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Myriophyllum jacobsii M.L.Moody (Haloragaceae), a new species from southeast Queensland, Australia

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Abstract

The new species ***Myriophyllum jacobsii*** (previously recognised variously as *M. crispatum*, *M. simulans*, and *M. variifolium*) is described from southeast Queensland. This species is distinguished from these other taxa primarily by comparably extreme emergent leaf length and novelty in transitional leaves (basal leaves of the emergent stem with pinnae or teeth). This is supported by phylogenetic results based on nrDNA ITS and cpDNA *mat*K-*trn*K sequence data. The species is also put in a phylogenetic context in relation to other closely related Australian species.

Introduction

In the seminal taxonomic treatment of Australian *Myriophyllum* (Haloragaceae) by Orchard (1986) several new species from the eastern states were recognised (including *M. crispatum* Orchard and *M. simulans* Orchard) and the closely allied *M. variifolium* Hook.f. was redefined. All have a relatively widespread distribution in the eastern states and some acknowledged morphological variants (Orchard 1986). *Myriophyllum crispatum* and *M. simulans* had previously been included in a broadly defined *M. propinquum* A.Cunn., now considered to be confined to New Zealand (Orchard 1980). In 1991 and 1994 Surrey Jacobs collected several stems of an unusually robust *Myriophyllum* from southeast Queensland near Gin Gin (*Jacobs 6037, 6087*) and the 'Myall Park' region (*Jacobs 7117*) and returned to Myall Park in 1997 with Barre Hellquist (*Jacobs 8361*). He noted the unusual plants and determined that all specimens most closely resembled *M. simulans*. Specimens of similar morphology had been collected previously from the region to the north near Bundaberg (*Orchard 4618*; 24°08' S, 151°55' E) and to the south near Meandarra (*Bean 18361*; 27°22' S, 150° 01' E) being variously identified as *M. crispatum*, *M. variifolium* and *M. gracile* Benth. The earliest collection I have observed was collected in Bundaberg in 1968 (*Taylor s.n.*). In 1999 Jacobs and Donald Les collected further specimens northeast of

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Miriam Vale (*Jacobs 8514 & Les 542*; CONN specimen labeled as *Jacobs (8514) & Les (542)*, whereas NSW specimen is cited as *Jacobs 8514 & Les*; Moody and Les (2010) cite voucher specimen as *Les 542*, thus both numbers are included here) to be included in a developing molecular phylogenetic study. Moody and Les (2010) have provided the first phylogenetic hypothesis for the genus and, primarily in response to suggestions of morphological variants by Orchard (1986) and Surrey Jacobs (pers. comm.), a closer investigation among some key species complexes of Australian eastern state taxa have been concluded using molecular markers. Several unique genotypes were uncovered with varying degrees of morphological distinction. Here I report the first of the new species resulting from this study, *Myriophyllum jacobsii*, based on a combination of morphological, molecular and geographic evidence.

Materials and Methods

Specimens of *M. jacobsii* from AD, BRI, CONN, HO and NSW were examined and sorted from among specimens of *M. crispatum*, *M. gracile*, *M. simulans* and *M. variifolium*. All measurements were made from dried specimens.

Phylogenetic results

In a phylogenetic study of *Myriophyllum*, Moody and Les (2010) conducted a broad sampling of *Myriophyllum* and generated sequence data for the nrDNA ITS and cpDNA *trn*K+*mat*K region, including most species discussed above (excl. *M. gracile*). Details of techniques and analyses of phylogeny are presented in Moody and Les (2010). A phylogram derived from the Bayesian analysis of combined ITS and *mat*K+*trn*K

