e.g. Fig. 1D). Toelken (2013: 53) further differentiates *H. intermedia* from *H. ericifolia* (erroneously as “*H. ericoides*”) by having “stalked flowers with the primary bracts borne towards the base of the flower stalk [vs. at the apex], the generally exposed leaf undersurface and 7–10 stamens”. The stamen count given for *H. intermedia* is 7–9 (–10), overlapping with *H. ericifolia*; both species lack staminodes. Primary bract position is often a good character in *Hibbertia*, but in these species the primary bract may be positioned half way along the pedicel (when present). The remaining character is a “generally exposed leaf undersurface” in *H. intermedia* (Toelken 2013: 53). However, *H. ericifolia* was described by Toelken (2013: 41) as having a range of leaf morphologies, from those with margins tightly abutting the abaxial midrib and completely obscuring the abaxial lamina to margins that do not abut the midrib and with the abaxial surface exposed; the species may have tooth-like tubercles on the edges of the margins and midrib or lack these entirely.

In my examinations, I was able to sort all specimens of *H. ericifolia* determined by Toelken (2013) into two discrete morphotypes based on characters of the abaxial leaf surface. The typical form (i.e. subsp. *ericifolia*) has leaf margins that tightly abut the midrib so that the abaxial lamina is completely obscured at maturity, lateral edges of the margin and midrib with tooth-like tubercles where they meet (sometimes tightly wedged under bulging margins and visible only by dissection) (Fig. 2E–H), and minute hairs on the abaxial lamina within the leaf lacunae (visible by dissection). The second morphotype has the abaxial leaf surface generally exposed (at least in young leaves), the abaxial lamina glabrous, and the lateral edges of the midrib and margins without tooth-like tubercles (Fig. 2A–D). This second morphotype includes the type of *H. ericifolia* subsp. *acutifolia*. In my examinations, I found 14 specimens determined by H.R. Toelken in 2012 (some later cited in Toelken 2013: 43) as *H. ericifolia* subsp. *ericifolia* from the Blue Mountains that can be confidently placed within *H. intermedia* with the help of these abaxial leaf characters (see ‘Selected specimens examined’ under *H. intermedia*).

The current circumscription of *H. ericifolia* can be improved by narrowly delimiting the species to include only specimens that have mature leaves with margins that completely hide the abaxial leaf lamina, tooth-like tubercles where the margins and midrib meet, and a

Table 1. Comparison of morphological characters between the species discussed.

	<i>H. ericifolia</i>	<i>H. acutifolia</i>	<i>H. intermedia</i>	<i>H. florida</i>	<i>H. angustinervis</i>
Abaxial leaf lamina visibility (excluding midrib)	obscured	exposed (at least when young)	exposed (at least when young)	obscured	exposed
Abaxial leaf lamina indumentum (excluding midrib)	minutely hairy	absent (glabrous)	absent (glabrous)	minutely hairy	absent (glabrous)
Tooth-like tubercles on leaf margins and abaxial midrib	present	absent	absent	present	absent
Abaxial midrib height	flush to slightly recessed below the margins	protuberant to \pm flush with the margins	recessed below the margins	\pm flush with the margins	recessed below the margins
Pedicel length (mm)	0–3	0–0.5	0–8	3–7.5	2–6
Primary bract size (mm)	1.2–2.5 \times 0.4–0.8	(4–) 5–8.5 \times 0.8–1.5	1.3–2.8 \times 0.3–0.5	2–3 (–5) \times 0.5–1 (–1.3)	1.5–3 \times 0.4–0.6
Primary bract position at anthesis	subtending calyx or on the upper half of the pedicel	subtending calyx	near the base to around the centre of the pedicel	subtending calyx or near the apex of the pedicel	near the base or on the lower half of the pedicel
Outer sepal shape	ovate to elliptic	lanceolate to ovate	ovate to elliptic	ovate to elliptic	ovate to elliptic
Outer sepal size (mm)	4–6.5 (–7) \times 2–3.2	7.4–8.5 \times 3.5–4.2	(3–) 4–6.2 \times 1.9–2.8	4.5–6 \times 2–3.2	5.8–7 \times 2–3.6
Outer sepal abaxial indumentum	sparse to moderately dense with simple hairs (rarely nearly glabrous)	absent (glabrous) or very sparse	absent (glabrous) or very sparse	sparsely to moderately hirsute with spreading simple hairs	sparsely to moderately hirsute with spreading simple hairs
Sepal hair type	simple (rarely twinned)	twinned or in fascicles of 3 or 4 (rarely simple)	simple (rarely twinned)	simple	simple
Stamen number	10–18 (–23)	(8–) 12–20 (–30)	8–14	c. 12–15	c. 24–28
Anther length (mm)	(0.8–) 1–2 (–2.5)	(1.7–) 2.5–3	1.4–2	0.9–1.5	1.2–1.8

hairy surface within abaxial lacunae. This necessitates *H. ericifolia* subsp. *acutifolia* being raised here to species rank as *H. acutifolia* (Toelken) T.Hammer. This also allows *H. ericifolia* to be more clearly delimited from *H. intermedia* based on the leaf characters discussed above. With the new circumscription, these three species are more clearly partitioned geographically (Fig. 3) and are readily differentiated based on multiple characters (Table 1).

Hibbertia florida

The situation with the subspecies of *H. florida* is similar to that of *H. ericifolia*. Toelken (2013) erected *H. florida* subsp. *florida* and subsp. *acutinervis*, segregating them by multiple morphological characters, yet evidently regarding them as sufficiently similar to include within the same species. Toelken (2013: 50) distinguished subsp. *florida* from subsp. *angustinervis* by being “shrubs [...] with decumbent wiry-woody branches” (vs. “shrubs [...] with spreading branches becoming rigid-woody”) and having a “primary bract usually subtending calyx or on the distal half of flower stalk” (vs. “primary bract usually situated on the lower half of the flower stalk”). He also used abaxial leaf characters to segregate the subspecies, describing the abaxial midrib (‘central vein’) in subsp. *florida* as being “thickened and

very much recessed from and up to as broad as revolute margins” (vs. “flush or slightly recessed from and broader than revolute margins” in subsp. *angustinervis*), and the undersurface between the midrib and margins as not being exposed and with rows of ‘teeth’ in subsp. *florida* (vs. exposed and without rows of teeth in subsp. *angustinervis*; Toelken 2013: 50, Fig. 2I–L). The taxa are geographically disjunct from one another and there are no intermediate specimens.

