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Notes on *Hibbertia* (Dilleniaceae: subgen. *Hemistemma*) — 12. The northern Australian species of the *H. banksii* group

H.R. Toelken

State Herbarium of South Australia, Botanic Gardens and State Herbarium, Hackney Road, Adelaide, South Australia 5000
Email: hellmut.toelken@sa.gov.au

Abstract: A detailed taxonomic revision of the northern Australian species of the *H. banksii* group of *Hibbertia* is presented based on morphological evidence, especially a re-evaluation of the tomentum on all parts of the plants, the variation caused by heterophylly and, most importantly, the structure of the unusual inflorescences in the genus. The 12 species and three subspecies, keyed out vegetatively and florally, are fully described and key characters are illustrated.

The following taxa are recognised (newly described ones and new combinations are in bold): ***H. arachnoidea*** Toelken, *H. arnhemica* S.T.Reynolds, *H. banksii* (R.Br. ex DC.) Benth. subsp. *banksii*, –subsp. ***sparsidentata*** Toelken, *H. brownii* Benth. subsp. *brownii*, –subsp. ***angustissima*** Toelken, –subsp. ***cordata*** Toelken, *H. candicans* (Hook.f.) Benth., *H. dealbata* (R.Br. ex DC.) Benth., *H. holtzei* F.Muell. (≠ *H. tasmanica* Baill.), *H. hooglandii* J.R.Wheeler, ***H. lagarophylla*** Toelken, *H. laurana* S.T.Reynolds, *H. ledifolia* A.Cunn. ex Benth., *H. muelleri* Benth.

Keywords: Dilleniaceae, *Hibbertia*, new species, nomenclature, revision, taxonomy, tropical Australia

Introduction

Species of the *Hibbertia banksii* group, as presented here, are distinguished by their unique monochasial inflorescences, the cincinni, with usually a number of flowers each subtended by commonly two bracts. The first species from Madagascar was published by Du Petit-Thouars (1806) in the new genus *Hemistemma* (Kellermann *et al.* 2022), and then Candolle (1817) described *Hemistemma angustifolium*, *H. banksii* and *H. dealbatum* from northern Australia. Further species were subsequently added from New Caledonia; this is the only place outside Australia where a significant number of species of *Hibbertia* occur, namely 24 species (Horn 2009) in different habitats of the island.

Bentham (1863) reduced the genus to sect. *Hemistemma* of *Hibbertia* in his *Flora Australiensis* and recognised seven species, among them *H. verrucosa* from south of tropical Western Australia, which is now excluded from the *H. banksii* group. In the description of *H. hooglandii* from tropical Western Australia, Wheeler (1989) explained that this species should be included in the *H. banksii* group, because it bears only simple hairs and the staminodes are borne in a tuft on the outside of the fertile stamens, while *H. verrucosa* and similar southern species have fascicled hairs and the staminodes are surrounding the outside of the cluster of fertile stamens. The single terminal flower on axillary short shoots of *H. hooglandii* represents a very reduced inflorescence, as it is also occasionally observed in *H. holtzei*. Following Bentham's *Flora*, Mueller (1885) described *H. holtzei* from the Darwin region, Bailey (1888) *H. millari* from northern Queensland, and Reynolds (1991) added *H. laurana* from Queensland and *H. arnhemica* from the Northern Territory to the Australian species of the *H. banksii* group.

Recently Horn (2009) broadened the concept of *Hibbertia* subgen. *Hemistemma*, mainly based on molecular assessments to include a large number of species originally referred to the genus *Pleurandra* Labill. (1806; Kellermann *et al.* 2022). Although flowers of species of *Pleurandra* also bear fertile stamens to one side of the ovaries, they are usually without staminodes on the outside, and in particular, flowers are usually not borne on cincinni inflorescences. The tropical Australian species of the erstwhile genus *Heminstemma* are in this revision presented as the *H. banksii* group within *Hibbertia* subgen. *Hemistemma*.

Characters

Apart from the unique inflorescences, species of the *Hibbertia banksii* group display a number of other unusual characters that need to be evaluated, so that the taxa can be clearly delineated.

Habit. Most of the species are shrubs, rarely to an almost tree-like size in *H. laurana* and they tend to regenerate after fires from their woody rootstock;

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collectors frequently record evidence of suckering. Plants with wiry branches are found in the small shrublets *H. arachnoidea* and *H. muelleri*, and the two decumbent to prostrate species *H. lagarophylla* and *H. holtzei*.

Hairs. Although only simple hairs are found in the species dealt with here, their shape varies from silky or crisped to short and more robust, to hooked hairs in *H. holtzei*. Hair type is useful in the identification of species. The rusty colour-tones of hairs in species like *H. brownii* and *H. banksii* are commonly used in field indentifications, in contrast with the white undersurface of leaves of *H. dealbata* and *H. candicans*. On older leaves that have been exposed to light for some time these were, however, observed to fade considerably; even herbarium specimens often show varying degrees of discolouration. As such, this characteristic was largely avoided in keys but mentioned in the descriptions for careful use.

Leaves. All too often, the broader ± flat leaves of the more common larger species are considered characteristic in this group, ignoring at least four (out of eleven) species with linear, almost terete leaves. These terete leaves have strongly revolute margins, which ± abut to the raised abaxial central vein, a character more commonly associated with species included within the *H. acicularis*, *H. sericea* and *H. stricta* groups. All species are without intrapetiolar tufts of hairs, although in some, e.g. *H. laurana*, hairy axillary buds may resemble them. Characteristic are also the ± flattened base of the petiole, which leave a flattened crescent-like leaf scar resembling those of the subgen. *Hibbertia*. However, they bear only three nodal veins as is typical in the broader subgen. *Hemistemma*, which has commonly broad crescent-shaped to almost triangular leaf scars.

The broad flat, usually coriaceous leaves exhibit a reticulate venation and vein-ends on the margins. This is accentuated by distal lobes in *H. banksii*, *H. laurana* and *H. holtzei*, each ending in a vein-end on first leaves of new growth flushes, but those gradually disappear as the intramarginal veins between the ends of the secondary veins strengthen on mature entire leaves (brochidodromous leaves). Note also the change in the angle at which the secondary veins branch from the central vein between juvenile and adult leaves, particularly in *H. banksii*. An obvious heterophylly like this was only observed in three species (*H. banksii*, *H. laurana* and *H. holtzei*), but as no seedlings were available for a more detailed study of other species, this could not be confirmed for a broader range, in order to compare it with similar variation in the *H. tomentosa* group (Toelken 2010a). Nevertheless, lobed leaves are here referred to as juvenile, whereas adult leaves are entire or almost so.

The other broad-leaved species mainly from the Northern Territory, viz. *H. arnhemica*, *H. brownii*, *H. candicans*, *H. dealbata*, but also *H. ledifolia* from Western Australia, show no obvious change in venation, except fewer veins on usually smaller basal (?juvenile) leaves, which have usually a rounded apex. They are then often followed by a number of exceptionally large leaves becoming gradually smaller below the terminal inflorescences; these smaller leaves must not be confused with the whorled leaves or additional bracts, which are usually of similar shape (cf. inflorescences).

Hibbertia holtzei has smaller rounded entire leaves at the base with few secondary veins, each ending in a marginal vein-end; these are gradually changing into shallowly lobed leaves, which in turn develop veins with ± clear intramarginal connections on the entire adult leaves (e.g. *I.D.Cowie 1359*; AD). Note also the almost glabrous rounded first leaves in this species, which were also recorded for the *H. aspera* group (Toelken 1998) and *H. tomentosa* group (Toelken 2010a).

Although the term discolorous is particularly frequently used in the case of *H. candicans* and *H. dealbata*, because of the white tomentum abaxially, it is important to note that most of the broad leaves show also some difference in colours above and below (cf. hairs).

Inflorescence. *Hibbertia hooglandii* stands out among the northern Australian species. Even though it has a similar flower structure to the other species of the *H. banksii* group, it bears single terminal flowers, while the other species of the group are easily distinguished by the presence of terminal special monochasial cymes, the cincinni, with usually several flowers. These cincinni (Weberling 1988) are easily recognised by two bracts, often of different shape and/or size, between flowers.

Below the inflorescences of all species of the Australian *H. banksii* group there are also groups of (2) 3–6 fascicled, commonly smaller leaves, which are here referred to as additional bracts, rather than hypsophylls (sensu Jackson 1965), to draw attention to the similar, but commonly bract-like leaves observed in the *H. acicularis*, *H. sericea* and *H. stricta* groups (all in subgen. *Hemistemma*). While in the latter three groups, these additional bracts are usually situated below a single flower, in the *H. banksii* group they are at the base of the inflorescences with few to many flowers. However, occasionally single-flowered inflorescences also occur, for instance in *H. holtzi*, and these may show some similarity to the single flowers on the inflorescences of the other three groups. Once it had been established that the additional bracts were part of the inflorescence, it was possible to observe inflorescences in three different positions on plants, which may differ from species to species, so that this was used as another character to distinguish some taxa. While here only an overview is presented, the individual species descriptions provide more detail, stressing specific variations.

Firstly, **terminal inflorescences** on main branches are found on at least some specimens of all Australian species of this group and are easily recognised by their commonly larger leaf-like additional bracts and usually more flowers than found on the other two types of

inflorescences on the same plant. The main variation they show is in the number of flowers; occasionally they are absent on some branches, for instace in *H. brownii*, *H. candicans* and *H. banksii*.

Secondly, immediately below the terminal inflorescence, one, rarely several, smaller (usually with shorter peduncle and fewer flowers) monochasial cymes are observed developing from the axils of the additional bracts of the terminal inflorescence (parent). These **additional inflorescences** have usually at the base ± spaced vegetative cauline leaves and/or at least their own set of often scale-like fascicled additional bracts. They therefore resemble the common development of new growth flushes after fruiting, which will also mainly sprout from the axils of the parent additional bracts; after varying amount of growth, the plant ends the season by its own terminal inflorescence. This development is often observed particularly in *H. brownii*, *H. candicans* and *H. holtzei*, where first a branch with spaced reduced cauline leaves will develop, before the inflorescence with its additional bracts are formed, depending on a prolonged season. In an abbreviated form it was also found in the other species. The additional inflorescences are therefore not considered to form part-inflorescences of the terminal inflorescence as in compound inflorescences, but represent part of new growth independent of the terminal inflorescence in prolonged tropical seasons.

At the same time this renewed growth from several additional bracts will result in apparent dichotomous to polytomous branching, because of the close setting of the additional bracts. This might be perplexing later, when the origin of this development can no longer be seen, as this unusual branching is always close to a terminal inflorescence, while normal axillary branching from any node of leafy parts of the plants is common in all species.

Thirdly, **lateral inflorescences** on usually distal axillary short shoots are commonly found below terminal and additional inflorescences in *H. banksii*, *H. brownii*, *H. candicans* and *H. laurana*, however *H. hooglandii* only produces lateral inflorescences on short shoots. While the polytomous branching is always indicative of additional inflorescences in association with the terminal inflorescence, lateral inflorescences always branch from the axil of a cauline leaf. The branchlets on which these inflorescences are developing become distally shorter and the number of additional bracts are gradually reduced to ultimately one. Finally, closer to the terminal inflorescence, lateral inflorescences are absent, for instance in *H. banksii*, *H. brownii* and *H. candicans*. It is interesting to note that lateral inflorescences with a single basal additional bract have rarely been recorded for *H. candicans* in the Northern Territory, but are common for northern Queensland. Further detailed field observations on developing inflorescences are needed, as between this single reduced additional bract and the peduncle, a small additional bud can usually be observed. This bud may develop into a short separate additional inflorescence, subtended again by a very reduced single additional bract. *Hibbertia banksii* follows a similar pattern except that the subtending additional bracts of the lateral inflorescences seem to be scales, never leaf-like. Too little material was available to confirm corresponding developments for the otherwise very similar *H. laurana*.

Lateral inflorescences with or without terminal inflorescences are also often observed on distal branches of *H. candicans*, *H. brownii* and *H. banksii*, but the missing terminal inflorescence may in some cases develop a little later.

The additional bracts can not only be used to identify the inflorescence, but also to determine the position of the inflorescence. In the case of the prostrate branches of *H. holtzei*, the inflorescence appears to be axillary, but was repeatedly found leaf (= additional bract)-opposed. As the inflorescence is always found opposite to the uppermost additional bract, it is accepted as a terminal inflorescence, particularly as records of new growth flushes ending in inflorescences (with own additional bracts) have been observed developing from the axils of both parent additional bracts on either side of the terminal inflorescence, as described under the species (cf. variations).

Unusual are *H. candicans*, *H. dealbata* and *H. ledifolia*, because the basal bract on their inflorescences is lanceolate to almost cordiform and the bracts alternate between linear and lanceolate to the apex of the inflorescence, and, while regularly alternate, the size of the bracts decreases upwards. *Hibbertia holtzei* differs in having a linear first bract, with all subsequent bracts being ± lanceolate.

Flowers. Large and relatively broad petals and their bright yellow colour results in showy flowers. The many stamens inside, ± shield-like folded over the ovaries, as well as the presence of thin short styles resemble flowers of species of the *H. aspera* group (Toelken 1998, fig. 2A, B) and the *H. cistoidea* subgroup of the *H. stricta* group in eastern Australia, but also in many other Western Australian species. The slender anthers in all these flowers dehisce ± introrsely (Toelken 1998, fig. 2D, E), sometimes ± laterally. While the styles of the *H. aspera* group are distally turned upwards, so that the stigmas come almost in contact with the anthers, they are in Australian species of the *H. banksii* group ± turned downwards, away from the anthers. The small point-stigmas in these groups are presented in different ways, so that in spite of the superficial resemblance of flowers there are probably variations in the pollination syndromes throughout Australia. In the *H. aspera* group, filaments are largely basally connate, presumably to stabilise the shield-like cover of the stamens over the styles and stigmas. In the Australian species of the *H. banksii* group this support is possibly supplied by the usually stiff staminodes at the back of the fertile stamens. In some species (e.g. *H. holtzei*) the staminodes were observed on photographs to remain

erect like a palisade fence, as if to present a barrier to the pollinator and to retain the pollinator at the same time in the front near the stigmas. Field work is urgently needed to substantiate these purely morphological observations; this might tie in with the arrangement of stamens, staminodes and the presentation of the stigmas observed in *Dillenia* (Hoogland 1952: 13, fig. 2), which seem to indicate similar, but presumably somewhat different pollination syndromes. The arrangement of the stamens in relation to the styles, although sometimes superficially similar in different groups within *Hibbertia* and apparently *Dillenia*, can usually be regarded as parallel developments.

Calyx. The size of the calyx lobes is often very variable, depending on the age of the flower, because the calyx of most species of *Hibbertia* is accrescent (i.e. continues to grow after flowering). This is often particularly well developed and at times confusing in *H. candicans*. On the other hand, the length of the calyx lobes is critical to distinguish between *H. banksii* and *H. laurana* and must therefore be observed at the same developmental stage, preferably when flowering.

Although the calyx lobes are commonly densely hairy on the outside, their central ridge is often not well visible distally, but it is usually well developed proximally. The ridge becomes even more obvious and rigid after flowering, so that the calyx lobes do not decay easily (cf. seeds). In some species a groove on the glabrous inside develops, particularly of the inner calyx lobes, e.g. in *H. arnhemica*. Unusual is also that these calyx lobes in *H. arnhemica* are not only ± glabrous, but also glossy on the inside surface, which is otherwise known in eastern Australia mainly from *H. australis* (Wakefield 1955; Toelken 2010b).

Stamens. Characteristic of the *H. banksii* group is the arrangement of the subequal fertile stamens into a single cluster of two or three rows, with another row of staminodes eccentric to them. The whole unit is ± curved hand-like over the fine short styles and stigmas, forming a pollination syndrome that is repeated with different adaptions, especially without staminodes, in different species groups of *Hibbertia* and *Dillenia* (cf. Flowers).

Gynoecium. Another characteristic of this group is that the two white-hirsute to shaggy ovaries have 1 or 2 ± basal ovules each, of which usually only one will mature. The short thread-like styles are unusual, as is the hirsute receptacle all around the basis of the ovaries and petals, although this has also been previously observed and then thought to be a characteristic of species of the *H. sericea* group (Toelken 2000).

Fruits and seeds. Judging from herbarium specimens, the fruit (a follicle) rarely dehisces, or it just splits so that the seeds remain enclosed in the ± closed rigid calyx with its woody central vein (ridge), which is particularly well-developed at the base of the calyx lobes. Commonly only one relatively large seed matures per ovary or often even only one per flower. The calyx and the fruit wall seem to decay gradually and no specimens have been examined showing any indication of animal predation. Such antitelechoric seed distribution was also described by Hoogland (1952) for some species of *Dillenia*. In that case, as in species of the *H. banksii* group, most of the seeds are ± completely surrounded by a membranous cup-shaped aril that is so thin that it is not easily recognised on dried herbarium specimens. It was, however, described by a collector as "orange or pale yellow to white" when fresh.

Taxonomy

This present revision of 12 species of the *H. banksii* group is largely based on morphological studies of herbarium material; a brief visit to the Northern Territory gave some insight into their habitats. The most obvious character of the *H. banksii* group are the monochasial inflorescences, the cincinni, with usually a number of sessile flowers each subtended by two bracts.

Another characteristic is the stamens, which are on one side of the ovary with staminodes eccentric to the fertile stamens, in contrast to only fertile stamens to one side of the ovary in the formerly recognised genus *Pleurandra* Labill. However, in dealing with a wider range of material from Australia Bentham (1863) included different groups in different sections of *Hibbertia* for the *Flora Australiensis*. It is interesting that he included *H. verrucosa* from southern Western Australia in sect. *Hemistemma*, as that species has similar flowers to the *H. banksii* group, but they are not on cincinni inflorescences.

Additional characters typical of the north-Australian species are one, rarely two, usually basal ovules per carpel; the aril on seeds consisting of a very short basal attachment surmounted by a membranous cup, usually covering much of the seed, but being so delicate that it is easily overlooked on dried material; only simple hairs on all species and the presence of long hairs on the ovaries extend to the receptacle in and around the basis of the ovaries and petals, as had also been described for some species of the *H. sericea* group (Toelken 2000). In addition, the types of simple hairs on different parts of the plants proved useful when distinguishing between species, and are also used in a separate key based predominantly on vegetative characters. The unusual pollination syndrome with the combined hand-like-arranged stamens folded over the ovaries and styles, including the stigmas, is not restricted to the *H. banksii* group, but found with various minor variations in other groups of *Hibbertia* and *Dillenia* (cf. Flowers).

The species studied from northern Australia form only a small part of the *H. banksii* group, which extends its distribution into south-east Asia and Madagascar, so that they are here alphabetically arranged, because it is at present not possible to assess individual relationships within the whole group. There is, for instance, a wide

variation of tomentum, as well as the shape of the leaves between species. Especially the shape of leaves varies from broad and flat (e.g. *H. holtzei*), to broad leaves with ± recurved margins (e.g. *H. banksii*), to linear leaves with revolute margins ± abutting to the swollen abaxial central vein in *H. muelleri* and *H. lagarophylla* in the Northern Territory and *H. arachnoides* in Queensland. A similar large range of different leaf shapes was also recorded from the *H. sericea* group (Toelken 2000), which is also included in Horn's subgen. *Hemistemma*.

As in previous publications (e.g. Toelken & Miller 2012) the two areas on the abaxial leaf surface between the central vein and the recurved margins are referred to as the undersurfaces.