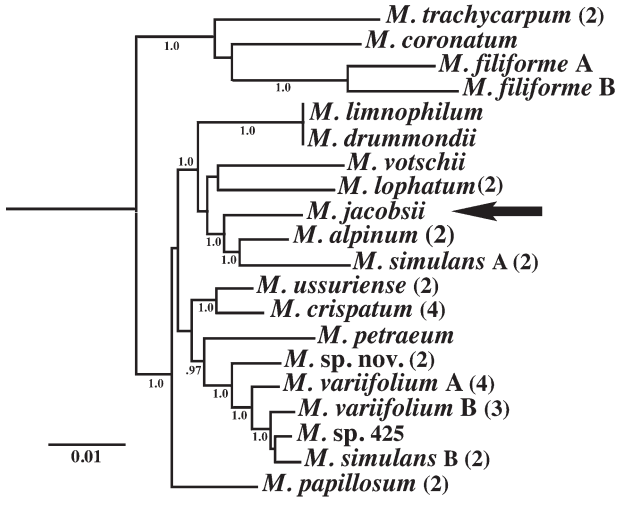

Fig. 1. Phylogram of *Myriophyllum* subsection *Nudiflorum* based on Bayesian phylogenetic analysis from Moody and Les (2010). Numbers next to branches represent nodal support based on Bayesian Posterior Probabilities (only those ≥ 0.95 are shown). Branch lengths are proportional and based on mean posterior estimates of evolutionary distance. Numbers after taxon names refer to number of accessions sampled (if > 1) for that taxon.

sequence data is presented in Figure 1. *Myriophyllum jacobsii* is strongly supported, with a Bayesian Posterior Probability (PP=1.0), as sister to a clade containing *M. alpinum* and one *M. simulans* genotype forming part of the 'lophatum clade' in *M.* subsection *Nudiflorum* (Moody & Les 2010). The 'lophatum' clade is sister to the 'variifolium' clade which includes *M. crispatum*, *M. variifolium* and a *M. simulans* genotype, all taxa to which *M. jacobsii* has been allied in the past (see Fig. 1).

Taxonomy

Myriophyllum jacobsii M.L.Moody, ***sp. nov.***

M. simulanti atque *M. crispato* simillima sed robustior foliis emersis linearibus vel teretibus, longioribus, (1.5-) 2-3.2 (-3.6) cm longis.

Type: Australia: Queensland: Darling Downs: 'Myall Park', Crater Paddock, 27° 13'34''S; 149° 41' 56'' E, *S.W.L. Jacobs 7117*, 24 April 1996 (holo: NSW362760). Fig. 2.

Stout perennial or paludal aquatic herb, rhizomatous; primary submerged stems usually prostrate with erect laterals, rooting at nodes; erect stems (15–) 30–50 cm tall, up to 20 cm emergent, 0.2–0.8 cm diameter, appearing yellow-green, sometimes reddish, especially when dried, lacking crisped hairs. Leaves whorled, subwhorled, rarely irregularly arranged, often all variations occurring on individual plants, and polymorphic. Submerged leaves in whorls of 5, subwhorled, rarely irregularly arranged, 1.5–3 cm long, 1.6–2.6 cm wide, pectinate with 12–26 filiform pinnae, ovate in outline; distance between whorls 5–20 mm; transitional submerged leaves noticeably smaller. Transitional emergent leaves in 2–4 whorls of 5, rarely lacking, linear or terete, 0.8–2.2 cm length with (5–)17–24 teeth or terete with pinnae 0.3–1.6 cm long, 0.3–0.4 cm wide; emergent leaves in whorls or subwhorls of 5–7, linear-terete (1.5–)2–3.2(–3.6) cm long, 0.3–0.6 cm wide when fully mature; 0–8(-all) emergent whorls do not subtend flowers.

Plants monoecious or dioecious. Inflorescence a spike with unisexual flowers borne singly in the axils of upper and sometimes transitional emergent leaves. Sometimes staminate or carpellate flowers on separate spikes of same plant. Monoecious spikes with carpellate flowers below, staminate above. Carpellate whorls 0–15(–20+), staminate whorls 0–20(–40+). Bracteoles of carpellate flowers white to pink, lanceolate, deltoid or ovate; 0.2–0.35 mm long, 0.15–0.3 mm wide, margins serrate. Bracteoles of staminate flowers white to pink, lanceolate-ovate (or deltoid), 0.45–0.8 mm long, 0.2–0.5 mm wide, margins serrate.

