

## Three new species of *Nymphaea* (Nymphaeaceae) in Australia

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### Abstract

*Nymphaea alexii* (aff. *N. hastifolia*, subgenus 'Confluentes'), *N. carpentariae* and *N. georginae* (both aff. *N. macrosperma*, subgenus *Anecphyia*) are described from the Gulf Savannah region of Queensland and immediately to the south. A key is provided for the native and naturalised species of *Nymphaea* in Australia.

### Introduction

As part of continuing studies in *Nymphaea* (Jacobs 1989, 1992, 1994), including sampling for an extensive DNA study, we have been able to collect good material sufficient to describe three new species.

*Nymphaea alexii* S.W.L. Jacobs & Hellq. *sp. nov.*

*N. hastifoliae* similis sed staminibus cremiis, apice ovarii rubro, cristis seminis nonnunquam carunculatis differt.

**Holotype.** Queensland: c. 23 km N of Normanton, Karumba rd, 17° 31.741'S 141° 09.625'E, S. Jacobs 9325 & C.B. Hellquist, 17 Apr 2005 (NSW). Isotypes: NASC, BRI.

Annual or perennial with a globose rhizome c. 2 cm diam. Blade elliptic, to 15 cm long, to 10 cm wide; margins slightly sinuate; stipules fused for c. 1 cm, the apical lobe free, acute c. 1 cm long. Flowers to 30 cm above the water, pleasantly-scented, day-flowering. Sepals 4–5, to 6 cm long, green outside; tip acute. Petals (18–)20–25(–40), to 5.5 cm long, 1.5 cm wide, lanceolate, white, grading into the stamens, no gap between petals and stamens; tip acute. Stamens cream, to c. 150; filaments membranous, to 17 mm long; anthers to 10 mm long; appendage white, much reduced and only visible on outer stamens. Ovary often red at the apex, with vestigial or obsolete sterile lobes; carpels 8 to 16; fruit globose, c. 4.5 cm diam. Seeds elongated, c. 1–2 mm long, glabrous, with longitudinal ridges, parts of the ridges sometimes proliferating irregularly into linear outgrowths when mature; cells of the testa with a comparatively large lumen (as judged from surface view) and short arms of more or less equal length, with a single



margin (as opposed to the apparent double margin in *N. hastifolia*), ends of the arms of the epidermal cells neither expanded nor raised, the cell walls covered with regularly-arranged minute papillae (visible at c. 500X on a SEM).

**Selection of specimens examined:** Queensland: c. 23 km N of Normanton, Karumba rd, Jacobs 9325a & Hellquist, 17 Apr 2005 (NSW, NASC, BRI); c. 25 km S of Normanton, Croydon rd, Jacobs 9326 & Hellquist, 17 Apr 2005 (NSW, NASC, BRI).

*N. alexii* grows in ephemeral billabongs and the shallow margins of more perennial lagoons (similar to *N. hastifolia*) during the end of the Wet and shortly after, and has often disappeared by May. It can be readily distinguished from *N. hastifolia*, or indeed from any other native *Nymphaea* sp., by its distinctive cream stamens and its small, ridged seeds. This species belongs in subgenus 'Confluentes'<sup>1</sup>.

The species is named after Alex James Fussell, grandson of SWLJ.

A minutely papillose seed surface, has not been observed elsewhere in subg. *Anecphyra* or 'Confluentes'. Interestingly, the seeds of this taxon are similar to those of *Ondinea purpurea*, as depicted by Schneider and Ford (1978), both in their longitudinal ridges and the granulate surface. A similar seed surface is known elsewhere in *Nymphaea* only in a group of species within subg. *Hydrocallis*.

***Nymphaea carpentariae* S.W.L.Jacobs & Hellq. sp. nov.**

*N. macrospermae* similis sed floribus albidis plerumque grandioribus, seminibus minoribus differt.

**Holotype.** Queensland: Burketown, bore drain of town bore, 17° 44.879'S 139° 32.899'E, S. Jacobs 9329 & C.B. Hellquist, 18 Apr 2005 (NSW). Isotypes: NASC, BRI.