Many names are lectotypified following McNeill (2014), as they were published before 1958 and based on not specifically determined type specimens with often numerous duplicates. This is particularly important in the case of species described by Candolle (1817), based on specimens collected by Joseph Banks and Robert Brown. Mabberley (1985) drew attention to Candolle's visit to London in 1816, when he examined collections of these two collectors (see also Hammer 2022). While Brown gave Candolle duplicate collections for his herbarium in Geneva (now G), this means that Candolle's descriptions are not only based on the material in G, but also on the specimens he saw during his travels. However, in the case of *H. brownii* Benth. and *H. candicans* (Hook. f.) Benth. only a holotype is cited as for each of these two taxa, only one type specimen could be located.

The present study being mainly based on herbarium material did not provide adequate information on the conservation status of all taxa and this needs to be formally assessed by the relevant state and federal agencies. At present only general remarks were added under the 'Conservation status' for each taxon. Similarly ecological data on the habitat preferences of taxa might often be incomplete.

Key to species based on vegetative characters (keys to subspecies see under species)

1. Young branches, particularly below inflorescences, with coarse appressed simple hairs (pubescent)
- **2.** Vein reticulum on adaxial leaf surface incompletely visible; ratio of leaf length : width is 6–14 : 1; branches usually with several inflorescences, rarely only a terminal one; NT, Qld . . . . . *H. candicans*
- **2:** Vein reticulum on adaxial leaf surface visible; ratio of leaf length : width is 2–5 (–6) : 1; single terminal inflorescences; NT . . . . . *H. dealbata*

1: Young branches, particularly below inflorescences, with fine ± erect simple hairs (tomentose to hirsute)
- **3.** Leaf margins strongly revolute and ± abutting central vein
  - **4.** Stems and branches prostrate to scrambling; petiole 0.3–0.6 (–1.2) mm long; NT . . . . . *H. lagarophylla*
  - **4:** Stems erect; petiole < 0.3 mm long
    - **5.** Leaves subopposite with very short internodes (± sessile); silky hairs on branches up to 2.5 mm long; Qld . . . . . *H. arachnoides*
    - **5:** Leaves well separated; silky hairs on branches rarely longer than 1.5 mm
      - **6.** Leaves almost terete and with straight pointed apex; WA . . . . . *H. hooglandii*
      - **6:** Leaves grooved along adaxial central vein and with pointed apex usually ± recurved; NT . . . . . *H. muelleri*
- **3:** Leaf margins flat to slightly revolute, but widely distant from abaxial central vein
  - **7.** Abaxial leaf surface glabrescent with few erect hooked hairs; NT . . . . . *H. holtzei*
  - **7:** Abaxial leaf surface densely hairy with ± appressed straight or crisped simple hairs
    - **8.** Leaf margins varying from dentate, sinuate or lobed to entire (heterophyllous)
      - **9.** Plants up to 4 m tall; Qld . . . . . *H. laurana*
      - **9:** Plants to 2 m tall; Qld . . . . . *H. banksii*
    - **8:** Leaf margins of all leaves entire, rarely undulate
      - **10.** Abaxial leaf surface with rugose-reticulate venation, with fine caducous longer hairs overtopping tomentose base; NT . . . . . *H. arnhemica*
      - **10:** Abaxial leaf surface with venation obscure or indistinct, tomentose without overtopping hairs
        - **11.** Young petiole discolorous; leaves (2.5–) 8–26 (–35) mm broad; NT . . . . . *H. brownii*
        - **11:** Young petiole white-tomentose above and below; leaves 2.1–2.7 (–10) mm broad; WA . . . . . *H. ledifolia*

Key to species based mainly on flowering material (keys to subspecies see under species)

1. Calyx > 11 mm long when flowering
  2. Bracts ovate to cordiform; NT . . . . . *H. arnhemica*
  2: Bracts oblong to oblong-elliptic; Qld . . . . . *H. laurana*
1: Calyx < 10.5 mm long when flowering
  3. Bracts alternately broader lanceolate and narrower linear in shape and decreasing upwards in size, rarely linear (only at the base in *H. holtzei*)
    4. Plants decumbent, perennial herbs; NT . . . . . *H. holtzei*
    4: Plants shrubs with erect branches becoming rigid-woody
      5. Stems and peduncle rusty-tomentose with short erect ± crisped fine hairs; WA . . . . . .*H. ledifolia*
      5: Stems and peduncles rusty-pubescent with short coarse appressed hairs
        6. Inflorescences only terminal, with (6–) 8–12 (–15) flowers; NT . . . . . *H. dealbata*
        6: Inflorescences terminal and axillary, with (2) 3–5 (–6) flowers; NT . . . . . *H. candicans*
  3: Bracts of similar shape but decreasing in size upwards (except *H. holtzei* with first bract linear)
    7. Calyx with long silky hairs ± appressed (sericeous); leaves linear on erect plants
      8. Flowers single, on short axillary branches; WA . . . . . *H. hooglandii*
      8: Flowers in terminal inflorescences with (1–) 3–15 flowers
        9. Young branches with short erect hairs (rusty-tomentose); NT . . . . . *H. brownii*
        9: Young branches with spreading silky hairs (white-hirsute)
          10. Internodes on stems < 1–2 (–3) mm long; leaves incurved; Qld . . . . . .*H. arachnoidea*
          10: Internodes on stems > 3 mm long; leaves spreading; NT . . . . . *H. muelleri*
    7: Calyx with long firm appressed hairs (strigose); leaves variously, if linear then on prostrate plants
      11. Plants with prostrate to decumbent branches
        12. Leaves linear with revolute margins almost abutting raised central vein; NT . . . . . *H. lagarophylla*
        12: Leaves broad and flat and with scarcely raised central vein; NT . . . . . *H. holtzei*
      11: Plants with erect-spreading branches
          13. Bracts ovate to lanceolate; leaves all entire; NT . . . . . *H. brownii*
          13: Bracts oblong to oblong-elliptic, leaves heterophyllous: shallowly lobed to entire; Qld . . . . . *H. banksii*

Hibbertia arachnoidea Toelken, ***sp. nov.***

A H. lagerophylla *et* H. muelleri *foliis distalibus subopositis, cum extremis venarum terminalium sursum versum et pilis sericeis usque ad 2.5 mm longis differt.*

Holotypus: Queensland, Maytown track, 8 Dec. 2017, *B.S. Wannan 7002 & S.L. Thompson* (CNS 146364). **Isotypi:** AD289869; MEL, *n.v.*

Hibbertia "Maytown Track" Jackes, *N. Queensland Naturalist* 49: 85, 88, Fig. 4 (2019)

Shrubs to 0.6 m tall, with slender erect branches from a root stock about 1 cm thick; branches with ridges of decurrent obvious leaf bases accentuated by short internodes, shaggy with long spreading straight to crisped silky simple hairs (up to 2.5 mm long), rusty but becoming soon paler to white and finally glabrescent. *Vestiture* persistent, with long white silky simple hairs, at first antrorse-spreading and ± shaggy, often becoming felt-like on branches and undersurface of leaves, while similarly textured long hairs on the calyx and bracts usually remain rusty, at least when young, and ± appressed. *Leaves* entire, becoming faintly discolorous; *petiole* practically absent, 0–0.2 mm, densely covered with long silky hairs similar to the undersurface; *lamina* linear, (8.2–) 9.5–14 (–22.3) × 0.3–0.4 (–0.5) mm, scarcely constricted towards the base, apex acute and usually with a vein-end 0.2–0.3 mm long, pointing upwards, adaxial surface strongly convex with obvious revolute margins and a slight groove above the central vein but no other veins are visible, glabrescent with few long spreading silky simple hairs along the central vein and margins, abaxial surface with distinctly raised revolute margins abutting the indistinct recessed central vein, which is densely covered with silky hairs, felt-like basally but overtopped by long spreading silky hairs up to 2.5 mm long. *Inflorescences* are monochasia (cincinni) with (1–) 3–5 flowers, subtended by 3 or 4 (rarely up to 8) smaller fascicled leaves (additional bracts), which apart from their reduced size are often dorsiventrally compressed and narrowly triangular but often not easily distinguishable from very dense terminal leaves on the account of this firm, dense tomentum, and usually supported by 1 or 2 (3) almost sessile additional

inflorescences branching from the axils of the additional bracts (sometimes with 2 or 3 scale-like, rusty-woolly additional bracts, but often indistinct because of dense tomentum), terminal on main branches and their distal side branches; *peduncle* (0–) 3–5 mm long, ± terete, covered by dense antrorse-spreading rusty coarser hairs overtopped by finer hairs; *bracts* similar in shape but decreasing in size upwards, broadly oblong to oblong-ovate, 1.8–3.5 × 1.3–2.4 mm, with rounded apex, central ridge obscured by dense, almost appressed rusty tomentum. *Calyx lobes* subequal, accrescent; *outer calyx lobes* ovate-oblong, 4.2–4.5 (–6) × 3.3–3.5 mm, slightly shorter than inner calyx lobes, obtuse to rounded, with central ridge obscured by dense, almost appressed, rusty tomentum, on the outside surface with firm long straight, ± appressed rusty hairs, on the inside surface glabrous and faintly glossy, outside hairs hugging the margins; *inner calyx lobes* ovate, 4.8–5.5 (–6.4) × 3.1–3.5 mm, obtuse, central ridge obscured by dense ± appressed rusty tomentum, on the outside surface with firm long straight, ± appressed rusty hairs, on the inside surface glabrous and faintly glossy, with outside hairs hugging margins. *Petals* broadly obovate, 8–9.5 × 2.8–4.2 mm, ± deeply bilobed. *Stamens*: *fertile stamens* 18–32, about twice as long than eccentric 8–12 *staminodes* (sometimes with terminal awn), all in a dense cluster to one side of the ovaries; fertile stamens with *filaments* 0.8–2 mm long, scarcely connate basally; *anthers* slender oblong, 2–2.5 mm long, truncate above and abruptly tapering below, dehiscing introrsely. *Pistils* 2; *ovaries* obovoid, each with 1 basal ovule, erect-hirsute; *styles* horizontally attached to the eccentric apex of the ovaries and then straight up in front of the stamens but curving towards the anthers below the stigma positioned opposite to the anther apex. *Fruits* and *seeds* not seen. **Fig. 1A–C**.

Distribution & ecology. Associated with sandstone outcrops, mainly on creek banks with open woodland of *Eucalyptus tetradonta*, *Corymbia nesophila* and *Grevillea glauca* in central northern Queensland.

Phenology. Flowering in Dec.

Conservation status. The species is restricted to the narrow banks of a creek. In addition, most of the flowers dissected were found without androecium and/or gynoecium due to heavy predation, so that to date no seeds have been examined. There are no reports of young plants. This predation raises concern about the conservation of this rare species.

Diagnostic features. Although superficially similar to *H. muelleri* and *H. lagarophylla*, *H. arachnoidea* differs by its upturned point of the leaves (rare in *Hibbertia*), very short internodes, so that the spirally arranged leaves appear almost opposite particularly below the inflorescence, being covered by even longer hairs especially on the leaves, which appear to be covered by cobwebs, and the presence of a number of short inflorescences distally on main branches.

Variation. The flowering period of the species seems to fall into a narrow time slot in the middle of the rainy season, when it is a challenge to use the tracks along which this plant grows, with the result that the few available collections show very variable flowers.

It seems that the lateral additional inflorescences are produced commonly in succession, even though in several cases some inflorescences flower almost concurrently with the main terminal inflorescence, while on other apices they develop in a different sequence. As the leaves are closely stacked and especially because of the very dense indumentum below the terminal inflorescences, it could not be ascertained with certainty whether later lateral inflorescences are situated in the axils of leaves shortly below the first terminal inflorescence.

Etymology. The long silky hairs around the leaves and young parts of much of the plant give the appearance of spider webs and hence the choice of the epithet *arachnoidea*, Latin "pertaining to spiders".

Other specimens examined

QUEENSLAND. Garden Ck, E of Jowalbinna-Maytown rd, 6 July 1990, *A.R. Bean 1784* (BRI); 6 km S of Jowalbinna turnoff on Maytown tk, 17 Nov. 1983, *J.R. Clarkson 5054* (BRI, MBA, QRS); Laura Plateau E of Maytown to Laura tk, 23 Jan. 2003, *I.D. Fox 1691a* (BRI); 20 miles [32 km] SW of Laura, Feb. 1978, *W. Hinton 99* (BRI); between Maytown and Cooktown, 1882, *E. Palmer 147* (MEL); c. 42 km SSW of Laura, close to edge of escarpment of Mosman Ck, 19 June 1987, *M. Parris 9191* (CANB); beside Maytown tk, 8 Dec. 2017, *B.S. Wannon 6999 & S.L. Thompson* (AD, BRI, CANB, CNS-REF, MEL, NSW); beside the Maytown tk, 8 Dec. 2017, *B.S. Wannon 7001 & S.L. Thompson* (AD, BRI, CANB); 8 Dec. 2017, *B.S. Wannon 7004 & S.L. Thompson* (AD, BRI); 17 km S of Jowalbinna on old Maytown to Laura coach rd, 7 Aug. 2003, *G.W. Wilson 177* (BRI, MBA).

Hibbertia arnhemica S.T.Reynolds

Austrobaileya 3: 533 (1991) — **Holotype:** Northern Territory, east of Mt Howship near East Alligator River, 8 July 1972, *M. Lazarides 7571* (BRI AQ0224787). **Isotypes:** CANB267449.1, CANB267450.2; DNA, K, L, NSW, *n.v.*

Shrubs up to 1 m tall, erect-spreading, multi-stemmed from woody root stock and often suckering, little branched; branches terete with scarcely raised and decurrent leaf bases, white-hirsute with long spreading silky simple hairs becoming densely tomentose as longer hairs soon wear off. *Vestiture* persistent, dense undercover of fine erect, rarely crisped simple hairs on leaves above and below, but usually ± rusty along the veins, overtopped by much longer spreading rusty hairs on young branches and inflorescences, especially rusty on calyx and bracts, progressively turning paler or white on branches and frutescence, but also wearing off gradually. *Leaves* usually indistinctly heterophyllous and

with margins undulate to entire, rarely shallowly lobed, discolorous; *petiole* 2–5 (–7.4) mm long, tomentose above and below and ± tinged rusty when young; *lamina* ovate to broadly elliptic, (38–) 45–75 (–98) × (22–) 35–45 (–65) mm, ± abruptly constricted into petiole, apex acute to pointed, becoming obtuse or truncate, adaxial surface flat with ± recessed-reticulate venation, with secondary veins acute to central vein and rarely paired, becoming reticulate with indistinct intramarginal connections, and vein-ends usually connected to undulation, pale brown-hirsute with overtopping white antrorse-spreading silky hairs soon wearing off, becoming pubescent, rarely glabrescent or glabrous, below rugose-reticulate venation usually rusty-hirsute when young fading to paler and loosing longer overtopping hairs to retain a tomentose undercover of fine crisped hairs often becoming ± felt-like. *Inflorescences* are monochasia (cincinni) with (4–) 10–16 (–19) flowers loosely arranged and subtended by 3 (–4) additional bracts usually of smaller, but rarely of different shape than cauline leaves, terminal mainly on main branches and often supported by 1 to 3 shorter additional inflorescences branching from the axils of the parent additional bracts (each with separate scale-like additional bracts visible), rarely lateral inflorescences are borne terminally on short axillary branches and then with ± scale-like, but usually persistent additional bracts; *peduncles* (0–) 3–14.5 mm long, terete, rusty-hirsute to tomentose; *bracts* similar in shape, but gradually decreasing upwards, ovate to broadly ovate, 8–16 (–24) × 5–12 (–15) mm, acute to pointed, rarely acuminate or cuspidate, with ridged central vein, strigose to hirsute, ultimately becoming pubescent. *Calyx lobes* subequal; *outer calyx lobes* lanceolate-elliptic, sometimes oblique, (12–) 14–18 (–21) × (3–) 3.5–4.5 mm, longer than inner calyx lobes, acute rarely becoming obtuse, without dorsal ridge, surface obscured by rusty antrorse-hirsute tomentum, outer surface with fine but firm simple hairs up to 4 mm long, inner surface glabrous and glossy except for few antrorsely spreading hairs at apex; *inner calyx lobes* obliquely ovate-oblong, (11.5–) 12–15 (–16.7) × (4.5–) 5–8 (–10.8) mm, obtuse to rounded, with basal ridge obscured by rusty strigose-hirsute tomentum, on the outside surface with fine antrorsely spreading simple hairs, on the inside surface glabrous and glossy, rarely with few hairs at the apex. *Petals* broadly obovate, 16–22 (–25) × 17–23.4 (–28) mm, emarginate to bilobed. *Stamens*: *fertile stamens* 18–21, usually slightly longer than 14–18 eccentric *staminodes* all in a cluster to one side of the ovaries; fertile stamens with *filaments* 1.2–1.8 mm, scarcely connate basally; *anthers* narrowly oblong, 3.2–3.8 mm long, abruptly constricted above and below, dehiscing introrse-laterally. *Pistils* 2; *ovaries* obovoid, with 2 basal ovules, villose; *styles* horizontally attached to ± mid-side of ovaries but then straight up in front of stamens positioning the stigmas in front of the apex of the anthers. *Fruits* not dehiscing. *Seeds* obovoid, 6.5 × 5.5 mm, brown to black; *aril* with scarcely fleshy attachment surmounted by a slightly lobed cup clasping the base of the seed. **Fig. 1J, K**.

Distribution & ecology. Growing usually in deep sand in *Eucalyptus-Melaleuca* shrubby woodland on sandstone of the western escarpment of the Arnhem plateau from Oenpelli to near Jim Jim Falls, Northern Territory.

Phenology. Flowering in Apr.–July.

Conservation status. Conserved in Kakadu National Park (N.P.).

Diagnostic features. The larger flowers, with calyx usually longer than 12 mm, distinguish *H. arnhemica* from other Australian species, except *H. laurana*. The latter is, however, distinguished by its narrow ± oblong bracts (broadly ovate in *H. arnhemica*), the branching of the secondary veins at an obtuse to right angle to the central vein and then continued to a vein-end, while secondary veins of *H. arnhemica* arch out from

Fig. 1. A–C *Hibbertia arachnoidea*: **A** abaxial leaf with central vein obscured by tomentum ×2; **B** adaxial leaf apex ×2; **C** transverse section through mid-leaf. **D, E, T *H. brownii*** subsp. ***brownii***: **D** terminal inflorescence overtopped by two additional inflorescences from subtending additional bracts; **E** centre of flower with pistils in front of fertile stamens and staminodes at back ×2.5; **T** abaxial leaf surface showing venation. **F, G *H. lagarophylla***: **F** abaxial leaf surface showing a narrow central vein ×3; **G** adaxial leaf apex ×3. **H, I *H. muelleri***: **H** adaxial leaf surface ×5; **I** abaxial leaf surface showing broad central vein abutting revolute margins ×5. **J, K *H. arnhemica***: **J** mature leaf with abaxial leaf surface showing intramarginal connections ×1; **K** apex of juvenile leaf without obvious veins abaxially ×1. **L, M *H. laurana***: **L** juvenile leaf with abaxial leaf surface showing secondary veins ending in vein-ends on marginal lobes ×1; **M** mature leaf with abaxial leaf surface showing secondary veins continue into intramarginal connections ×1. **N, O *H. holtzei***: **N** juvenile leaf with abaxial leaf surface showing secondary veins ending in vein-ends on marginal lobes ×1; **O** mature leaf with abaxial leaf surface showing secondary veins continue into intramarginal connections ×1. **P, Q *H. banksii*** subsp. ***banksii***: **P** juvenile leaf with abaxial leaf surface showing secondary veins ending in vein-ends on marginal teeth ×1; **Q** mature leaf with abaxial leaf surface showing secondary veins continue into intramarginal connections ×1. **R, S *H. banksii*** subsp. ***sparsidetata***: **R** juvenile leaf with abaxial leaf surface showing secondary vein ending in vein-ends on marginal teeth ×1; **S** mature leaf with abaxial leaf surface showing secondary veins continue into intramarginal connections ×1. **U, V *H. candicans***: **U & V** variations of abaxial leaf surfaces ×1. **W, X *H. dealbata***: **W** abaxial leaf surface ×1; **X** upper leaf surface ×1.5. — A–C *J.R. Clarkson 5056* (BRI077358); D, E *I. Telford 8356* (CBG8005433); T *P.A. Fryxell & A. Craven 4230* (MEL695345); F, G *D.E. Murfet 4492* (AD184877); H, I *P.A. Fryxell & J. McD. Stewart 4889* (MEL695689); J, K *T.S. Henshall 1883* (MEL1515656); L *H. v. d. Werff 11715* (QRS); M *M. Parris 9197* (CBG8703405); N *I.D. Cowie 1359* (CANB00404467); O *R.L. Specht 106* (BRI010245); P, Q *B. Hyland 5445* (QRS027674); R, S *P.I. Forster 19431* (AD99806226); U *D.L. Jones 6973* (CBG9220258); V *J. Wrigley & I. Telford 1608* (CBG042949); W, X *G.J. Leach 3047* (AD99241191).