My examinations confirmed the differences given by Toelken (2013) and revealed two additional characters to differentiate the taxa (Table 1). In subsp. *florida* the abaxial leaf lamina is usually hidden between the margins and midrib (Fig. 2I, J), but dissection reveals that the lacunae contain minute hairs, whereas the abaxial lamina (i.e. excluding the midrib) of subsp. *angustinervis* is glabrous (Fig. 2K, L). Stamen number also varies between the taxa, with subsp. *florida* having c. 12–15 and subsp. *angustinervis* having c. 24–28 stamens. These differences, in conjunction with those already discussed by Toelken (2013), are very distinctive and significant enough to warrant recognition of *H. florida* subsp. *angustinervis* at species rank as *H. angustinervis* (Toelken) T.Hammer.

Taxonomy

Hibbertia acutifolia (Toelken) T.Hammer, *comb. et stat. nov.*

Hibbertia ericifolia subsp. *acutifolia* Toelken, *J. Adelaide Bot. Gard.* 26: 44 (2013). — **Holotype:** New South Wales, Sarahs Knob, 21 Oct. 2006, R. & J. Miller *s.n.* (AD294968!). **Isotypes:** BRI!, CANB!, NSW!, PERTH!.

Spreading to erect *shrubs* 0.2–0.6 m high; young branchlets ridged from the thickened, persistent and peg-like leaf bases (hypopetioles), glabrous or sparsely puberulous with minute, antrorse hairs that are single, twinned or arranged in 3- or 4-haired fascicles; intrapetiolar tufts of straight hairs to c. 0.3 mm long. *Leaves* spreading, scattered, linear to narrowly lanceolate or narrowly elliptic, (3–) 5–9 (–12) mm long, 0.6–1.2 mm wide; epipetiole adaxially sparsely puberulous and abaxially glabrous; margins recurved to revolute and not tightly abutting the midrib when young but tightening as the leaves mature and elongate or sometimes tightly abutting the midrib even when young, without tooth-like tubercles where the edges meet the abaxial midrib; adaxial lamina sparsely tuberculate, glabrescent with sparse, antrorse simple to twinned hairs that quickly wear off, ± glabrous at maturity; abaxial midrib usually ± level with the narrow margins, smooth and without tooth-like tubercles, glabrous or with a few minute hairs usually near the apex; abaxial lamina (excluding midrib) glabrous; apex acute or obtuse, if acute then tapering to a blunt point, occasionally slightly recurved. *Flowers* solitary, terminal, sessile or rarely subsessile. *Bracts* 1–4; primary bract subtending the calyx, lanceolate to narrowly elliptic, (4–) 5–8.5 mm long, 0.8–1.5 mm wide, abaxially glabrous, adaxially with very sparse, short, antrorse simple hairs, the midrib abaxially distinctly protuberant at least distally, the abaxial lamina broadened and clearly visible, the apex acute and sometimes ± recurved; secondary bracts grading into the leaves. *Sepals* herbaceous, on both surfaces with minute, antrorse hairs that are usually twinned or arranged in 3- or 4-haired fascicles (rarely simple), or the outer ones ± glabrous abaxially; outer sepals broadly lanceolate to ovate, 7.4–8.5 mm long, 3.5–4.2 mm wide, usually becoming quickly glabrous abaxially, the abaxial midrib prominently ridged towards the apex, which is acute and usually has the raised midrib continuing as a short point; inner sepals broadly ovate to broadly elliptic, 7.5–9 mm long, 3.5–5.5 mm wide, obtuse and shortly mucronate, the indumentum more persistent than on the outer sepals, the midribs not prominent. *Petals* 5, yellow, broadly obovate, 6–8.5 mm long, deeply emarginate. *Stamens* (8–) 12–20 (–30), all around the gynoeceum; filaments 1–1.5 mm long; anthers rectangular, (1.7–) 2.5–3 mm long, dehiscent by introrse, longitudinal slits; staminodes absent. *Carpels* 3; ovaries compressed-ovoid to globular, 1.2–1.5 mm long, densely villous; styles inserted eccentrically on the carpel apex, erect then spreading through the ring of

stamens, 2.5–4 mm long. *Ovules* 4–6 per carpel. *Seeds* not seen. **Figs 1A–D, 2A, 2B.**

Diagnostic features. Leaves with the glabrous abaxial lamina often visible (at least in young leaves) between the smooth midrib and margins (i.e. tooth-like tubercles lacking); flowers sessile or subsessile; primary bract lanceolate to narrowly elliptic, (4–) 5–8.5 mm long, 0.8–1.5 mm wide; outer sepals ± abaxially glabrous; inner sepals with minute, antrorse hairs that are single, twinned or in fascicles of 3 or 4; stamens (8–) 12–20 (–30), arranged around 3 hairy carpels.

Phenology. Flowering mostly September–January, with a peak in November.

Distribution. Endemic to New South Wales, occurring mostly on near-coastal hills south of Sydney to Wollongong in Royal N.P., Heathcote N.P. and Dharawal N.P., with some records inland around Balmoral and in Bargo State Conservation Area and Nattai N.P. (Fig. 3). It has also been recorded from near Narrabeen Lake, north of Sydney. One outlying southern specimen is reported to be collected from “near Windellama” (*J. Pulley s.n.*; CBG43383.1); the specimen is identical to those collected around Mittagong and there are no other specimens or observations to corroborate a distribution that extends to Windellama. It is likely the specimen was collected further north than Windellama (closer to Mittagong), however if this specimen was collected near Windellama, the species may no longer be present there.

Habitat. Recorded from eucalypt woodlands, heathlands and coastal scrub, commonly on sandy soil.

Conservation status. Not conservation-listed.

Notes. *Hibbertia acutifolia* can be differentiated from *H. ericifolia* and *H. intermedia* based on several key characters (Table 1), including a larger primary bract, inner sepals with minute twinned or fascicled hairs (vs. usually simple hairs), outer sepals larger and lanceolate to ovate, and longer anthers. It has been previously included within a broadly circumscribed *H. serpyllifolia* R.Br. ex DC., but this species is now only recognised from north of Yeppoon, Queensland (Toelken 2013). *Hibbertia acutifolia* is distinguished from *H. serpyllifolia* by having larger primary bracts that are (4–) 5–8.5 × 0.8–1.5 mm [vs. (1.2–) 2.5–3 (–3.4) × (0.2–) 0.4–0.5 mm], leaves with an abaxial midrib that is often protuberant above the margins (vs. midrib scarcely raised), and outer sepals that are usually glabrous (vs. sparsely pubescent to puberulous with long simple hairs over short spreading simple hairs; Toelken 2013: 60).