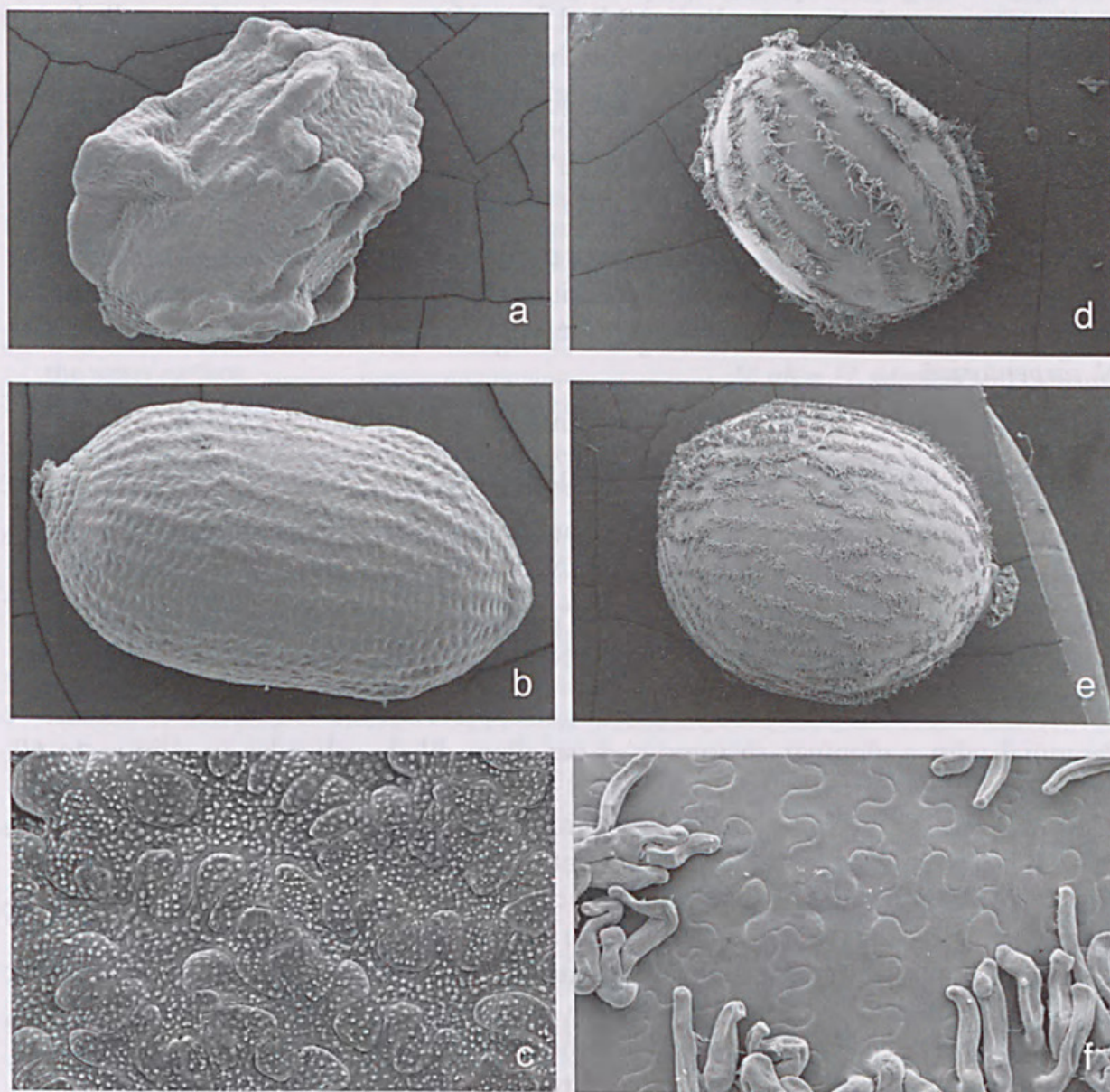
Perennial with a globular to elongate rhizome to c. 4 cm long. Blade orbicular to elliptic, to 45 cm diam.; margins with regularly-spaced triangular teeth to 1.5 mm long; stipules fused for (1–)4–8 cm, terminal lobe free, acute, 0.5–1 cm long. Flowers to 40 cm above the water, lightly scented; day-flowering. Sepals 4, to 6.5 cm long, green outside with purple streaks, streaks occasionally obscuring the green; tip obtuse. Petals mostly 12–22, 4–6 cm long, 1.5–2.5 cm wide, oblanceolate to spatulate, mostly white, rarely with some blue, with a space of c. 1 cm between petals and stamens; tip obtuse; when blue, most of the petals coloured, not just the outer petals and fading only slightly with maturity. Stamens yellow, mostly 150–300; filaments membranous to cylindrical, to 25 mm long; anthers 2.5–5 mm long, appendages vestigial or obsolete. Ovary lobes vestigial or obsolete; carpels 7–19; fruit globose, c. 4 cm diam. Seeds spherical to elongate-spherical, 2–3.5 mm long, c. 2 mm wide, with more or less continuous rows of short hairs usually c. 0.1–0.15 mm long; cells of the testa with a lumen of variable width and arms of unequal length with the ends of the arms expanded but not raised.

