

A taxonomic revision of *Hollandaea* F.Muell. (Proteaceae)

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Summary

Ford, A.J. & Weston, P.H. (2012). A taxonomic revision of *Hollandaea* F.Muell. (Proteaceae). *Austrobaileya* **8**(4): 670–687. The genus *Hollandaea* (Proteaceae) is revised, redescribed and distinguished from its closest relative, the genus *Helicia*. *Hollandaea porphyrocarpa* A.J.Ford & P.H.Weston and *H. diabolica* A.J.Ford & P.H.Weston are newly described, illustrated and diagnosed from related species. Notes on habitat, distribution, and conservation status for all four species of *Hollandaea* are provided. A key to the species of *Hollandaea* is presented.

Key Words: Proteaceae, *Hollandaea*, *Hollandaea diabolica*, *Hollandaea porphyrocarpa*, *Hollandaea riparia*, *Hollandaea sayeriana*, Australia flora, Queensland flora, taxonomy, identification key, new species

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Introduction

Hollandaea F.Muell. is a genus of four species that is endemic to Australia (Cooper & Cooper 2004) with all species being confined to the Wet Tropics area of north eastern Queensland. The name *Hollandaea* first appeared in the literature in April 1887 (Anon. 1887) prior to its formal publication in June 1887 (Mueller 1887), being noted in a report of a meeting at which Mueller exhibited specimens and indicated his intention to publish.

Hollandaea sayeriana (F.Muell.) L.S.Sm. was originally described as *Helicia sayeriana* F.Muell. by Mueller (1886). The following year, as outlined above, Mueller erected *Hollandaea* and transferred *Helicia sayeriana* to it, as *H. sayeri* F.Muell. (Mueller 1887). Unfortunately, this species name was illegitimate because the specific epithet was nomenclaturally superfluous when published. Bailey (1899) described *Hollandaea lamingtoniana* F.M.Bailey which appeared as such in *The Queensland Flora* (Bailey 1901), but was rightly transferred to *Helicia* Lour. by Smith (1952), who attributed the new combination to C.T.White. Engler (1888) overlooked or was unaware of these taxa in

his treatment of the Proteaceae and Smith (1956) made the legitimate combination *H. sayeriana*. *Hollandaea* became accepted as a distinct monotypic genus (see e.g. Johnson & Briggs 1963; Venkata Rao 1971; Johnson & Briggs 1975), differing from all other genera of Proteaceae in producing a follicular fruit containing numerous wingless seeds.

Johnson & Briggs (1963: 42) placed *Hollandaea* in the subfamily *Grevilleoideae* Engl. as a genus incertae sedis on the grounds that it "... shows little advancement from the primitive Grevilleoid condition, except perhaps in its undivided leaves, thick wingless seeds with obliquely arranged cotyledons, fully adnate filaments, and bright pink flowers (crimson in bud), which do not, however, show any particular structural adaptation to ornithophily". By "primitive Grevilleoid condition" they meant a hypothetical ancestral suite of states including follicular fruits containing numerous, winged seeds, the production of pseudoracemose inflorescences bearing lateral pairs of actinomorphic flowers and a haploid chromosome number of $n = 14$. Venkata Rao (1971) agreed with Johnson & Briggs in placing *Hollandaea* in subfamily *Grevilleoideae* and placed it in his tribe *Telopeae* Venk.Rao on the basis of its multiple

ovules and follicular fruit. Moreover, he placed *Hollandaea*, together with *Knightia* R.Br. and *Darlingia* F.Muell., in the (nomenclaturally invalid) new subtribe *Hollandinae* Venk.Rao. Venkata Rao's *Telopeae* was considered by Johnson & Briggs (1975) to be polyphyletic, as it included parts of their tribes *Embothrieae* L.A.S.Johnson & B.G.Briggs, *Knightieae* L.A.S.Johnson & B.G.Briggs and *Helicieae* L.A.S.Johnson & B.G.Briggs. They argued (Johnson & Briggs 1975: 108) that *Hollandaea* had been shown by their studies to be "more probably a member of the Helician branch of the subfamily" and that it shared "only primitive characters with Knightieae or Embothrieae". Johnson & Briggs' tribe *Helicieae* included *Hollandaea* in its own subtribe, *Hollandaeinae* L.A.S.Johnson & B.G.Briggs, as well as *Triunia* L.A.S.Johnson & B.G.Briggs in the monotypic subtribe *Triuniinae* L.A.S.Johnson & B.G.Briggs and two other genera, *Xylomelum* Sm. and *Helicia*, in the subtribe *Heliciinae* L.A.S.Johnson & B.G.Briggs. These four genera were grouped together on the basis of the putatively synapomorphic loss of divided pre-adult leaves, a character state that is found in numerous other genera of *Grevilleoideae*. These other genera were placed by Johnson & Briggs in other tribes on the basis of other putative synapomorphies.

Hollandaea remained a monotypic genus until Hyland (1995) added a second species, describing the highly restricted *Hollandaea riparia* B.Hyland from the Roaring Meg Creek area, south of Cooktown. This species was sampled, along with species of 45 other genera, in the first published molecular phylogenetic analysis of the Proteaceae (Hoot & Douglas 1998). Hoot and Douglas' analysis included genera that had been proposed by Venkata Rao (1971 – *Knightia*) and Johnson & Briggs (1975 – *Helicia*, *Xylomelum*, *Triunia*) to be closely related to *Hollandaea* and showed very strongly (100% bootstrap support) that the sister group of *Hollandaea* is *Helicia*, contrary to all previous classifications. The relationships of this clade were unresolved, forming part of a polytomy of 11 lineages that together constituted the *Grevilleoideae* in their best estimate of relationships (Hoot

& Douglas 1998: 309: figure 2). The grouping of *Hollandaea* and *Helicia* as sister taxa was also found by Weston & Barker (2006) in their supertree analysis of the results of published and unpublished molecular phylogenies of the Proteaceae. They recognised this clade as the subtribe *Heliciinae*, one of four subtribes plus four ungrouped genera in the tribe *Roupaleae* Meisn. in their new classification of the Proteaceae. Monophyly of the *Roupaleae* is poorly supported as is resolution of its internal relationships. Conflicting evidence from different molecular data sets has prevented identification of the sister group of the *Heliciinae* with confidence: *rbcL* cpDNA sequences strongly group *Helicia* and *Hollandaea* with *Knightia* (Barker et al. 2007) but this putative relationship is not corroborated by analyses of other chloroplast loci (Hoot & Douglas 1998) nor by analysis of ITS nuclear ribosomal DNA sequences (Weston & Barker 2006). A supermatrix analysis of the Proteaceae conducted by Sauquet *et al.* (2009), using all available DNA sequences (1 nuclear and 7 chloroplast regions) and phylogenetic analyses using both Bayesian probability and maximum parsimony criteria, again grouped *Helicia* with *Hollandaea* as a clade, with a posterior probability of 1.0 and 100% parsimony bootstrap support. In this analysis, the sister group of the *Heliciinae* was resolved as the monotypic genus *Megahertzia* A.S.George & B.Hyland, with a posterior probability of 0.99 but parsimony bootstrap support of only 59%.

Weston & Barker's (2006) subtribe *Heliciinae* is characterised morphologically by the possession of anatropous ovules that develop, on fertilization, into thick, unwinged seeds. These states are found elsewhere in the tribe *Roupaleae*. *Xylomelum* has anatropous ovules and *Triunia* has fleshy and unwinged seeds (Weston 2006). Detailed analysis of the distribution of these character states in the Proteaceae is needed to determine which, if either, of them is synapomorphic for the *Heliciinae*.