Unfortunately, the epithet (meaning “acute-leaved”) chosen by Toelken (2013) may be quite deceptive for specimens collected on coastal headlands in Royal N.P. (e.g. *T.A. Hammer 354* & *A.E. McDougall*), which have leaves that are typically shorter, broader and more obtuse than populations further inland (see Fig. 1A–D); this form was also noted by Toelken (2013: 44). Field work

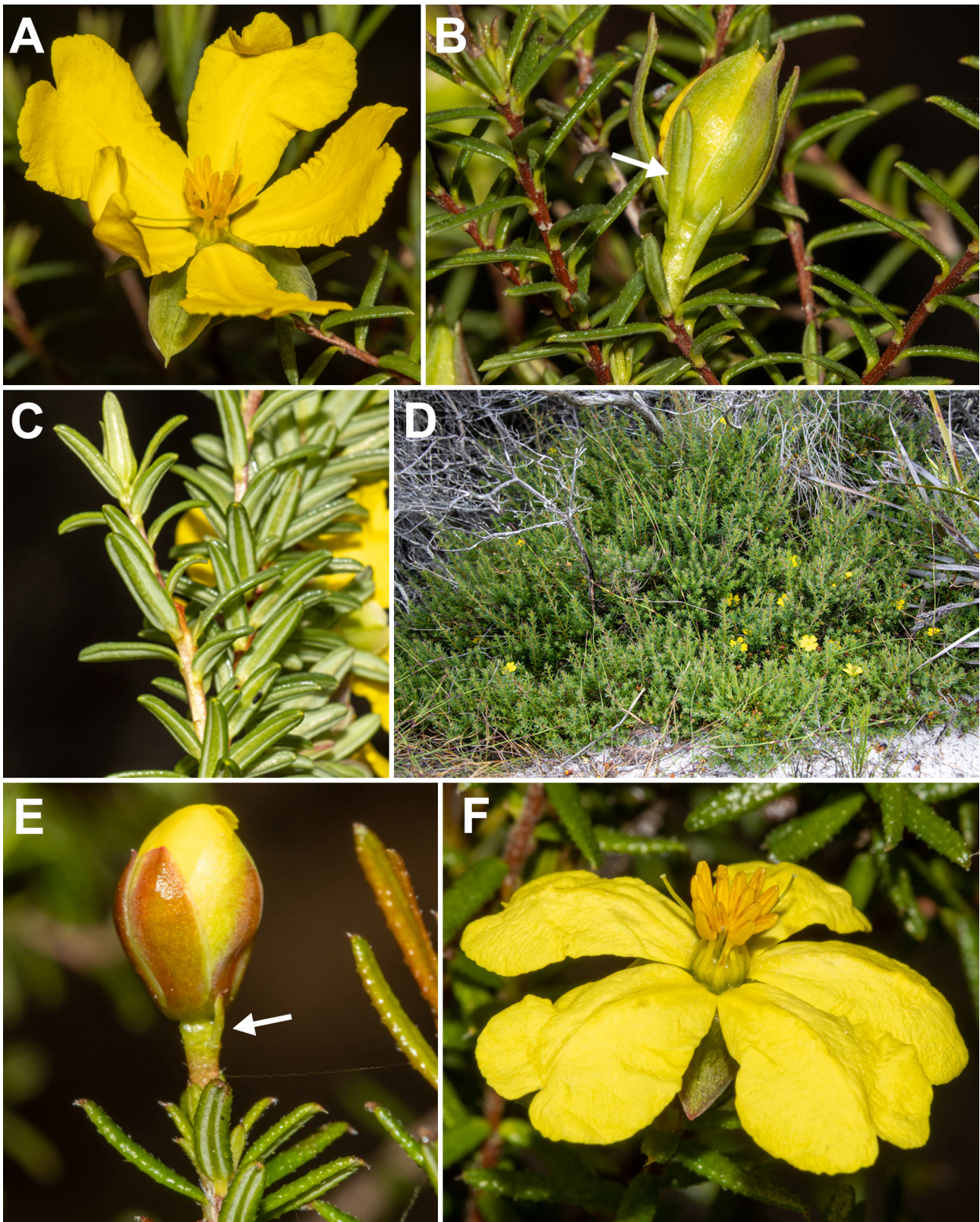


Fig. 1. Representative morphology of *Hibbertia acutifolia* (**A, B** inland form; **C, D** coastal form) and *H. intermedia* (**E, F**). Arrows indicate primary bracts. — A, B T.A. Hammer 351 & A.E. McDougall (AD); C, D T.A. Hammer 354 & A.E. McDougall (AD); E, F T.A. Hammer 336 & A.E. McDougall (AD). Photos: T.A. Hammer.

in Royal N.P. in 2022 indicated that the coastal and inland forms form a grade, and I hypothesise that the morphology of the coastal form may be environmentally influenced. A similar phenomenon may be happening with the varieties of *H. vestita*, in which var. *thymifolia* occurs on coastal headlands and is more prostrate and with wider and more obtuse leaves than the typical inland variety (var. *vestita*); more study on this is needed.

Selected specimens examined

NEW SOUTH WALES. Mt Keira, near Wollongong, 1954, *C. Bryant s.n.* (MEL35823); Wattamolla Rd, towards beach, Royal N.P., 28 Aug. 1970, *B. Hain 177* (CBG); Yowie Bay, Nov. 1908, *A.A. Hamilton s.n.* (NSW85840); Royal N.P., on Wisers Track c. 45 m from Sir Bertram Stevens Dr, c. 9 km S of Loftus, 10 Nov. 2022, *T.A. Hammer 335 & A.E. McDougall* (AD, NSW); on fire trail in reserve off of William St, Balmoral Village, 100 m NE of gate on William St, 12 Nov. 2022, *T.A. Hammer 351 & A.E. McDougall* (AD, NSW); Royal N.P., the Coast Track to The Balconies, c. 700 m from Beachcomber Ave, c. 150 m from The Balconies, 13 Nov. 2022, *T.A. Hammer 354 & A.E. McDougall* (AD, NSW); Royal N.P., headland S of Wattamolla Beach, 6 Oct. 1974, *R.D. Hoogland & G.L. Stebbins 12463* (CANB, UC); E side of the main scenic drive (Sir Bertram Stevens Dr), 1.0 km W of crossing of Flat Rock Ck, Royal N.P., 26 Oct. 2001, *J.W. Horn 4225* (AD; CANB, DUKE, NSW, *n.v.*); Bargo River gorge at the end of Yarran Rd, Bargo, 6 Nov. 1987, *P. Hind 5434, P. Cuneo & G. D'Aubert* (NSW); Waterfall to Bulli Pass Rd, 8 Nov. 1950, *H.K. Mair & E.F. Constable s.n.* (NSW16112); near Windellama, 6 Nov. 1965, *J. Pulley s.n.* (CBG43383.1).

Hibbertia angustinervis (Toelken) T.Hammer, *comb. et stat. nov.*

Hibbertia florida subsp. *angustinervis* Toelken, *J. Adelaide Bot. Gard.* 26: 50 (2013). — **Holotype:** New South Wales, Mount Naman, 34 km SW Coonabarabran, 13 Dec. 1973, *H. Streimann 767* (AD97516045!). **Isotypes:** A, BRI AQ0180742!, CBG 54763.1, L, K.