Staminate flowers 4-merous, sessile. Sepals 4, ovate, oblong or deltoid, white, pink or red, 0.25–0.4 mm long, 0.1–0.25 mm wide; petals 4, white to red becoming purplish, often white basally becoming pink to purple distally, hooded or keeled, 1.8–2.8 mm long, 1–1.5 mm wide, becoming recoiled after anthesis. Stamens 8; filaments 1.1–1.5 mm long after anthesis; anthers linear-oblong, 1.6–2 mm long, 0.3–0.5 mm wide, non-apiculate; styles and ovary absent or represented by minute torus. Carpellate flowers 4-merous, pink-red, sessile. Sepals, petals and stamens absent; styles 4, 0.25–0.3 mm long, tongue-shaped, reflexed; stigmas white, densely fimbriate, covering length of style; ovary syncarpous, 4-locular, cubic-globose, 0.4–0.5 mm long, 0.4–0.5 mm diameter, moderately papillose; papillae < 0.1 mm long. Fig. 3.

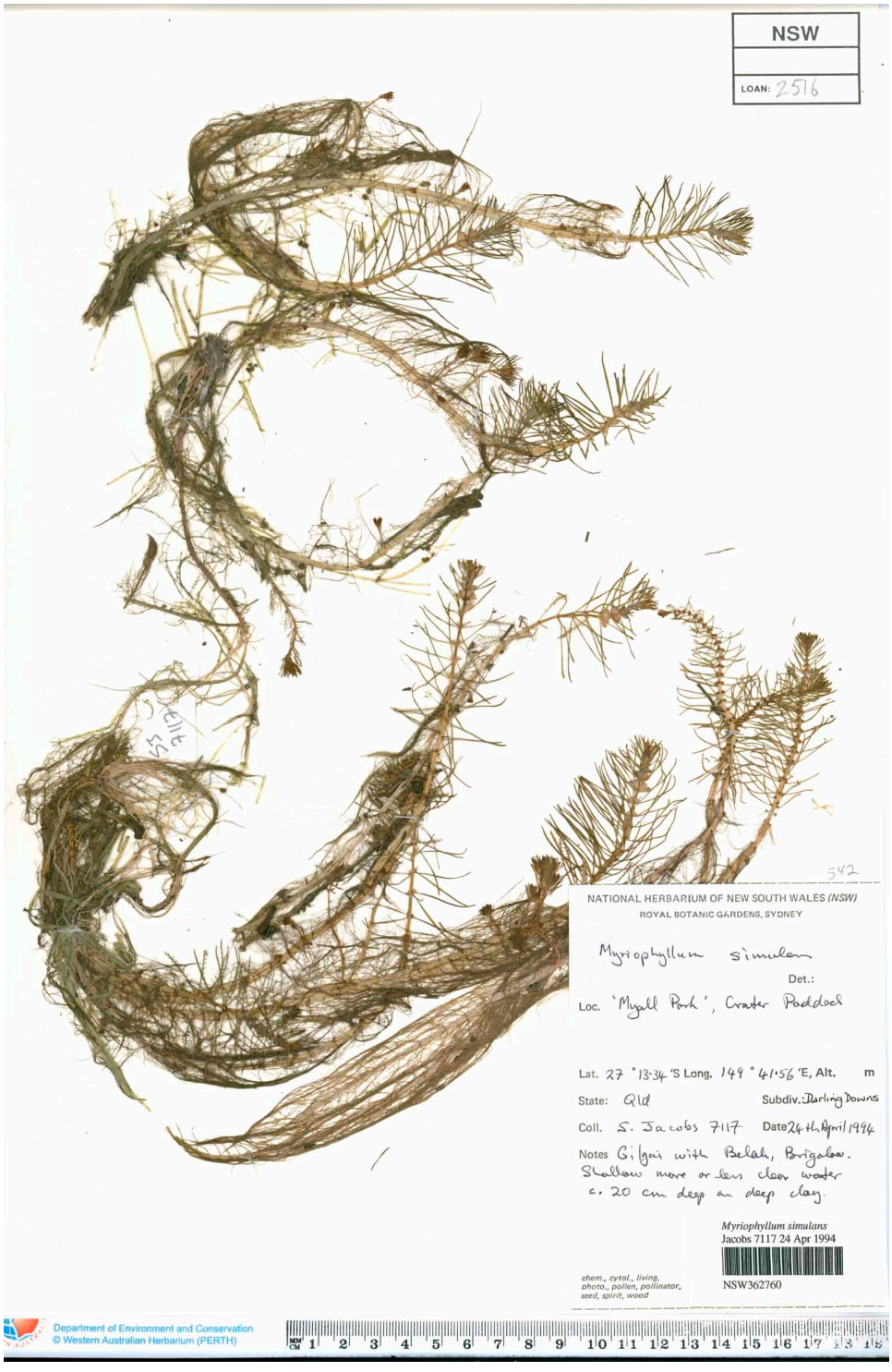

Fig. 2. Holotype of *Myriophyllum jacobsii*.

Table 1: Comparative morphology for *Myriophyllum jacobsii* and closely associated species.

	Mature emergent leaf length (mm)	Transitional emergent leaf length (mm)	Transitional emergent leaf teeth/pinnae #	Emergent leaf arrangement	Fruit shape
M. jacobsii	(15–)20–32 (–36)	8–22	(5–)16–24	Irregularly arranged - whorled	± cubic