Hollandaea and *Helicia* are distinguished morphologically from one another by their ovary, fruit and seed morphology (Foreman

1995; Hyland 1995). The ovary of *Hollandaea* contains ovules borne in an oblique orientation from lateral placentae. Until now, *Hollandaea* has been characterised as consistently having four or more ovules per ovary but this now needs to be amended, as the here-described *Hollandaea diabolica* has 2–4 ovules. On fertilization, these develop into angular seeds that are released at maturity from a follicular fruit. The ovary of *Helicia* contains two erect ovules borne from basal placentae. On fertilization, one (or rarely both) of these develops into a globose to ovoid or ellipsoid seed (hemispherical to hemielliptical if both ovules develop), enclosed within an indehiscent (drupaceous or dry) fruit. Outgroup comparisons with other members of the tribe *Roupaleae* and with its sister group (tribe *Banksieae* Dumort. plus *Sphalmium* B.G.Briggs, B.Hyland & L.A.S.Johnson according to Weston & Barker [2006]) suggest that indehiscent fruit may be a synapomorphy for *Helicia*. Johnson & Briggs (1975) assumed that numerous ovules per carpel is plesiomorphous for the Proteaceae as a whole and for all subgroups that include multiovulate taxa. According to this interpretation, reduction to two ovules would also be a synapomorphy for *Helicia*. However, outgroup comparison suggests the possibility that multiple ovules might be more parsimoniously interpreted as a synapomorphy for *Hollandaea*.

In the early 1990s two new proteaceous taxa were observed and collected from the vicinity of a walking track on the Main Coast Range near Mossman, north-east Queensland. Significantly, one of these taxa (described below as *Hollandaea diabolica* A.J.Ford & P.H.Weston) was investigated by Carpenter (1994) for leaf cuticle morphology. In his opinion, “cuticular morphology.... indicates that this taxon cannot be aligned with any described genus, although it is most likely to be allied to *Helicieae*”. Since that time, additional specimens have been collected and new locations of each species have been documented. The currently accepted morphological circumscription of *Hollandaea* includes one of these taxa and needs to be

modified only minimally, by expanding the range of ovule numbers to 2–20, to encompass the other. Both taxa are described below as new species of *Hollandaea*.

Materials and methods

The study is based upon examination of herbarium material from BRI, CNS and NSW with field observations by the first author. All specimens cited have been seen by one or both authors.

Measurements of the floral parts and fruits of *Hollandaea* are based on material preserved in 70% ethanol. Common abbreviations in the specimen citations are: dbh (diameter at breast height), E.P. (Experimental Plot), L.A. (Logging Area), N.P.R. (National Park Reserve), S.F.R. (State Forest Reserve) and T.R. (Timber Reserve).

Estimates of extent of occurrence *sensu* IUCN (2001) were derived from validation of original collection localities. These data points were loaded into ESRI ArcView 3.2 and the draw polygon feature used to calculate the area between the points. Area of occupancy estimates were derived from a digital Regional Ecosystem map together with the first author’s knowledge of vegetation types and habitats within the Wet Tropics bioregion (hereafter referred to as the Wet Tropics) (Environment Australia 2005). These estimates are not strictly RE driven, therefore they possibly represent a relatively more accurate picture of occurrence and occupancy.

Species names in the distribution and habitat notes are those that are currently accepted by the Queensland Herbarium (BRI).

The abbreviation RE in the distribution and habitat notes refers to Regional Ecosystem, descriptions of which can be viewed at: www.derm.qld.gov.au/wildlife-ecosystem/biodiversity/regional_ecosystems/index.php

NCA is an abbreviation for the Queensland Nature Conservation Act (1992) and its associated schedules. Discussions of conservation status are made in reference to the criteria of the IUCN (2001).

Species are arranged alphabetically. Suggested affinities between species are indicated in the *Affinities* section for each taxon.

Character phylogenies of qualitative morphological characters were reconstructed by mapping them onto a phylogenetic tree of proteaceous genera (Sauquet *et al.* 2009) using the parsimony option in Mesquite version 2.75. The following characters (and their states) were analysed in this way: trichome morphology (basifixed or medifixed), ovule form (anatropous, hemitropous or orthotropous); ovule number (two, more than two), ovule placentation (basal, lateral, apical), micropyle orientation (micropyle pointing towards base of locule or pointing obliquely across locule), cotyledon thickness (laminar or fleshy), seed wing (absent or present).

Character phylogenies

The four character states that diagnose the subtribe *Heliciinae* from other members of the tribe *Roupaleae* – possession of medifixed trichomes, anatropous ovules, fleshy cotyledons, and unwinged seeds were all resolved unequivocally as synapomorphies for the *Heliciinae* on the tree of Sauquet *et al.* (2009). Of the character states distinguishing *Hollandaea* from *Helicia*, multiple ovules was resolved as synapomorphic for *Hollandaea* and indehiscent fruit as synapomorphic for *Helicia*.

Taxonomy

Hollandaea F.Muell., *Australas. Chem. Druggist* 2(6): 173 (June 1887). **Type:** *H. sayeriana* (F.Muell.) L.S.Sm.

Derivation of name: Named after Sir Henry Thurston Holland, first Viscount Knutsford (1825–1914), Secretary of State for the Colonies between 1887 and 1892.

Single or multistemmed trees or large shrubs. Trichomes medifixed. Bark compact and close, usually inconspicuously lenticellate, lacking any significant features. Leaves alternate, spirally inserted, simple; seedlings lacking cataphylls; juvenile leaves unlobed, prominently toothed or rarely entire; adult

leaves entire or inconspicuously toothed, venation brochidodromous, primary venation conspicuous on both surfaces, secondary venation discernible, tertiary venation discernible. Petioles swollen, pulvinate. Conflorescence an elongated unbranched raceme of flower pairs, lateral, cauliflorous, ramiflorous or borne just proximal to the lowest/oldest leaves, usually pendulous, composed of 54–224 flowers; each flower pair subtended by a scale-like bract (common bract); common peduncle present. Flowers bisexual, pedicellate on common peduncle, hypogynous. Floral bract conspicuous, inserted variously along pedicel. Perianth actinomorphic, differentiated into a narrow basal claw and clavate apical limb in mature bud; tepals 4, not connate, glabrous adaxially, glabrous or hairy abaxially, splitting with individual tepals coiling and reflexed at anthesis, caducous following anthesis. Stamens 4, equal; filaments adnate to tepals; anthers 2-locular, with a distinct mucro, dehiscing introrsely through longitudinal slits. Hypogynous glands 4, free or connate, fleshy. Gynoecium glabrous; ovary sessile, ovules anatropous, obliquely oriented, 2–20; placentae lateral; style straight; tip clavate, functioning as a pollen presenter; stigma terminal. Fruit dehiscent, follicular, usually asymmetrical; style persistent. Seeds fleshy, unwinged, usually angular, 1–20 per fruit, testa thin. Germination usually hypogeal. Cotyledons fleshy. $2n = 28$

Distribution: Endemic to the Wet Tropics, Queensland, Australia; four species.

Key to the species of *Hollandaea*

The following key allows for both flowering and fruiting specimens. (See Cooper & Cooper 2004: 414, 415 for exquisite fruit illustrations).

