

***Hibbertia paranthera* (Dilleniaceae), a remarkable new species from the Prince Regent River in Western Australia**

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Abstract

Thiele, K.R. *Hibbertia paranthera* (Dilleniaceae), a remarkable new species from the Prince Regent River in Western Australia. *Nuytsia* 25: 307–312 (2015). A distinctive and remarkable new species in *Hibbertia* Andrew subgen. *Pachynema* (R.Br. ex DC.) J.W.Horn is described and illustrated. *Hibbertia paranthera* K.R.Thiele *sp. nov.* differs from all other species in subgen. *Pachynema* (and in the whole of *Hibbertia*) in having an androecium reduced to two large stamens, and a corolla of three petals. The new species is currently known from two populations c. 30 km apart in sandstone habitats in a remote area in Prince Regent National Park, between the Prince Regent River and Prince Frederick Harbour.

Introduction

Hibbertia Andrew subgen. *Pachynema* (R.Br. ex DC.) J.W.Horn is a small, highly distinctive group of subshrubs with a centre of diversity in the Top End monsoonal tropics of the Northern Territory. The last revision of the group (as *Pachynema* R.Br. ex DC.) by Craven and Dunlop (1992) recognised seven species, with six endemic in the Northern Territory and one, *H. sphenandra* (F.Muell. & Tate) J.W.Horn (as *P. sphenandrum* F.Muell. & Tate), occurring also in the Kimberley region of Western Australia. Another species, *H. conspicua* (J.Drumm. ex Harv.) Gilg from south-west Western Australia, was described originally in the monotypic genus *Huttia* J.Drumm. ex Harv., transferred to *Pachynema* by Bentham (1863) and to *Hibbertia* (as *H. huttii* F.Muell. *nom. illeg.*) by Mueller (1871). It clearly belongs in subgen. *Pachynema* based on morphological and molecular evidence (Horn 2009), along with a further Northern Territory species, the very rare *H. goyderi* F.Muell. The new species described here is thus the tenth in the subgenus.

Species of subgen. *Pachynema* are morphologically highly distinctive, with a very different vegetative architecture and floral morphology from other members of *Hibbertia*. Above-ground parts of all species comprise leafless, photosynthetic, sometimes flattened, often annually produced phylloclades bearing tiny, deciduous scales (bracts and sylleptic prophylls); true leaves, when present, are few in number and found only in the seedling stage or at the base of strong regrowth. Craven and Dunlop (1992) and Horn (2005, 2009) speculated that the whole above-ground flowering plant may be an inflorescence. All but two species (*H. conspicua*, *H. goyderi*) have white to pink or red flowers, in contrast to the yellow (rarely orange) flowers that are universal elsewhere in the genus. The androecium in subgen. *Pachynema* is also highly distinctive, with (in most species) an outer whorl typically of seven (rarely more) stamens and an inner whorl of two androecial

elements (stamens or staminodes) oriented in the transverse plane of the flower and often differing markedly from the outer whorl in size and shape. Stamens in all species are flattened or gibbous with poorly differentiated anther thecae, rather than filamentous with well-developed anthers as in other taxa in the genus. There may or may not be an additional whorl of staminodes external to the outer stamen whorl; in *H. sphenandra* these are confluent as a corona. The androecial arrangement in subgen. *Pachynema* is unique in Dilleniaceae, and perhaps amongst angiosperms (Horn 2009). Two species (*H. haplostemona* J.W.Horn and *H. praestans* (Craven & Dunlop) J.W.Horn) have a reduced androecium with only four or five stamens.

In this context, the new species described here as *H. parathera* K.R.Thiele is significant. It has been collected only three times from two populations, in a remote part of the north-west Kimberley region of Western Australia, and is clearly distinct from all other known taxa. It exhibits the most extreme floral reduction described to date in the genus, with an androecium comprising only two stamens and a corolla of three petals.

Key to species of *Hibbertia* subgen. *Pachynema*, amended from Craven and Dunlop (1992)

1. Petals yellow
 2. Sepals glabrous; stamens surrounded by a whorl of staminodes (Northern Territory) **H. goyderi**
 - 2: Sepals pubescent (the outer ones rarely glabrous); staminodes absent (south-west Western Australia)..... **H. conspicua**
- 1: Petals white to pink or red
 3. Petals white to pink, deciduous (except in *H. parathera*); corona absent
 4. Stamens smooth to sub-papillate; anther thecae (0.8–)1–2.5 mm long
 5. Stamens 9–11; petals 4 or 5; style shorter than ovary; stems terete to flattened **H. cravenii**
 - 5: Stamens 2; petals 3; style much longer than ovary; stems triquetrous..... **H. parathera**
 - 4: Stamens papillate; anther thecae 0.3–0.5 mm long
 6. All branchlets terete to compressed; stems dimorphic **H. juncea**
 - 6: All branchlets flattened, or if stems dimorphic then branchlets of the shorter stems flattened and branchlets of the taller stems terete to flattened
 7. Stems dimorphic, the shorter stems with branchlets 3–10(–15) mm wide and the taller stems with terete to flattened branchlets distinctly narrower than those of the shorter stems..... **H. complanata**
 - 7: Stems not dimorphic, the branchlets 5–10(–35) mm wide **H. dilatata**
 - 3: Petals red, persistent, or if deciduous then corona present
 8. Corona present **H. sphenandra**
 - 8: Corona absent
 9. Stamens 5, gibbous **H. haplostemona**
 - 9: Stamens 4(5), flat **H. praestans**

