

NEW AUSTRALIAN SPECIES OF NYMPHOIDES SÉGUIER (MENYANTHACEAE)

by

HELEN I. ASTON*

ABSTRACT

Nymphoides montana, *N. planosperma*, *N. quadriloba*, *N. spongiosa* and *N. subacuta* are described as new species from Australia. Full descriptions and illustrations, together with notes on distribution, habitat and diagnostic features are provided.

TAXONOMY

This paper is a precursor to a revision of *Nymphoides* Séguier in Australia.

All five species described have the following characteristics in common:

Attached, emergent, glabrous, aquatic herbs. *Leaf blades* floating. *Pedicels* erect to semi-erect and emergent when in flower, recurved and submerged when in fruit. *Flowers* regular, bisexual, heterostylous, either long- or short-styled. *Calyx* divided almost to the base. *Corolla* sympetalous, c. 2-2.5 times as long as the calyx (3 times as long in *N. montana* and *N. subacuta*). *Corolla lobes* alternate to the calyx lobes, induplicate-valvate in bud, spreading at maturity, \pm emarginate, each lobe consisting of a lanceolate mid-section with a transverse fringe of long fine papillae just above its base and with two broad side-wings. *Corolla tube* $<$ calyx, with a cluster of short papillae on the midline between the filament bases. *Stamens* as many as the corolla lobes, inserted on the corolla tube at the junction of the lobes; filaments short; anthers bilocular, dorsifixed, dehiscent introrsely by longitudinal slits, the locules of each anther united by a \pm fleshy dorsal connective along their distal half to four-fifths, free but \pm appressed basally. *Ovary* superior (almost so in *N. montana* and *N. subacuta*), unilocular with parietal placentation, with small, obtuse, hair-tipped nectaries projecting from the base of the ovary wall opposite the midlines of the corolla lobes. *Style* simple, apical. *Stigmas* as many as the placentas. *Fruit* a capsule surrounded by the persistent calyx, usually indehiscent and ripening underwater.

Each species is placed in either a "geminata group" or an "indica group" of species. These two groups are readily distinguished by both corolla colour and inflorescence although the distinction based on corolla colour is not infallible outside Australia (Ornduff, 1969; Ornduff and Mosquin, 1970).

Corolla yellow to orange; *inflorescence* indeterminate, lateral or terminal, typically lax and floating with a pair of pedicellate flowers and two semi-amplexicaule bracts at each node, the bracts of each pair \pm opposite, with one subtending the two pedicels and the other clasping the stem
..... "geminata group" (*N. montana*; *N. subacuta*)

Corolla white pinkish or mauve, yellow only in the throat; *inflorescence* a dense cluster of pedicels arising unilaterally at the junction of a long petiole-like stem and a true petiole, the true petiole either resembling a short continuation of the stem or else minute and apparently absent, the floating leaf blade then sessile at the inflorescence
..... "indica group" (*N. planosperma*; *N. quadriloba*; *N. spongiosa*)

* National Herbarium of Victoria, Birdwood Avenue, South Yarra, Victoria 3141.

Nymphoides montana H. I. Aston, sp. nov.*Nymphoides geminata* sens. Aston (1973:111), non (R.Br.) Kuntze.*Nymphoides* sp. nov. "G", Aston in litt.

Plantae perennes. Stolones fluitantes ad 2 m longi. Laminae foliorum \pm circulares, integrae, profunde cordatae, latissime obtusae, (2.5-)4-11 x (2.5-)4-10.5 cm. Inflorescentia laxa, binis floribus pedicellatis binisque bracteis ad nodos; internodis ad 5(-10) cm longis. Flores heterostyli, 5(6)-partiti. Corolla 23-38 mm diametro, flava; lobae alis lateralibus latis perlaciniatis, fimbriaque transversa prope lobae basin papillarum tenuium liberarum formata, praeditae. Capsula ellipsoidea, (5.5-)6-9 x (3-)4-5 mm. Semina 42-90 per capsulam, ellipsoidea valde autem compressa, 1.1-1.55 x 0.8-1.15 x 0.5-0.7 mm (longitudo latitudine sesquialongior, crassitie duplo longior), nigrescentia ad nigra maturitate, nitentia, laevia; caruncula basalis circularis, pallida, tenuis, inconspicua.