- 1 Flowers present 2
- 1. Fruit present 5
- 2 Tepal abaxial surface clothed in medifixed hairs 3
- 2. Tepal abaxial surface glabrous 4
- 3 Leaf base cuneate, confluence axis > 150 mm long 4. *H. sayeriana*
- 3. Leaf base attenuate, confluence axis < 110 mm long 2. *H. porphyrocarpa*
- 4 Leaf margin recurved, leaf apex obtuse to retuse, confluence axis hairy, tepals creamish, yellowish or with green hue 1. *H. diabolica*
- 4. Leaf margin flat, leaf apex obtuse to acute, confluence axis glabrous, tepals purplish or purple with blue-green hue 3. *H. riparia*
- 5 Fruit surface sculptured 6
- 5. Fruit surface smooth 7
- 6 Fruit smoothly (and shallowly) wrinkled to the touch, seeds 14–20 mm long, leaf apex acute-obtuse 3. *H. riparia*
- 6. Fruit roughly (and deeply) wrinkled to the touch, seeds 22–25 mm long, leaf apex retuse-obtuse 1. *H. diabolica*
- 7 Fruit green when ripe, > 60 mm long 4. *H. sayeriana*
- 7. Fruit purple when ripe, < 50 mm long 2. *H. porphyrocarpa*

1. *Hollandaea diabolica* A.J.Ford & P.H.Weston, **species nova**. Distinguished from *H. riparia* by fruit shape ($\pm$ equidimensional versus longer than wide), seed size (22–25 mm versus 14–20 mm), leaf apex (obtuse-retuse versus obtuse-acute), leaf length:width ratio (<3.6:1 versus >4:1), tepal colour (creamish or yellowish versus purplish) and ovule number (2–4 versus 6–8). **Typus:** Queensland. COOK DISTRICT: Pinnacle Rock Track [Daintree National Park, NW of Mossman], 1 February 1996, B. Hyland 25914RFK (holo: BRI; iso: CNS, NSW).

Proteaceae sp. ‘Devils Thumb’; Carpenter (1994: 291, 292).

Orites sp. (Pinnacle Rock Track WWC 867); Hyland et al. (2003).

Hollandaea sp. (Devils Thumb); Cooper & Cooper (2004: 414).

Hollandaea sp. (Devils Thumb P.I.Forster+ PIF10720); Forster & Edginton (2007: 171; 2010: 165).

Illustrations: Cooper & Cooper (2004: 414) as *Hollandaea* sp. (Devils Thumb); Hyland et al. (2003) as *Orites* sp. (Pinnacle Rock Track WWC 867).

Single stemmed canopy or subcanopy trees to 25 m high, with trunk diameters to 50 cm dbh recorded; buttresses absent. Bark nondescript. Terminal and axillary buds clothed in dark brown, minute, medifixed hairs. Branchlets initially somewhat angled and sparsely clothed in mostly pale-coloured minute medifixed hairs, becoming terete and glabrous. Seedlings: first leaves sub-opposite, toothed, stem hairy. Juvenile leaves simple, unlobed, prominently toothed. Leaves alternate, petiolate, discolourous, dull or slightly shiny on adaxial surface and very pale ($\pm$ pruinose) on abaxial surface; lamina elliptic to elliptic-obovate, 69–155 $\times$ 20–55 mm, base attenuate, apex retuse to obtuse with acumen absent; margin usually recurved; both surfaces glabrous although rare pale-coloured minute medifixed hairs may be present on midvein on adaxial surface; midvein raised on each

surface, more prominent on abaxial surface; venation slightly bullate on adaxial surface, equally conspicuous on both surfaces, primary venation conspicuous on both surfaces with 5–8 primary lateral veins on each side of midvein. Petioles slightly swollen, 3–4 mm long, slightly convex on adaxial surface; glabrous or with rare, minute, dark-coloured medifixed hairs, appearing to be winged and much longer due to the attenuate nature of the leaf base. Conflorescences ramiflorous or just below the lowest/oldest leaves, composed of 54–140 flowers; conflorescence axis 48–120 mm long, weakly angled (not terete), longitudinally striated (when dry), moderately clothed in brown medifixed hairs. Common bracts c. 0.7 mm long, ovate, with mostly marginal hairs. Floral bracts c. 0.5 mm long, ovate, glabrous except for minute pale brown marginal hairs, inserted usually about halfway along pedicel. Pedicels terete, 2.1–3 mm long, sparsely clothed in brown medifixed hairs, paired on a peduncle c. 1 mm long. Tepals 27–33 mm long and clavate at apex in mature bud, splitting distally at first with individual tepals coiling and reflexed at anthesis, apex acute, cream, yellow or greenish, glabrous on abaxial and adaxial surface. Stamens with free filament tips 0.4–0.8 mm long, inserted c. 5 mm from tepal apex; anthers 4–5 mm long (including a blunt appendage/mucro of c. 0.3 mm long). Hypogynous glands free, fleshy. Style 20–24 mm long; pollen presenter 3–4 mm long; ovary 1.9–2.6 mm long, ovules 2–4, placenta marginal. Fruit 40–50 mm diameter, asymmetrical but appearing globose to spherical, deeply wrinkled (with a honeycomb texture), orange-green, leathery on outer surface, woody on inner surface, style persistent. Seeds 1–4 per fruit, 22–25 mm long on the longest axis, usually smooth, testa thin, radicle c. 2 mm long. Germination hypogeal. **Fig. 1.**

Additional specimens examined: Queensland. COOK DISTRICT: Pinnacle Rock Track, 4 km W of Karnak, Jun 1992, *Forster PIF10720 et al.* (BRI, CNS); Pinnacle Rock Track, Feb 1996, *Hyland 25913RFK* (CNS); *loc. cit.*, Feb 1996, *Hyland 25909RFK* (CNS); West of Karnak, via Mossman, Jan 1995, *Cooper 867 & Cooper* (BRI, CNS); *loc. cit.*, Jan 1995, *Cooper 868 & Cooper* (BRI, CNS); Daintree N.P., Pinnacle Rock Track, NW of Mossman, just before the *Gleichenia* area, Oct 2005, *Ford 4747 et al.* (BRI, NSW, CNS); *loc. cit.*, Oct 2005, *Ford 4750 et*

al. (BRI, NSW, CNS); Pinnacle Rock, Whyanbeel, Sep 1991, *Sankowsky 1205* (CNS); East Mulgrave River, Bellenden Ker, Nov 1995, *Jensen 525* (CNS).

Distribution and habitat: *Hollandaea diabolica* is endemic to the Wet Tropics bioregion in north-eastern Queensland, where it is currently known to occur on the eastern fall of the Main Coast Range west of Mossman (see above) and an area on the East Mulgrave River to the south of Mt Bellenden Ker (**Map 1**). On the Main Coast Range it inhabits very wet mountainous notophyll vine-forests/rainforests on soils derived from granite. Here the common canopy species include: *Acmena hemilampra* subsp. *orophila* B.Hyland, *Balanops australiana* F.Muell., *Elaeocarpus* sp. (Mossman Bluff D.G.Fell 1666), *Halfordia kendack* (Montrouz.) Guillaumin, *Planchonella euphlebia* (F.Muell.) W.D.Francis, *Syzygium* spp. and *Sphalmium racemosum* (C.T.White) B.G.Briggs, B.Hyland & L.A.S.Johnson. Common small trees and shrubs include: *Chionanthus axillaris* R.Br., *Haplostichanthus submontanus* Jessup subsp. *submontanus*, *Linospadix minor* (W.Hill) F.Muell., *Oraniopsis appendiculata* (F.M.Bailey) J.Dransf., A.K.Irvine & N.W.Uhl, *Pittosporum rubiginosum* A.Cunn., *Schistocarpha johnsonii* F.Muell., *Steganthera cooperorum* Whiffin, *S. maccooraia* (F.M.Bailey) P.K.Endress and *Symplocos graniticola* Jessup. No floristic assemblage information is available for the East Mulgrave River population. Altitudinal range, from existing specimens, is 450–1000 m.