Taxonomy

Hibbertia paranthera K.R.Thiele, *sp. nov.*

Type: Prince Regent River, Western Australia [precise locality withheld for conservation reasons], 20 January 2004, M.D. Barrett & R.L. Barrett 1342 (*holo*: PERTH 07007604; *iso*: CANB, MEL).

Hibbertia sp. Prince Regent (M.D. Barrett & R.L. Barrett 1342), Western Australian Herbarium, in *FloraBase*, <http://florabase.dpaw.wa.gov.au/> [accessed 18 January 2015].

Pachynema sp. Prince Regent (M.D. Barrett & R.L. Barrett 1342), Western Australian Herbarium, in *FloraBase*, <http://florabase.dpaw.wa.gov.au/> [accessed 18 January 2015].

Glabrous, lignotuberous *shrubs* to 1.2 m high; stems and branchlets green becoming glaucous with age, not dimorphic, acutely triquetrous, the faces to 10 mm broad, at base becoming rounded through secondary thickening and with pale grey, flaky bark; flowering portions of stems *c.* 1 mm broad. *Leaves* on adult plants reduced to small, deciduous, scarious, ovate to triangular scales 0.8–3 mm long; seedling and resprout leaves not seen. *Flowers* pedicellate, widely spaced and single at the nodes of distal branchlets; floral bract 1, similar in size and shape to the scale leaves, sometimes displaced below the apparent insertion of the pedicel by partial fusion of the pedicel with the internode above; free portion of pedicels 1–3 mm long, gently recurved so the flowers are \pm pendent. *Sepals* 5, 3.5–5.5 mm long, obovate-oblong, acute to obtuse, sometimes apiculate, glabrous, rose-pink with a narrow, thinner-textured, whitish margin, the inner ones longer, broader and more obtuse than the outer. *Petals* 3, *c.* 4.5 mm long, obovate, narrower and paler than the sepals, erose-denticulate especially towards the apex. *Stamens* 2, 4.5–5.5 mm long (subequal to the inner sepals at anthesis), on opposite sides of the gynoecium and transverse to it, robust and flattened; anther thecae introrse, 2–2.5 mm long, dehiscing longitudinally. *Staminodes* absent. *Carpels* 2; ovaries ovoid, glabrous, *c.* 1 mm long; ovules 2, basal; styles erect, at first connivent then curved and diverging but approaching each other distally, *c.* 4 mm long. *Fruiting carpels* (immature only seen) globular, glabrous; mature seeds not seen. (Figure 1)

Diagnostic features. Uniquely diagnosed from all other species in the genus in having triquetrous stems with leaves reduced to scales, an androecium of two large stamens opposing each other on either side of the gynoecium, and 3 petals.

Other specimen examined. WESTERN AUSTRALIA: [locality withheld for conservation reasons] 19 Jan. 2010, R.L. Barrett, M. Maier & P. Kendrick RLB 6287 (PERTH).

Phenology. The only known flowering specimens were collected in January.

Distribution and habitat. Known from two populations in Prince Regent National Park in the North Kimberley IBRA bioregion (Department of the Environment 2013), where it grows amongst sandstone boulders and broken sandstone on river slopes and above deep gorges, in dense shrublands below widely spaced *Eucalyptus miniata* and *Livistona lorophylla*.

Conservation status. *Hibbertia paranthera* is listed as Priority Two under Department of Parks and Wildlife Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–), under the name *H. sp. Prince Regent* (M.D. Barrett & R.L. Barrett 1342) (Jones 2014). Both known populations are in a national park. They had 15 and 20 plants respectively at the time of collecting,