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the central vein at an acute angle and end in reticulate venation (best observed on the abaxial leaf surface).

Variation. The heterophylly is not very distinct in *H. arnhemica* and, similar to other species from the Northern Territory, the lower leaves also start with a much shorter lamina (35–40 mm long) with a rounded apex, ranging into larger undulate to shallowly lobed juvenile leaves followed by often three times longer entire leaves (e.g. *M. Lazarides 7858*). Although the number of secondary veins increases ± in relation to the size of leaves, their acute branching from the central vein remains. On the above specimen, the veins ultimately form ± visible intramarginal connections on a few leaves. The venation of leaves on many other specimens are often not as clear.

The shape of the leaves of a specimen from near Oenpelli (*L.G. Adams 2784*) differs in that they are often sharply pointed, but the leaves on *L.A. Craven 5820* from near Jim Jim Falls show a gradient into the normally broader and blunter leaves of plants from the southern distribution area.

Most of the flowers on the inflorescences are arranged in two rows, each ± retained by similar broad bracts. The additional inflorescences from the axils of the additional bracts of the main terminal inflorescence on main branches are often subtended by a caducous whorl of scale-like additional bracts, but they must nevertheless be interpreted as independent inflorescences (cf. *H. holtzei*). Short inflorescences on axillary short shoots with few proximal leaves (*I.D. Cowie & J.J. Bruhl 8253*) or with only scale-like additional bracts (*M. Lazarides 7858*) below the terminal inflorescence have rarely been recorded.

Other specimens examined

NORTHERN TERRITORY. 33 mls [52.8 km] SSE of Oenpelli, 10 July 1972, *L.G. Adams 2784* (CANB); 3 mls [5.3 km] upstream of Jim Jim Falls, 14 July 1972, *N. Byrnes 2726* (CANB); near top of Jim Jim Falls, 16 Mar. 1999, *I.D. Cowie & J.J. Bruhl 8253* (AD); 3.5 km ESE of Jim Jim Falls, 23 May 1980, *L.A. Craven 5820* (CANB, MEL, PERTH); top of Jim Jim Falls, 31 Jan. 1981, *C.R. Dunlop 5711* (CANB, MEL); Mt. Gilruth area, 8 June 1978, *T.S. Henshall 1883* (MEL); c. 12 mls [19.2 km] N of El Sharana Mine, 26 Feb. 1973, *M. Lazarides 7858* (CANB, PERTH); 3.5 km ESE of Jim Jim Falls, 23 May 1980, *M. Lazarides 8940* (MEL; CANB, *n.v.*); 10.5 km NE of Mt Evelyn, 19 Apr. 1990, *A.V. Slee & L.A. Craven 2593* (AD).

Hibbertia banksii (R.Br. ex DC.) Benth.

Fl. Austral. 1: 20 (1863); F.M.Bailey, *Syn. Queensl. Fl.* 4 (1883); F.Muell., *Sec. Syst. Census Austral. Pl.* 1: 1 (1889); Gilg, *Nat. Pflanzenfam.* III(6): 119 (1893); F.M.Bailey, *Queensl. Fl.* 1: 17 (1899); Banks & Solander (Britten ed.), *Illustr. Austral. Pl. Cook's Voy.* 1: 5, t. 2 (1900); F.M.Bailey, *Compr. Cat. Queensland Pl.* 18, fig. 4 (1913); Gilg & Wederm., *Nat. Pflanzenfam.* edn 2, 21: 29 (1925); Domin, *Biblioth. Bot.* 89: 421 [975] (1928); A.C.Sm., *J. Arnold Arbor.* 22: 497 (1941); Hoogl., *Fl. Males. Ser.* 1, 4: 150, fig. 3 (1951); S.T.Reynolds, *Austrobaileya* 3(3): 530 (1991). — *Hemistemma banksii* R.Br. ex DC., *Syst. Nat.* 1: 413 (1817); Poir., *Dict. Sci. Nat.* 20: 560 (1821); DC., *Prodr.* 1: 71 (1824); Spreng., *Syst. Veg.* 2: 610 (1825); G.Don, *Gen. Hist.* 1: 73 (1831); Heward, *J. Bot. (Hook.)* 4: 250, 257 (1842). — **Type citation:** "in Novâ-Hollandia ad Endeavour-River, *S. Jos. Banks.* 3. (v. s. sp. Comm. À cl. R. Brown.)". **Lectotype (here designated):** Queensland, Endeavour River, *J. Banks s.n.*; (G-DC00201269). **Isolectotypes:** BM000550451, BM 001209992, BM001209993, MEL1579682, NSW 133445, NSW133708, P00682325.

Shrubs up to 2 m tall, usually multi-stemmed, erect to spreading; branches terete, with raised leaf bases scarcely decurrent, densely hirsute becoming pubescent to glabrescent, covered with ± crisped rusty-brown simple hairs in a dense basal undercover overtopped by fewer longer hairs particularly at growing points. *Vestiture* persistent, with dense often dark rusty undercover of erect usually ± crisped simple hairs normally overtopped by scarcely longer crisped rusty hairs on branches, petioles and inflorescences, especially with hairs on calyx becoming ± antrorse-appressed (pubescent), while the tomentum is persistent and often felt-like between darker veins on abaxial leaves, but scarcely persistent on adaxial leaf surfaces. *Leaves* heterophyllous, shallowly lobed to entire, concolorous; *petiole* (2.2–) 3–6 (–8.4) mm, rusty-hirsute above and below; *lamina* oblanceolate to narrowly elliptic, (2.4–) 45–90 (–116) × (3–) 8–26 (–35) mm, gradually tapering into petiole, acute to obtuse, adaxial surface flat with grooved central vein and with slightly recessed to scarcely raised reticulate venation and usually ending in vein-ends on the lateral margins, particularly at the tip of distal teeth on juvenile leaves, or entire margins with intramarginal connections on adult leaves visible, crisped rusty-tomentose often restricted to venation, abaxial surface with ± raised revolute margins and central vein, as well as usually secondary veins (but reticulate venation incomplete or obscured) rusty-pubescent with densely crisped simple hairs similar to the dense felt-like crisped paler hairs covering the rest of the undersurface except that the central vein and margins are overtopped by few to many ± straight spreading hairs. *Inflorescences* are monochasia (cincinni) with (3–) 4–7 (–11) sessile flowers, subtended by 2 (3) additional bracts, terminal on main branches and/or often with few to many lateral inflorescences on axillary branches of distal leaves with own basal scale-like additional bracts (1 or 2); terminal inflorescence sometimes supported by 1 or 2 additional inflorescences branching from the parent additional bracts and with their own reduced additional bracts; *peduncle* 16–35 (–42) mm long, ± terete, hirsute to pubescent with ± crisped rusty simple hairs; *bracts* similar in shape, slightly decreasing upwards, oblong to oblong-lanceolate, 2–5 (–6.6) × 0.9–1.3 mm, with central ridge ± obscured by rusty-hirsute to pubescent tomentum with ± spreading rusty simple hairs. *Calyx lobes* subequal to unequal; *outer*

calyx lobes lanceolate-elliptic, (5.8–) 6–8 (–10.3) × 3.5–4.4 (–5) mm, obtuse rarely acute, distal central ridge largely covered by dense rusty-pubescence while proximal central ridge becomes more prominent in fruiting, outer surface with slender antrorsely appressed simple hairs, inner surface often with groove along central vein, with some distal hairs but mainly glabrous and rarely glossy; *inner calyx lobes* broadly elliptic to obovate-elliptic, 5.6–7.5 (–9.2) × 4–5.3 (–5.9) mm, obtuse to rounded, with central ridge covered with dense rusty-pubescence but occasionally becoming visible proximally in fruiting stage, outer surface with slender antrorse, ± appressed simple hairs, inner surface often with groove along central vein, glabrous and rarely glossy. *Petals* broadly obovate, 9–23 × 7–15 mm, bilobed. *Stamens*: *fertile stamens* (20–) 25–44 (–48), usually in 3 rows, larger than the 13–18 eccentric *staminodes*, all in a cluster to one side of the ovaries; fertile stamens with *filaments* 2–2.2 mm long, scarcely connate basally; *anthers* slender-oblong, 2.3–2.5 (–2.7) mm long, abruptly constricted above and less so below, introrsely dehiscing. *Pistils* 2; *ovaries* obovoid, each with 2 basal ovules, densely hirsute; *styles* ± vertically attached to the eccentric apex of the ovaries and then straight erect in front of the stamens but then slightly curved away to position the stigmas in front of the apex of the anthers. *Fruits* indehiscent. *Seeds* broadly obovoid to almost spherical, 2–2.4 × 2–2.2 mm, light to mid-brown; *aril* often with slightly swollen attachment surmounted by a slightly lobed cup-like membrane tightly covering most of the seed.

Diagnostic features. *Hibbertia banksii* is commonly recognised by the rusty-hirsute to rusty-tomentose indumentum on branches and particularly on the undersurface of the leaves. More specificly, the margins and central vein on the abaxial leaf surface differ from those of *H. brownii* by longer spreading straight, often dark-rusty hairs over fine, often crisped hairs. But these are mainly observed on young leaves and wear off soon. *Hibbertia brownii* is furthermore distinguished by the absence of teeth and/or obvious vein-ends on the leaf margins. *Hibbertia laurana* is mainly distinguished by its larger flowers, but plants are altogether larger in height, reaching an almost tree-like habit up to 4 m tall. However, care is advised, as most species in the *H. banksii* group have an accrescent calyx, so that fruiting calyces of *H. banksii* have often been observed to be longer and similar to that of *H. laurana*. Both these two species have also very similar inflorescences, though usually with fewer flowers in the case of *H. laurana*.

Variation. The variability of *Hibbertia banksii* is large, due to re-occurring heterophylly sometimes at different stages on different collections or rarely all on the same specimen (cf. leaves, heterophylly, above). With every new growth flush the morphological variation doubles ranging from the usually toothed juvenile leaves to ± entire adult leaves. Both juvenile leaves, as well as adult leaves vary with environmental conditions in both subspecies, which have been recorded from heathlands, woodlands and forests.

Reynolds (1991) already recognised two forms, which are here raised to subspecies level. These are mainly based on leaf characters, while different sizes of the aril on seed recorded by Reynolds could not be verified as only flowering specimens are commonly collected. However, she had not seen the type of *H. banksii*, so that she was not aware that her forma *rigidula* would needed to be the typical forma (cf. typification), meaning that her typical forma becomes now subsp. *sparsidentata*. Their individual variations are discussed under the respective subspecies. Usually, no single character distinguishes specimens of the two subspecies. Ideally only leaves at the same stage in the range of the heterophylly can be compared, but adult leaves are common in the subsp. *sparsidentata*, while they are rarely produced in subsp. *banksii*.

The inflorescences are as complex as those in *H. brownii* and *H. candicans*. Both subspecies have a terminal one, which is usually supported by one to few additional inflorescences; occasionally, ± lateral inflorescences have been recorded. In the case of the latter, a gradual transition from leaf-like to scale-like additional bracts was not observed, but often two reduced additional bracts are found on either side of the peduncle. Repeated branching of the lateral inflorescence was rarely seen (e.g. *L.J. Brass 8431*).

Typification. The presence of already recognised infraspecific taxa (Reynolds 1991) in *Hibbertia banksii* necessitates a clear typification, in order to identify the typical taxon.

There are several duplicates of Banks' collection of *H. banksii* in various herbaria. Some of these were seen by Hoogland in preparation of his *Flora Malesiana* treatment of the family (Hoogland 1951). In 1950, he attached determinavit labels with the annotation "type" to BM000550451 and "type dupl." to P00682325. A third specimen NSW133708 was also identified by Hoogland with a similar label in 1971 as an "isotype". However, Hoogland never published a formal typification of the name.

When Candolle named *H. banksii*, he used a manuscript name by Robert Brown. The specimen G-DC00201269 is in Candolle's herbarium and was definitely examined by him when preparing the description. It is also the only specimen labelled by Brown with that epithet. As such, it is designated as the lectotype of *H. banksii*.

Important to note is that the central branchlet on the isolectotype BM00055051, in particular, shows broad leaves with an obtuse to rounded apex, commonly with more than 3 teeth along each margin of juvenile leaves, and with lateral veins on the abaxial surface, which are forming an acute angle to the central vein, characteristic for the typical subspecies, *Hibbertia banksii* subsp. *banksii*.

Key to subspecies

1. Leaf lamina with broadly obtuse to rounded or slightly emarginate apex, ± abruptly constricted into petiole; juvenile leaves with (3) 4–7 (8) rounded teeth each with one vein-end, or ± undulate with (3) 4–7 (8) obvious vein-ends, ranging into entire adult leaves, with most secondary veins on the abaxial surface arising at acute angle to the central vein and arching out to vein-ends on lateral margins without, or very rarely developing obvious intramarginal connections . . . . . *H. banksii* subsp. *banksii*

1: Leaf lamina with acute to bluntly acute apex, base cuneate; juvenile leaves with 1–3 acute lobes each with one, or only with 1–3 obvious vein-ends on each margin, ranging into entire adult leaves, with most secondary veins on the abaxial surface arising at an obtuse to right angle to the central vein and usually forming clear intramarginal connections . . . . . *H. banksii* subsp. *sparsidentata*

Hibbertia banksii subsp. ***banksii***

Hibbertia banksii forma *rigidula* S.T.Reynolds, *Austrobaileya* 3(3): 530 (1991). — **Holotype:** Queensland, Cook district, Tozer Gap, July 1948, *L.J. Brass 19425* (BRI). **Isotype:** CANB.

Leaf lamina (12–) 14–30 (–35) mm broad, with obtuse to rounded or emarginate apex and lobes (rarely not present) and abruptly constricted into petiole; *juvenile leaves* with distal secondary veins on the abaxial surface branching from the central vein at acute angle and arching-out to (3) 4–8 vein-ends on each lateral margin, ranging into *adult leaves* with distal secondary veins on the abaxial surface branching off the central vein at acute angle and rarely developing clear intramarginal connections and/or with marginal vein-ends. *Fertile stamens* 20–25. **Fig. 1P, Q**.

Distribution & ecology. Grows on sandy soil sometimes associated with sandstone in heath often in the undercover of eucalypt woodland in northern Queensland (Co).

Phenology. Flowering mainly Apr.–Aug.

Conservation status. Widespread on the Cape York Peninsula and conserved in, for instance, Iron Range N.P.

Variation. Reynolds (1991) distinguished the leaves of her forma *rigidula* from forma *banksii* by a broadly obtuse apex and with up to 6 teeth along the distal margins. This adequately describes the type specimen of *H. banksii*, which she had not seen, so that the forma *rigidula* now needs to be placed into synonomy of subsp. *banksii*.

Additional specimens now available show that both subspecies are very variable and occur in heathland, woodland and even on forest margins, and accordingly the leaves tend to exhibit different shapes and sizes. In addition to expected size changes, the development of dentate leaf margins on juvenile leaves of each new growth flush is prolonged under shaded conditions, while in open heath-like vegetation usually narrower adult leaves are found with almost entire margins. Juvenile leaves are more pointed and most secondary veins on the abaxial surface branch off the central vein at an acute angle and end at a vein-end on one of the marginal teeth. The number of teeth, as well as the branching of the vein, change gradually on leaves between extremes of the juvenile and adult stage and this development may be promoted or retained longer due to environmental conditions. Nevertheless, this taxon is here accepted as the typical subspecies. A fact that is underpinned by field observations on *P.I. Forster 32714*: "Grows sympatrically but with no intermediates with *P.I. Forster 32715* [subsp. *sparsidentata*]".

The following specimens of possible local forms, distinguished by their indumentum on the adaxial leaf surface, can at present not be adequately evaluated:

1. Commonly specimens of subsp. *banksii* have few fine hairs, but become glabrous soon, e.g. *R.W. Johnson 4979*
2. Other specimens are glabrous already when young, e.g. *B.J. Conn 3790*
3. Few have hooked hairs, which are usually retained towards the margins: e.g. *P.I. Forster 33710*, *P.I. Forster 32714*.

Selection of specimens examined (54 seen)

QUEENSLAND. Tozer Gap, 1948, *L.J. Brass 18425* (BRI); Jardine River (R.), 19 May 1948, *L.J. Brass 18847* (BRI); Mt Tozer, 1948, *L.J. Brass 19030* (BRI); 4 km NW of Mt Tozer, 21 Aug. 1983, *B.G. Briggs 7330* (CANB, NSW); 3 km from Chester R. S towards Rocky R., 2 Aug. 1978, *G. Butler 537* (CANB); 10 mls [16 km] from Portland Rd on Iron Ra., 16 June 1970, *C.R. Dunlop 1697* (BRI, CANB); Cooktown, *s.dat.*, *Fitzalan s.n.* (MEL 15779670); 10 mls [16 km] NE of Iron Ra., 14 Apr. 1944, *H. Flecker s.n.* (BRI, NSW, QRS); Cape Weymouth, upstream of Brown Ck, Iron Ra. Rd, 14 Apr. 1988, *P.I. Forster 4157* (BRI); Head of Hann Ck, 46.5 km from Moreton Telegraph Stn, 27 June 1988, *P.I. Forster 4556* (BRI); Kennedy Beach tk, 16 June 2007, *P.I. Forster 32714 & K.R. McDonald* (BRI); Shelbourne Bay, 14 June 2008, *P.I. Forster 33710* (BRI); 13 mls [20.8 km] NNE of Pascoe R. crossing, Aug. 1965, *C.H. Gittins 1021* (BRI, MEL, NSW); 5 mls [8 km] of Rocky R., 13 Sep. 1971, *B. Hyland 5445* (BRI, QRS); Mt Carter, 15 Sep. 1974, *B. Hyland 7557* (BRI, CANB, NSW, QRS); Puff de Looney Ridge, 3 July 1972, *A. Irvine 260* (BRI, QRS); East Adeline Ck, Daintree N.P., 16 Oct. 2003, *R.C. Jago 6550, R. Russell & W. Carrodes* (BRI); Heathlands Stn, E side of hstd, headwaters of Cholmondeley Ck, 16 Jan. 1992, *D.L. Jones 8723 & C.H. Broers* (CANB; BRI, *n.v.*); Cape Sidmouth, *n.dat.*, *C. Moore 83* (MEL 1579681); along rd from Heathlands to Captain Billy Beach, 13 May 1980, *A. Morton 639* (BRI, MEL);

12 mls [19.2 km] S Portland Rd, 29 June 1972, *G.C. Stocker 877* (BRI, QRS); Tozer Gap, 10 Aug. 2006, *B.S. Wannon 4557* (BRI); Tozer Gap, Iron Ra. N.P., 6 Oct. 2000, *B.H. Waterhouse 6058* (CANB); Mt Tozer, 23 Oct. 1968, *L.J. Webb & J.G. Tracey 8619* (BRI); Tozer Gap, 6 Sep. 1976, *J. Wrigley 232* (CANB); Isabella Falls, 18 June 1972, *J. Wrigley & I. Telford NQ1357* (CANB); 10 mls [16 km] Laura, 20 June 1972, *J. Wrigley NQ1479 & I. Telford* (CANB).

