Bry. Div. Evo. 46 (1): 064–070
https://www.mapress.com/bde

Article

ISSN 2381-9677 (print edition)
BRYOPHYTE DIVERSITY & EVOLUTION
ISSN 2381-9685 (online edition)

https://doi.org/10.11646/bde.46.1.9

New records and range extensions for liverworts (Marchantiophyta) in the Australian Wet Tropics bioregion

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Dedication

The authors present this work as a tribute to the memory of the late David Meagher (1956–2023). David was working on this report with the two other authors prior to his death. His passion for bryophytes and his research in all areas of bryology was inspiring. David's untimely death in August 2023 was a tragic loss to Australian bryology.

Abstract

Three species of liverworts are reported as new to Australia, all from the Australian Wet Tropics bioregion: *Colura corynophora, Drepanolejeunea serricalyx*, and *D. tricornua.* Significant range extensions within the bioregion are reported for another two species. *Cololejeunea kapingaensis*, previously reported as ramicolous, is here reported as an epiphyll.

Key words: epiphylly, garden, Queensland

Introduction

The last 25 years has seen a vast increase in our knowledge of the liverwort flora of northern Australia, mostly centred on the Australian Wet Tropics (e.g., Pócs & Streimann 1999, Meagher 2008, Pócs & Cairns 2008, Meagher 2010, Renner 2011, Renner *et al.* 2013, Brown & Renner 2014, Renner 2018, Renner 2020, Renner & Wilson 2018, Pócs & Renner 2021). At present about 400 species of liverworts (Marchantiophyta) are known from the Australian Wet Tropics bioregion (AVH 2023).

In this paper we report three species new to Australia and two species with significant range extensions, from collections in the Paluma Range by Andi Cairns from her private garden in Paluma, at the southern end of the Australian Wet Tropics (19°00'32.62" S, 146°12'28.05" E, elevation 895 m), together with older collections from nearby locations by Tamás Pócs. *Cololejeunea kapingaensis* Miller (1956: 170), previously reported as ramicolous, is here reported as an epiphyll.

Species new to Australia

Colura corynophora (Gottsche, Lindenb. & Nees) Trevisan de Saint-Léon, Mem. Reale Ist. Lombardo Sci., Ser.3, Cl. Sci. Mat.4: 402. 1877

Previous records from the Australian Wet Tropics were reported as published in error (Pócs 2015), and are now published here for the first time from northern areas (AUSTRALIA, Queensland Cape Tribulation: *T.Pócs 9983/AU*,

 Submitted: 6 Oct. 2023; Accepted by Christine Cargill: 18 Nov. 2023; published: 29 Dec. 2023

CANB 805604.1, 25 August 1999; *T.Pócs & H.Streimann 9989/AA*, NSW 895556, 27 August 1999). A collection from the Paluma Range, at the southern limit of the bioregion, extends the known range south by about 200 km.

The species can be recognised by many leaves without a lobule sac and the lobule-bearing leaves being shorter than those without lobules. The globular lobule sac also lacks a crest (Figs. 1.1 and 1.2). *Colura corynophora* is known from Cambodia, China (Zhu & So, 2001), India (Singh *et al.* 2020), Indonesia, Malaysia (Lee *et al.* 2022), eastwards to the Mariana Islands and Fiji (Pócs & Eggers 2007), New Guinea (Pócs 2013), New Caledonia, Philippines. Sri Lanka, Thailand, Vietnam (Pócs *et al.* 2013, Bakalin & Nguyen Van Sinh 2016).

Specimen seen:—AUSTRALIA. Queensland: Paluma Range, Paluma, elev. 895 m, private garden, epiphyll on leaf of rainforest tree, 6 April 2020, *A.Cairns WT-1201*, BRI AQ1045136.

Drepanolejeunea serricalyx Herzog, Ann. Bryol. 9: 126–127 (figs 8 and 9), 1936 [1937]

Drepanolejeunea serricalyx is a rare species with a Malesian-Pacific distribution, known previously only from Java, Sabah (Malaysian Borneo) (Lee *et al*. 2022,) Papua New Guinea, Philippines and Fiji (Söderström *et al*. 2011, Pócs *et al.* 2019, 2020). This species is differentiated by Herzog (1930) by the only 4─6 ocelli per leaf and by the 5-carinate perianth with irregularly serrate (not horned) wings. The related *D. thwaitesiana* (Mitten 1861a: 117) Stephani (1913a: 350) has many (10─30) scattered ocelli and *D. fissicornua* Stephani (1913b: 344) from the same group is autoicous with spiny horns on the perianth restricted to the apex, while *D. serricalyx* is dioicous and has teeth along the wing apex, not extended into the horns (Figs. 1.5 and 1.6). Söderström *et al.* (2011, 2016) considered it to be a doubtful species belonging to the *D. thwaitesiana* complex, which includes large species with many ocelli in the leaves. However, it is prudent to maintain it as a separate species until a formal review of the complex is undertaken.