Spreading *shrubs* to c. 0.8 m high; young branchlets ridged from the thickened, persistent and peg-like leaf bases (hypopetioles), sparsely to densely hirsute with spreading simple hairs; intrapetiolar tufts of straight hairs to c. 1.3 mm long. *Leaves* spreading, scattered, oblong to oblong-lanceolate or linear (due to in-rolling of the margins), 3.5–6 mm long, (1–) 1.2–1.6 mm wide; epipetiole sparsely hairy adaxially, ± glabrous abaxially; margins recurved to revolute, not tightly abutting the midrib, without tooth-like tubercles on the edges; adaxial lamina tuberculate, with antrorse simple straight hairs on each tubercle that may wear off with age; abaxial midrib sunken below the margins, ± smooth and without tooth-like tubercles, with sparse simple hairs; abaxial lamina (excluding midrib) glabrous, usually visible at least when young but occasionally hidden beneath the revolute margins; apex acute to obtuse, usually slightly recurved and with a tuft of straight simple hairs that may wear off. *Flowers* solitary, terminal, pedicellate; pedicel 2–6 mm

long, elongating and often nodding in fruit, with hairs as for the young branchlets. *Bracts* 1–3; primary bract near the base or on the lower half of the pedicel, linear to linear-elliptic, 1.5–3 mm long, 0.4–0.6 mm wide, with very sparse simple hairs on both surfaces, the apex acute and sometimes ± recurved and with a short tuft of simple hairs; secondary bracts at the base of the pedicel grading into the leaves. *Sepals* herbaceous, abaxially sparsely to moderately hirsute with spreading coarse simple hairs, adaxially glabrous or with very sparse simple hairs near the apex; outer sepals ovate to elliptic, 5.8–7 mm long, 2–3.6 mm wide, the midrib raised towards the apex, which is acute and often slightly recurved and with a tuft of short simple hairs; inner sepals broadly elliptic to obovate, 5.5–6.5 mm long, 3.5–4.6 mm wide, the apex rounded. *Petals* 5, yellow, broadly obovate, c. 6–9 mm long, deeply emarginate. *Stamens* c. 24–28, all around the gynoecium; filaments 1.3–2 mm long; anthers elliptic, 1.2–1.8 mm long, dehiscent by introrse, longitudinal slits; staminodes absent. *Carpels* 3; ovaries compressed-ovoid to -obovoid, 1.5–2 mm long, densely villous; styles inserted eccentrically on the carpel apex, erect then spreading through the ring of stamens, 3–4 mm long. *Ovules* 4 per carpel. *Seeds* not seen. **Fig. 2K, L.**

Diagnostic features. Leaves with the glabrous abaxial lamina often visible between the smooth midrib and margins (i.e. lacking tooth-like tubercles); flowers on a pedicel 2–6 mm long; primary bract near the base of or on the lower half of the pedicel; sepal outer surface with coarse, short to long simple hairs; stamens c. 24–28, arranged around 3 hairy carpels.

Phenology. Flowers recorded October–December.

Distribution. Apparently restricted to Warrumbungle N.P., New South Wales.

Habitat. Recorded as occurring in “wet depressions on rock shelves” (*H. Streimann 767*) and “in gully” (*A.G. Floyd 651*).

Conservation status. Not conservation-listed.

Specimens examined

NEW SOUTH WALES. Warrumbungle Mountains, 8 Oct. 1946, *P. Althofer s.n.* (NSW85821); Fluted Mountain, Warrumbungle Ranges, 6 Oct. 1946, *G.W. Althofer 18* (MEL); Mt Naman, Warrumbungles N.P., 14 Oct. 1977, *A.G. Floyd 651* (CANB).

Hibbertia ericifolia Hook.f.

Bot. Antarct. Voy. III (Fl. Tasman.) 1(1): 14, t. 3 (1855), as “*ericaefolia*”. — *Hibbertia ericifolia* Hook.f. subsp. *ericifolia*, *J. Adelaide Bot. Gard.* 26: 42 (2013). — **Type citation:** “Gunn, 1022”, “Common on serpentine formation, Asbestos Hills; also at Launceston and Georgetown, Gunn.—(Fl. Oct. Nov.)”. **Lectotype (here designated):** Tasmania, W. [of] Launceston, 24 Dec. 1842, *R.C. Gunn 1022* (K000700201 image!). **Remaining syntype:** Tasmania, Asbestos Hills, George