M. crispatum	5–18	< 5 [lower]; (5–) 10–17 [upper]	6–8	whorled	± cubic
M. simulans	5–15(–18)	(< 5) 5–15	(< 12) 12–28	Irregularly arranged -whorled	± cubic
M. variifolium	8–15(–24)	6–15(–20)	(< 8) 8–10	whorled	columnar

Fruit sessile, pink to red, ± cubic, 0.6–0.9 mm long, 0.6 mm diameter, rounded at base becoming slightly tapered distally, moderately papillose, with papillae ≤ 0.1 mm long, rarely some individuals fruits appearing almost striate due to arrangement of papillae; mericarps 4, separating freely at maturity, cylindrical, widest towards base.

Selection of specimens examined: Queensland: Darling Downs, 'Myall Park' Abergeldie Dam, *Jacobs 8361 & Hellquist*, 29 Nov 1997 (BRI, NSW). Leichhardt: Blackdown Tableland, ca 32 km SE of Blackwater, campsite on Mimosa Creek, *Henderson 00794*, 24 Apr 1971 (BRI). Port Curtis: Rosedale-Bundaberg road at Rosedale, *Orchard 4618*, 4 Apr 1975 (HO). 5 km North of Junction of Bundaberg Rd with Miriam Vale Road, *Jacobs 8514*, 15 Oct 1999 (NSW). Wide Bay: Blucher Creek, 1 km S of Biggenden, *Crisp 2647*, 28 May 1977 (BRI). 46.3 km West of Tara, towards Meandarra, *Bean 18361*, Apr 2002 (BRI). Bundaberg District, waterhole on stock route, *Taylor s.n.*, Aug 1968 (BRI).