Hollandaea diabolica has been collected in RE7.12.16a (East Mulgrave and Main Coast Range populations) and 7.12.20 (Main Coast Range population), the former regarded as a very common and widespread community within the Wet Tropics. However, it is very likely that the two populations have different floristic associations as they are on either side of the Black Mountain Corridor (BMC) and several of the species listed above do not occur south of the BMC. Although both *H. diabolica* and *H. porphyrocarpa* occur in RE 7.12.20 they have not yet been recorded as co-occurring.



Fig. 1. *Hollandaea diabolica*. A. branchlet with inflorescences $\times 0.4$. B. paired flowers at anthesis showing floral bracts $\times 3$. C. close up of ovary showing hypogynous glands and floral bract $\times 3$. D. lateral view of fruit with persistent style $\times 1$. A–C from Hyland 25914RFK (CNS); D from Cooper 868 & Cooper (CNS). Del. W.Smith

Phenology: Flowers have been recorded in January and February; fruits have been recorded in January.

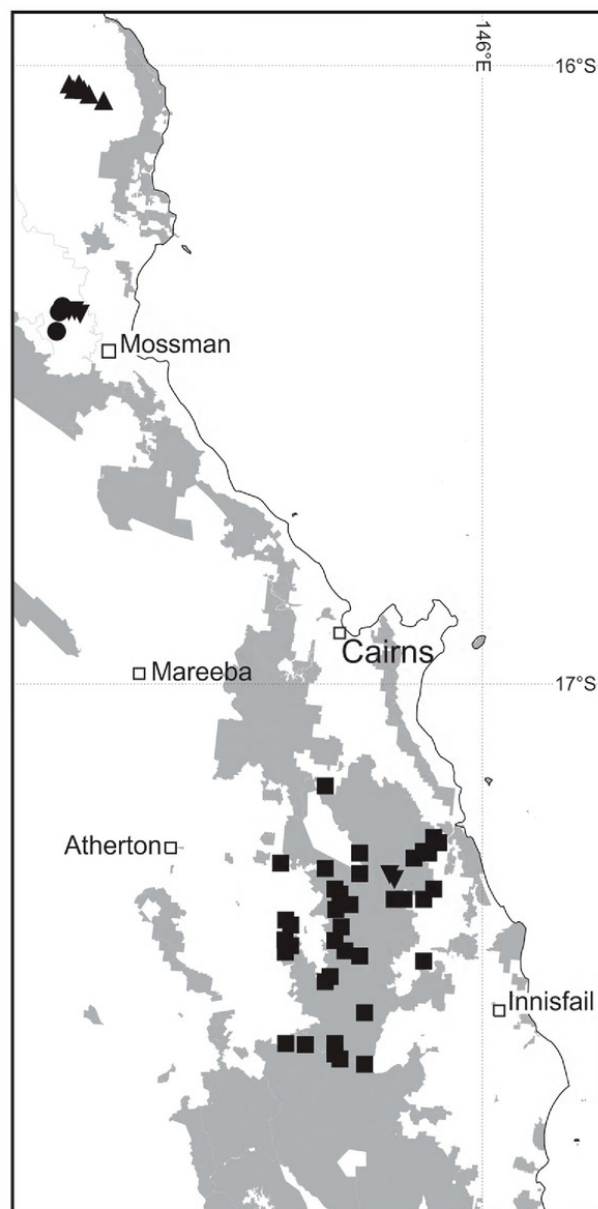
Notes: The woody remains of the fruit are usually conspicuous under mature trees. These remains, and fallen yellowish leaves, are often the only clues that this species is in the area. The perianth is recorded as being creamish to yellow or greenish; the style is pink to mauve and cream at the apex; the ovary is pink and hypogynous glands are yellowish.

Juvenile leaves have an acute-acuminate apex and lack the conspicuous retuse-obtuse apex of adult leaves. With such an apex, seedlings (and saplings) could easily be confused with local glabrous species of *Helicia*.

The East Mulgrave River collections are sterile and no fruit remnants were recorded. Until fertile collections of this population are made to suggest otherwise we have incorporated that population's data into the above descriptions and the following assessment.

Affinities: *Hollandaea diabolica* appears to be most closely related to *H. riparia*, in that they share the features of $\pm$ pruinose abaxial leaf surface, wrinkled/verrucose fruit surface, glabrous abaxial tepal surface and a relatively low ovule number. *H. diabolica* can be distinguished from *H. riparia* on the following features: fruit shape ($\pm$ equidimensional versus longer than wide, respectively), larger seeds (22–25 mm versus 14–20 mm), leaf apex (obtuse-retuse versus obtuse-acute), leaf length:width ratio ($<3.6:1$ versus $>4:1$), usually shorter confluence axis (48–120 mm versus 110–155 mm) and fewer ovules (2–4 versus 6–8). Comparisons between all species of *Hollandaea* are provided in **Table 1**.

Conservation Status: All existing collections have been made within the World Heritage Area of the Wet Tropics bioregion. *Hollandaea diabolica* only occurs in the Daintree and Wooroonooran National Parks. As it has a very disjunct and narrow geographical range, with an extent of occurrence estimated to be



Map 1. Distribution of *Hollandaea* species in north-east Queensland (*H. diabolica* ▼, *H. porphyrocarpa* ●, *H. riparia* ▲, *H. sayeriana* ■)

less than 50 km² and an area of occupancy estimated to be less than 5 km², it is considered at risk at this time. An approximate estimate of the population sizes is not known, but an optimistic guess of less than 100 mature individuals on the Main Coast Range, and perhaps a similar number at the East Mulgrave River is neither conservative nor extravagant. A thorough search of nearby areas is required to determine the population size and structure. Nonetheless, due to the extremely disjunct nature, limited distribution and estimated population sizes we recommend *H. diabolica*

being listed as “Vulnerable” under the IUCN (2001) criteria as it fulfills the criteria under categories VU, D1 and D2.

Etymology: The specific epithet has been formed arbitrarily and comes from the Latin *diabolus*, (devil) in reference to the locality, Devils Thumb.

2. *Hollandaea porphyrocarpa* A.J.Ford & P.H.Weston, **species nova**. Distinguished from *H. sayeriana* by the leaf base (attenuate versus cuneate), fruit size (35–45 mm versus 60–150 mm), confluence axis length (52–103 mm versus 150–380 mm) and anther length (4.5–6 mm versus 2–3.1 mm). **Typus:** Queensland. COOK DISTRICT: Daintree National Park, Pinnacle Rock Track, NW of Mossman, beyond the *Gleichenia* area, 13 October 2005, *A.Ford 4742, W.Cooper & R.Russell* (holo: BRI [2 sheets + spirit]; iso: CNS, K, L, MEL, MO, NSW).

Hollandaea sp. (Pinnacle Rock Track P.I.Forster+ PIF10714); Forster & Edginton (2007: 171; 2010: 165).

Hollandaea sp. (Pinnacle Rock Track PIF10714); Hyland *et al.* (2003).

Hollandaea sp. (Pinnacle Rock Track); Cooper & Cooper (2004: 415).

Illustrations: Cooper & Cooper (2004: 415) as *Hollandaea* sp. (Pinnacle Rock Track); Hyland *et al.* (2003) as *Hollandaea* sp. (Pinnacle Rock Track PIF10714).