Hibbertia banksii subsp. ***sparsidentata*** Toelken, ***subsp. nov.***

A subsp. banksii *laminis foliorum acutis et ubi juvenalis 1–3 dentibus distalibus marginalibus et venis secondaribus divaricatibus differt.*

Holotypus: 53 km from Cooktown on old McIver Rd, 21 May 1970, *S.T. Blake 23454* (BRI AQ180344). **Isotypi:** CANB, MEL, NSW, *n.v.*

Leaf lamina (3–) 8–20 (–33) mm broad, with ± acute apex and teeth (if present), base cuneate; *juvenile leaves* with distal secondary veins on the abaxial surface branching off central vein at acute to obtuse angles and arching out to 1–3 vein-ends on each lateral margin, ranging into *adult leaves* with distal secondary veins on the abaxial surface branching off central vein at obtuse to usually right angles and developing clear intramarginal connections and without obvious marginal vein-ends. *Fertile stamens* 21–48. **Fig. 1R, S**.

Distribution & ecology. Recorded usually from sandy soil from low open forest to heathland from Cooktown to the Cape York Peninsula, Queensland (Co), and Papua New Guinea.

Phenology. Flowering (Feb.) Apr.–Sep. (Oct.).

Conservation status. Widespread on Cape York Peninsula and conserved in several parks and reserves.

Variation. The variation of subsp. *sparsidentata* is more complex than that of subsp. *banksii*, not only because of a more active response of leaves to light reduction in woodland or forests, but also in the more common variations of developmental stages of the heterophyllous leaves. In general, all leaves tend to be longer and broader near Cooktown, and especially near Hope Mission (e.g. *V. Scarth-Johnson 541A*, leaves approach measurements in subsp. *banksii*), while the leaves on another specimen, *L. Pedley 2605*, from nearby, "on sand in heath community", are much smaller and comparable to those commonly found on the northern Cape York Peninsula, e.g. *J. Wrigley 1391 & I. Telford*. Another specimen, *K. Paijmans 1557*, from "tall Acacia/Melaleuca/Tristania savanna" in Papua New Guinea has much larger leaves. All these specimens still show the typical venation on narrow and broader mature leaves. Since the small-leaved form is predominantly recorded from heathland, while plants near the type locality near Cooktown are mainly associated with woodland or forests, it seems that much of the differences within subsp. *sparsidentata* seem to be attributable to environmental conditions. The above specimen (*K. Paijmans 1557*) and a specimen of subsp. *banksii* (*C.H. Gittins 1021*) also show that additional inflorescences on axillary branches frequently occur in both subspecies of *H. banksii* and in the absence of additional characters do not justify a segregation of such forms, as was done in the case of the segregation of *H. candicans* from *H. dealbata* by Bentham (1863).

Adult leaves with secondary veins branching at about right angles to the central vein and forming obvious intramarginal connections, though the latter might at times be obscured by strongly revolute margins, are the more common feature in this subspecies. This venation and the acute apex of the leaf lamina are the distinctive feature of many specimens. Furthermore the 1–3 pointed marginal teeth each with a vein-end are characteristic to this subspecies, in contrast to 3–6 (–8) usually blunt teeth, except for vein-end in subsp. *banksii*. However, the leaf lamina at this juvenile stage in the heterophylly has a similar venation with ± acute branching secondary veins and no or usually scarcely developed intramarginal connections in both subspecies. Intermediate stages in the heterophylly observed in protected habits enforce this dual system of identification of the two subspecies.

It is also interesting to notice that although the two subspecies both commonly occur on sandy soils they have only once been recorded sympatrically (*P.I.Forster 32714 & 32715*).

Etymology. The subspecific epithet *sparsi-dentata*, Latin, "sparsely dentate" refers to the very much fewer teeth along juvenile leaves.

Selection of specimens examined (88 seen)

PAPUA NEW GUINEA. Tumbuke, Kussa R., Dec. 1936, *L.J. Brass 8431* (BRI); 60 km W of Daru, Balimo Subdistrict, 4 June 1972, *K. Paijmans 1557* (CANB).

AUSTRALIA. QUEENSLAND. Lake Wicheura, 30 June 1985, *B.A. Barlow & K.R. Thiele 3881* (BRI, CANB); mouth of Endeavour R., 16 May 1970, *S.T. Blake 23312* (BRI, CANB, NSW); Daintree R., 13 Feb. 1932, *L.J. Brass 2324* (BRI, MEL); Newcastle Bay, 11 May 1948, *L.J. Brass 18768* (BRI, CANB); Jardine R., 20 May 1948, *L.J. Brass 18878* (BRI, CANB); 12.6 km SW of beach on tk from Starke Stn to McIvor R. mouth, 1 Feb. 1984, *J.R. Clarkson 5140* (BRI, MEL, NSW, QRS); Cape Sidmouth, *s.dat.*, *A. Cunningham 83* (MEL1579681); Scrubby Ck, 8 Sep. 1973, *A.W. Dockerill 717* (BRI, QRS); 32 km NE of Bamaga, N of Jardine R., Oct. 1971, *J. Dodson s.n.* (BRI); Hutchinson Ck mouth, Alexandra, 14 Nov. 1995, *P.I. Forster 18064* (QRS); Bolt Head, Temple Bay, 28 June 1996, *P.I. Forster 19431* (AD; BRI, MEL, *n.v.*); Kennedy Beach tk, 16 June 2007, *P.I. Forster 32715* (BRI); 4 km S of Shelbourne Bay, 17 June 2008, *P.I. Forster 33785* (BRI); Archer Point, 2 Apr. 1996, *B. Gray 6696* (QRS); Lake Wicheura, near Lockerbie, 28 Nov. 1962, *B. Hyland 2491* (BRI); between Massy Ck and Rocky R., 15 Sep. 1971, *B. Hyland 5503* (BRI, QRS); Altanmoui, 28 July 1972, *B. Hyland 6321* (BRI, QRS); Olive R., 13 Sep. 1974, *B. Hyland 7463* (BRI, CANB, QRS); 35 mls

[56 km] N of Cooktown, 28 June 1976, *B. Jackes s.n.* (JCT); N of Massy Ck, c. 13 km NW of "Silver Plains", 18 Aug. 1978, *A. Kanis 2018* (CANB; BRI, *n.v.*); E of Escape R., old Camalco campsite near lake, W of Sadd Point, 27 Aug. 1978, *A. Kanis 2074* (BRI, CANB); Battle camp Rd, NW of Cooktown, 21 Feb. 2004, *K.R. McDonald 1797* (AD; BRI, *n.v.*); Shelbourne Bay, 13 Sep. 2007, *K.R. McDonald 6912* (BRI); 5 km SE of Starke Hstd., 5 Aug. 1978, *K. Paijmans 2777* (BRI); Hopevale Mission, 14 June 1968, *L. Pedley 2695* (BRI); Endeavour R., 1881, *W. Persieh 29* (MEL); Endeavour R., 1883, *W. Persieh 1026* (MEL); c. 8 km from Cooktown road to Archer Point, 11 Sep. 1977, *J.M. Powell 749 & J. Armstrong* (CANB, QRS, NSW); Cooktown, North Shore, 20 Aug. 1977, *V. Scarth-Johnson 570A* (BRI); S of McIvor R. crossing on Cooktown–Starke Rd, 4 Feb. 1977, *L.J. Webb & J.G. Tracey 6203* (BRI); between Starke and Cape Flattery, 13 July 1976, *L.J. Webb & J.G. Tracey 13486* (BRI); Gunshot Ck, 90 km N of Moreton Telegraph Stn, 26 Aug. 1985, *K.A. Williams 85155* (BRI); 27 mls [43.2 km] N of Cooktown, 18 June 1972, *J. Wrigley NQ1391 & I. Telford* (CANB).

CULTIVATED. ex Cape Flattery, cultivated at Tolga, *G. Sankowsky 01506* (QRS); flowering specimen showing extreme lobes of large leaves under favourable, presumably sheltered conditions.

Hibbertia brownii Benth.

Fl. Austral. 1: 21 (1863), "*brownei*"; F.Muell., *Sec. Syst. Census Austral. Pl.* 1: 1 (1889), "*brownei*"; Ewart & Davies, *Fl. N. Territory* 193 (1917), "*brownei*"; Domin, *Biblioth. Bot.* 89: 421 [975] (1928); Specht in Specht & Mountf., *Rec. Amer.-Austral. Sci. Exped. Arnhem Land* 3: 464 (1958); Harmer, *N. Austral. Pl.* 1: 46 (1976); Chippend., *Proc. Linn. Soc. New South Wales* 96: 249 (1972). — **Type citation:** "N. Australia? *R. Brown. (Hb. R. Br.)*". **Holotype:** Northern Territory, Arnhem Land, Melville Bay, *R. Brown s.n.* [J.J. Bennett 4914] (BM).

Shrubs, usually 0.6–1.5 m, or rarely up to 3.5 m tall, spreading, often suckering; branches ± terete, with ± visible decurrent leaf bases, rusty-tomentose (rarely white) with short erect to porrect simple hairs, though becoming paler with age, sometimes overtopped by few longer hairs when young. *Vestiture* persistent, with an undercover of short erect pale brown simple hairs overtopped by scarcely longer pale hairs on branches, upper surface of petiole and inflorescences where they often becoming antrorse-appressed, while the sparse hairs on the adaxial leaf surfaces ± wear off, those of undersurfaces, including the lower surface of the petiole, are long white silky hairs that become felt-like. *Leaves* entire, discolorous; *petiole* (0–) 0.2–3 mm long, rarely absent, discolorous, rusty-tomentose adaxially, white-tomentose abaxially; *lamina* lanceolate to lanceolate-elliptic, rarely elliptic or linear, (16–) 35–80 (–123) × (2–) 10–25 (–32) mm, ± abruptly constricted into petiole or rarely with cordate base, apex obtuse to rounded or acute to often shortly pointed when young, adaxial surface ± flat except for a slightly grooved central vein and/or raised reticulated veins densely covered with fine rusty-tomentum, becoming ultimately glabrescent similar to areas between veins, secondary veins branch at about right angles to central vein (except the basal veins), margins ± revolute, dull-glabrescent with silky hairs rarely coiled, to glossy, abaxial surface with slender central vein and slightly revolute margins raised and densely covered with white fine appressed simple hairs similar to those on the rest of the undersurface but not felt-like, lateral veins and network usually not or very incompletely visible. *Inflorescences* are monochasia (cincinni) with (4–) 8–12 (–18) sessile flowers, subtended by (2) 3 subequal leaf-like additional bracts, terminal on main branches and/or often with few smaller lateral inflorescences on axillary branches of distal leaves with their own 1–3 often increasingly reduced additional bracts; in addition, the terminal inflorescence is often subtended by few additional inflorescences branching from the axils of few or all of the additional bracts of the terminal inflorescence; *peduncle* 10–50 mm long, ± terete, commonly rusty-tomentose, rarely becoming paler; *bracts* subequal in shape but gradually decreasing in size upwards, lanceolate, to obliquely linear-lanceolate, 6–18 × 3–8 mm, usually with central ridge, discolorous- to rusty-tomentose distally, ± sessile, often not directly subtending flowers or sometimes lower bracts without flowers. *Calyx lobes* unequal; *outer calyx lobes* lanceolate to lanceolate-elliptic, 6.6–7.5 (–8.3) × 3.5–3.8 mm, usually longer than inner calyx lobes, pointed, with central ridge only distally visible due to the rusty-appressed pubescence similar to the margins, outer surface with mainly dense felt-like, ± crisped brown rarely white appressed simple hairs, except for rusty antrorse-appressed simple hairs along at least the upper half of the central vein and the margins, inner surface grooved along the central vein, glabrous or rarely with few distal hairs; *inner calyx lobes* broadly oblong to oblong-obovate, 6.5–7.3 × 4.2–4.4 mm, obtuse to rounded or cuspidate, with central ridge distally visible only due to rusty appressed or spreading scattered hairs similar to the broad margins, but past flowering a distinctive ridge of the basal central vein develops, on the outside surface with mainly dense felt-like, ± crisped appressed, usually rusty simple hairs except for usually few rusty largely antrorse-appressed simple hairs along at least the upper half of the central vein and the broad margins. *Petals* broadly obovate-cuneate, 10–14 × 9–11 mm, distinctly emarginate or lobed. *Stamens*: in a cluster on one side of the ovary; *fertile stamens* 16–25, equally long to slightly longer than the 6–12 eccentric *staminodes*; fertile stamens with *filaments* 1–1.4 mm long, scarcely connate basally; *anthers* slender-oblong, 2.1–2.3 mm long, abruptly constricted above and below, introrsely dehiscing. *Pistils* 2; *ovaries* broadly obovoid, each with 1 ovule, hirsute; *styles* ± horizontally attached to eccentric apex of ovaries then shortly curved out and straightened erect in front of stamens and curved to hooked centropedally to position the stigmas in front of the apex of the anthers. *Fruits* scarcely dehiscing. *Seeds* broadly obovate, 3.6–4 × 3.2–3.6 mm, mid-brown; *aril* with short attachment surmounted by a scarcely lobed membranous cup covering about half of the seed.

Diagnostic features. The leaves of *H. brownii* vary from slender linear to linear-lanceolate with a pointed apex to elliptic with a blunt to rounded apex and thus closely resemble *H. candicans* or *H. dealbata*, in particular as inflorescences are either terminal on main branches and/or on short lateral branches. *Hibbertia brownii* is, however, distinguished by the short, ± erect hairs on the branches and silky hairs, which are white or rarely rusty, and the revolute margins and central vein on the abaxial leaf surfaces (coarse and appressed in *H. brownii* and *H. dealbata*). The petiole exhibits usually a strip of white hairs, which are similar to hairs on the undersurface of the leaf on either side of the often brown central vein. The discolorous petiole distinguishes this species from *H. candicans* and *H. dealbata*, as well as from *H. banksii*. The discolorous leaves without lobes and/or vein-ends along the margins mainly distinguish *H. brownii* from *H. banksii*, a Queensland species also with rusty abaxial leaf surfaces. The records of *H. brownii* for Queensland by Bailey (1883, 1899, 1913) must be attributed to misidentifications.

Three separate subspecies are recognised and described with their diagnostic features and variation discussed below.

Typification. The holotype specimen inscribed "*R. Brown s.n.* [J.J. Bennett 4914]" was examined in the Natural History Museum several years ago, but it did not have a barcode or accession number at the time.

Key to subspecies

1. Leaves lanceolate to ovate-oblong or elliptical, if narrower than 5 mm then shorter than 25 mm
  2. Leaf lamina ± abruptly constricted into short petiole without auricles; hairs on branches and calyx rusty, rarely completely fading to white . . . . . *H. brownii* subsp. *brownii*
  2: Leaf lamina sessile and with auricles up to 12 mm long on either side of the branch; hairs on branches and calyx silvery white . . . . . *H. brownii* subsp. *cordata*
1: Leaves very narrowly linear up to 6.5 mm broad and usually longer than 45 mm . . . . . *H. brownii* subsp. *angustissima*

Hibbertia brownii subsp. ***brownii***

Multi-stemmed shrublets rarely taller than 1.5 m; branches rusty-tomentose with short erect hairs sometimes fading to pale-brown. *Leaves* with petiole 0.2–3 mm long; lamina lanceolate to elliptic and ± abruptly constricted into petiole, adaxial surface with ± detailed reticulate veins. *Calyx* with appressed fine rusty hairs, sometimes bleaching except along central ridge and margins. **Fig. 1D, E, T**.

Distribution & ecology. Commonly recorded from sandy soils or lateritic gravel, but also in crevices of the sandstone plateau, usually in open *Eucalyptus* forests, including *Eucalyptus tetradonta* and/or *E. miniata*, of the northern Northern Territory .

Phenology. Flowering mainly June to Sep., but some flowers have been recorded throughout the year.

Conservation status. Widespread and conserved in Kakadu N.P.

Variation. The lowest leaves of *H. brownii* tend to be short and broad, with a rounded to cuspidate apex, and although they may resemble leaves of *H. dealbata*, they are distinguished by short discolorous petioles with ± erect and not appressed hairs. The leaves of *H. brownii* soon become more acute or at times mucronate and their bases abruptly constrict into a short petiole, particularly on the main branches. However, distal branches have narrower and acute to pointed leaves (see the sequence of leaves on 2 sheets of *R. Pullen 9506*), such that specimens may resemble those of *H. candicans*, especially as some of these can produce additional inflorescences on axillary branches in addition to the usual terminal inflorescences (e.g. *S.T. Blake 17136*). The distinctive hairs of *H. brownii* and *H. candicans* (see diagnostic features) clearly differentiate the two species.

It must be stressed that in the case of plants of *H. brownii* with additional lateral inflorescences, no supporting character/s could be found that would suggest segregating them from those with only terminal inflorescences, as was accepted as a character separating *H. candicans* from *H. dealbata*. There are, however, specimens of a little-known local form from Frances Creek Mine area (*D. van den Hoek 10, 11 & T. Orr*) with single terminal inflorescences and ± rusty-tinged hairs on the central vein and revolute margins on the abaxial leaf surfaces. It is also noteworthy that lower lateral inflorescences of *H. brownii* have ± reduced leaves and/or additional bracts, but some of them are reduced to scale-like or with caducous scales (*M. Lazarides 7866*).

Terminal inflorescences have sometimes additional inflorescences and/or part-inflorescences branching from the axils of the additional bracts. In the case of *M. Lazarides 7970* there are four of these, one from each of the additional bracts, but they have apparently no scars of their own additional bracts. Furthermore, the main inflorescence has often a few bracts on its peduncle, but in the case of *G. Wightman 1716 & C. Dunlop* there are 15 and more bracts, which demonstrate long periods of flowering and that the lower fruits have already been shed.