Specimens seen:—AUSTRALIA. Queensland: Paluma Range, Paluma, elev. 895 m, private garden, epiphyll on leaf of planted *Camellia* sp. shrub, 6 April 2020, *A.Cairns WT-1203*, BRI AQ1045139.

AUSTRALIA. Queensland: Paluma Range, Paluma, elev. 895 m, private garden, epiphyll on leaf of rainforest tree, 6 April 2020, *A.Cairns WT-1204*, BRI AQ1045140.

Drepanolejeunea tricornua Herzog, Ann. Bryol. 9: 124, 1936

This species also belongs to the *D. thwaitesiana* complex, and is differentiated by having many scattered ocelli that are distinctly larger than the neighbouring cells (fig.1.7) and long, entire perianth horns of unequal length (Mizutani 1990). As with *Drepanolejeunea serricalyx*, it is prudent to maintain it as a separate species until a formal revision proves otherwise. It is known otherwise from Cambodia (Tixier 1979), Vietnam (Pócs *et al* 2013, Siregar *et al.* 2017), Fiji (Pócs *et al*. 2011, Söderström *et al*. 2011), through Peninsular Malaysia (Siregar *et al.* 2017, Lee *et al.* 2022), Sabah (Malaysian Borneo) (Mizutani 1990, Chuah-Petiot 2011, Pócs *et al*. 2019, 2020) and Java (Söderström *et al*. 2010) to Papua New Guinea (including New Britain) (Pócs *et al.* 2019).

Specimen seen:—AUSTRALIA. Queensland: Paluma Range, Paluma, elev. 895 m, private garden, epiphyll on leaf of rainforest tree, 6 April 2020, *A.Cairns WT-1202A*, BRI AQ1045137.

Range extensions in the Australian Wet Tropics bioregion

Cololejeunea trichomanis **subsp.** ***cordiflora*** (Steph.) Pócs, Acta Bryolichenol. Asiat. 4: 104, 2011

Basionym: *Cololejeunea cordiflora* Stephani, *Hedwigia* 34(5): 246, 1895a.

Known from widely separate sites in the Wet Tropics: Big Tableland, near Wujal Wujal, (*H.Streimann 30764*, CANB 811878.1) and from the start of the Mt Bartle Frere walking track (*J.A.Curnow 4067*, CANB 811886.1; *J.A.Curnow 4070,* CANB 811900.1), Australian records of *C. cordiflora* were first published in Pócs & Streimann (1999). A record from Mt Fisher near Millaa Millaa (*T.Pócs 99114/AG*, EGR) is illustrated in part in Pócs and Piippo (2011: 105, fig.16k). It is not synonymous with *C. goebelii* (Gottsche ex Schiffner 1893: 240) Schiffner (1898: 244) (= *C. trichomanis* (Gottsche 1882: 362) Bescherelle (1892: 14), as stated in McCarthy (2003: 31), where it is also cited mistakenly as *C. cordifolia*. It has a unicellular hyaline style at the base of lobule, whereas *C. goebelii* has a filiform style of 2–5 cells. Pócs in Pócs & Piippo (2011:104) made the new combination with *C. trichomanis* from which *C. cordiflora* differs only by the number of stylus cells. They found there to be a transition between filiform and unicellular styles, all of which occur in Queensland collections. This is supported by the molecular study of Yu *et*

al. (2013, figs 2 & 3, pp 557, 559) which shows the relationship between *C. trichomanis* and *C. trichomanis* subsp. *cordiflora*, justifying the distinction of the latter even at a greater distance than the subspecies level.

Specimen seen:—AUSTRALIA. Queensland: Paluma Range, Paluma, elev. 895 m, private garden, epiphyll on leaf of rainforest tree, 6 April 2020, *A.Cairns WT-1205*, BRI AQ1045141.

Cololejeunea kapingaensis H.A.Miller. Bryologist 59(3): 170. 1956

This species was first described from the Caroline Islands where it was recorded growing on bark (Miller 1956). Pócs and Streimann (2006) reported the species from Australia as 'ramicolous'; however, the recent collection from the same location as that collected by Pócs in 2002 (Pócs and Streimann 2006), was epiphyllous, growing tightly appressed to a leaf (Fig.1.4). *Cololejeunea kapingaensis* is distinguished from other Australian species of *Cololejeunea* (Spruce 1884: 291) Stephani (1891: 208) (Meagher & Pócs 2017) by the combination of a border of 1–2 rows of hyaline cells on the leaves (although this border is often eroded), scabrid leaf surface, small trigones, the presence of 2 lobule teeth (Fig. 1.3), and a lack of intermediate thickenings in the leaf cell walls.