Single stemmed canopy or subcanopy trees to 15 m high, with trunk diameters to 20 cm dbh recorded; buttresses absent. Terminal and axillary buds clothed in minute, dark brown hairs. Branchlets terete, glabrous to glabrescent, smooth. Seedlings: cotyledons obovate, 15–17 × 13–17 mm, base sagittate; hypocotyl glabrous, first leaves sub-opposite, toothed, stem hairy. Juvenile leaves prominently toothed with 4–8 teeth on each side. Adult leaves petiolate, discolorous, dull on adaxial and abaxial surfaces; lamina elliptic to elliptic-obovate, 90–157 × 32–60 mm, base attenuate, apex acuminate to acute-acuminate with acumen 3–12 mm long; margin flat or slightly recurved, entire or sparsely denticulate, both surfaces glabrous; midvein

raised on each surface, more prominently so on abaxial surface; faintly 3-veined at base, primary venation conspicuous on both surfaces with 6–10 primary lateral veins on each side of the midvein, equally conspicuous on both surfaces. Petioles swollen, pulvinate, 4–6 mm long, ± terete, glabrous, appearing to be winged and much longer than they are due to the very attenuate shape of the leaf base. Confluences cauliflorous, ramiflorous or just below the lowest/oldest leaves, composed of 58–106 flowers; confluence axis 52–103 mm long, weakly angled (not terete) when dry, densely clothed in pale to mid-brown hairs. Common bracts *c.* 0.9 mm long, lanceolate, with mostly marginal hairs. Common peduncle of flower pair *c.* 2 mm long. Floral bracts triangular to ovate, *c.* 0.7 mm long, glabrous except for minute, pale brown marginal hairs, inserted usually about halfway along pedicel. Pedicels terete, 3–4.5 mm long, clothed in pale brown hairs. Tepals 26–29 mm long in mature bud, splitting proximally at first with individual tepals coiling and reflexed at anthesis, apex acute, pink, moderately clothed on abaxial surface in pale brown hairs, glabrous adaxially. Stamens with free filament tips *c.* 0.4 mm long, inserted *c.* 7 mm from tepal apex; anthers 4.5–6 mm long (including a mucro of *c.* 0.7 mm long). Hypogynous glands connate, fleshy. Style 16–20 mm long; pollen presenter *c.* 5 mm long; ovary 2.5–3 mm long, ovules 12–16, placenta marginal. Fruit leathery (neither fleshy nor woody), 35–45 mm long, *c.* 30 mm diameter, asymmetrical and somewhat hemispherical in shape with one side nearly flat, smooth, purplish, style persistent. Seeds angular, many-faced with the abaxial face convex, 6–9 per fruit, 13–16 mm long on the longest axis, testa thin, radicle *c.* 3 mm long, adaxial surface of cotyledons flat. Germination epigeal to hypogeal (cotyledons usually splitting the testa and forming a distinctive hypocotyl). **Fig. 2.**

Additional specimens examined: Queensland. COOK DISTRICT: Pinnacle Rock Track, 4.5 km W of Karnak, Mossman, Jun 1992, *Forster PIF10714 et al.* (BRI, CNS); Pinnacle Rock Track, Feb 1996, *Hyland 25910RFK* (CNS); Ridges above the Mossman River in the Mossman Gorge, May 1991, *Russell s.n.* (CNS); Pinnacle Rock, Whyanbeel, Sep 1991, *Sankowsky 1206* (CNS); West of

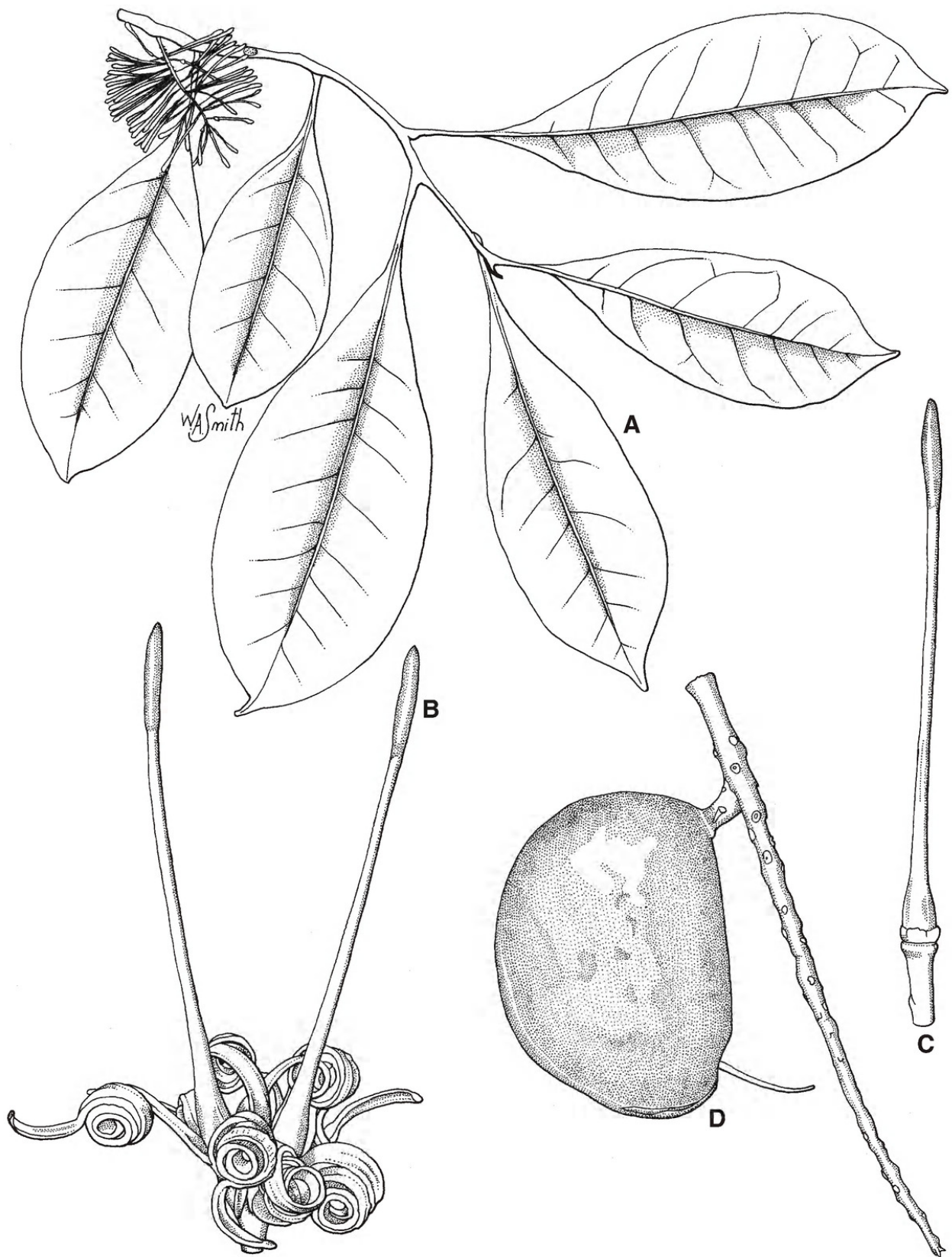


Fig. 2. *Hollandaea porphyrocarpa*. A. branchlet with inflorescences $\times 0.4$. B. paired flowers at anthesis $\times 3$. C. close up of ovary showing hypogynous glands and floral bract $\times 3$. D. lateral view of fruit with persistent style $\times 1$. A–C from Ford 4742 et al. (BRI); D from Cooper 865 & Cooper (CNS). Del. W. Smith

Karnak, via Mossman, Dec 1994, *Cooper 865 & Cooper* (BRI, CNS); Daintree N.P., Pinnacle Rock Track, NW of Mossman, beyond the Gleichenia area, Oct 2005, *Ford 4745, Cooper & Russell* (BRI, CNS, NSW).