Selection of specimens examined (102 seen)

NORTHERN TERRITORY. 17 mls [27.2 km] NNW of Oenpelli, 4 July 1972, *L.G. Adams 2733* (CANB); 5 km NE

of Mt Cahill, 17 May 1988, *W. Bishop 807* (DNA, NSW); East Alligator R., 2 Oct. 1942, *S.T. Blake 17136* (BRI, CANB, QRS); 3.5 mls [56 km] SE of Raffles Bay, 18 July 1961, *G. Chippendale 8199* (AD, CANB, MEL, NSW); Nourlangie , SW edge of airstrip, 11 Dec. 1986, *M.J. Clark 726* (CANB, DNA); Douglas Springs area, Nitmiluk N.P., 25 May 2001, *I. Cowie 9324* (AD, BRI, CANB, MEL; MO, NSW, *n.v.*); N of Oenpelli, 23 June 1992, *I. Cowie 3023 & R.Booth* (AD; DNA, *n.v.*); 16 km SE of Koongarra, 2 June 1980, *L.A. Craven 6248* (AD, CANB); above UDP Falls, 21 May 1983, *P.A. Fryxell & L.A. Craven 4230* (AD, CANB, MEL); Mt Gilruth area, 2 June 1978, *C.R. Dunlop 4875* (CANB); Nabarlek, 5 May 1990, *R. Hinz 634* (AD, BRI, DNA); Port Essington, 1885, *M. Holtze 457* (MEL); Port Darwin, 1886, *M. Holtze s.n.* (MEL 685389); Port Darwin, Mar. 1911, *M. Holtze s.n.* (NSW242759, NSW242760); Lightning Dreaming, 24 Feb. 1984, *D.L. Jones 1488* (CANB, DNA); East Alligator R., 18 July 1972, *M. Lazarides 7646* (BRI, CANB, NSW; DNA, K, *n.v.*); 7 mls [11.2 km] NE of El Sharana Mine, 26 Feb. 1973, *M. Lazarides 7866* (CANB, DNA, PERTH); near Coronation Ck, c. 13 mls [20.8 km] WSW of Mt Evelyn, 2 Mar. 1973, *M. Lazarides 7970* (BRI, CANB, DNA, NSW, PERTH); gorge near Plum Tree Ck, c. 47 mls [75.2 km] ENE of Pine Creek, 11 Mar. 1965, *M. Lazarides & L.G. Adams 177* (CANB, DNA, NSW); near Nourlangie Safari Camp, 22 Mar. 1965, *M. Lazarides & L.G. Adams 289* (CANB; DNA, L, K, *n.v.*); Cannon Hill Airstrip, 30 Jan. 1973, *P. Martensz AE 613* (BRI, CANB, NSW); along coast c. 20 km NE of Murgenella, 2 June 1988, *A.A. Munir 6065* (AD; DNA, *n.v.*); summit of Mt Gilruth, 6 June 1976, *I. Olsen 2709* (NSW); East Alligator R. near Cahills Crossing, 2 June 1974, *R. Pullen 9444* (BRI, CANB; DNA, *n.v.*); Nimburwah Rock, 6 June 1974, *R. Pullen 9506* (CANB; DNA, *n.v.*); Obiri Rocks, 11 Apr. 1987, *R.W. Purdie 3174* (CANB); Oenpelli, 24 Sep. 1948, *R.L. Specht 1051* (AD, BRI, CANB, MEL, NSW); Obiri Rock tk near junction with Oenpelli Road, 15 Aug. 1980, *I.R. Telford 8356 & J.W. Wrigley* (CANB, NSW, DNA, *n.v.*); Frances Ck Mine lease, near Ochre Hill Pit, 13 June 2017, *D. van den Hoek 10 & T. Orr* (DNA); Frances Ck Mine lease, near Ochre Hill Pit, 13 June 2017, *D. van den Hoek 11 & T. Orr* (DNA); 2 km E of Jabiru, 16 May 1991, *J.Z. Weber 9726* (AD); Bradys Rd, Murgenella, 9 July 1985, *G. Wightman 1933* (CANB; DNA, *n.v.*); headwaters of East Alligator R., 31 Mar. 1984, *G. Wightman 1381 & C. Dunlop* (CANB; DNA, *n.v.*); Magela Ck headwater, W branch, 12 Sep. 1984, *G. Wightman 1716 & C. Dunlop* (CANB, DNA, MEL, NSW; K, *n.v.*).

Hibbertia brownii subsp. ***cordata*** Toelken, ***subsp. nov.***

A subspecie typica fruticibus ad 3.5 m altis, laminis foliorum sessilibus et cordatis, tomentisque albis in ramis et calycibus differt.

Holotypus: Northern Territory, Gardjendjarrbdi on upper Liverpool River, 9 Aug. 2004, *J. Russell-Smith 10682* (DNA D0168712). **Isotypi:** AD289870; CANB, *n.v.*

Multi-stemmed shrubs up to 3.5 m tall; branches white-tomentose with short erect and crisped hairs. *Leaves* sessile, oblong-lanceolate with both lobes of ± clasping cordate base up to 12 mm long, adaxial surface detailed reticulate veins ± raised. *Calyx* with appressed fine white hairs.

Distribution & ecology. Usually recorded from sandstone in open woodland in Arnhem Land.

Phenology. Flowering Aug., Sep.

Conservation status. Known only from a few collections.

Variation. The petiole, although obviously flattened and somewhat leaf-like, is a distinct feature of both, subsp. *brownii* and subsp. *angustissima*. The abaxial surface of the petiole of the two taxa is covered with a white tomentum similar to the undersurface of leaves, usually visibly continued to the base on both sides of the central vein. The absence of a petiole in subsp. *cordata* is striking, because the lamina with its eared cordate base is attached directly to the branch, while the lamina on plants of the other two subspecies is ± tapering or even sometimes abruptly constricted into the short petiole that separates it from the branch. Furthermore, subsp. *cordata* is also densely covered with silvery straight and crisped hairs particularly on the inflorescence. In contrast, the other subspecies have brown hairs, although these may often be partly bleached to off-white in the field or on older herbarium specimens.

While leaf laminas of subsp. *cordata* resemble more closely those of the typical subspecies with acute apices and up to 80 mm long, those of *J. Schatz 7* are obtuse to rounded at the apex, some of them up to 113 × 34 mm, and those of *C. Brock 303* cover the range between these two extremes.

Etymology. The epithet *cordata*, Latin, refers to the cordate base of the leaf lamina.

Specimens examined

NORTHERN TERRITORY. Upper Goomadeer Catchment, 4 July 2001, *J. Brock 303* (DNA); Upper East Alligator R., 20. Feb. 1991, *J. Brock 766 & J. Russell-Smith* (BRI, DNA); Arnhem Plateau, 16 Sep. 2002, *J. Schatz 7* (DNA).

Hibbertia brownii subsp. ***angustissima*** Toelken, ***subsp. nov.***

A subspecie typica foliis angustissimis, (45–) 60–90 (–108) × (2–) 3–5 (–6.5) mm, tomentis brevioribus in bractiis et calycibus differt.

Holoypus: Northern Territory, E of Havelock Falls, c. 79 km SSW Maningrida, 19 Mar. 2000, *I.D. Cowie 8664* (DNA D144915). **Isotypus:** MEL, *n.v.*

Slender shrub to 1.5 m tall; branches rufous-tomentose with short ± crisped erect hairs. *Leaves* subsessile, linear, (45–) 60–90 (–108) × (2–) 3–5 (–6.5) mm, scarcely constricted into very short petiole; adaxial surface with lateral veins obscure. *Calyx* with short antrorse rufous hairs.

Distribution & ecology. Grows on coarse laterite gravel on a plateau remnant in open forest with *Eucalyptus tetradonta*, *E. miniata* and *Corymbia bleeseri* in western Arnhem Land.

Phenology. Flowering Mar.

Conservation status. Known only from type collection.

Variation. Although some leaves of the typical subspecies may be as narrow as 5 mm, they are then less than 25 mm long, often occurring on depauperate material, whereas all mature leaves on the type specimen of subsp. *angustissima* are longer than that and usually narrower. No intermediates, comparable to the wide range in the width of leaves of *H. candicans*, are known in *H. brownii*. The absence of a visible lateral vein on the adaxial surface of the leaves is common in narrow-leaved forms and species of *Hibbertia*.

Etymology. The very narrow slender leaves is referred to in the epithet *angustissima*, Latin, "very narrow".

Hibbertia candicans (Hook.f.) Benth.

Fl. Austral. 1: 21 (1863); F.M.Bailey, *Syn. Queensland Fl.* 1: 1 (1883); F.Muell., *Sec. Syst. Census Austral. Pl.* 1: 1 (1889); F.M.Bailey, *Queensl. Fl.* 1: 12 (1899); F.M.Bailey, *Compr. Cat. Queensland Pl.* 18 (1913); Domin, *Biblioth. Bot.* 89: 421 [975] (1928); Ewart & Davies, *Fl. N. Territory* 193 (1917). — *Hemistemma candicans* Hook.f., *Hooker's J. Bot. Kew Gard. Misc.* 9: 48, fig. 2 (1857). — **Type citation:** "In Australia orientali tropica ad Cap. York. (J. MacGillivray legit, itinere navarchi Stanley, October, 1848)". — **Holotype:** Cape York, Oct. 1848, *J. MacGillivray* [Voyage of Rattlesnake Bot. 427] (K000687500).

Hibbertia millari F.M.Bailey, *Syn. Queensl. Fl.*, 2nd Suppl.: 1 (1888); F.M.Bailey, *Queensland Fl.* 1: 13 (1899); F.M.Bailey, *Compr. Cat. Queensland Pl.* 18 (1913); Domin, *Biblioth. Bot.* 89: 421 [975] (1928) — **Type citation:** "Musgrave Electric Telegraph Station, North Queensland. – T. Barclay-Millar." **Lectotype (here designated):** Musgrave, *T. Barclay Millar s.n.* (BRI AQ0341719). **Isolectotype:** K000700368.

Hibbertia dealbata auct. non (R.Br. ex DC.) Benth.: J.Brock, *Top End Native Pl.* 219, fig. (1988).

Shrubs up to 1.5 m tall, few-stemmed, spreading to decumbent, much-branched; branches angular or ridged when young with prominent decurrent leaf bases becoming terete, usually densely rusty-pubescent with antrorse appressed hairs. *Vestiture* ± persistent, with short dense simple hairs occurring in coarser, ± appressed rusty form on branches, petioles, outer surface of the calyx and mainly on the veins and margins of the adaxial and abaxial leaf surfaces, while the finer, felt-like, but also appressed white hairs are restricted to the undersurfaces of leaves excluding major veins. *Leaves* entire, discolorous; *petiole* 0.6–3 (–5.3) mm long, appressed rusty-pubescent above and below; *lamina* linear-elliptic, rarely lanceolate-elliptic, (14–) 40–85 (–122) × (2.5–) 4–12 (–31) mm, (length : width ratio 6–10 (–14) : 1), tapering into petiole, apex acute to pointed, adaxial surface ± flat with slightly grooved central vein, bases of lateral veins visible and rusty-pubescent, while surface in between puberulous particularly towards the margins, glabrescent, abaxial surface with raised revolute margins and central vein as well as bases of lateral veins rusty-pubescent with appressed simple hairs dissimilar in shape to most of the undersurface with finer white felt-like denser pubescence with appressed, often crisped simple hairs. *Inflorescences* are monochasia (cincinni) with (1–) 3–5 (6) flowers, subtended by (2) 3 (4) often unequal additional bracts, terminal on main branches and/or often with few to many lateral inflorescences from distal axillary branches with own basal scale-like 2 or 3 additional bracts progressively being reduced to one very small bract, from where an additional lateral inflorescence is rarely developed; with terminal inflorescence sometimes supported by rarely more than one smaller additional inflorescence branching from the axil of the parent additional bracts; *peduncle* 8–35 (–41) mm long, angular to ridged, densely rusty-pubescent with appressed simple hairs; *bracts* gradually decreasing upwards and dissimilar bracts alternating, broader ones linear-lanceolate, 3–6 (–8) × 1–4 (–5) mm often not directly subtending flowers, ± acuminate, usually with scarcely visible central vein, ± rusty-pubescent; narrower bracts linear rarely linear-lanceolate, 2.1–3.7 × 0.3–0.5 mm, pointed, without central vein visible, rusty-pubescent. *Calyx lobes* unequal; *outer calyx lobes* ovate to ovate-oblong, rarely lanceolate, (7.3–) 7.5–8.5 (–9.8) × (3.2–) 3.5–4.2 mm, acute to pointed or cuspidate and with an apical tuft of rusty hairs, often without obvious central vein, outer surface appressed rusty-pubescent with short straight simple hairs ± spreading on the margins, inner surface glabrous except for few hairs at the apex; *inner calyx lobes* broadly ovate to ovate-elliptic, (7.4–) 7.8–9 (–10.3) × 3.6–4.5 mm, obtuse, cuspidate to rounded, lacking obvious central ridge, outer surface appressed rusty-pubescent with short straight simple hairs ± spreading on the margins, inner surface glabrous, rarely few hairs at the apex. *Petals* broadly obovate, 12–17 × 11–18 mm long, distinctly emarginate. *Stamens*: *fertile stamens* 20–26, larger than 9–11 eccentric *staminodes*, all in a cluster on one side of the ovaries; fertile stamens with *filaments* 1.6–1.8 mm long, scarcely connate basally; *anthers* slender-oblong, 2.7–3 mm long, abruptly constricted above and below, introrsely dehiscing. *Pistils* 2; *ovaries* broadly obovoid, each with 1 basal ovule, densely hirsute; *styles* horizontally attached to the eccentric apex of the ovaries, then shortly curved outwards and again straightened up in front of the stamens, but distally curved away from them to position the stigmas not directly in front of the apex of the anthers. *Fruits* indehiscent. *Seeds* obovoid to obpyriform, 5.3–6.1 × 3.8–4.2 mm, mid-brown; *aril* with scarcely fleshy attachment surmounted by a scarcely lobed membranous cup tightly covering most of the seed except for a slightly lobed apex. **Fig. 1U, V**.

Distribution & ecology. Growing usually in sandy soils often associated with laterite or sandstone in open *Eucalyptus* or *Allosyncarpia* woodland or forest in tropical Northern Territory and northern Queensland.

Phenology. Flowering Feb.–June.

Conservation status. Widespread in Northern Territory and conserved in, for instance, Kakadu N.P. It is not as common in Queensland, where it occurs in Iron Range N.P.

Diagnostic features. Traditionally, the narrow leaves of *H. candicans* are used to distinguish the species from *H. dealbata*. However, leaves have been observed to be as wide as 25 mm, particularly those lower on the plant; it must be acknowledged that these leaves are also longer than typical, and the length : width ratio of 6–10 (–14) : 1 is maintained (in *H. dealbata* this ratio is 2–5 (–6) : 1). These larger leaves of *H. candicans* also do not display a complete reticulum of the veins on the adaxial surface, unlike observed in *H. dealbata*. Bentham (1863) also referred to the many axillary inflorescences found in *H. candicans*, in contrast to the mainly terminal inflorescences in *H. dealbata*, but single terminal inflorescences are occasionally observed in very narrow-leaved (possibly depauperate) specimens of *H. candicans*. The inflorescences, particularly axillary ones of *H. candicans*, bear usually 3–5 flowers, while the only terminal inflorescences found in *H. dealbata* usually produce 6–12 flowers per inflorescence. Both these species are distinguished from other broad-leaved species in this group of hibbertias by the short rusty appressed hairs on the stems.

Variation. *Hibbertia candicans* is known for its narrow leaves with a length : width ratio 6–10 (–14) : 1, but in extreme cases, e.g. *L.A. Craven 6249*, some of the lower leaves can be as much as 205 : 1 (or 82 × 4 mm). The combination of slender leaves, gradually tapering to the base and apex, will always distinguish the occasional specimens with only single terminal few-flowered inflorescences on a few main branches from *H. dealbata*. Often the internodes between small cauline leaves are very short, so that it is possible to assume these are depauperate plants, as the ratio is still high, allowing the specimen to be indentified as *H. candicans* (e.g. *P.I. Forster 8932*, a plant growing in a windswept environment).

The lateral inflorescences of *H. candicans* usually display a whorl of additional bracts, subtending the peduncle, and develop more cauline leaves downwards on axillary branches. The more distal lateral inflorescences, however, display usually three additional bracts in the axil of the subtending leaf, but two of these are reduced and finally on the uppermost inflorescences only one reduced leaf is observed to the side of the base of the peduncle (*C. Dunlop 6756 & G.M. Wightman*; *N. Byrnes 2471*). Between this leaflet and the base of the peduncle, usually a bud can be seen, which sometimes develops into an additional inflorescence from this single additional bract (*M. Lazarides 7879*); this state has also been observed in *H. brownii*. While this feature was observed in the Northern Territory only localised and often not to its full extreme, Queensland plants frequently display these lateral inflorescences with reduced additional bracts.

The basal bract is generally lanceolate, but there are also specimens with inflorescences where the basal flower is subtended by a linear bract, which then alternates with a second broader one to the apex of the inflorescence. Other cases were observed with a basal flower subtended by a linear and a lanceolate bract, presumably due to the abortion of the first flower.

Typification. Since only one type specimen of *H. candicans* (K000687500) could be located, which is annotated in red "Hibb. candicans Bth." by George Bentham, it is accepted as the holotype.

Both type specimens of *H. millari* just bear the locality "Musgrave", in spite of the more detailed type citation in the protologue, which must have been added by Bailey at Brisbane, one of these specimens (BRI AQ0341719) is here selected as the lectotype.

Selection of specimens examined (c. 120 seen)

NORTHERN TERRITORY. 37 mls [59.2 km] S of Oenpelli, 10 July 1972, *L.G. Adams 2790* (CANB); 48 mls [76.8 km] NE of Pine Creek, 24 Jan. 1972, *N. Byrnes 2471* (CANB; DNA, K, *n.v.*); 25 mls [40 km] N of Oenpelli, 15 July 1961, *G. Chippendale NT8088* (AD; DNA, PERTH, *n.v.*); 7 km WSW of Twin Falls, 25 May 1980, *L.A. Craven 5927* (AD, CANB); 16 km SE of Koongarra, 2 June 1980, *L.A. Craven 6249* (CANB, DNA, MEL); head of gorge between Twin Falls and Jim Jim Falls, 23 Mar. 1984, *L.A. Craven & G.M. Wightman 8246* (AD; CANB, DNA, *n.v.*); El Sharana Road, c. 70 km NE of Pine Creek, 5 Mar. 1985, *C.R. Dunlop 6756 & G.M. Wightman* (AD, CANB, DNA, NSW); Donydji, 20 June 1989, *C.R. Dunlop 8507 & G.J. Leach* (AD; BRI, DNA, MEL, *n.v.*); 41 mls [65.6 km] from Pine Creek to UDP Falls, 30 Apr. 1975, *C.H. Gittins 2838* (DNA, NSW); Mt Basedow Ra., 1 June 1973, *T.G. Hartley 13905* (CANB; DNA, *n.v.*); Narbalek, off Tin Camp Rd, 3 Apr. 1988, *R. Hinz 1* (MEL; BRI, DNA, *n.v.*); Northcoast of Arnhem Land, *s.dat.*, *J. McKinley s.n.* (MEL1009747); near Mt Basedow, c. 16.5 mls [26.4 km] SSE of Nourlangie Safari Camp, 27 Feb. 1973, *M. Lazarides 7879* (CANB, DNA, PERTH); 12 km SW of Twin Falls, 25 May 1980, *M. Lazarides 8980* (CANB; DNA, *n.v.*); Eva Valley Stn turn-off, 17 mls [27.2 km] N of Maranboy Police Stn, 3 Mar. 1965, *M. Lazarides & L.G. Adams 6* (CANB, NSW; DNA, K, L, *n.v.*); c. 73 mls [116.8 km] NE of Maranboy Police Stn, 6 Mar. 1965, *M. Lazarides & L.G. Adams 91* (CANB, NSW; B, BRI, K, L, *n.v.*); Kakadu N.P., Fisher Ck, 19 Apr. 1990, *G.J. Leach 2783 & I.D. Cowie* (AD; BRI, DNA, MEL, *n.v.*); Near Kurundie Ck, Kakadu N.P., 20 Apr. 1990, *G.J. Leach 2840 & I.D. Cowie* (AD; DNA, *n.v.*); Ngkurr, Numbulwar Rd, 9 Sep. 1993, *G.J. Leach 3884 & J. Egan* (AD; BRI, DNA, *n.v.*); Head of Koolpin Ck, 20 Apr. 1995, *G.J. Leach 4380 & L. Greshke* (AD; DNA, *n.v.*); Kuburra, NE of Nourlangie Rock, 17 May 1988, *A.A. Munir 5718* (AD; DNA, *n.v.*); 15 mls [24 km] NE of Goyder R. crossing, 17 June 1972, *J.*

Must 1020 (CANB, NSW; BRI, K, L, *n.v.*); below waterfall, Nitmiluk N.P., 17 Apr. 2002, *G.J. Leach & M. Pritchard 4706* (CANB; BRI, DNA, *n.v.*); Nitmiluk Gorge N.P., 3.5 km from Visitor Centre on walking trail, 26 Apr. 1987, *R.W. Purdie 3383* (CANB; DNA, *n.v.*); Kakadu N.P., upper Birdie Ck area, 18 Apr. 1990, *A.V. Slee & L.A. Craven 2511* (AD, CANB; DNA, *n.v.*); 6 km SW of Mt Brockman, 23 Apr. 1980, *I.R. Telford 8061 & J.W. Wrigley* (CANB).