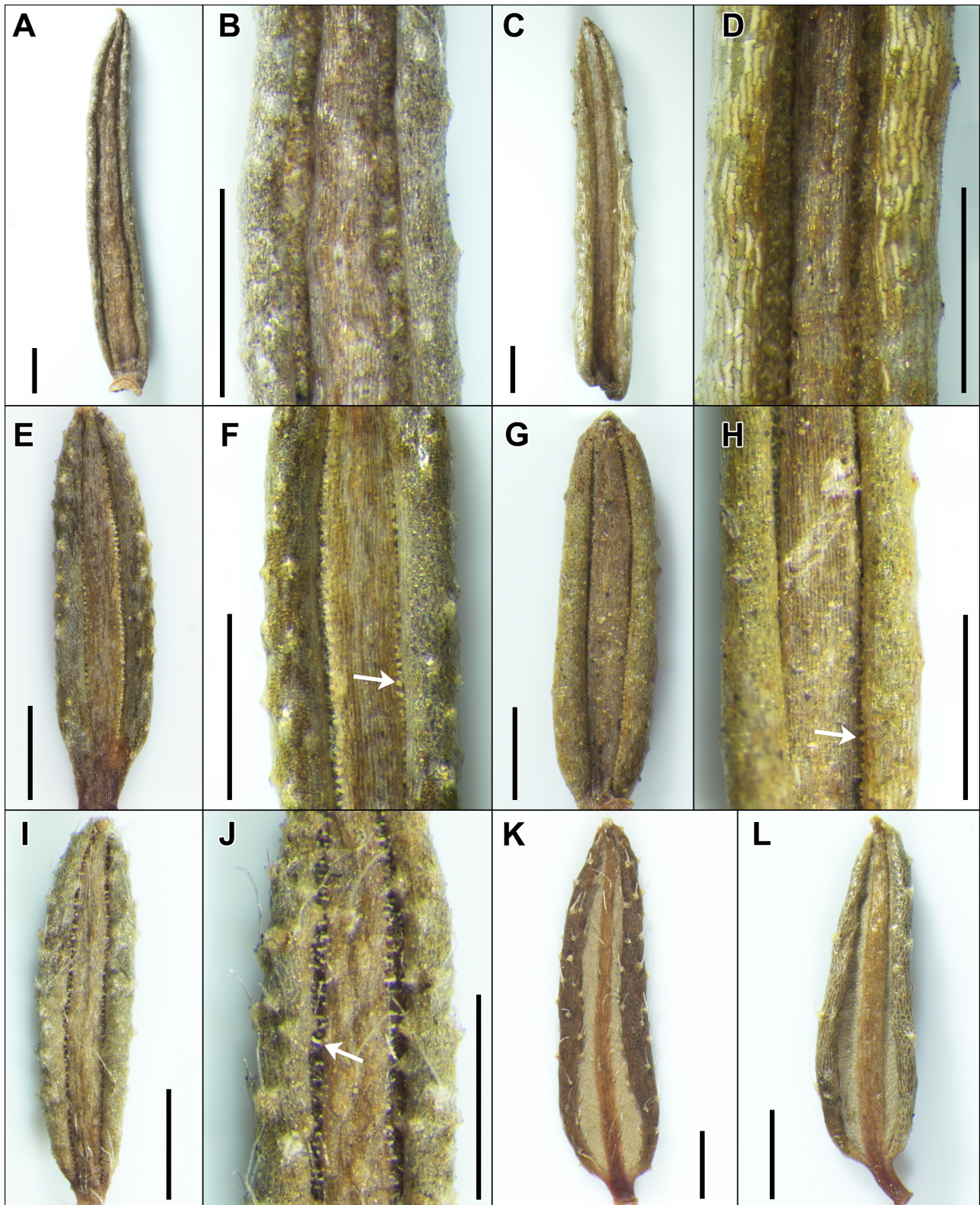


Fig. 2. Comparison of the abaxial leaf morphology of *Hibbertia acutifolia* (A, B), *H. intermedia* (C, D), an immature leaf of *H. ericifolia* (E, F), a mature leaf of *H. ericifolia* (G, H), *H. florida* (I, J), and *H. angustinervis* (K, L). Arrows indicate tooth-like tubercles. Scale bars = 1 mm. — A, B J.W. Horn 4225 (AD); C, D A.E. Orme 396 & R. Johnstone (AD); E–H S. Donaldson 209, G. Corsini & R.J. Rudd (AD); I, J R. Coveny 8950 & S.K. Roy (CANB); K, L H. Streimann 767 (BRI).

Town, 26 Oct. 1843, *R.C. Gunn 1022* (K000700199 image!). **Possible syntypes:** Tasmania, *R.C. Gunn s.n.* (L.2386061 image!, M0212893 image!, NY00428765 image!, P03175398 image!, P03175399 image!, S08-20102, TCD0009648 image!, US03384931 image!).

Hibbertia serpyllifolia var. *minutifolia* F.Muell. ex Benth., *Fl. Austral.* 1: 32 (1863). — *H. minutifolia* F.Muell., *First Gen. Report* 9 (1853), *nom. nud. & inval.* — **Lectotype:** Victoria, Mount Aberdeen [= Mount Buffalo], 28 Feb. 1853, *F. Mueller s.n.* (MEL35816A), *vide* Toelken, *J. Adelaide Bot. Gard.* 26: 42 (2013). **Syntype:** Buffalo Ranges, 26 Feb. 1853, *F. Mueller s.n.* (MEL35816B). **Possible syntypes** (*vide* Toelken 2013): K000700195 image!, MEL35585, MEL1518879.

Spreading to erect *shrubs* (0.2–) 0.3–0.6 m high; young branchlets ridged from the thickened, persistent and peg-like leaf bases (hypopetioles), sparsely to moderately hirsute with antrorse, appressed to spreading simple hairs; intrapetiolar tufts of straight hairs to c. 0.5 mm long. *Leaves* spreading, scattered, linear to narrowly elliptic, 2.5–9 mm long, 0.6–1.1 mm wide; epipetiole adaxially sparsely puberulous and abaxially glabrous; margins revolute and tightly abutting the midrib so that the abaxial lamina is obscured, or barely visible when young, with distinct tooth-like tubercles on the edges bordering the midrib (occasionally obscured); adaxial lamina smooth to densely tuberculate, glabrescent or persistently hairy, with sparse to rarely dense antrorse simple hairs often with a basal tubercle; abaxial midrib usually sunken below the bulging margins, with distinct tooth-like tubercles on the edges bordering the revolute margins, glabrous or with a few scattered hairs; abaxial lamina (excluding midrib) tomentose (usually only visible by dissection); apex obtuse to acute, sometimes slightly recurved, occasionally with a tuft of a few simple hairs. *Flowers* solitary, terminal, sessile or on short pedicels to c. 3 mm long. *Bracts* 2–5; primary bract subtending the calyx or on the upper half of the pedicel (if present), linear-lanceolate to linear-elliptic, 1.2–2.5 mm long, 0.4–0.8 mm wide, with flat to ± incurved margins and without a distinct midrib, abaxially with sparse simple hairs or glabrous, adaxially with very sparse short antrorse simple hairs, the apex acute and often with a few simple hairs; secondary bracts grading into the leaves and developing revolute margins that abut the midrib with noticeable tooth-like tubercles between them. *Sepals* herbaceous, on both surfaces with antrorse, appressed to spreading, simple (rarely twinned) hairs that are usually more persistent at the apex, occasionally abaxially keeled or with the midrib slightly raised near the apex; outer sepals ovate to elliptic, 4–6.5 (–7) mm long, 2–3.2 mm wide, the apex acute; inner sepals broadly ovate to elliptic or broadly elliptic, 4.5–6.5 mm long, 2.2–3.8 mm wide, obtuse and shortly mucronate, the indumentum usually more persistent than on the outer sepals. *Petals* 5, yellow, broadly obovate, 4.5–9 mm long, deeply emarginate. *Stamens* 10–18 (–23), all around the gynoeceum; filaments 1.4–2 mm long; anthers rectangular, (0.8–) 1–2 (–2.5) mm long, dehiscing by introrse, longitudinal slits; staminodes absent or

rarely a few outer stamens not fully formed. *Carpels* 3; ovaries compressed-ovoid to -obovoid, 1–2.5 mm long, densely villous; styles inserted eccentrically on the carpel apex, erect then spreading through the ring of stamens, 1.8–3.5 mm long. *Ovules* 4–6 per carpel. *Seeds* narrowly ellipsoidal, c. 1.5 mm long, c. 1.2 mm wide, brown; aril an uneven membranous cup covering the lower third of the seed. **Fig. 2E–H.**

Diagnostic features. Leaves with the hairy abaxial lamina ± obscured, the revolute margins and midrib with tooth-like tubercles on the lateral edges; flowers sessile or on pedicels to c. 3 mm long; primary bract ≤ 2.5 mm long, subtending the calyx or on the upper half of the pedicel; sepal abaxial surface with simple (rarely twinned) hairs; stamens 10–18 (–23), arranged around 3 hairy carpels.

Phenology. Flowers mostly September–February.

Distribution. Occurs from eastern central New South Wales to eastern Victoria and northern and central Tasmania (Fig. 3).

Habitat. Growing in a variety of habitats including floodplains, rocky slopes or outcrops, sometimes in near-coastal or subalpine areas, and typically in eucalypt woodlands or forests on sandy soils, sometimes with gravel or over granite.