Distribution and habitat: *Hollandaea porphyrocarpa* is endemic to the Wet Tropics bioregion in north-eastern Queensland, where it is currently known to occur on the eastern fall of the Main Coast Range west of Mossman (**Map 1**). This area is locally known as either “Devils Thumb” or “Pinnacle Rock”. It inhabits very wet mountainous notophyll to microphyll vine-forests or vine-fern thickets/rainforests on soils derived from granite. Common canopy species include: *Cryptocarya corrugata* C.T.White & W.D.Francis, *Elaeocarpus elliffii* B.Hyland & Coode, *Halfordia kendack*, *Myrsine oreophila* Jackes, *Niemeyera* sp. (Mt Lewis A.K.Irvine 1402) and *Sphalmium racemosum*. Common small trees and shrubs include: *Ardisia pachyrrhachis* (F.Muell.) F.M.Bailey, *Austromuelleria valida* B.Hyland, *Baloghia parviflora* C.T.White, *Catalepidia heyana* (F.M.Bailey) P.H.Weston, *Chionanthus axillaris*, *Pittosporum rubiginosum*, *Psychotria* spp., *Stegantthera cooperorum*, *Triunia montana* (C.T.White) Foreman and *Wendlandia connata* C.T.White. Conspicuous understory species include: *Cyathea rebecca* (F.Muell.) Domin, *Linospadix apetirolata* Dowe & A.K.Irvine and *Morinda podistra* Halford & A.J.Ford. Altitudinal range, from existing specimens, is 1000–1090 m.

Hollandaea porphyrocarpa has only been collected in RE7.12.20.

Phenology: Flowers have been recorded in May, June, September and October; fruits have been recorded in December.

Notes: The commonly recorded cauliflorous inflorescences make this species unmistakable in the field. This is one of only three proteaceous species in the tropical rainforests of northern Queensland to have this feature.

The perianth is rosy pink in bud and at anthesis; the style is violet at the base and the apex, whilst the mid sections are white; hypogynous glands are creamish yellow and the ovary is purple. New leafy growth is

recorded as being green.

The flowers have a slight sweet scent and Bridled Honeyeaters (*Lichenostomus frenatus* (Ramsay)) have been observed visiting them.

Affinities: *Hollandaea porphyrocarpa* appears to be most closely related to *H. sayeriana*, in that they share a smooth fruit surface, abaxial tepal surface clothed in medifixed hairs and a relatively high ovule number. *H. porphyrocarpa* can be distinguished from *H. sayeriana* on the following features: leaf base (attenuate versus cuneate, respectively), smaller fruit (35–45 mm versus 60–150 mm), smaller seeds (13–16 mm versus [12–] 20–30 mm), shorter confluence axis (52–103 mm versus 150–380 mm) and longer anthers (4.5–6 mm versus 2–3.1 mm). Comparisons between all species of *Hollandaea* are provided in **Table 1**.

Conservation status: All existing collections have been made within the World Heritage Area of the Wet Tropics bioregion. *Hollandaea porphyrocarpa* has only been collected in one mountainous area, mostly along a walking track, within the Daintree National Park, west of Mossman. It has a very narrow geographical range, from the Pinnacle Rock Track area south towards the Mossman River (R. Russell, personal communication, 2006), with an extent of occurrence estimated to be less than 30 km² and an area of occupancy estimated to be less than 15 km² and is considered at risk at this time. An estimate of the size of the single population is not known, but an optimistic guess of less than 300 mature individuals is not extravagant. A thorough search to cover areas away from the walking track is necessary to gain a better understanding of the population size and structure. Nonetheless, due to the extremely narrow distribution and estimated population size we would recommend *H. porphyrocarpa* being listed as “Vulnerable” under the IUCN (2001) as it fulfills the criteria under categories VU, D1 and D2.

Etymology: The specific epithet is derived from the Greek *porphyreos* (purple, dark red) and *carpos* (fruit) and alludes to the unique purple-coloured fruit of this species.

3. *Hollandaea riparia* B.Hyland, *Fl. Australia* 16: 499 (1995). **Type:** Queensland. COOK DISTRICT: Timber Reserve 165, Baird Logging Area, Qld, 22 September 1980, B.Hyland 10626 (holo: CNS; iso: BRI; CANB *n.v.*).

Illustrations: Cooper & Cooper (2004: 414); Hyland (1995: Fig. 139); Nicholson & Nicholson (2000: 38); Hyland *et al.* (2003).

Single or usually multistemmed large shrubs or small trees 4–6 m high, with trunk diameters to 15 cm dbh recorded; buttresses absent. Bark nondescript. Terminal and axillary buds clothed in dark brown, minute medifixed hairs. Branchlets initially slightly angled to terete and glabrous, the angled branchlets becoming terete. Seedlings: cotyledons with peltate base; first leaves alternate, toothed; stem hairy. Juvenile leaves simple, unlobed, prominently to sparsely toothed (or rarely entire). Leaves alternate, petiolate, discolorous, dull or slightly shiny on adaxial surface and very pale to pruinose on abaxial surface; lamina narrow-elliptic or oblong to oblanceolate-obovate, 71–205 × 12–39 mm, base attenuate, apex obtuse-acute with acumen absent; margin flat when fresh and slightly recurved when dry; both surfaces glabrous with occasional dark-coloured medifixed hairs present on midvein on abaxial surface; midvein raised on each surface, more prominent on abaxial surface; venation equally conspicuous on both surfaces, primary venation conspicuous on both surfaces with 6–9 primary lateral veins on each side of midvein. Petioles slightly swollen, 0.5–3 mm long, ± flat on adaxial surface, glabrous or with very rare minute, dark coloured medifixed hairs, appearing to be winged and much longer due to the extremely attenuate nature of the leaf base. Conflorescences ramiflorous or just below the lowest/oldest leaves, composed of 130–198 flowers; conflorescence axis 110–155 mm long, weakly angled (not terete), longitudinally striated (when dry), glabrous. Common bracts narrow-ovate, *c.* 0.8 mm long, glabrous except for one or two long hairs at apex. Floral bracts ovate-lanceolate, *c.* 0.7 mm long, glabrous except for one or two minute hairs at the apex,

inserted at base or apex of pedicel. Pedicels terete, 1.9–2.2 mm long, glabrous, paired on a peduncle *c.* 1 mm long. Tepals 28–32 mm long and clavate at apex in mature bud, splitting proximally at first with individual tepals coiling and reflexed at anthesis, apex acute, purplish to purple-green-bluish, glabrous on abaxial and adaxial surface. Stamens with filaments 0.1–0.3 mm long, inserted *c.* 6 mm from tepal apex; anthers 5.5–6 mm long (including a blunt appendage/mucro of *c.* 0.6 mm long). Hypogynous glands free, the apex with a fringe of finger-like papillae, fleshy. Style 21–25 mm long; pollen presenter 3.2–4.3 mm long; ovary 2.2–2.6 mm long, ovules 6–8, placenta marginal. Fruit leathery on both surfaces, 25–50 mm long × 22–26 mm diameter, asymmetrical, semi-discoid (appearing “half-moon” shaped in side view), deeply wrinkled (verrucose), green and pruinose, style persistent. Seeds smooth or angular, 2–8 per fruit, 14–20 mm long on the longest axis, testa thin, radicle *c.* 1.2 mm long. Germination hypogeal. **Fig. 3.**

Additional specimens examined: Queensland. COOK DISTRICT: Roaring Meg Creek, Oct 1984, *Sankowsky s.n.* (CNS); T.R. 165 Roaring Meg Creek, Apr 1997, *Ford 1887* (BRI, CNS); *loc. cit.*, Nov 1996, *Ford 1808* (BRI, CNS); T.R. 165 Alexandra L.A., Jun 1977, *Hyland 9390* (CNS); T.R. 165 Noah Alexandra L.A., Roaring Meg Creek, Oct 1997, *Ford 2002* (CNS); T.R. 106 Parish of Noah Baird L.A., Roaring Meg Creek, Jul 1997, *Hyland 26019RFK* (CNS); *loc. cit.*, Jul 1997, *Hyland 26020RFK* (CNS).