QUEENSLAND. 4 km SSW of Bamaga, 4 Feb. 2008, *S. Baira 2* (BRI); Newcastle Bay, 2.5 mls [4 km] S of Somerset, 8 May 1948, *L.J. Brass 18692* (CANB; BRI, *n.v.*); Jardine R., 19 May 1948, *L.J. Brass 18838* (CANB; BRI, *n.v.*); Browns Ck, Pascoe R., 17 July 1948, *L.J. Brass 19634* (BRI, CANB; BRI, *n.v.*); Sharp Point, mouth of Escape R., 4 June 1978, *J.R. Clarkson 2119* (CANB; MBA; BRI, *n.v.*); 46.1 km SE of Heathlands, 29 Feb. 1992, *J.R. Clarkson 9247* (BRI, MBA; DNA, *n.v.*); Skull Ck, Bamaga, 10 May 1975, *S.J. Dansie 20121* (QRS); Upper Archer R., on Kennedy Rd, 6 July 1972, *A.R. Dockrill 475* (QRS); Steve Irwin Wildlife Res., 17 Dec. 2008, *D.G. Fell 9879* (BRI); Newcastle Bay, between Narau and Nanthau, 27 Feb. 1990, *P.I. Forster 6360* (AD, BRI; DNA, *n.v.*); Bolt Head, Temple Bay, 11 June 1991, *P.I. Forster 8932* (AD, BRI); Olive R. Environmental Res., 15 June 2007, *P.I. Forster 32674* (BRI); Tozer Pass, Aug. 1965, *C.H. Gittins 1083* (MEL; BRI, NSW, *n.v.*); Cowal Ck crossing, 20 June 1981, *B. Gray 2034* (QRS; BRI, CANB, *n.v.*); 15 km SW of "Heathland", 17 Aug. 1974, *L.A.S. Johnson 7777* (NSW); W of Cockatoo Ck, 26 Jan. 1992, *D.L. Jones 8973* (CANB); Bamaga, 26 Oct. 1965, *W.T. Jones 38321* (CANB); Bromley Stn., 6.9 km along tk from Bromley Hstd towards Wattle Hill, 24 May 2004, *R.A. Kerrigan & R.K. Harwood 835* (AD; DNA, *n.v.*); Albany Isl., Aug. 1855, *F. Mueller s.n.* (MEL119776); c. 2.7 km SW of Cape York, 26 Oct. 1965, *L.S. Smith 12459* (CANB; BRI, *n.v.*); False Pera Head, 24 Aug. 1999, *N.N. Smith 4442* (BRI); just N of Kendall R., 15 June 2006, *B.S. Wannan 4464 & P. Graham* (BRI, DNA); 40 km S of Coen towards Musgrave Stn, 23 June 1972, *J. Wrigley & I. Telford NQ1608* (CANB).

Hibbertia dealbata (R.Br. ex DC.) Benth.

Fl. Austral. 1: 21 (1863); F.Muell., *Syst. Cens.* 1: 1 (1882); Gilg, *Nat. Pflanzenfam.* 3, 6: 119 (1893); F.M.Bailey, *Compr. Cat. Queensland Pl.* 18 (1913); Ewart & Davies, *Fl. N. Territory* 193 (1917); Specht in Specht & Montf., *Rec. Amer.-Austral. Sci. Exped. Arnhem Land* 3: 260, 383, 400, 464 (1958); Stearn, *Austral. Flow. Paint. Ferd. Bauer* t. 2 (1976); Harmer, *N. Austral. Pl.* 1: 46 (1976). — *Hemistemma dealbatum* R.Br. ex DC., *Syst. Nat.* 1: 413 (1817); Deless., *Icon. Select. Pl.* 1: 20, t. 76 (1821); Poir., *Dict. Sci. Nat.* 20: 560 (1821); DC., *Prodr.* 1: 71 (1824); Spreng., *Syst. Veg.* 2: 510 (1825); G.Don, *Gen. Hist.* 1: 73 (1831). — **Type citation:** "in Novae-Hollandiae terrâ Arnheimicâ, R. Brown (v.s. sp.)." **Lectotype (here designated):** Northern Territory, Arnhem Bay, Feb. 1803, *R. Brown s.n.* [J.J. Bennett 4913] (BM000574418). **Isolectotypes:** BRI AQ0341698, CANB278209, E00781243, G00201271, K000687455, MEL695390, P1441327828553, P1441327828571, P1441327828591.

Shrubs up to 1 m tall, few-stemmed, spreading; branches angular to ridged when young with prominent decurrent leaf bases, becoming terete and rigid-woody, densely rusty-pubescent with antrorse appressed hairs. *Vestiture* persistent, with simple hairs occurring as coarser, usually appressed rusty hairs on branches, petioles and mainly on veins of adaxial and abaxial leaf surfaces and on the outer surface of the calyx, while the finer felt-like, but also appressed, white hairs are restricted to the undersurface of abaxial leaves but absent from their major veins and ± revolute margins. *Leaves* entire, discolorous; *petiole* 2.5–6 (–10) mm long, rusty-pubescent with antrorse appressed simple hairs above and below; *lamina* elliptic to broadly elliptic-obovate, rarely elliptic-lanceolate, (32–) 40–55 (–83) × (10–) 16–25 (–32) mm, (length : width ratio 2–5.5 (–6) : 1), gradually to abruptly constricted into petiole, obtuse to cuspidate becoming rounded, rarely acute, adaxial surface ± flat but grooved above the central vein and sometimes lateral veins being densely covered with antrorse appressed rusty simple hairs glabrescent also between the often indistinct finer reticulate venation, numerous (usually >12 also visible below) lateral veins branch at an acute angle to central vein, abaxial surface with ± raised revolute margins, central and lateral veins covered with similar antrorse appressed rusty hairs while between the veins and margins dissimilar finer white appressed felt-like hairs occur. *Inflorescenses* are monochasia (cincinni), with (6–) 8–12 (–15) sessile flowers, subtended by usually 3 subequal additional bracts, terminal only on main branches and not recorded to be supported by additional inflorescences; *peduncle* 1.5–2.5 (–3.8) mm long, angular to ridged, densely rusty-pubescent with appressed simple hairs; *bracts* with broader and narrower bracts alternating and gradually decreasing upwards: broader bracts lanceolate to lanceolate-falcate, 2.5–7.3 × 2–3 (–3.5) mm, rusty-pubescent, smaller ones linear-spathulate to linear, 2.2–3.5 × (0.5–) 1–1.5 mm, sometimes without axillary flower, rusty-pubescent with appressed simple hairs. *Calyx lobes* unequal, somewhat accrescent; *outer calyx lobes* ovate, 6.3–6.8 (–7.1) × 3.4–3.6 mm, acute and with tuft of long rusty terminal hairs, without obvious central vein, on the outside surface appressed rusty-pubescent with straight simple hairs becoming spreading on the margins, on the inside surface glabrous and glossy except for few spreading hairs at the apex; *inner calyx lobes* broadly ovate, 7.1–7.5 × 4.6–5.2 mm, without obvious central vein, on the outside surface appressed rusty-pubescent with straight simple hairs becoming spreading on the margins, on the inside surface glabrous and glossy except for few spreading hairs at the apex. *Petals* broadly obovate, (12–) 15–18 × (10–) 14–18 mm, obviously emarginate to bilobed. *Stamens*: *fertile stamens* 10–12, usually slightly larger than 9 or 10 eccentric *staminodes*, all in a cluster to one side of the ovaries; fertile stamens with *filaments* 1.2–1.4 mm long, scarcely basally connate; *anthers* slender-oblong, 2.1–2.3 mm long, abruptly constricted above and below, introrsely dehiscing. *Pistils* 2; *ovaries* broadly obovoid, each with 1 basal ovule, hirsute; *styles* ± horizontally attached to the eccentric apex of ovaries,

then slightly curved outward and again straightened erect in front of the stamens but curved away again to position the stigmas in front of the apex of the anthers. *Fruits* not dehiscing. *Seeds* obovoid, 6.2 × 3.3 mm, mid-brown; *aril* with faint attachment surmounted by a membranous cup clasping much of the seed. **Fig. 1X, Y**.

Distribution & ecology. Recorded mainly from sandy laterite soils, but also white sandy soil predominantly in *Eucalyptus tetradonta* forests in north-eastern Northern Territory, particularly from the area around the Gove Peninsula and surrounding islands.

Phenology. Flowering Aug.–Jan.

Conservation status. On several specimens, the species is described as not considered threatened.

Diagnostic features. *Hibbertia dealbata* is distinguished from the very similar *H. candicans* by inflorescences with (6–) 8–12 (–15) flowers on main branches, by a ± complete reticulate venation on the adaxial leaf surfaces, as well as by its shorter and broader leaves with a length : width ratio of 4–5.5 (–6) : 1. *Hibbertia candicans* and *H. dealbata* are distinguished from *H. brownii* by their branches and petioles being rusty-pubescent with antrorsely appressed, usually short coarse simple hairs, as well as the different shapes of the bracts subtending alternating flowers of the inflorescences.

Variation. Although *H. dealbata* has generally shorter and broader leaves, some of the lower leaves on branches are twice as long as distal leaves (up to 83 mm long on *R.L. Specht 844*).

The inflorescence is similar to that of *H. candicans* in producing alternating broader and narrower bracts and, although the main cincinnus is more floriferous, no additional inflorescences or part-inflorescences have been recorded for the species.

Typification. It is difficult to select a lectotype (McNeill 2014) among the many duplicates (syntypes) of R. Brown's collections of *Hibbertia* (*Hemistemma) dealbata*, because Candolle did not annotate any specimen(s) consulted. The specimen BM000574418 bears the inscription "Curatelloides dealbata" in Brown's handwriting, a name also used in his manuscript, indicating that Candolle must have examined this specimen and adopted the epithet on his visit to London in 1816 (Mabberley 1985). As this unpublished name is not found on G00201271 and other duplicates that Candolle might have consulted prior to his publication of the species as *Hemistemma dealbatum* in 1817, the specimen BM000574418 is selected as lectotype.

Selection of specimens examined (33 seen)

NORTHERN TERRITORY. Elcho Isl., 9 Feb. 1978, *M.A. Clements 1193* (CANB); Cotton Isl., 28 May 1992, *I.D. Cowie 2958* (DNA, MEL); Pobassoo Isl., 24 Apr. 1996, *I.D. Cowie 6539* (DNA, MEL); Melville Bay, Jan. 1972, *S.A. Dunk 12* (AD); N of Nhulunbuy, 13 Oct. 1993, *J. Egan 2720* (BRI; DNA, *n.v.*); 5 km S of Gove Airport, 16 July 1978, *J. Eurell 15* (CANB); 19.7 km S of Gove Airport, 19 Nov. 1989, *P.I. Forster 6017* (BRI; DNA, MO, *n.v.*); Mt Saunders, 25 Sep. 1971, *D. Hinz 259* (CANB; DNA, K, *n.v.*); Gove Peninsula, turnoff to Yirrkala, 20 June 1998, *D. Keith & B. Pellow 192* (NSW); Wessel Islands, 1 Oct. 1972, *P.K. Latz 3361* (CANB; DNA, *n.v.*); Wigram Isl., English Company Islands, 24 July 1992, *G.L. Leach 3047* (AD, BRI; DNA, *n.v.*); Groote Eylandt, 27 Jan. 1975, *D. Levitt 399* (CANB; DNA, K, *n.v.*); Elcho Isl., 2 July 1975, *J.R. Maconochie 2099* (CANB; DNA, K, *n.v.*); Drimmie Heads, E of Catalina Beach, 5 Nov. 2008, *A.A. Mitchell 8756* (BRI; CANB, DNA, *n.v.*); 15 mls [24 km] N of McLaren R., 17 June 1972, *J. Must 1027* (CANB, NSW; DNA, *n.v.*); Yirrkala, 8 Aug. 1948, *R.L. Specht 844* (AD, BRI, CANB, MEL, NSW; DNA, K, L, *n.v.*); Nhulunbuy, 5 km W Giddy R., 12 Sep. 1985, *G. Wightman 2242* (CANB; DNA, *n.v.*).

Hibbertia holtzei F.Muell.

Defin. Some new Austral. Pl. [S. Sci. Rec. n.s. pre-print] 1 (1885); reprinted in *Bot. Centralbl.* 24: 373 (1885) & *Repert. Spec. Nov. Regni Veg.* 42: 86 (1937); Ewart & Davies, *Fl. N. Territory* 193 (1917); Specht in Specht & Mountf., *Rec. Amer.-Austral. Sci. Exped. Arnhem Land* 3: 260 (1958); Chippend., *Proc. Linn. Soc. New South Wales* 96: 249 (1972). — **Type citation:** "Near Port Darwin; Maurice Holtze". **Lectotype (here designated):** Northern Territory, Port Darwin, 1885, *M. Holtze 525* (MEL1553908). **Isolectotype:** KFTA0001202, MEL1553909.

Hibbertia tasmanica auctt. non Baill.: Hoogland, *Austral. Syst. Bot. Soc. Newslett.* 34: 3 (1983), p.p. excl. type; J.Brock, *Top End Native Pl.* 219, fig. (1988), *p.p.* (see appendix).

Subshrub with prostrate to scrambling herbaceous branches from perennial root stock, mainly young leaves and calyx ± tinged purplish-green; branches terete-wiry, with leaf bases scarcely raised or decurrent, shortly hirsute to pilose with few erect longer hairs over dense shorter hairs. *Vestiture* ± persistent, with sparse pale undercover almost pilose overtopped with few slightly longer spreading hairs, but wearing off soon on branches and inflorescences particularly on bracts, but also with occasional antrorse-appressed hairs on the calyx, while the adaxial leaf surfaces, particularly the veins and margins are ± densely covered with pale erect hooked simple hairs and the abaxial leaf surface is usually glabrous. *Leaves* heterophyllous serrate to entire, not discolourous; *petiole* 2–4.5 (–8) mm long, white-tomentose above and below; *lamina* broadly elliptic to lanceolate-elliptic, (25–) 45–70 (–80) × (15–) 20–28 (–35) mm, ± abruptly constricted into petiole, obtuse to acute but often with 4–6 (–10) serrations distally each with a vein-end, adaxial surface with slightly recessed main veins, pubescent or puberulous with short hooked simple hairs each with a tubercle base, becoming glabrescent between major veins, abaxial surface with ± raised primary and secondary veins (branching at acute angle) forming ± visible intramarginal connections

and usually continuing into vein-ends, puberulous with mainly hooked simple hairs along raised veins and revolute margins of the lamina. *Inflorescences* are monochasia (cincinni) with (1) 2–5 sessile flowers, subtended by 2 (–4) additional bracts, often shifted by subsequent growth, terminal on main branches, but often also lateral inflorescences on new growth flushes branching from axils of parent additional bracts, each with independent additional bracts; *peduncle* 15–35 mm long, thread-like, fine-pilose, rarely tomentose with short erect hairs rusty to paler; *bracts* variable in shape, decreasing in size upwards: proximal bract often without flower and linear, 2.2–6 (–7.4) mm long, shortly pubescent with rusty antrorse simple hairs, other bracts linear-lanceolate, 2–6.5 (–7.4) × 1–25 mm long, without central ridge visible, pubescent to tomentose with ± short rusty erect hairs. *Calyx lobes* subequal to unequal; *outer calyx lobes* lanceolate, 7.4–7.7 × 3.2–3.5 mm, acute to pointed, with often distal indistinct ridge, on the outside surface moderately densely antrorse-pubescent with short simple hairs along the centre and at the base becoming sparser to the margins, on the inside surface sparsely hairy to glabrescent on the lower half; *inner calyx lobes* lanceolate-elliptic to oblong, 7–7.3 × 3.6–4 mm, obtuse to rounded, scarcely ridged, on the outside surface densely antrorse-pubescent with short simple appressed hairs becoming fewer towards the margins, on the inside surface glabrous. *Petals* obovate, (10–) 12–16 (–18) mm long, emarginate to lobed. *Stamens*: *fertile stamens* 12–14, usually slightly longer than the slender 9–11 eccentric *staminodes*, all in a cluster to one side of the ovaries; fertile stamens with *filaments* 0.7–1 mm long, scarcely connate basally; *anthers* slender-oblong, 1.7–2.2 mm long, erect to slightly incurved, abruptly constricted above and below, introrsely dehiscing. *Pistils* 2: *ovaries* obovoid, somewhat laterally compressed, each with 2 basal ovules, hirsute; *styles* horizontally attached to eccentric apex of ovaries, then sharply curved down and up again to straighten in front of the stamens, positioning the stigmas at apex of anthers. *Fruits* splitting but scarcely releasing seeds. *Seeds* ovoid-oblong, c. 4.4 × 3.2 mm, brown; *aril* with faint attachment surmounted by a scarcely developed membranous cup sparsely covering the seeds. **Fig. 1N, O**.

Distribution & ecology. Grows in sandy to lateritic soils, mainly in *Eucalyptus miniata* forests near Darwin, Northern Territory.

Phenology. Flowering Nov.–Mar.

Conservation status. Unknown.

Diagnostic features. *Hibbertia holtzei* differs from all other Australian species by its shortly hooked hairs on the adaxial leaf surface of at least the young leaves. These hairs are usually retained at least on the revolute margins and mainly on the central vein abaxially, while the undersurface in between vein and margin is quite glabrous.

Variation. The prostrate growth habit and the presence of commonly only two additional bracts often make it difficult to observe, whether inflorescences are terminal or at times also axillary, because the main growth had continued from the axil of one additional bract and the latter had shifted in the process, so that the inflorescence appears to have developed from the axil of the second additional bract. However, a terminal origin of these inflorescences is accepted here on the basis of distal inflorescences, which are always terminal, but they often show short continued growth from the axils of the parent additional bracts (new growth flush) and which will end in more inflorescences with independent pairs of additional bracts. Repeated flowering on the same branch in the same season appears to be common in this species (e.g. *H.S. McKee 8279*).

Heterophylly in *H. holtzei* is similar to other species. Young branches from the rootstock start with short and rounded leaves, which have very small pointed vein-ends distally (*I.D. Cowie 1359*), but these become only noticeable when serrately lobed on the sixth or seventh leaves. Then the leaves are about three times larger and much longer. However, all leaves, beginning from the first one, have scattered hooked hairs on the main veins of the adaxial surface. Mature leaves with entire margins, though often ± undulate and with intramarginal connections of the secondary veins, develop in this case at about leaf eleven, when the first flowers appear. In other specimens the stage of serrate-lobed leaves is longer, and it can be seen repeated with new growth flushes. It is also noteworthy that in this species the secondary veins are rarely paired.