**Selection of specimens examined:** Queensland: Between Normanton and Maggieville, Clarkson 2697, 6 Nov 1979 (NSW681541); c. 4 km N of Normanton, Karumba rd, Jacobs 9324 & Hellquist, 17 Apr 2005 (NSW); Boogan Lagoon, Jacobs 1280, 26 Apr 1974 (NSW681369); Forked Lagoon 'Wernadinga', Jacobs 1368, 30 Apr 1974 (NSW681 368); E of Croydon, Georgetown rd, Jacobs 8588 & Les, 22 Oct 1999 (NSW440424); Cumberland Chimney, c. 22 km W of Croydon, Georgetown rd, Jacobs 9320 & Hellquist, 16 Apr 2005 (NSW).

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1. Formal description of the subgenus *Confluentes* is waiting on the publication of the treatment of this group in the Flora of Australia series.





**Fig. 1.** *Nymphaea* seeds; the bare patches, or areas where the features are less well defined, are those areas where the seeds pack tightly next to each other. **a**, *Nymphaea alexii* (SJ9325) seed showing the ridges and the proliferation or caruncles present on most seeds (c. 35X); **b**, *N. alexii* (SJ9325) seed showing minimal proliferation, some proliferation is visible at top right; the ridges are clearly visible. This seed is from the same collection as Fig. 1a and all fruits examined have both types of seed (c. 35X); **c**, *N. alexii* (SJ9325) seed surface showing the characteristic papillae on the surface of the epidermal cells (c. 425X); **d**, *N. carpentariae* (SJ9329) whole seed showing the more or less continuous rows of hairs and a smaller seed than *N. georginae* in Fig. 1e (c. 25X); **e**, *N. georginae* (SJ9335) whole seed showing the partly disorganized and incomplete rows of hairs and a larger seed than *N. carpentariae* in Fig. 1d (c. 15X); **f**, *N. georginae* (SJ9335) seed surface showing the epidermal cells with a narrow lumen and short irregular arms (c. 225X)



*N. carpentariae* grows in perennial or near perennial billabongs and lagoons around the Gulf of Carpentaria. It can be distinguished from *N. macrosperma* by the usually larger white flowers, and from *N. georginae* by the smaller seeds and by the blue-flowered forms of the latter fading with age. Although the differences in shape and dimensions of the seeds in *N. carpentariae* and *N. georginae* do not seem very great, when compared side by side the differences are quite striking. This species belongs in subgenus *Anecphyia*. Specimens of this species have usually been included in *N. immutabilis*.

This is the original 'Albert De L'Estang' sent to Bailey in Brisbane; there are still some of the original distinctive seeds in the Herbarium (BRI). Most of what is now grown and sold as cv. 'Albert De L'Estang' appears to be *N. immutabilis*. The cultivar 'Andre Leu' is *N. carpentariae*.

The species is named for the Gulf of Carpentaria region in which it grows.

*Nymphaea georginae* S.W.L.Jacobs & Hellq. *sp. nov.*

*N. macrospermae* similis sed floribus in quoque loco plerumque albidis caeruleisque, floribus caeruleis decolorantibus differt. A *N. gigantea* seminibus majoribus differt.