Distribution and habitat: *Hollandaea riparia* is endemic to the Wet Tropics bioregion in north-eastern Queensland, where it is currently only known to occur as a rheophyte in the Roaring Meg Creek catchment (south of Cooktown) (**Map 1**). It inhabits the riparian zone of creek sides in notophyll-mesophyll vine-forests/rainforests on alluvial soils derived from granite. The dominant canopy species is *Xanthostemon chrysanthus* (F.Muell.) F.Muell. ex Benth. Other canopy species include *Acmena hemilampra* (F.Muell. ex F.M.Bailey) Merr. & L.M.Perry subsp. *hemilampra*, *Blepharocarya involucrigera* F.Muell., *Buckinghamia ferruginiflora* Foreman & B.Hyland, *Gymnostoma australiana* L.A.S.Johnson, *Ormosia ormondii* (F.Muell.) Merr. and *Tristanopsis*



Fig. 3. *Hollandaea riparia*. A. branchlet with inflorescences $\times 0.4$. B. paired flowers at anthesis showing floral bracts $\times 3$. C. close up of ovary showing hypogynous glands and floral bract $\times 3$. D. lateral view of fruit with persistent style $\times 1$. A–C from Ford 1887 (CNS); D from Ford 2002 (CNS). Del. W. Smith

exiliflora (F.Muell.) Peter G.Wilson & J.T.Waterh. Common small trees and shrubs include *Acronychia acronychioides* (F.Muell.) T.G.Hartley, *Chionanthus ramiflorus*, *Choriceras majus* Airy Shaw, *Diospyros* sp. (Baird LA B.P.Hyland 9374), *Dinghousia globularis* (Ding Hou) R.H.Archer and *Phyllanthus brassii* C.T.White. Altitudinal range, from existing specimens, is 250–350 m.

Hollandaea riparia has been collected in RE7.3.49a (usually) and 7.3.10a (rarely).

Phenology: Flowers have been recorded in April and June; fruits have been recorded from September to November.

Notes: The perianth is recorded as purplish to purple-green-bluish; the style is pale pink to pink-purple; the ovary is pink and hypogynous glands are yellowish. Juvenile leaves and adult leaves are similar.

Affinities: *Hollandaea riparia* appears to be most closely related to *H. diabolica* in that they share the features of $\pm$ pruinose abaxial leaf surface, wrinkled/verrucose fruit surface, glabrous abaxial tepal surface and a relatively low ovule number. *H. riparia* can be distinguished from *H. diabolica* on the following features: fruit shape (longer than wide versus $\pm$ equidimensional, respectively), smaller seeds (14–20 mm versus 22–25 mm), leaf apex (obtuse-acute versus obtuse-retuse), leaf length:width ratio ($>4:1$ versus $<3.6:1$), usually longer conflorescence axis (110–155 mm versus 48–120 mm) and more ovules (6–8 versus 2–4). Comparisons between all species of *Hollandaea* are provided in **Table 1**.

Conservation Status: All existing collections have been made within the World Heritage Area of the Wet Tropics bioregion within Timber Reserve 165. Currently, *Hollandaea riparia* is listed under the *NCA* as *Vulnerable*. It has a very narrow geographical range, with an extent of occurrence estimated to be less than 20 km² and an area of occupancy estimated to be less than 5 km², and is considered at risk at this time. An approximate estimate of the population sizes is not known, but an optimistic guess of less than 300 mature individuals is neither conservative

nor extravagant. Nonetheless, due to the extremely limited distribution and estimated population sizes we agree that *H. riparia* be listed as “Vulnerable” under the IUCN (2001) as it fulfills the criteria under categories VU D1 and D2.

Etymology: The specific epithet is derived from the Latin word *riparius* (the bank of a stream) and alludes to the habitat of this species.

4. *Hollandaea sayeriana* (F.Muell.) L.S.Sm., *Proc. Roy. Soc. Queensland* 67: 39 (1956); *Helicia sayeriana* F.Muell., *Vict. Naturalist* 3: 93 (1886); *Hollandaea sayeri* F.Muell., *Australas. Chem. Druggist* 2: 173 (1887), *nom. illeg.* **Type:** Queensland. COOK DISTRICT: Mt Bellenden Ker, *s.dat.*, *W.Sayer s.n.* (holo: MEL).

Illustrations: Williams (1984: 159); Wrigley & Fagg (1991: 404); Nicholson & Nicholson (1994: 41); Hyland (1995: 392); Hyland *et al.* (2003); Cooper & Cooper (2004: 415).

Single-stemmed subcanopy trees to 17 m high, with trunk diameters to 30 cm dbh recorded (but usually much less); buttresses absent. Bark nondescript. Terminal and axillary buds clothed in minute, dark brown medifixed hairs. Branchlets initially slightly angled and clothed in minute red-brown medifixed hairs, becoming terete and glabrous, smooth. Seedlings: first leaves alternate; toothed, stem hairy. Juvenile leaves simple, unlobed, prominently toothed. Leaves alternate, petiolate, discolorous, dull on adaxial and abaxial surfaces, the abaxial surface pale lime-green; lamina broadly elliptic to obovate, 90–260 $\times$ (52–)90–171 mm, base cuneate, apex acute-obtuse to acuminate with acumen to 8 mm long; margin flat or slightly recurved, denticulate or rarely entire; abaxial surface glabrescent; midvein raised on each surface, more prominent on abaxial surface, on adaxial surface the midvein is raised proximally and depressed distally; venation equally conspicuous on both surfaces, primary venation conspicuous on both surfaces with 7–10 primary lateral veins on each side of the midvein. Petioles swollen, pulvinate, 2–7 mm long, $\pm$ terete,

glabrescent. Conflorescences ramiflorous or just below the lowest/oldest leaves, composed of 92–224 flowers; confluence axis 150–380 mm long, angled (not terete) when dry, densely clothed in dark brown, medifixed hairs. Common bracts lanceolate, 0.8 mm long, with mostly marginal hairs. Floral bracts lanceolate to ovate, *c.* 0.7 mm long, glabrous except for minute, dark brown marginal hairs, inserted in lower half of pedicel (and usually near base of pedicel). Pedicel terete, 2.9–3.5 mm long, clothed in dark brown medifixed hairs, paired on a peduncle *c.* 1 mm long. Tepals 20–26 mm long and clavate at apex in mature bud, splitting proximally at first with individual tepals coiling and reflexed at anthesis, apex acute, pink, moderately clothed on abaxial surface with hairs as for pedicels, glabrous adaxially. Stamens with free filament tips up to *c.* 0.1 mm long, inserted *c.* 5 mm from tepal apex; anthers 3.1–3.9 mm long (including a mucro of *c.* 0.4 mm long). Hypogynous glands connate, the apex with a fringe of globose papillae, fleshy. Style 17–21 mm long; pollen presenter *c.* 2 mm long; ovary 2.6–3.1 mm long, ovules 12–20, placenta marginal. Fruit leathery (neither fleshy nor woody), 60–150 mm long, 21–43 mm diameter, asymmetrical and somewhat ellipsoidal in shape with one side nearly flat, smooth, green, style persistent. Seeds angular to hemispherical or shortly cylindrical, often many-faced with the abaxial face convex, 3–20 per fruit, 12–30 mm long on the longest axis, testa thin, radicle 1–2 mm long, adaxial surface of cotyledons flat. Germination hypogeal. *Sayers's silky oak*.

Additional selected specimens examined: Queensland.