Typification. Among the two type specimens of *Hibbertia holtzei* at Melbourne, MEL1553908 was selected as the lectotype as it bears the locality, collector and a date of collection. The other syntype (MEL1553909) is inscribed with a few notes but without the origin of the collection; it was not selected as lectotype to avoid a possible confusion with a later collection of the species by M. Holtze (MEL1009368).

Specimens examined

NORTHERN TERRITORY. 15 mls [24 km] S Darwin, 19 Feb. 1969, *N. Byrnes 1359* (CANB; DNA, NT, *n.v.*); near Marlow Lagoon among the two specimens of *Hibbertia holtzei*, Palmerston, 18 Jan. 1991, *I.D. Cowie 1359* (AD, CANB, DNA); *s.loc.*, *s.dat.*, *M. Holtze 796* (MEL1009368); Nightcliff, 9 Feb. 1961, *H.S. McKee 8279* (NSW; DNA, *n.v.*); Winnellie, 11 Feb. 1961, *H.S. McKee 8371* (NSW); Howard Springs Rd, 29 Nov. 1971, *J. Must 891* (NSW; CANB, DNA, NT, *n.v.*); Delissaville, Cox Peninsula, 27 Mar. 1948, *Specht 106* (BRI; DNA, *n.v.*); Northern Territory, 1886, *J.E. Tenison-Woods 525 & J.E. Holtze* (BRI; MEL, *n.v.*).

Hibbertia hooglandii J.R.Wheeler

Nuytsia 7(1): 69 (1989); J.R.Wheeler, *Fl. Kimberley Region* 152 (1992). — **Holotype:** Western Australia, Mitchell Plateau, north of camp, *J.S. Beard 8467*, 27 Feb. 1979 (PERTH03626687). **Isotype:** CANB.

Shrublets up to 40 cm tall, erect to spreading, often multi-stemmed; branches little branched, with leaf base shortly decurrent, often ridged, eventually becoming terete and wiry-woody, puberulous to pubescent especially below flowers or glabrescent with slightly crisped simple hairs mainly on leaf bases. *Vestiture* not persistent, pubescent to glabrescent with silky, ± appressed, often crisped simple hairs on branches and leaves, similar but longer hairs on the outside surface of the calyx lobes. *Leaves* entire and more or less terete, not discolorous; *petiole* absent; *lamina* linear, 13–55 × 0.3–0.5 mm, slightly broadening towards an almost clasping base, pointed to needle-like, above ± convex to almost terete, glabrous or sparsely pubescent mainly along the central vein with fine silky simple hairs (no lateral veins visible above and below), below with revolute margins ± abutting the broad raised central vein with rarely a few protruding silky hairs visible of the undersurface. *Inflorescences* reduced to single terminal flowers on a lateral short shoot with 2 or 3 basal leaves, or directly from the leaf axil on the main branch but then with scale-like additional bracts, each peduncle subtended by 6 short needle-like additional bracts in subterminal clusters; *peduncle* (6–) 15–28 mm long, puberulous to glabrous; *bracts* linear to subulate, 2.5–7 mm long, subtending flower, with few fine crisped hairs to glabrous. *Calyx lobes* subequal; *outer calyx lobes* lanceolate to linear-lanceolate, 5–8 × 2–3 (–3.5) mm, pointed and with ± pronounced central ridge, outside with crisped, often felt-like appressed hairs, inside glabrous; *inner calyx lobes* ovate to ovate-oblong, 5.5–8 × 2.5–4 (–5.5) mm, with obvious central ridge mainly distally, on outside surface with crisped silky hairs ± appressed, inside surface glabrous. *Petals* broadly obovate 5.5–11 × 5–10 mm, ± emarginate. *Stamens* in cluster on one side of the ovaries; *fertile stamens* 17–25 in 2 or 3 rows, about as long as staminodes; *staminodes* linear, centrifugally to fertile stamens; *filaments* (0.5–) 1–1.5 mm long, scarcely connate; *anthers* narrowly obloid, 2–2.3 mm long, abruptly constricted above and below, dehiscing introrsely. *Pistils* 2; *ovaries* broadly obovoid, each with 2 basal ovules, hirsute to shaggy with white hairs; *styles* attached to the apex of the ovaries and then spreading straight in front of the stamens and curved upwards near their apex. *Fruit* enclosed in calyx. *Seeds* ± globular, c. 5 × 4.6–5 mm, light brown; *aril* covering lower two thirds of seed, waxy.

Illustration: J.R.Wheeler, *Nuytsia* 7: 70, fig. 1 (1989).

Distribution and ecology. Recorded mainly from lateritic soils, but also clay in palm-eucalypt woodland in the northern Kimberley Region of Western Australia (WGA, Cga).

Phenology. "Flowers and fruits recorded for October, January, February, May and June." Wheeler (1989).

Conservation status. Rare in generally inaccessible areas. Not listed as threatened in Western Australia (Western Australian Herbarium 2023).

Diagnostic features. Distinguished from other species in the group, particularly from *H. arachnoidea* and *H. muelleri*, two taxa with similar erect habit and linear leaves, by a single flower terminating on lateral short shoots in the axils of distal leaves (but always below a growing terminal apex). Generally the undersurface of the leaves is not visible, except for some hairs, as the revolute margins ± abut to the raised swollen central vein.

Variation. The single flowers (reduced inflorescences) are borne in distal clusters, usually below the growing terminal apex on axillary short shoots from a number of nodes. While the branches below have some reduced leaves at their base, the distal branches have only a whorl of much-reduced additional bracts in the axil of the leaf on the main branch. In the case of *D. Halford Q1423*, the fruits are born apparently terminal, but a terminal scar on the same node as the fruit (also with scales on the additional bracts) shows that the terminal vegetative growth had been abscissed on all three flowering branches.

Specimens examined

WESTERN AUSTRALIA. c. 10 km W Gibb R., Kalumburu Rd, along Warrender Rd, King Edward R. crossing, 29 May 1992, *D. Halford Q1423* (BRI); Napier Broom Bay, 16 Dec. 1909, *G.F. Hill 62* (MEL); Pim Hill, 26 May 1984, *S.J. Forbes 2185* (MEL); Mitchell Plateau, 50 km ESE mining camp on rd to Theda, 11 May 1983, *P.A. Fryxell & L.A. Craven 4059* (CANB); Pim Hill, SE West Bay, 27 May 1984, *J.H. Willis s.n.* (MEL293926).

Hibbertia lagarophylla Toelken, ***nom. nov.***

Hemistemma angustifolium R.Br. ex DC., *Syst. Veg.* 1: 414 (1817); Deless., *Icon. Select. Pl.* 1: 20, t. 77 (1821); Steud., *Nomencl. Bot.* 1: 399 (1821); Poir., *Dict. Sci. Nat.* 20: 561 (1821); Poir., *Tabl. Encycl.* 3: 644 (1823); Spreng., *Syst. Veg.* 2: 610 (1825); DC., *Prodr.* 1: 71 (1824). — *Hibbertia angustifolia* (R.Br. ex DC.) Benth., *Fl. Austral.* 1: 21 (1863), *nom. illeg. non* Salisb. (1808); Baill., *Hist. Pl.* 1: 100 (1868); Gilg, *Nat. Pflanzenfam.* 3, 6:119 (1893); Ewart & Davies, *Fl. N. Territory* 193 (1917); Gilg & Werderm., *Nat. Pflanzenfam.* edn 2, 21: 29 (1925); Specht in Specht & Mountf., *Rec. Amer.-Austral. Sci. Exped. Arnhem Land* 3: 324 (1958). — *Hibbertia benthamii* F.Muell., *Syst. Census Austral. Pl.* 1: 1 (1882), *nom. illeg. non* F.Muell. (1864); F.Muell., *Sec. Syst. Census Austral. Pl.* 1: 1 (1889). — **Type Citation:** "in Novae-Hollandiae terrâ Arnheimicâ, R. Brown (v. s. sp.)". **Lectotype (here designated):** Northern Territory, Everett Island, Arnhem Bay, *P. Good sub R. Brown* [J.J. Bennett 4912] (BM000574419). **Isolectotypes:** BM000574404, BRI AQ0341700, CANB278205, E00791168, G00201224, K000687453, MEL 1010243, NSW86609, P144132785095.

Subshrub with many stems from a woody rootstock, with prostrate to decumbent branches up to 0.4 m long; branches terete and with short decurrent leaf bases, wiry-woody, often much branched, finely tomentose soon becoming puberulous to glabrescent with fine

short rusty (soon becoming paler) spreading or crisped simple hairs, sometimes overtopped by scattered longer hairs particularly below and on the peduncle. *Vestiture* ± persistent, with dense undercover of short erect pale simple hairs and overtopped by scarcely longer brown hairs wearing off soon and remainder becoming ± antrorse-appressed on branches, petiole, darker brown on the inflorescences with calyx and bracts ± appressed and similar but sparser to glabrescent on adaxial leaf surface, while with fine white silky hairs becoming felt-like on the undersurface except for veins having brown hairs. *Leaves* entire, discolorous; *petiole* 0.3–0.6 (–1.2) mm long, ± discolorous with pale brown straight simple hairs above and ± silky white simple hairs below; *lamina* linear, (18–) 30–45 (–67) × (0.8–) 1.2–2.5 (–3.2) mm, scarcely constricted into short petiole, acute to pointed with protruding central vein, adaxial surface ± convex with distinctly revolute margins, rarely flat, but grooved above the central vein and no other venation visible, covered with scattered long fine straight pale antrorse-appressed hairs particularly on the vein and flanks of margins, abaxial surface with distinctly raised revolute margins and central vein covered with few long fine ± straight antrorse-appressed simple hairs similar to the white hairs (not felt-like) on the undersurface. *Inflorescences* are monochasia (cincinni) with (1) 3 or 4 (5) sessile flowers, terminal on few to many main branches, subtended by (2) 3 (–5) usually leaf-like additional bracts, sometimes supported by an additional inflorescence branching from the parent additional bracts, and producing their own often reduced additional bracts; *peduncle* 2.5–22 mm long, terete, densely rusty-pubescent with antrorse hairs often overtopped by few longer hairs; *bracts* similar in shape, scarcely reducing upwards, linear-lanceolate becoming linear-triangular distally, 1.8–4.5 × 0.3–1.5 (–2.2) mm, abruptly constricted into base, without central ridge, with some larger sterile bracts often on the peduncle, rusty-pubescent with short appressed simple hairs. *Calyx lobes* unequal; *outer calyx lobes* lanceolate-elliptic, (3.6–) 3.8–4.4 × 3.2–3.6 mm, acute to pointed accentuated by terminal hairs, distal central ridge largely obscured by dense rusty-pubescence, on the outside surface with short coarse antrorse-appressed simple hairs becoming less dense towards the margins, on the inside surface glabrous and dull; *inner calyx lobes* broadly elliptic to elliptic-ovate, 4.7–5.4 (–6.5) × 4.3–5 mm, obtuse to rounded, without obvious central ridge, on the outside surface rusty-pubescent with dense short antrorse-appressed simple hairs along the centre becoming sparse towards the margins, on the inside surface glabrous and dull. *Petals* obovate, 8.6–12.5 × 7.2–8.3 mm, emarginate to bilobed. *Stamens*: in a cluster on one side of the ovaries, *fertile stamens* 12–14, usually slightly larger than 9 or 10 eccentric *staminodes*; fertile stamens with *filaments* 1.1–1.3 mm long, scarcely connate basally; *anthers* slender-oblong, 1.1–1.25 mm long, abruptly constricted above and below, introrsely dehiscing. *Pistils* 2; *ovaries* broadly ovoid, each with 1 or 2 basal ovules, hirsute; *styles* horizontally attached to the eccentric apex of the ovaries then slightly curved out and straightened up in front of the stamens but towards the apex again curved away to position the stigmas well in front of the apex of the anthers. *Fruits* not dehiscing. *Seeds* broadly obovoid, c. 5.8 × 4.2 mm; *aril* with a faint attachment surmounted by an irregularly lobed membranous cup clasping to the lower part of the seeds. **Fig. 1F, G**.

Distribution & ecology. Recorded from sandy soils, connected with either laterite or sandstone, in *Eucalyptus* woodlands in north-eastern Arnhem region of the Northern Territory

Phenology. Flowering June–Oct.

Conservation status. Rare in localised populations in the Ramingining area of Arnhem Land, which deserve conservation.

Diagnostic features. *Hibbertia lagarophylla* can be distinguished from the similar *H. muelleri*, not only by the decumbent habit, but also the slender linear leaves displaying the white silky hairs of the undersurface of leaves, which are usually continued onto the abaxial petiole, as well as by the shorter erect hairs (rarely up to 0.5 mm long) on branches. *Hibbertia arachnoidea* also has narrow leaves with a paler undersurface, but is distinguished by its closely set leaves with very short internodes between them, by the absence of a petiole and by even longer hairs on the branches than *H. muelleri*. *Hibbertia ledifolia* appears superficially to be a broad-leaved form of *H. lagarophylla* but is a large shrub up to 4 m tall and with larger flowers.

Variation. Occasionally, the leaves of *H. lagarophylla* are very narrow (0.8–1.2 mm wide), e.g. on the specimen *C.R. Dunlop 7541*, but the tomentum and decumbent habit will distinguish the species adequately.

That same collection also shows a second set of additional inflorescences developing from the axils of the parent additional bracts with or without leaves, below their own whorl of additional bracts, as if these were additional growth flushes, but apparently from the same season. This type of growth flush is rarely observed in other species, except *H. holtzei*, and then flowers are only produced in the next season.

The first leaves on a new shoot are often much longer, but in contrast to those of, for instance *H. candicans*, they are scarcely broader than normal leaves (cf. *D.E. Murfet 4978*).

Typification. Among a number of duplicates (syntypes) of R. Brown's collection from Everett Island, Arnhem Land, examined, none shows any annotation by Candolle. However, one specimen is labelled in Brown's handwriting as "Curatelloides angustifolia" (BM000574419), the specific epithet adopted by Candolle; hence this specimen is selected as the lectotype of the species in preference to other syntypes. Apparently, the type was not actually collected by Robert Brown, but by Peer Good, the gardener on board of HMS *Investigator* (George & Moore 2022).

Etymology. The previously used Latin epithet *angustifolia* was translated into Greek to *lagarophylla*, from *lagaros*, "narrow, thin" and *phyllon*, "leaf".

Specimens examined

NORTHERN TERRITORY. Arnhem Land, 1928, *H. Basedow 86* (AD); Arnhem Land, 1928, *H. Basedow 96* (AD); 29 mls [46.4 km] NE of Goyder R. crossing, 17 June 1972, *N. Byrnes 2651* (CANB; DNA, K, *n.v.*); c. 56 km S of Maningrida, 17 Mar. 2000, *I.D. Cowie 8560* (BRI; DNA, MEL, *n.v.*); c. 16 km ESE of Ramingining, 19 June 2000, *I.D. Cowie 9405* (BRI; DNA, *n.v.*); Ramingining area, along Dhabla Rd, 31 July 1998, *I.D. Cowie & C.R. Dunlop 7912* (AD, BRI, CANB; DNA, *n.v.*); Buckingham R., 5 Dec. 1987, *C.R. Dunlop 7541* (AD, DNA, MEL); Djinmili Repeater site, 10 km NW of Blyth R., 19 Oct. 2004, *D.E. Murfet 4774* (AD); Central Arnhem Rd, near Donydji, 12 June 2005, *D.E. Murfet 4978* (AD); 22 km S of Maningrida, 13 June 2005, *D.E. Murfet 4992* (AD).

Hibbertia laurana S.T.Reynolds

Austrobaileya 3 (3): 531, fig. 1A–G (1991). — **Holotype:** Queensland, Mushroom Rock, 5.3 km E of Peninsula Developmental Road on an IWS track leaving the main road, 0.5 km N of the Laura River, 26 Apr. 1983, *J.R. Clarkson 4710* (BRI AQ0395200). **Isotypes:** MBA486.1, QRS76284 (both incorporated into CNS), DNA D0031780.

Shrubs 3–4 m tall, multi-stemmed, erect-spreading; branches with slightly raised but not decurrent leaf bases, tomentose with dense rusty erect simple hairs overtopped by scattered, about twice longer fine simple hairs but often caducous. *Vestiture* persistent, with dense rusty undercover of erect ± crisped simple hairs usually overtopped by scarcely longer crisped rusty hairs on branches, petioles and inflorescences with hairs on calyx becoming ± antrorse-appressed (pubescent), while the tomentum is persistent and often felt-like between darker veins on abaxial leaf surfaces, but scarcely persistent on adaxial leaf surfaces. *Leaves* heterophyllous, discolorous, often with reduced branches in its axils vaguely similar to intrapetiolar tufts; *petiole* 2–12 mm long, rusty-tomentose with few longer over short erect simple hairs, as on branches; *lamina* broadly elliptic to elliptic-obovate, (42–) 50–80 (–97) × (13–) 15–30 (–38) mm, abruptly constricted into petiole and usually with obtuse to rounded apex and pronounced terminal vein-end, margins ± shortly revolute and with 2 or 3 (–5) slight distal serrations each with a vein-end, adaxial surface ± flat except groove above central vein and with recessed 7–9 pairs of secondary veins at acute to obtuse angle arching antrorsely and terminating into marginal vein-ends and/or incomplete intramarginal veins, pubescent to glabrescent, while the area of the upper surface in between reticulum is glabrous and ± glossy to dull, abaxial surface with raised central and lateral veins, veins woolly with ± rusty crisped hairs overtopped by longer erect hairs as also along the margins, undersurface in between woolly with dense crisped white simple hairs. *Inflorescences* are monochasia (cincinni) with (2–) 4 or 5 flowers, usually subtended by 2 additional bracts, terminal on main branches and/or on distal reduced axillary branchlets usually with 1 or 2 scale-like additional bracts at the base; *peduncle* (3–) 9–28 mm long, angular, shortly rusty-hirsute, rarely -tomentose, with short spreading and often somewhat crisped hairs; *bracts* similar in shape, decreasing upwards, lanceolate to almost linear-triangular, (3.5–) 5–9 × 1.5–2.5 mm, without obvious ridge, rusty-tomentose to -pubescent with spreading to ± appressed simple hairs. *Calyx lobes* subequal; *outer calyx lobes* ovate to ovate-elliptic, (11.6–) 12–14 × 7.2–8.5 mm, obtuse to rounded and with terminal tuft scarcely lengthened, with central ridge mainly proximal but largely obscured by hirsute cover, on the outside surface with ± uniform cover of antrorsely spreading pale-rusty simple hairs, on the inside surface glabrous and glossy; *inner calyx lobes* broadly obovate to obovate-elliptic, 11.4–13.8 × 7.6–9 mm, ± rounded, with central ridge well developed particularly at the base, on the outside surface with pale-rusty simple hair antrorse to erect-spreading, especially along the central ridge, on the inside surface glabrous and glossy. *Petals* broadly obovate, 13–21 × 10–16 mm, bilobed. *Stamens*: *fertile stamens* 30–42, distinctly longer than 10–14 eccentric *staminodes*, all in a broad cluster to one side of the ovaries; fertile stamens with *filaments* 1–1.2 mm long, scarcely connate basally; *anthers* slender-oblong, 3.4–4.2 mm long, abruptly constricted above and below, ± laterally dehiscing. *Pistils* 2; *ovaries* obovoid, each with 2 basal ovules, hirsute; *styles* ± horizontally attached to the eccentric apex of ovaries, then bending slightly outward and again erect in front of the stamens but curved again centrifugally to position the stigmas well in front of the apex of the anthers. *Fruits* not dehiscing. *Seeds* obovoid, 5–5.8 × c. 4.2 mm, mid-brown; *arils* with basal attachment surmounted by a membranous cup enclosing the ± whole seed. **Fig. 1L, M**.