**Holotype.** Queensland: Georgina River, Camooweal, 19° 55.576'S 138° 06.903'E, S. Jacobs 9332 & C.B. Hellquist, 19 Apr 2005 (NSW). Isotypes: NASC, BRI (blue-flowered specimen).

Perennial with a globular rhizome c. 4 cm diam. Blade orbicular to elliptic, to 60 cm diam.; margins with regularly-spaced narrow-triangular to triangular teeth to 2–4 mm long; stipules fused for 1–3 cm with free acute terminal lobes 0.3–1 cm long. Flowers to 30 cm above the water, fragrant, day-flowering Sepals 4, to 6.5 cm long, green outside with purple streaks, streaks occasionally obscuring the green; tip obtuse. Petals mostly 12–26, 4–7 cm long, 2–3.5 cm wide, oblanceolate to spatulate, white or, less commonly, blue, rarely pink, and fading with age, with a space of c. 1 cm between petals and stamens; tip obtuse; when blue, most of the petals coloured, not just the outer petals. Stamens mostly 150–250; filaments membranous to cylindrical, to 25 mm long; anthers to 6 mm long, appendages vestigial or obsolete. Ovary often red with lobes vestigial or obsolete; carpels 7–19; fruit globose, c. 4 cm diam. Seeds globose to subglobose, (1.5–)2.5–4 mm diam., with often interrupted rows of short hairs c. 0.1–0.15 mm long; cells of the testa with a comparatively long-narrow lumen and arms of unequal length with ends slightly expanded but not raised.

**Selection of specimens examined:** Queensland: Georgina River, Camooweal, Jacobs 5531 & P. Wilson, 4 May 1988 (NSW280651); Jacobs 9332 & Hellquist, 19 Apr 2005 (NSW); Flood channel of Thomson River, Longreach, Jacobs 9335 & Hellquist, 20 Apr 2005 (NSW).

N.T.: James River, nr 'Avon Downs', Chippendale s.n., 20 Jun 1960 (NSW); Jacobs 5300, 5303, 5304, 5306 & K. Wilson, 7 Jun 2005 (NSW); Jacobs 9331 & Hellquist, 20 Apr 2005 (NSW).

*Nymphaea georginae* grows in the billabongs and flood channels of the upper parts of northern rivers flowing into the Lake Eyre system. These waterbodies may hold water for >1 year but also are frequently dry for >1 year. It can be distinguished from *N. carpentariae* by the larger seeds and from *N. macrosperma* by the larger flowers of blue-flowered plants fading with age. This species belongs in subgenus *Anecphyia*. This species has the strongest scent of any in subg. *Anecphyia*, but it is still considerably less scented than species of subg. 'Confluentes'. Specimens of this species have usually been included in either *N. gigantea* or *N. immutabilis*.



The species is named for the Georgina River, one of several in which it grows and the type locality.