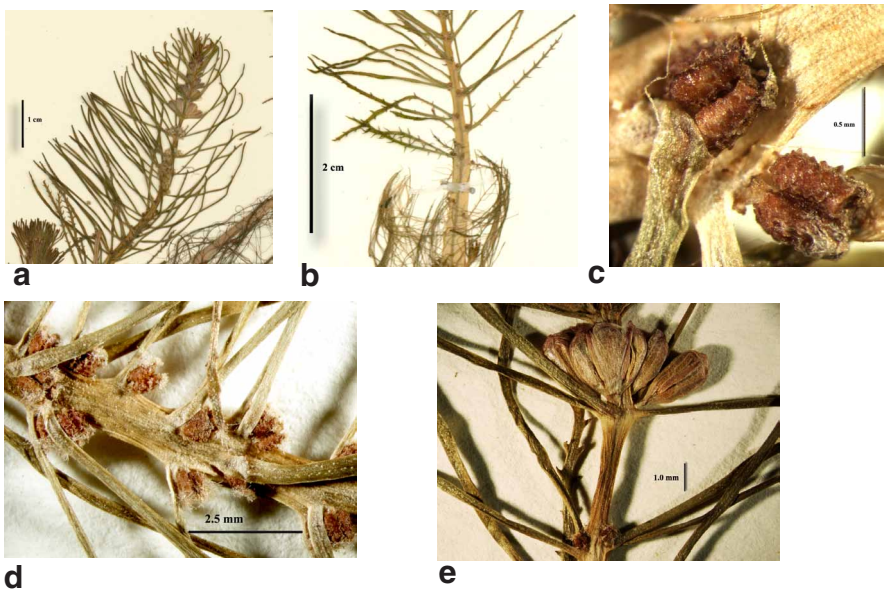

Fig. 3. *Myriophyllum jacobsii*. **a,** emergent leaves; **b,** transitional leaves; **c,** fruit; **d,** portion of carpellate inflorescence; **e,** transition between carpellate and staminate flowers.

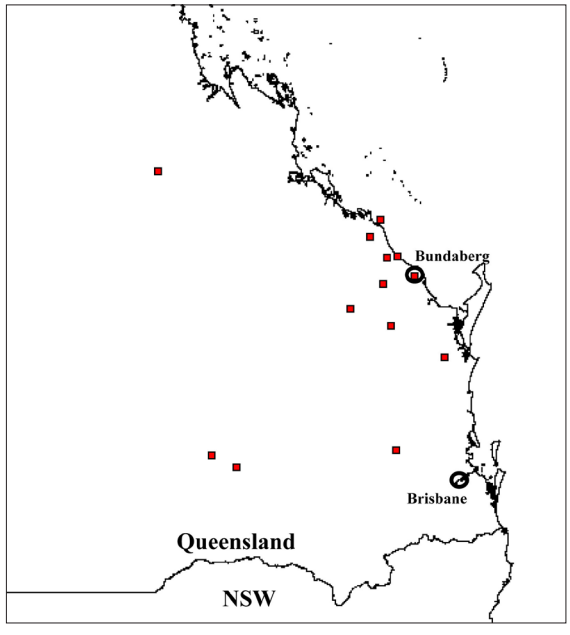

Fig. 4. Distribution map of *Myriophyllum jacobsii* in southeast Queensland, Australia.

Notes: this species is most similar in morphology to *M. crispatum*, *M. simulans* and *M. variifolium* but has much longer mature emergent leaves than all (Table 1). While there is some overlap with these species at the lower end of *M. jacobsii* leaf length, all specimens examined had most mature emergent leaves > 20 mm. Transitional leaves (here referring to those leaves retaining some pinnae or teeth on the emergent stem at the transition from the submerged stem (Fig. 3b)) in combined length and number of teeth (or pinnae), especially in the lowermost whorls, are also characteristic for this species compared to *M. crispatum* and *M. variifolium* (Table 1). Also, *M. jacobsii* is a much more robust plant than *M. simulans* in general, usually has some leaves not strictly whorled and lacks the crisped hairs that are common but not universal in *M. crispatum* and has ± cubic fruit compared to the columnar fruit of *M. variifolium*. In a phylogenetic context, *M. jacobsii* is sister to a clade containing *M. alpinum* and one genotype of *M. simulans*, but is highly divergent from both using both nrDNA ITS and cpDNA data (Fig. 1).

Distribution, Habitat, Phenology: *Myriophyllum jacobsii* has been collected from lagoons, shallow stagnant or clear water (0.5–1 m depth), creeks and drainage areas. It is distributed in southern Queensland, northeast to Blackdown Tableland, southeast near Crows Nest and west to Myall Park (Fig. 4). This species has been collected with flower and fruit from Apr–Dec.

Etymology: this species is named for Surrey W. L. Jacobs, a superb aquatic botanist, colleague and friend.

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