COOK DISTRICT: Cucania, Apr 1948, *Stephens 12344* (CNS); Bellenden Ker bottom cable station, May 1996, *Gray 6725* (CNS); The Boulders, on walk to lookout, 7 km (by road) west of Babinda, Jun 1992, *Conn 3635* (BRI, CNS, MEL, NSW); The Boulders, Babinda, Mar 1980, *Jago (R.L.) 415* (CNS); Weinert's Creek Babinda, May 1978, *Jago (R.L.) 89* (CNS); N.P.R. 226, Bellenden Ker, junction of Windin Falls road and Bartle Frere road, Apr 1995, *Jensen 218* (CNS); Old Boonjee road, May 1981, *Foreman 103* (CNS); S.F.R. 310, Windin L.A., Nov 1987, *Hyland 25216RFK* (CNS); *loc. cit.*, May 1982, *Gray 2551* (CNS); Topaz road, Apr 1974, *Stocker 1158* (BRI, CNS); Towalla road, Towalla, May 1993, *Cooper 534 & Cooper* (CNS); S.F.R. 755 Boonjee L.A., Apr 1972, *Hyland 5935* (BRI, CNS); S.F.R. 755, Gosschalk L.A., E.P./34, Nov 1976, *Unwin 125* (CNS); S.F.R. 755,

Badgery L.A., Nov 1981, *Hyland 11272* (CNS); Henrietta Creek, Palmerston Highway, Jan 1993, *Cooper 479 & Cooper* (CNS); T.R. 1244 Palmerston, Mar 1979, *Gray 1316* (CNS); S.F.R. 756, Maalan L.A., Jan 1979, *Dansie 20138* (CNS).

Distribution and habitat: *Hollandaea sayeriana* is endemic to the Wet Tropics bioregion in north-eastern Queensland, where it is currently known to occur between Mt Bellenden Ker (south of Cairns) and the Innisfail area, including the eastern edge of the Atherton Tableland (**Map 1**). It inhabits very wet mesophyll to (rarely) notophyll vine-forests/rainforests on soils derived from basalt, granite and fine grained metasediments (mudstones). Common canopy species throughout its range include *Alstonia scholaris* (L.) R.Br., *Backhousia bancroftii* F.M.Bailey & F.Muell. ex F.M.Bailey, *Beilschmiedia bancroftii* (F.M.Bailey) C.T.White, *Cardwellia sublimis* F.Muell., *Cryptocarya oblata* F.M.Bailey, *Elaeocarpus ruminatus* F.Muell., *Endiandra bessaphila* B.Hyland, *Ficus pleurocarpa* F.Muell., *Ficus variegata* Blume, *Franciscodendron laurifolium* (F.Muell.) B.Hyland & Steenis, *Myristica globosa* subsp. *muelleri* (Warb.) W.J.de Wilde and *Syzygium gustavioides* (F.M.Bailey) B.Hyland. Common small trees and shrubs throughout its range include *Apodytes brachystylis* F.Muell., *Ardisia brevipedata* F.Muell., *Atractocarpus hirtus* (F.Muell.) Puttock, *Brombya platynema* F.Muell., *Gossia dallachiana* (F.Muell. ex Benth.) N.Snow & Guymer, *Hypsophila dielsiana* Loes., *Irvingbaileya australis* (C.T.White) R.A.Howard, *Psychotria* sp. (Utchee Creek H. Flecker NQNC5313), *Rockinghamia angustifolia* (Benth.) Airy Shaw and *Symplocos hayesii* C.T.White & W.D.Francis. Altitudinal range, from existing specimens, is from near sea-level to 800 m.

Hollandaea sayeriana has been collected or reliably reported in the following REs: 7.8.1a (occasionally), 7.8.2a (commonly), 7.8.12 (rarely), 7.11.1a (rarely), 7.11.12a (occasionally), 7.11.28 (rarely), 7.11.29a (rarely), 7.11.29b (rarely) and 7.12.1a (commonly).

Table 1. Morphological comparison of *Hollandaea* species (fruit and seed features mostly taken from Cooper & Cooper [2004: 413–415])

Characters	<i>H. diabolica</i>	<i>H. riparia</i>	<i>H. porphyrocarpa</i>	<i>H. sayeriana</i>
Fruit surface	sculptured	sculptured	smooth	smooth
Fruit colour	orange–green	green	purple	green
Fruit length	40–50 mm	25–50 mm	35–45 mm	60–150 mm
Seed colour	brown	cream/yellow/ green	cream/green	whitish
Seed length	22–25 mm	14–20 mm	13–16 mm	12–30 mm
Seeds per fruit	1–4	2–8	6–9	3–20
Leaf apex	retuse– obtuse	obtuse–acute	acute–acuminate	acute–obtuse to acuminate
Leaf base	attenuate	attenuate	attenuate	cuneate
Leaf length:width	2.6–3.6	4–8	2.5–2.8	1.2–2.2
Pedicel length	2.1–3 mm	1.9–2.2 mm	3–4.5 mm	2.9–3.5 mm
Conflorescence axis length	48–120 mm	110–155 mm	52–103 mm	150–380 mm
Conflorescence axis pubescence	moderately hairy	glabrous	densely hairy	densely hairy
Tepal length	27–33 mm	28–32 mm	26–29 mm	20–26 mm
Tepal condition (abaxial surface)	glabrous	glabrous	clothed in medifixed hairs	clothed in medifixed hairs
Style length	20–24 mm	21–25 mm	16–20 mm	17–21 mm
Ovule number	2–4	6–8	12–16	12–20
Anther length	4–5 mm	4–6 mm	4.5–6 mm	2–3.9 mm
Filament length	0.4–0.8 mm	0.1–0.3 mm	c. 0.4 mm	0–0.1 mm
Hypogynous glands	free	free	connate	connate

Phenology: Flowers have been recorded in April, May, June and October; fruits have been recorded in January, March and November.

Notes: The perianth is pink to purple-red in bud and pink, crimson or purple-pink at anthesis. New leafy growth is recorded as being blue-black or maroon. The flower aroma has been variously described as being: ‘sweet like honey’, ‘sweetly fragrant’ and also as ‘strongly unpleasant’.

Affinities: *Hollandaea sayeriana* appears to be most closely related to *H. porphyrocarpa* in that they share a smooth fruit surface, abaxial tepal surface clothed in medifixed hairs and a relatively high ovule number. *H. sayeriana* can be distinguished from *H. porphyrocarpa* on the following features: leaf base (cuneate versus attenuate, respectively), larger fruit

(60–150 mm versus 35–45 mm), larger seeds ([12–] 20–30 mm versus 13–16 mm), longer conflorescence axis (150–380 mm versus 52–103 mm) and shorter anthers (2–3.1 mm versus 4.5–6 mm). Comparisons between all species of *Hollandaea* are provided in **Table 1**.

Conservation status: Most existing collections have been made in Wooroonooran National Park which is within the World Heritage Area of the Wet Tropics bioregion. Currently, *Hollandaea sayeriana* is listed under the *NCA* as *Near Threatened*. It is estimated to have an extent of occurrence of 1100 km² and an area of occupancy of 620 km². We recommend *H. sayeriana* being retained as *Near Threatened* as it fulfills the criteria under categories *Near Threatened* A, E and

possibly *C.* We feel it would be premature to suggest a “Near Threatened” status under the IUCN guidelines, even though it may well be, as it is unlikely that it would qualify for any higher status in the future given that there is no evidence to support either the necessary population sizes or number of populations or any decline under any of the other necessary criteria.

Etymology: The species is named for W.A. Sayer, a 19th century Australian naturalist, botanical collector and collector of the type specimen.

Excluded names

Hollandaea lamingtoniana F.M.Bailey, *Queensland Agric. J.* 5:390 (1899) = *Helicia lamingtoniana* (F.M.Bailey) C.T.White ex L.S.Sm.

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