### Key to native and naturalised species of *Nymphaea* in Australia.

1. Petals yellow, grading into stamens (with filaments to 38 mm long); leaf blade margin sinuate; horizontal stolons and vertical rhizomes both present. .... *N. mexicana*<sup>2</sup>
- 1\* Petals white, blue or pink; grading into stamens or a distinct gap present; leaf blade margins various; stolons absent; rhizomes either horizontal, or vertical and more or less tuberous. .... 2
2. Rhizomes horizontal or suberect, elongated and vigorous; flowers more or less floating on the water surface. .... *N. alba*, *N. odorata* and hybrids
- 2\* Rhizomes tuberous, erect; flowers standing clear of the water surface. .... 3
3. Petals grading into stamens; leaf blade with entire, sinuate or dentate margins. .... 4
- 3\* Distinct gap present between petals and stamens; blade with sinuate or dentate margin. .. 9
4. Filaments flattened, thickened, tough; leaf blade margin dentate; blade undersurface usually pubescent ..... *N. pubescens*
- 4\* Filaments membranous and either cylindrical, or all flattened, or only some outer filaments flattened; leaf blade undersurface always glabrous; blade margin sinuate. .... 5
5. Anthers to 24.5 mm long; apical appendage to 10 mm long. .... *N. caerulea*<sup>3</sup>
- 5\* Anthers 13 mm long or less; apical appendage minute or absent. .... 6
6. Anthers cream; top of ovary frequently red; seeds with longitudinal ridges and these often with proliferations. .... *N. alexii*
- 6\* Anthers yellow; top of ovary rarely red; seeds without longitudinal ridges or proliferations. .... 7
7. Filaments to 25 mm long; sepals to 11.5 cm long; petals blue to mauve, white, or pink; widespread; habitats various. .... *N. violacea*
- 7\* Filaments to 18 mm long; sepals to 7 cm long; petals white. .... 8
8. Sepals usually with purple flecks, to 7 cm long; anthers to 8.5 mm long, sometimes apiculate; carpels 11–22; fruit to 2.5 cm diam.; seeds glabrous, 1.75–2.5 mm long, 1–1.5 mm wide, cells of testa without a 'double edge'; growing in more or less permanent water; Cape York Peninsula, New Guinea. .... *N. elleniae*
- 8\* Sepals without purple flecks, to 6 cm long; anthers to 5.5 mm long; appendage absent; carpels 8–16; fruit to 4.5 cm diam.; seeds glabrous, spherical, c. 1 mm diam., cells of testa with a 'double edge'; growing in ephemeral water on floodplains; N.T., W.A. .... *N. hastifolia*
9. Filaments flattened and tough; petals usually <10; stamens usually <25; leaf blade margin sinuate; mature seed <1.5 mm long. .... *N. nouchali*
- 9\* Filaments membranous, slightly flattened to cylindrical; petals usually >10; stamens usually >50; leaf blade margin toothed; mature seeds >2.5 mm long. .... 10
10. Sepal margins pink; petals becoming dark pink with age; blade margin with sparse teeth to 2 mm long. .... *N. atrans*
- 10\* Sepal margins white or blue, rarely pink; petals not darkening with age, teeth usually more than 2 mm long. .... 11

2. The plant introduced in Australia is a hybrid involving this species, rather than pure *N. mexicana*, as in other places where this taxon is said to be introduced.

3. The introduced plant in eastern Australia is not typical of *N. caerulea*, originally described from Egypt, but better fits what has traditionally been treated as *N. capensis*. However, further work on the interpretation of the type of this latter name is required (J. Wiersema pers. comm.).



11. Anthers to 6 mm long; sepals to 6.5 cm long; petals to 26 on fully developed flowers, white, deep blue, rarely pink; blade margin with teeth to 4 mm long. .... 12
- 11\* Anthers >6 mm long; sepals to 12 cm long; petals to 34 on fully developed flowers, blue, white, or rarely pink; blade margin with teeth to 5 mm long. .... 14
12. Flowers mostly blue, rarely pink or white, comparatively small; petals to 5 cm long and all the same colour; sepals to c. 4.5 cm; leaves comparatively large with teeth on mature leaves cylindrical from a shallow triangular base; seeds globose to subglobose, 3–4.5 mm diam. .... *N. macrosperma*
- 12\* Flowers mostly white with some blue, rarely pink, larger; petals to 7 cm long and all the same colour; sepals to 6.5 cm; leaves not as large with teeth on mature leaves triangular to narrow-triangular; seeds globose to elongate-spherical, 2–4 mm diam. .... 13
13. Seeds spherical to elongate-spherical, 2–3.5 mm long, c. 2 mm wide, with more or less continuous rows of short hairs; flowers mostly white, rarely blue, no obvious fading with age. .... *N. carpentariae*
- 13\* Seeds globose to subglobose, 2.5–4 mm diam., with often interrupted rows of short hairs; flowers mostly white but blue flowers still common, the blue flowers fading with age. .... *N. georginae*
14. Anthers to 10 mm long; rarely apiculate; when coloured the petals fading with age; carpels 12–18; seeds ovate, pubescent, the hairs arranged in more or less continuous rows of short hairs; cells of the testa with a long lumen and short arms of equal length, the ends not raised, rarely expanded. .... *N. gigantea*
- 14\* Anthers to 15 mm long; often apiculate; when coloured the petals usually not fading with age; carpels 9–20; seeds oblong, pubescent or rarely glabrous, with sparse to dense hairs in discontinuous or disorganised rows, sometimes almost appearing scattered; cells of the testa with a long lumen and arms of equal to unequal length, the ends sometimes slightly expanded but not raised. .... *N. immutabilis*

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