Conservation status. Not conservation-listed.

Typification. Hooker (1855) cited “Gunn 1022” as the specimen used in the protologue. At Kew there are two sheets of material collected by Gunn with what appears to be three separate collections (K000700199, K000700200 and K000700201). Two of these specimens K000700199 and K000700201 include the collecting number “1022” that was cited by Hooker (1855), and both include locations that were reported in the protologue, “Asbestos Hills, George Town” (K000700199) and “Launceston” (K000700201). The dates reported on the labels were 26 Oct. 1843 (K000700199) and 24 Dec. 1842 (K000700201). The “holotype” cited by Toelken (2013) was “Tasmania, near Launceston, *Gunn 1022/1842*, 24.xii.1842”, indicating that he considered K000700201 to be the holotype of *H. ericifolia*, and he possibly did not see the other sheet of Gunn material at K. As both specimens at K bear the collecting number and locations cited in the protologue, they are both here considered syntypes. The citation of K000700201 as a “holotype” by Toelken (2013) did not inadvertently lectotypify the name, because on or after 1 January 2001 the use of the terms “lectotype” and “here designated” is required for lectotypification (see Art. 7.11, 9.23 in Turland 2018).

The specimen K000700200, mounted on the same sheet as K000700199, has a label reading “637, V. D. Land, Gunn”, indicating a different collecting number and a location generalised to “Van Diemen’s Land” (Tasmania). This number was not reported by Hooker

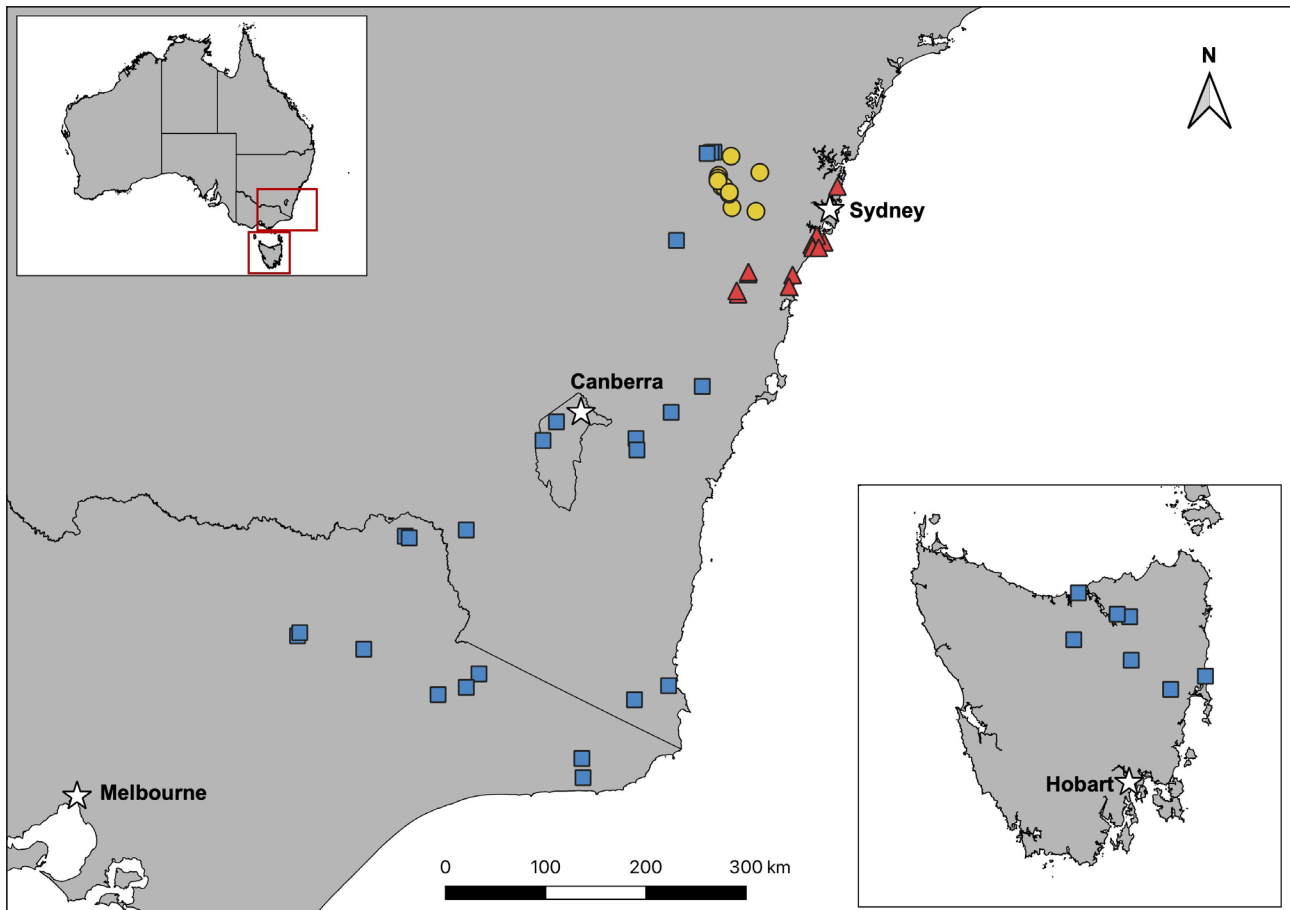


Fig. 3. Distribution of *Hibbertia acutifolia* (red triangles), *H. ericifolia* (blue squares) and *H. intermedia* (yellow circles) based on locations of specimens examined in this study.

(1855) and therefore is not considered to be a syntype. There is additional Gunn material at M, NY and TCD, all of which lack the collecting number and locations specified in the protologue, but rather just generally say “Ex Herb. Hook.” and “Hab. Tasmania”. As one cannot be certain that these materials are from *Gunn 1022*, these specimens are considered here to be only possible syntypes. Toelken (2013) cited an isotype at BM, but I have been unable to view this specimen.

Selected specimens examined

AUSTRALIAN CAPITAL TERRITORY. Cotter Dam, 12 Feb. 1959, *E. Gauba s.n.* (CANB4717.1); Bendora Dam, Upper Cotter River, 29 Oct. 1971, *I.R. Telford 2999* (CANB).