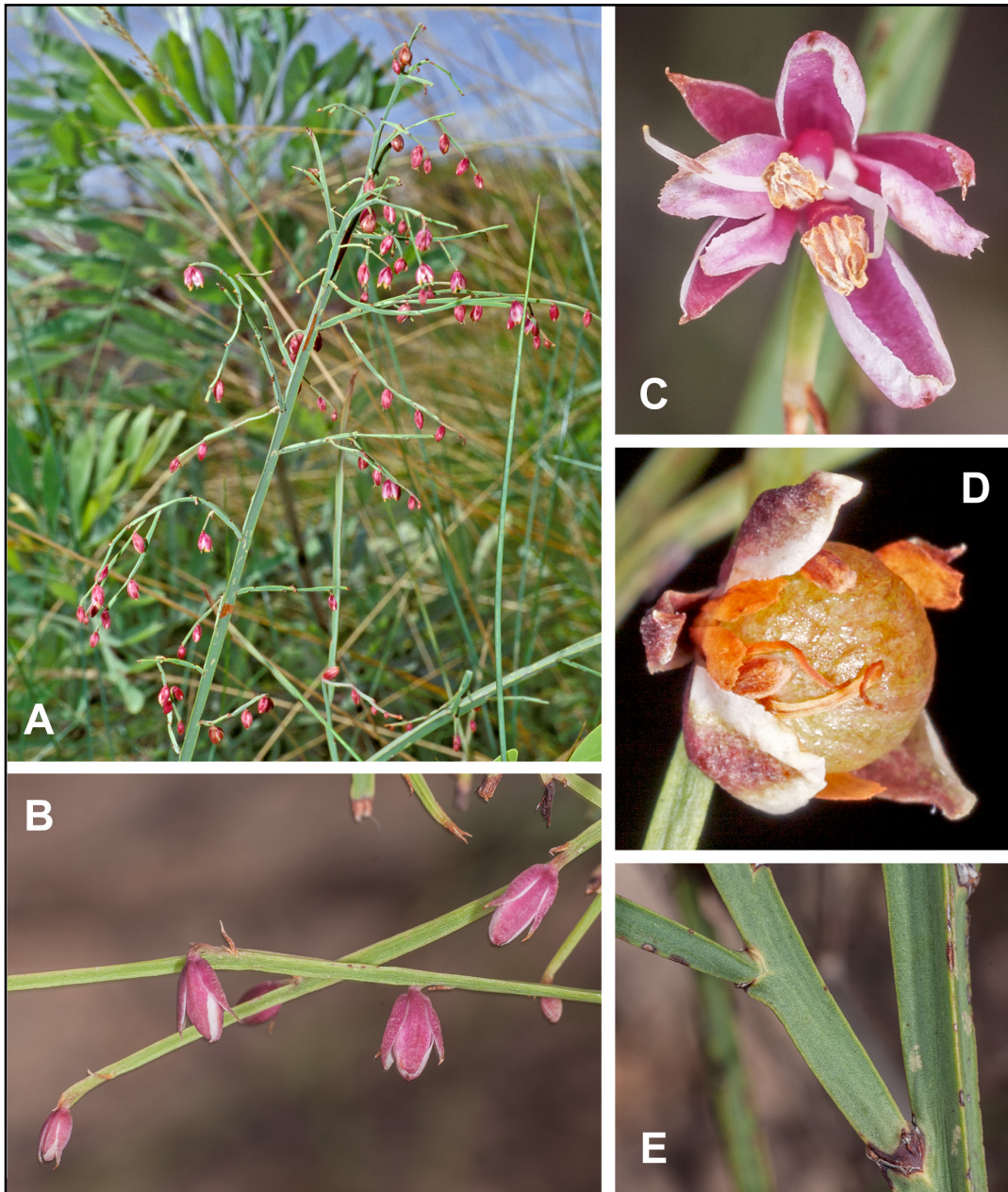


Figure 1. *Hibbertia parathera*. A – flowering plant showing the tangled habit; B – flowering branches; C – flower, the petals somewhat opened, showing the characteristic pair of stamens and three petals shorter than the inner sepals; D – fruit; E – base of branch. Images from the location of R.L. Barrett 6287. Photographs by R.L. Barrett.

and searches in similar habitat elsewhere in the vicinity failed to locate other populations. The region where it has been collected is remote, rugged and botanically under-explored, and other populations are likely to exist; however, the absence of further records from other surveys in the general area indicate that the species is likely to be naturally rare.

Both specimens were collected from relatively long-unburnt, dense shrub patches in fire-sheltered sites. The lignotubers of *H. parathera* sit close to the soil surface (R. Barrett pers. comm.) and may

be damaged by hot fires; accordingly, frequent and intense fires, which are widespread in the area, may be a threat to the species.

Etymology. The epithet is from the Latin *par* (a pair) and *anthera* (the pollen-bearing part of a stamen).

Notes. *Hibbertia paranthera* was first collected, with few, withered flowers, by Bob Makinson in June 1998 (specimen at CANB, *n.v.*). It was recognised as a potentially new species of *Pachynema* by the late Lyn Craven (CANB), who encouraged further searches of the area by Russell and Matt Barrett, resulting in the relocation in 2003 of the original population and collection of flowering specimens. The second population was discovered by chance in 2010 during flora surveys of the Prince Regent River area.