Specimen seen:—AUSTRALIA. Queensland: Paluma Range, Paluma, elev. 895 m, private garden, epiphyll on leaf of rainforest tree, 6 April 2020, *A.Cairns WT-1202B*, BRI AQ1045138.

Colura queenslandica B.M.Thiers Brittonia 39: 175. F. 1–8. 1987

A rare species previously known only in Australia from its type locality in Queensland, Moreton Distr., Cooloola Nat. Park (Thiers 1987), elev. ~50 m, and from K'gari (Fraser Island, UNESCO 2023), Great Sandy National Park, elev. 60m (Pócs & Streimann 2006). Described by Thiers (1987) as 'epiphytic on twigs' and by Pócs & Streimann (2006) as 'epiphyllous', the range of altitudes and different habitats suggest that this species might be more widespread than previously reported.

Specimen seen:—AUSTRALIA. Queensland: Paluma Range, Paluma, elev. 895 m, private garden, epiphyll on leaf of rainforest tree, 6 April 2020, *A.Cairns WT-1206,* BRI AQ1045142.

Note: The type locality for *Colura queenslandica* cited as 'Bellenden Ker, 1550 m' in the legend for Figure 1 (Pócs 2015, p. 8) was reported in error (pers. comm. T. Pócs, 30th September 2023).

Accompanying the above species and also epiphyllous on garden trees and shrubs are the more widespread *Cololejeunea inflata* Stephani (1895b: 249), *Cheilolejeunea trapezia* (Nees 1830: 357) Kachroo & Schuster (1961: 509) (see Fig. 1.8 & 1.9), *Leptolejeunea maculata* (Mitten 1861b: 118) Schiffner (1898: 275) and the rare *Cheilolejeunea ventricosa* (Schiffner 1894: 246) He (1999: 60) (see Pócs & Streimann 2006, Pócs 2016).

Discussion

Paluma is a small, isolated township, surrounded by national park. The larger trees in A. Cairns' privately-owned garden, apart from *Grevillea baileyana* McGillivray (1986: 2) (planted by current owners), are regrowth from the adjacent rainforest or remnants of rainforest after it was originally cleared in the 1930s (Venn, 2002).

Precipitation at Paluma is variable, with most rain falling Dec–March (BoM 2023). Rainfall was unusually high for that period in 2018–2019 (~4520 mm), with an average annual rainfall of ~1750 mm for the preceding five years (median ~2070 mm) (BoM 2023).

The mapped Regional Ecosystem of the forest to the south and east of the Paluma private garden is classified as RE 7.12.16a, described as 'Simple notophyll vine forest on wet and moist uplands, granite and rhyolite. Uplands of the cloudy wet to moist rainfall zones (DES 2023). Notophyll leaves are 7.5 cm–12.5 cm long, simple, leathery, with few species deciduous (Webb 1959).

Epiphylls are known to be common on leathery, smooth, evergreen (persistent) leaves (Glime & Pócs 2018). *Camellia* sp. shrub also has leathery, smooth, evergreen leaves and is the only planted shrub species with epiphyllous growth in the garden.

While it is remarkable that a home garden harbours so many epiphyllous liverworts, it has been observed that home gardens or woody crops (such as coffee or tea plantations) can preserve many forest epiphytes including bryophytes, even if the original forests have disappeared (Hemp *et al.* 2023). Very few records are known for epiphylls from such environments.