NEW SOUTH WALES. Nowra Rd, 5 miles [8 km] E of Nerriga, 27 Oct. 1965, *L.G. Adams 1484* (CANB, MEL); 15 km W of Tianjara Falls along Turpentine Rd, 17 Nov. 1992, *S. Donaldson 209*, *G. Corsini & R.J. Rudd* (AD; CBG, NSW, *n.v.*); Mt Palerang, 30 Oct. 1951, *E. Gauba s.n.* (CANB 004763.1); minor peak NE of Mt Lowden, Tallangatta State Forest (S.F.), 12 Dec. 1973, *R.D. Hoogland 12447* (CANB; NSW, K, L, MEL, US, HBG, UC, *n.v.*); both sides of Bells Line Rd, 2.85 km E of junction with Petra Ave in Clarence, 29 Oct. 2001, *J.W. Horn 4250* (AD; CANB, DUKE, *n.v.*); the big plain, 5 miles [8 km] East Mt Werong, 24 Oct. 1951, *L.A.S. Johnson & E. Constable s.n.* (NSW31038); South Black Range, Tallaganda S.F., 10.5 miles [16.9 km] from Hoskingtown

[Hoskingtown], 19 Nov. 1952, *C.W.E. Moore 2111* (CANB); 330 kV line near Yellow Bog Ck, 17 Nov. 1959, *M.E. Phillips 3587 & J. Raeder-Roitzsch* (NSW); Gourock Range, 12 km E of Hoskingtown [Hoskingtown] towards Braidwood, 3 Nov. 1973, *I.R. Telford 3623* (CANB).

VICTORIA. East Gippsland, Rocky outcrop c. 3.3 km north of Mt Coopracambra summit, 10 Sep. 1988, *D.E. Albrecht 3638* (AD); near Bemm River Inlet, 23 Oct. 1987, *R. Bates 11277* (AD); N of Captain Cook N.P., 7 miles [11.3 km] direct NW of Cape Everard, 11 Dec. 1969, *A.C. Beaugelhole & E.W. Finck 32331* (CANB); 4 km E of Tamboon on Clinton Rocks Track 0.5 km SE of Fisherman's Track, 31 May 1979, *S.J. Forbes 54* (CANB); near Lake Catani, Mount Buffalo N.P., 21 Dec. 1970, *R.D. Hoogland 11920* (CANB, MEL; K, M, *n.v.*); c. 6 miles [9.7 km] N of Wulgulmerang, along road to Benambra, 29 Dec. 1970, *R.D. Hoogland 11923* (CANB, MEL; L, E, OKLA, NSW, *n.v.*); East Gippsland, Wulgulmerang, “Kunzea Hill”, SE of Mt Seldom-Seen, 27 Nov. 1962, *J.H. Willis s.n.* (MEL119828).

TASMANIA. 0.5 km downstream from Leake Dam, 22 Nov. 1974, *R.J. Chinnock 2172* (AD); Lilydale Rd near Launceston, 12 Nov. 1952, *W.M. Curtis s.n.* (HO29266); Railton, 24 Oct. 1930, *F.H. Long 210* (HO); St. Patricks River, 15 Nov. 1892, *L. Rodway 17* (HO); Launceston–Lilydale Rd, Jan. 1943, *J.H. Wilson s.n.* (HO116928); Lilydale Rd near Launceston, 15 Feb. 1943, *J.H. Wilson s.n.* (HO3264).

Hibbertia florida Toelken

J. Adelaide Bot. Gard. 26: 49–50 (2013). — *Hibbertia florida* Toelken subsp. *florida*, *J. Adelaide Bot. Gard.* 26: 50 (2013). — **Holotype:** New South Wales, Mount Dowe, 24 Nov. 1993, *H.R. Toelken 8546* (AD106480!) Isotypes: B!, BRI!, CANB!, G!, K!, MEL!, MO!, NSW!, PERTH!.

Decumbent *shrubs* to c. 0.4 m high; young branchlets ridged from the thickened, persistent and peg-like leaf bases (hypopetioles), sparsely to densely hirsute with spreading simple hairs; intrapetiolar tufts of straight hairs to c. 1 mm long. *Leaves* spreading, scattered, linear to linear-oblong, 3–6 mm long, 0.8–1.2 mm wide; epipetiole on both surfaces with sparse simple hairs at least when young, glabrescent; margins revolute and tightly abutting the midrib, with tooth-like tubercles on the edges; adaxial lamina tuberculate, with antrorse simple (rarely twinned) straight hairs on each tubercle that wear off with age; abaxial midrib sunken below the margins, with tooth-like tubercles on the edges that meet the margins, with sparse simple hairs; abaxial lamina (excluding midrib) tomentose, usually hidden beneath the revolute margins and visible only by dissection; apex acute to obtuse, usually slightly recurved and with a tuft of straight simple hairs that may wear off. *Flowers* solitary, terminal, on pedicels 3–7.5 mm long. *Bracts* 1–3; primary bract subtending calyx or near the apex of the pedicel, linear to linear-elliptic, 2–3 (–5) mm long, 0.5–1 (–1.3) mm wide, with very sparse simple hairs on both surfaces, the apex acute and sometimes ± recurved and with a short tuft of simple hairs; secondary bracts at or near the base of the pedicel and grading into the leaves. *Sepals* herbaceous, abaxially sparsely to moderately hirsute with spreading simple hairs, adaxially glabrous or with very sparse simple hairs near the apex; outer sepals ovate to elliptic, 4.5–6 mm long, 2–3.2 mm wide, the midrib raised towards the apex, which is acute and often slightly apiculate and with a tuft of short simple hairs; inner sepals broadly ovate to elliptic, 4.5–6.5 mm long, 2.8–4.3 mm wide, the midrib flat or slightly raised towards the apex, which is rounded but with the midrib usually continued as a short point. *Petals* 5, yellow, broadly obovate, c. 5–7 mm long, deeply emarginate. *Stamens* c. 12–15, all around the gynoeceum with most stamens clustered in the gaps between carpels; filaments 1.2–2 mm long; anthers elliptic, 0.9–1.5 mm long, dehiscent by introrse, longitudinal slits; staminodes absent. *Carpels* 3; ovaries compressed-ovoid, c. 1.4 mm long, densely villous; styles inserted eccentrically on the carpel apex, erect then spreading through the ring of stamens, 3–3.5 mm long. *Ovules* 4 per carpel. *Seeds* not seen. **Fig. 2I, J.**

Diagnostic features. Leaves with the minutely hairy abaxial lamina ± obscured, the revolute margins and midrib ± level with one another and with tooth-like tubercles where they meet; flowers on pedicels 3–7.5 mm long; primary bract subtending calyx or

on the upper half of the pedicel; stamens c. 12–15, arranged around 3 hairy carpels.

Phenology. Flowers October–November.

Distribution. Occurs in the Nandewar Range in north-eastern New South Wales, with most records from Mount Kaputar N.P.

Habitat. Grows in woodlands on shallow loamy and rocky soil.

Conservation status. Not conservation-listed.

Specimens examined

NEW SOUTH WALES. Mt Lindsay near Nandewar, Nov. 1909, *R.H. Cambage s.n.* (NSW85823); Eckfords Lookout track, Mount Kaputar N.P. [38 km ENE of Narrabri], 22 Nov. 1976, *R. Coveny 8950* & *S.K. Roy* (CANB, NSW); on walking track from Mt Dowe to Eckards Lookout, Mount Kaputar N.P., 25 Nov. 1987, *J.M. Fox 87/125* (CANB); Mount Kaputar N.P., E of Dawsons Springs, 3 Nov. 1972, *R.D. Hoogland 12297* (CANB; A, G, K, L, NSW, UC, *n.v.*).