The family Dilleniaceae is unusual amongst eudicots for its wide range of floral morphology and patterns of symmetry, particularly involving the androecium, and has been the subject of extensive studies (Weberling 1988; Horn 2005, 2009). Its position at the base of the core eudicots makes it particularly important in studies of evolutionary and genetic controls on morphology and floral symmetry (Horn 2005). Within the family, *Hibbertia* exhibits the widest variation in floral form (Stebbins & Hoogland 1976; Tucker & Bernhardt 2000; Horn 2009).

Hibbertia paranthera substantially increases the range of variation in *Hibbertia* species. It is the only known species with an androecium reduced to two stamens. The position of the stamens transverse to the carpels indicates that they represent the inner pair of androecial elements (stamens or staminodes) found in other taxa in subgen. *Pachynema*, the outer whorl in this case being completely suppressed. In the other two species with a reduced androecium (*H. haplostemonia* and *H. praestans*), the inner androecial whorl is suppressed and the outer reduced in number. In other species of subgen. *Pachynema* the corolla comprises four or five petals, while all flowers of *H. paranthera* examined have three petals.

It is also highly distinctive within the pink- and red-flowered members of subgen. *Pachynema* (that is, excluding *H. conspicua* and *H. goyderi*) in having the ovaries much shorter than the styles; in the other pink- and red-flowered species the styles are short to very short relative to the ovaries. The long-styled carpels of *H. paranthera* are very similar to those in the yellow-flowered *H. conspicua*, and to those in many species of subgen. *Hibbertia* and subgen. *Hemistemma* (Touars) Horn.

Craven and Dunlop (1992) recognised two sections within *Pachynema*, sect. *Stemmatanthus* F.Muell & Tate and sect. *Pachynema*. The new species does not fit readily within either section, as the persistent petals, non-dimorphic stems and introrse anthers would suggest that it belongs in sect. *Stemmatanthus*, while the pink petals and relatively large, well-displayed flowers with distinct anther thecae suggest it belongs in sect. *Pachynema* (perhaps most closely related to *H. cravenii* J.W.Horn, the only other species with two large anthers rather than staminodes or small stamens in the inner androecial whorl). Current phylogenies have insufficient sampling to assess the sections further; however, the inclusion by Horn (2009) of *H. conspicua* and *H. goyderi* in subgen. *Pachynema*, both of which were excluded from *Pachynema* by Craven and Dunlop (1992), and the similarity in gynoeceum morphology between the pink-flowered *H. paranthera* and the yellow-flowered *H. conspicua*, means that these sections are problematic anyway, and they should probably be abandoned.

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References

- Bentham, G. (1863). *Flora Australiensis*. Vol. 1. (Reeve and Co.: London.)
- Craven, L.A. & Dunlop, C.R. (1992). A taxonomic revision of *Pachynema* (Dilleniaceae). *Australian Systematic Botany* 5: 477–500.
- Department of the Environment (2013). *Australia's bioregions (IBRA)*, IBRA7, Commonwealth of Australia. <http://www.environment.gov.au/topics/land/national-reserve-system/science-maps-and-data/australias-bioregions-ibra#ibra> [accessed 15 January 2015].
- Horn, J.W. (2005). *The phylogenetics and structural botany of Dilleniaceae and Hibbertia Andrews*. PhD thesis. (Duke University: Durham, North Carolina).
- Horn, J.W. (2009). Phylogenetics of Dilleniaceae using sequence data from four plastid loci (*rbcL*, *infA*, *rps4*, *rpl16* intron). *International Journal of Plant Sciences* 170: 794–813.
- Jones, A. (2014). *Threatened and Priority Flora list for Western Australia*. (Department of Parks and Wildlife: Kensington, Western Australia.)
- von Mueller, F. (1871). *Fragmenta Phytographiae Australiae* 7(56): 123.
- Stebbins, G.L. & Hoogland, R.D (1976). Species diversity, ecology and evolution in a primitive angiosperm genus : *Hibbertia* (Dilleniaceae). *Plant Systematics and Evolution* 125:139–154.
- Tucker, S.C. & Bernhardt, P. (2000). Floral ontogeny, pattern formation and evolution in *Hibbertia* and *Adrastaea* (Dilleniaceae). *American Journal of Botany* 87: 1915–1936.
- Weberling, F. (1988). Inflorescence structure in primitive angiosperms. *Taxon* 37: 657–690.
- Western Australian Herbarium (1998–). *FloraBase—the Western Australian Flora*. Department of Parks and Wildlife. <http://florabase.dpaw.wa.gov.au/> [accessed 15 January 2015].