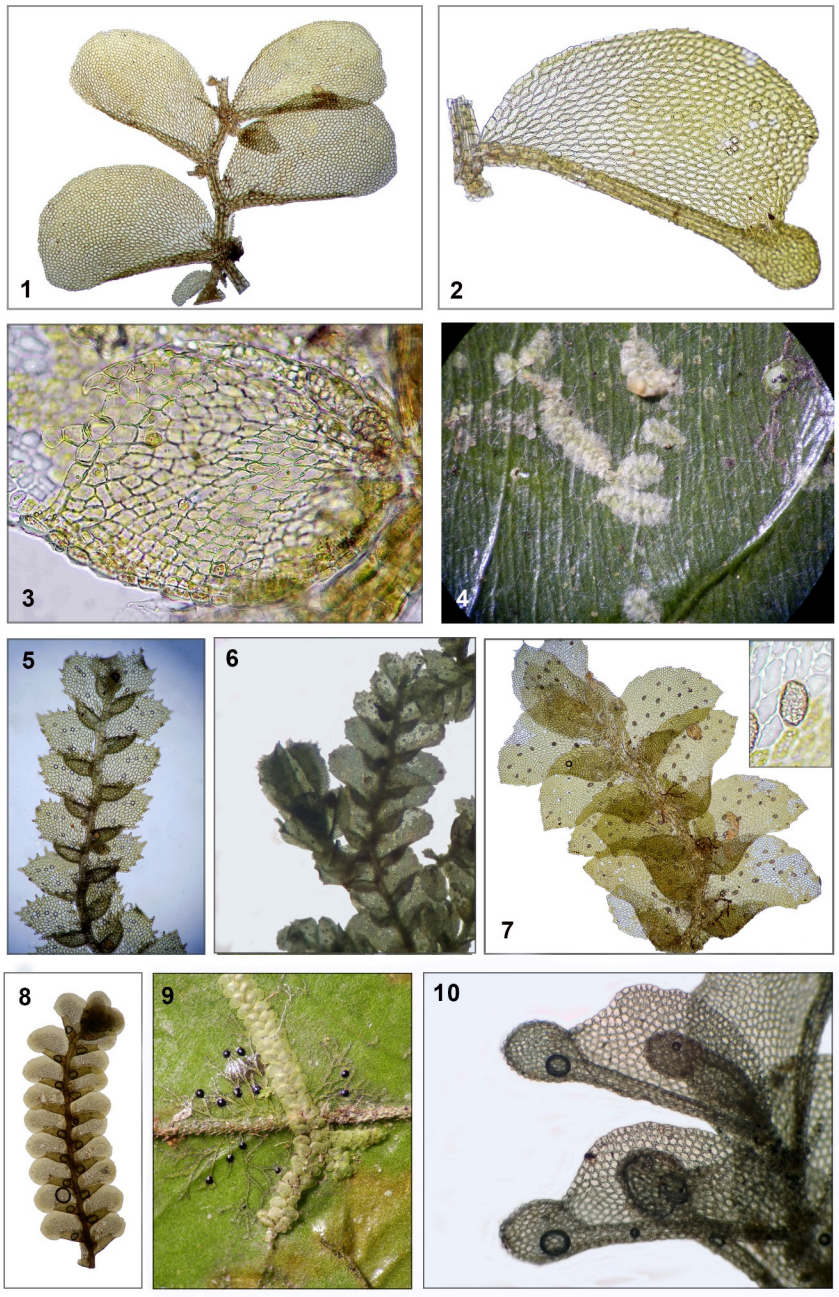

FIGURE 1. 1.1 *Colura corynophora* shoot with reduced leaf lobules, ventral view; leaf length to 1.24 mm. **1.2** *Colura corynophora* leaf with well-developed lobule sac, ventral view; leaf length 0.83 mm. **1.3** *Cololejeunea kapingaensis* lobule, 205 µm long, ventral view. **1.4** *Cololejeunea kapingaensis* habit; stems 3–5 mm long. Leaves adherent to the substrate by their hyaline margin, dorsal view. **1.5** *Drepanolejeunea serricalyx* shoot, 2 mm long, ventral view. **1.6** *Drepanolejeunea serricalyx* shoot, 2 mm long, with perianth. **1.7** *Drepanolejeunea tricornua* shoot, leaves ~0.5 mm long, 0.3 mm wide, ventral view. Inset: ocelli larger than neighbouring cells, ~30 µm long ×20 µm wide. **1.8** *Cheilolejeunea trapezia* shoot, 4 mm long, ventral view. **1.9** *Cheilolejeunea trapezia* habit, plant ~ 1.1–1.24 mm wide, dorsal view with foliicolous lichen *Strigula* sp. **1.10** *Colura queenslandica* leaves, ~1.5 mm long, ventral view. Photographs for figures 1–5, 7–9 by Andi Cairns, and figures 6 and 10 by Tamás Pócs.

Acknowledgements

We acknowledge the Traditional Owners of Paluma and surrounding lands—the Nywaigi, Gugu Badhun, and Gurambilbarra Wulgurukaba—on which collections have been made, and recognise their Elders past, present and

emerging. We thank the Queensland Department of Environment and Science for permission to collect bryophytes in the Australian Wet Tropics.

We also thank Megan Grixti and J.K. Oliver for helpful advice. Finally, we are very grateful to our reviewers—Christine Cargill, Anders Hagborg and Lars Söderström—for their useful remarks and amendments.

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