Hibbertia intermedia (DC.) Toelken

J. Adelaide Bot. Gard. 25: 74, fig. 1E–H (2012). — *Pleurandra intermedia* DC., *Syst. Nat.* 1: 420 (1817). — **Type citation:** “in montibus Novae-Hollandiae [in the mountains of New Holland (Australia)]. Caley”. **Presumed Holotype** (see below): “n. Holl., 1816, m[isit]. Lambert” (G-DC G00201214 image!).

Spreading to decumbent *shrubs* 0.2–0.5 m high; young branchlets ridged from the thickened, persistent and peg-like leaf bases (hypopetioles), sparsely to densely hirsute with antrorse appressed to spreading simple hairs; intrapetiolar tufts of straight hairs to c. 0.6 mm long. *Leaves* spreading, scattered, linear to narrowly oblong, (2–) 3–5 (–6) mm long, 0.6–1.1 mm wide; epipetiole ± glabrous; margins recurved to revolute and not tightly abutting the midrib when young but tightening as the leaves mature, without tooth-like tubercles on the edges that meet that abaxial midrib; adaxial lamina tuberculate, with antrorse simple straight hairs on each tubercle that occasional wear off with age; abaxial midrib sunken below the margins, ± smooth and without tooth-like tubercles, with very sparse simple hairs to ± glabrous; abaxial lamina (excluding midrib) glabrous, usually visible at least when young but occasionally hidden beneath the revolute margins; apex acute to obtuse, usually slightly recurved and with a tuft of straight simple hairs that occasionally wear off. *Flowers* solitary, terminal, subsessile on pedicels to 8 mm long, elongating and often nodding in fruit, with hairs as for the young branchlets. *Bracts* 2–4; primary bract at the base of or on the lower half of the pedicel, linear or linear-triangular, 1.3–2.8 mm long, 0.3–0.5 mm wide, with very sparse simple hairs on both surfaces to ± glabrous, the apex acute and sometimes ± recurved and with a short tuft of simple hairs; secondary bracts grading into the leaves. *Sepals*

herbaceous, abaxially glabrous or glabrescent with sparse short usually appressed (rarely spreading) simple (rarely twinned) hairs that are more persistent towards the apex, adaxially glabrous or with very sparse simple hairs; outer sepals ovate to elliptic, (3–) 4–6.2 mm long, 1.9–2.8 mm wide, the apex acute or rarely obtuse, occasionally keeled distally and often with a tuft of straight hairs at the apex; inner sepals broadly ovate to broadly elliptic, 4.2–6.5 mm long, 2.8–4.2 mm wide, obtuse and shortly mucronate, the midrib scarcely to slightly raised. *Petals* 5, yellow, broadly obovate, 5.5–7.5 mm long, deeply emarginate. *Stamens* 8–14, all around the gynoecium; filaments 1–1.7 mm long; anthers rectangular, 1.4–2 mm long, dehiscing by introrse, longitudinal slits; staminodes absent. *Carpels* 3; ovaries compressed-ovoid, 1.5–1.8 mm long, densely villous; styles inserted eccentrically on the carpel apex, erect then spreading through the ring of stamens, (2–) 2.5–3 mm long. *Ovules* (2–) 4 per carpel. *Seeds* not seen. **Figs 1E, 1F, 2C, 2D.**

Diagnostic features. Leaves with the glabrous abaxial lamina often visible between the smooth midrib and margins, which lack tooth-like tubercles on the lateral edges, the midrib recessed below the bulging margins; flowers subsessile or on pedicels to 8 mm long; primary bract at the base of or on the lower half of the pedicel, < 3 mm long; sepals ± abaxially glabrous or with sparse simple (rarely twinned) hairs; stamens 8–14, arranged around 3 hairy carpels.

Phenology. Flowers mostly October–March.

Distribution. Occurs in the Blue Mountains, Central Tablelands region, New South Wales (Fig. 3), mostly known from Blackheath to Kings Tableland.

Habitat. Typically occurs in low heathy scrub or low eucalypt woodlands, sometimes under tall dense shrubs in sandy soil over sandstone.

Conservation status. Not conservation-listed.

Typification. The specimen G-DC G00201214 is the presumed holotype given that it is the only known specimen of the type material. There is reason to believe that there may have been other material that was seen by De Candolle prior the publication of the species in Candolle (1817). The specimen at G-DC includes a note that reads “n. Holl., 1816, m. Lambert”, indicating that it was collected in Australia, 1816 and sent to de Candolle from A.B. Lambert, probably following a visit to his herbarium in the UK (Staffeu 1967; see Hammer 2022). Lambert’s herbarium, including potentially other sheets of the type material, was auctioned off in 317 lots, with Caley’s specimens (Lot numbers 39, 42 and 43) from Australia being sold to William Pamplin (Miller 1970: 518). It is unknown if any additional type material of *Pleurandra intermedia* was part of this and exactly where this material may be currently stored, if it still exists.

Selected specimens examined

NEW SOUTH WALES (asterisk indicates redetermination from Toelken 2013). Medlow Bath, 7 Nov. 1959, *C. Burgess s.n.* (CANB004775.1)*; Medlow Bath, 27 Nov. 1959, *C. Burgess s.n.* (CANB004725.1)*; Kings Tableland, 4 Nov. 1962, *C. Burgess s.n.* (CANB010913.1)*; Katoomba, “Xmas” [presumably 25 Dec.] 1908, *J.H. Camfield s.n.* (NSW85849)*; between Medlow Bath and Blackheath, 2 Oct. 1938, *D.O. Cross s.n.* (NSW127213)*; Cook’s River, Nov. 1900, *A.A. Hamilton s.n.* (NSW85836)*; on the corner of Tableland Rd and unnamed track, 900 m N of Queen Victoria Hospital, 3.3 km S of Great Western Hwy, 11 Nov. 2022, *T.A. Hammer 336 & A.E. McDougall* (AD, NSW); Burrarorang to Wentworth Falls, Oct. 1898, *J.H. Maiden s.n.* (NSW85860)*; Blackheath, Apr. 1899, *J.H. Maiden s.n.* (NSW85851)*; Mt Wilson, Oct. 1899, *J.H. Maiden s.n.* (NSW85848)*; c. 0.8 km along Kedumba Valley firetrail from Queen Victoria Hospital, 18 Oct. 2003, *A.E. Orme 396 & R. Johnstone* (AD, NSW); Prince Edward St. near Memorial Park, Blackheath, 27 Mar. 1957, *C.L. Wilson 529* (NSW)*.

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