Distribution & ecology. Grows on skeletal sandy soil among sandstone boulders in dry sclerophyll woodland with *Eucalyptus tetrodonta*, *Corymbia dichromophloia* and *C. stockeri* mainly near Laura, in north-western Queensland.

Phenology. Flowering May–Aug.

Conservation status. The species has a very local distribution.

Diagnostic features. *Hibbertia laurana* is very similar to *H. banksii* subsp. *banksii*, but is distinguished by its longer rounded calyx lobes, which become quite hard after flowering, longer hairs on young branches (often up to 2.5 mm long) and by being a much larger erect plant (up to 4 m tall).

Variation. Many specimens give the impression that *H. laurana* closely resembles *H. banksii* subsp. *banksii*, because of their broader leaves with scarcely raised lateral vein-ends and depressed venation on the upper leaf surface (e.g. *Hyland 8115*). However, *H. laurana*

presents a complete recombination of characters of both subspecies of *H. banksii*. In addition, the acute leaf apex, fewer vein-ends and secondary veins branching at obtuse to right angles from the central vein, especially in adult leaves, are more similar to *H. banksii* subsp. *sparsidentata*. The two types of leaves often occur on the same specimen (e.g. *S.J. Dansie s.n.*), but *N.Byrnes 3303* bears only entire adult leaves.

The inflorescences develop similar to those in *H. banksii*, starting first in the distal axils, each of them bearing at their base the two additional bracts (often with several leaves below them as in *H. candicans*), from which new growth flushes will originate. Terminal inflorescences develop usually later or are only found on some branches.

Specimens examined

QUEENSLAND. Near Early Man site, N of Laura R., 16 May 1975, *N. Byrnes 3303* (QRS; BRI, *n.v.*); Henderson Ra., June 1986, *S.J. Dansie AFO05396* (QRS); Giant Horse Gallery, Laura, 9 Mar. 1975, *B. Hyland 8115* (BRI, CANB, QRS); upper reaches of Gorden Ck, E of Laura-Maytown Rd, 6 July 1990, *A.R. Bean 1767* (BRI); Stanley Isl., 28 May 1998, *J. le Cussan 469* (BRI); Stanley Isl., 7 June 1991, *M. Godwin C3512* (BRI); 1 km E of lower Normandy R. crossing on Battle Camp Rd, 3 Aug. 1986, *K. Hill 1931, P. Hind & D. Healey* (BRI; NSW, *n.v.*); 35 km SW of Laura, just below top of escarpment of Pine Tree Ck, 21 May 1987, *M. Parris 9197* (CANB); Split Rock near Laura, 9 July 1990, *E.M. Ross s.n.* (BRI AQ505648); Sandy Ck, 6 km NE of Jowalbinna (25 km SSE of Laura), 14 July 1998, *B.S. Wannan 906, K. Trapnell & M. Wardrop* (BRI; CANB, NSW, *n.v.*); Jowalbinna camp, c. 30 km SSW Laura, 15 June 1990, *H. van der Werff 11715* (QRS; MO, *n.v.*).

Hibbertia ledifolia A.Cunn. ex Benth.

Fl. Austral. 1: 22 (1863); F.Muell., *Syst. Census Austral. Pl.* 1: 1 (1882); F.Muell., *Sec. Syst. Census Austral. Pl.* 1: 1 (1889); Ewart & Davies, *Fl. N. Territory* 192, 193 (1917); Domin, *Biblioth. Bot.* 89: 421 [975] (1928); C.A.Gardner, *Enum. Pl. Austral. Occ.* 83 (1931); Beard, *W. Austral. Pl.* 67 (1965); Beard, *W. Austral. Pl.* edn 2: 88 (1970); A.S.George & Kenneally, *Wildlife Res. Bull. W. Austral.* 6: 52 (1977); Marchant & Keighery, *Kings Park Res. Notes* 5: 63 (1979); J.R.Wheeler, *Fl. Kimberley Reg.* 152, fig. C1–4 (1992). — **Type citation:** "N. Australia. York Sound, A. Cunningham". **Lectotype (here designated):** Western Australia, Hunter's River, York Sound, Sep. 1820, *A.Cunningham 250* (K000075650). **Isolectotypes:** BM834621, BM834622, BRI AQ0341709, K000075651, K000075652, MEL0666912A, NSW 430042, US81276716.

Hemistemma ledifolium A.Cunn. ex Benth., *Fl. Austral.* 1: 22 (1863), *nom. inval.*, *pro syn.*

Hemistema ledifolium A.D.Chapm., *Austral. Pl. Name Index* 1582, *orth. var.*

Shrubs up to 2 m tall, spreading; branches becoming rigid-woody and with very short internodes, terete or with slightly decurrent leaf-bases with a semicircular leaf scar, rusty-tomentose. *Vestiture* ± persistent except on the upper leaf surface, with very dense, ± rusty-tinged fine curly simple hairs being tomentose to shortly hirsute often becoming woolly on leaves and branches, becoming longer, coarser and ± appressed and being hirsute to strigose on the inflorescence especially on the outside surface of the calyx. *Leaves* entire, discolorous (green above and rusty turning white later); *petiole* 0.4–1.6 (–2.2) mm, distinct with short white hairs above and below; *lamina* linear-elliptic, rarely oblong, 8.8–18.7 (–42) × 2.1–2.7 (–10) mm, ± abruptly constricted into petiole, acute often with ± recurved vein-end and appearing obtuse, adaxial surface slightly grooved and often tomentose along the central vein, but usually no lateral veins visible, otherwise pubescent to tomentose but soon glabrescent, abaxial surface with ± revolute margins and scarcely raised central vein as well as undersurface densely tomentose to shortly hirsute and often becoming felt-like, rusty soon becoming white. *Inflorescences* are monochasia (cincinni) with 3 or 4 (–6) sessile to slightly stalked proximal flowers, subtended by 3 or 4 (–6) additional bracts, terminal on main branches; *peduncle* (3–) 5–18 mm long, shortly rusty-hirsute to tomentose with usually crisped simple hairs; *bracts* alternately dissimilar in shape, decreasing upward: lanceolate, 2.5–4.1 × 1.4–1.8 mm, usually with pronounced central vein, rusty-pubescent to brown-strigose, or alternately linear-lanceolate 1.6–2.5 × c. 1.4 mm, rusty-pubescent. *Calyx lobes* subequal; *outer calyx lobes* elliptic-ovate, 7.8–8.5 (–13) × 4.6–5.1 mm, bluntly acute to obtuse, on the outside surface rusty-hirsute to -strigose with fine spreading to appressed long hairs, on the inside surface glabrous or with few hairs towards the apex; *inner calyx lobes* elliptic-ovate to ovate, 8.6–9.0 × 4.9–5.6 mm, obtuse to rounded, on the outside surface rusty-hirsute to -strigose with fine spreading to appressed long hairs, on the inside surface glabrous. *Petals* obovate, 14–15 mm long, bilobed. *Stamens*: *fertile stamens* 28–35 arranged in 2 or 3 rows and longer than 15–22 eccentric *staminodes* all in a cluster to one side of ovaries; fertile stamens with *filaments* 1.4–1.7 mm long, scarcely connate basally; *anthers* narrowly oblong, 2.8–3.5 mm long, abruptly constricted (almost truncate) above and below, dehiscing introrsely. *Pistils* 2; *ovaries* obovoid, with 2 or 3 subbasal ovules, white-hirsute; *styles* horizontally attached to the eccentric side of the ovaries and from there straight erect in front to the stamens, positioning the stigmas parallel to anthers. *Fruits* not dehiscing. *Seeds* almost spherical but laterally compressed, c. 3.6 × 3.2 mm, brown; *arils* with fleshy basal attachment and surmounted by a sinuate membranous cup covering half to two-third of the seeds.

Distribution & ecology. Wheeler (1992) recorded *H. ledifolia* from rocky habitats around Mt Anderson and Prince Frederick Harbour in north-western Western Australia (WGa).

Phenology. Flowering May–June.

Conservation status. Restricted locally.

Diagnostic features. The hairs on the branches and leaves of *H. ledifolia* are short and erect (tomentose) unlike other species, viz. *H. candicans* and *H. dealbata*, which have also alternating broad and narrow bracts, but hairs which are finely crisped and become felt-like on the undersurface. All hairs on the abaxial leaf surface are similar to those occurring on the revolute margins, the central vein and in between margin and vein, as also observed in *H. brownii*, but *H. ledifolia* is distinguished by longer calyx lobes, 7.3–9 (–13) mm.

Typification. Among three type collections of *H. ledifolia* at Kew, only two (K000075650 and K000075651) were annotated in red pencil by Bentham as "Hibb. ledifolia Bth." The first of these K000075650 bears the name-giving identification of "Hemistemma ledifolium A.Cunn." and was used as the lectotype, while K000075651 was annotated with the manuscript name "Hemistemma intermedium C[unningham].". None of the other specimens were identified by Bentham and, in fact, specimens MEL0666912A and NSW430042 are listed as syntype or isotype of *Hibbertia ledifolia* Benth., respectively. The two specimens K000075651 and K000075652, originally identified as "Hemistemma intermedium C" and with the same locality and date, were obviously included in Bentham's concept of the species, as his annotation on K000075651 shows.

Specimens examined

WESTERN AUSTRALIA. Peninsula NE of Frederic Harbor at mouth of Hunter R., 8 June 1985, *P.A. Fryxell, L.A. Craven & J. McD.Stewart 4684* (CANB); 300 m upstream of junction of tidal/fresh water interface, 10 Apr. 1992, *A.A. Mitchell & T. Willing 2414* (CANB).

Hibbertia muelleri Benth.

Fl. Austral. 1: 21 (1863); F.Muell., *Second Syst. Census Austral. Pl.* 1: 1 (1889); Gilg, *Nat. Pflanzenfam.* 3, 6: 119 (1893); Ewart & Davies, *Fl. N. Territory* 193 (1917); Gilg & Werderm., *Nat. Pflanzenfam.* edn 2, 21: 29 (1925); Domin, *Biblioth. Bot.* 89: 421 [975] (1928); Chippend., *Proc. Linn. Soc. New South Wales* 96: 249 (1972); Harmer, *N. Austral. Pl.* 1: 46 (1976); — **Type citation:** "N. Australia. Barren places at the mouth of the Victoria, Providence Hill, etc. *F. Mueller*". **Lectotype (here designated):** In campis sterilibus ad ostium fluminis Victoria, Providence Hill etc., Providence Hill, Sep. 1855, *F. Mueller s.n.* (K000687454). **Isolectotypes:** MEL0212895, MEL0212896, MEL666872, TCD0009688.

Shrublets up to 0.4 m tall, few- to multi-stemmed, erect; branches terete with short indistinct leaf bases, white-hirsute with basal dense pubescence with ± crisped pale antrorse-spreading simple hairs overtopped by twice longer scattered ± erect-spreading fine hairs, soon becoming puberulous to glabrescent. *Vestiture* persistent for a short time, with sparse erect undercover of pale to white simple hairs overtopped by distinctly longer pale hairs but all wearing off soon on branches and especially on leaves, but less so the usually deeper brown hairs on inflorescences, particularly the silky ones which are ± appressed to the bracts and the outer surfaces of the calyx. *Leaves* entire, not discolorous as the paler undersurface is usually completely covered by the revolute margins; *petiole* absent, but base of lamina above and below long remaining hirsute with basal dense pubescent undercover with ± crisped pale or white antrorse-spreading simple hairs and overtopped by twice longer scattered white ± erect-spreading hairs; *lamina* linear, (13–) 18–35 (–43) × 0.8–1.5 mm, scarcely constricted at base, acute with usually recurved point, adaxial surface ± convex into revolute margins, with grooved central vein but no other venation visible, covered with scattered long fine straight pale spreading to antrorse-appressed hairs particularly on vein and flanks of margins, abaxial surface with distinctly raised revolute margins and central vein abutting and paler undersurface not visible, covered with few long fine ± straight spreading to antrorse-appressed simple hairs similar to upper surface. *Inflorescence* are monochasia (cincinni) with (1) 2–4 sessile flowers, subtended by 3–6 additional bracts, terminal on main branches, rarely supported by 1 or 2 sessile flowers (presumed reduced additional inflorescence) in the axils of the additional bracts; *peduncle* (1–) 2–10.4 mm long, terete, hirsute like branches with dense white-pubescent undercover of ± crisped pale antrorse-spreading simple hairs and overtopped by twice longer scattered ± erect-spreading white silky hairs; *bracts* similar in shape but gradually decreasing upwards, lanceolate-cordiform with long acuminate apex, 2.1–6.4 × 1.4–2.5 mm, without pronounced central ridge, often not directly subtending flowers, hirsute to sericeous with long white silky hairs erect but becoming ± appressed. *Calyx lobes* subequal; *outer calyx lobes* lanceolate to lanceolate-elliptic, 5.3–5.8 × 2.4–2.7 (–3) mm, acute to pointed accentuated by terminal hairs, distal central ridge largely obscured by dense pale pubescence, on the outside surface with long silky appressed simple hairs becoming less dense towards the margins, on the inside surface glabrous and glossy except for a few hairs at the apex; *inner calyx lobes* elliptic, 6.2–6.8 × 2.5–2.8 mm, obtuse to rounded, with slightly bulging central ridge basally but ± obscured by dense pubescence, on the outside surface with long silky appressed simple hairs becoming less dense towards the margins, on the inside surface glabrous except for sometimes a few hairs at the apex. *Petals* not seen. *Stamens*: *fertile stamens* 16–18, usually slightly longer than the 8 or 9 eccentric *staminodes* all in a cluster to one side of the ovaries; fertile stamens with *filaments* 1.2–1.4 mm long, scarcely connate basally; *anthers* slender-oblong, 1.6–1.8 mm long, abruptly constricted above and below, introrsely dehiscing. *Pistils* 2; *ovaries* broadly obovoid, each with 1 (2) ovule, hirsute. *Fruits* and seeds not seen. **Fig. 1H, I**.

Distribution & ecology. Grows associated with sandstone in open eucalypt woodland in the lower Daly River area, Northern Territory.

Phenology. Flowering in June.

Conservation status. Very localised distribution.

Diagnostic features. Although superficially resembling *H. lagarophylla*, *H. muelleri* is distinguished by its erect habit, the white undersurface of the leaves completely obscured by the strongly revolute margins and by much longer fine hairs on branches and leaves.

Variation. The few specimens examined were remarkably uniform.

Typification. Of the known syntypes of *Hibbertia muelleri*, two (K000687454 and MEL666872) bear F. Mueller's provisional identification of "Hemistemma angustifolia" and detailed information of the locality and date of the collection. The sparse specimen of MEL0212895 has only a standard herbarium label indicating a possible duplicate.

The Mueller collection at Kew (K000687454) was annotated by Bentham in red pen as "Hibb. muelleri Bth." It is therefore accepted as the lectotype and the similar specimen, MEL666872, as well as MEL0212895 are accepted as isolectotypes, as well as TCD0009688, which was identified as *Hibbertia angustifolia* mistakenly, following F. Mueller's provisional name of his collection as "Hemistemma angustifolia".

Specimens examined

NORTHERN TERRITORY. Daly R. area, near Pepperminati, 22 June 1988, *J. Brock 388* (DNA; CANB, *n.v.*); Docherty Hills, WSW of Daly R. Police Stn, 22 June 1985, *P.A. Fryxell & J.M. Stewart 4889* (CANB; DNA, *n.v.*); Port Keats, 11 Aug. 1983, *G. Wightman 596 & C. Dunlop* (AD, BRI; DNA, *n.v.*).

Appendix

Since Hoogland (1983) re-instated *Hibbertia tasmanica* Baill. as an older name for *H. holtzei*, concern remained about the epithet and the type citation "Crescit in Tasmania", as the species occurs only in the Northern Territory. Further examination revealed three specimens in the Paris. Only one bears a printed label with details of the locality, the expedition and "M. LE GUILLOU 1841". However, the printed locality on this label, "Baie Rafles Côte N. de la Nouvelle Hollande", has been crossed out and replaced with "Van Diemen Tasmanie" in Baillon's handwriting (Hoogland 1983). This specimen was cited by Hoogland as the holotype of *H. tasmanica*, which is here accepted as an inadvertend lectotypification of the name (Art. 9.10; Turland *et al.* 2018). According to George (2009: 613), the expedition of the Astrolabe and Zélée visited "Raffles Bay, 27 Feb.–8 Apr. 1839, Hobart 12 Dec. 1839–2 Jan. 1840", so that the unusual epithet is thought to be due to a confusion between the Van Diemen Gulf in northern Australia and Van Diemen's Land in the south.

The other two specimens (P00682345, P00682348) do not bear a printed label with details of the locality and expedition, but both have herbarium labels written in a similar handwriting: "Hibbertia / Raffles-Baie Dr Hombron / (N^{lle} Hollande Sept^{b}) 1841". On P00682348 "(Van Diemen?)" is added in the centre and "M. Leguillou 1841" instead of "Dr Hombron". Hoogland labelled in Mar. 1972 both these specimens as "probably isotype", without indication as to why. It is most likely that they are additional gatherings, especially as one is attributed to Dr. Hombron, a member of the same expedition (George 2009). Why all three specimens are dated 1841 is not known (April 1839, according to George 2009). The two specimens are treated as remaining syntypes, rather than isolectotypes.

In the protologue of *H. tasmanica*, the identification of the species hinges on single flowers on peduncles usually longer than leaves, which are stellate-pubescent on the adaxial leaf surfaces. These stellate hairs can be recognised on type-photographs (JSTOR) of larger leaves, in addition, paler circular scales on the calyx of mature flowers can be observed, as well. As such, all three specimens can be identified as *H. cistifolia* R.Br. ex DC. *Hibbertia holtzei*, which was previously regarded as a later synonym of *H. tasmanica*, is another taxon and differs by simple hairs on adaxial leaf surfaces and on the calyx.

Interesting is also that Baillon (1866, 1868) used in the discussion the generic name *Trimorphandra*, but concluded that it is a synonym of *Hibbertia*. This former genus, established for the New Caledonian species *T. pulchella* Brong. & Gris, could be distinguished by the heterantherous flowers. However, these are also another significant characteristic of *H. cistifolia*.

The following addition is suggested to be inserted to the synonomy of *H. cistifolia* R. Br. ex DC. in Toelken (2010b: 35):

Hibbertia* (*Trimorphandra*) *tasmanica Baill., *Adansonia* 6: 264 (1866); Baill., *Hist. Pl.* 1: 97, fig. 132 (1868). — **Type citation:** "Crescit in Tasmania ubi, anno 1840, legit *Le Guillou* (herb. Mus. par.)". **Lectotype:** Van Diemen Tasmanie, 'Voyage de l'Astrolabe et de la Zélée 1838–1840', 1841, *M. Le Guillou s.n.* (P00682346), *fide* Hoogland, *Austral. Syst. Bot. Soc. Newslett.* 34: 3 (1983), as "Type". **Remaining syntypes:** Raffles-Baie (N^{lle} Hollande Sept^{b}), 1841, *Dr Hombron s.n.* (P00682345); (Van Diemen?), Raffles-Baie (N^{lle} Hollande Sept^{b}), 1841, *M. Leguillou s.n.* (P00682348) (both annotated as "probably isotype" by Hoogland).

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