Stoloniferous perennial. *Stolons* long and floating with roots suspended from the nodes on plants in water, becoming rooted to the substrate when waters evaporate; stolons in deeper waters to 2 metres long x 1.5-4 mm diam. with internodes c. 10-60 cm long, mostly few-noded and forked once to thrice; stolons on stranded plants often reduced to a single node 1-2 cm long. *Basal leaves* several; petioles slender, cylindrical, to 70 cm long; blades \pm circular in outline, usually a little longer than broad, occasionally a little broader than long, rarely very broad-ovate, deeply cordate (the lobes mostly 30-45% of the total blade length and separated by a sinus of 0°-40° (-70°) or rarely slightly overlapping), very broad-obtuse, often somewhat emarginate, entire or rarely slightly crenate, (2.5-)4-11 x (2.5-)4-10.5 cm. *Cauline leaves* from the stolon nodes similar, becoming progressively smaller and shorter-petioled toward the stolon extremities, those on stranded plants reduced in size (sometimes < 1 cm) and varying from reniform to elliptic and from cordate to truncate to tapered at the base. *Inflorescence* as for the "geminata group", the internodes few-11 in number, each 2-50(-100) mm long; bracts lanceolate-ovate, 4-7(-10) mm long; pedicels 20-80(-125) mm long. *Flowers* 5(6)-partite. *Calyx lobes* lanceolate to narrow-ovate, thick-textured with narrow translucent margins, (5-)6-8(-10) mm long. *Corolla* 23-38 mm span, "bright lemon yellow" to "bright yellow". *Corolla lobes* broad-elliptic; mid-section glabrous except for the conspicuous transverse fringe of fine papillae near its base and sometimes a few similar papillae along its midline above the fringe; side-wings broad, undulate, strongly lacinate, extending from the apex of the lobe almost to the base. *Corolla tube* papillae free within the cluster, sessile. *Stamens* with filaments c. 0.6 and 1.7 mm long in long-styled and short-styled flowers respectively; anthers \pm linear-ovate, c. 2.5-3.5 times as long as broad, 2.4-3.5 mm long. *Gynoecium (long-styled flower)* c. 10.5 mm long; ovary free except at the base, \pm linear-conical, gradually tapered into the style; placentas 2, long, extending down at least the central half of the ovary wall; ovules c. 90-170; style c. 2.5-3.5 mm long; stigmas 2, each a broad-rhomboid, shortly-papillate, lacinate, erect wing c. 3.5 x 2.75 mm. *Gynoecium (short-styled flower)* c. 6 mm long; style c. 1.5 mm long; stigmas c. 2 x 2.5 mm, condensed, deeply-lobed and undulate thus obscuring the basic wings. *Capsule* ellipsoid, equal to or a little longer than the calyx, (5.5-)6-9 x (3-)4-5 mm, often breaking free in the water by decay of the pedicel before the seeds are released. *Seeds* (23-)42-90 per capsule; body of seed ellipsoid but strongly laterally compressed, 1.1-1.55 mm long x 0.8-1.15 mm wide x 0.5-0.7 mm thick, dark grey-black to black when mature, shining, smooth; basal caruncle present, circular, pale, thin and generally inconspicuous.

TYPE COLLECTION:

Lake Hill, south-west of Nunniong Plains, East Gippsland, Victoria, grid W6(-3), 20.i.1971, *Beaglehole & Finck ACB36345* (Holotype: MEL 1504963. Isotypes: BRI, CANB, MEL 1504964-965, NSW).

PARATYPE:

Morass Creek, about 9 km north of Benambra, at crossing of the Omeo to

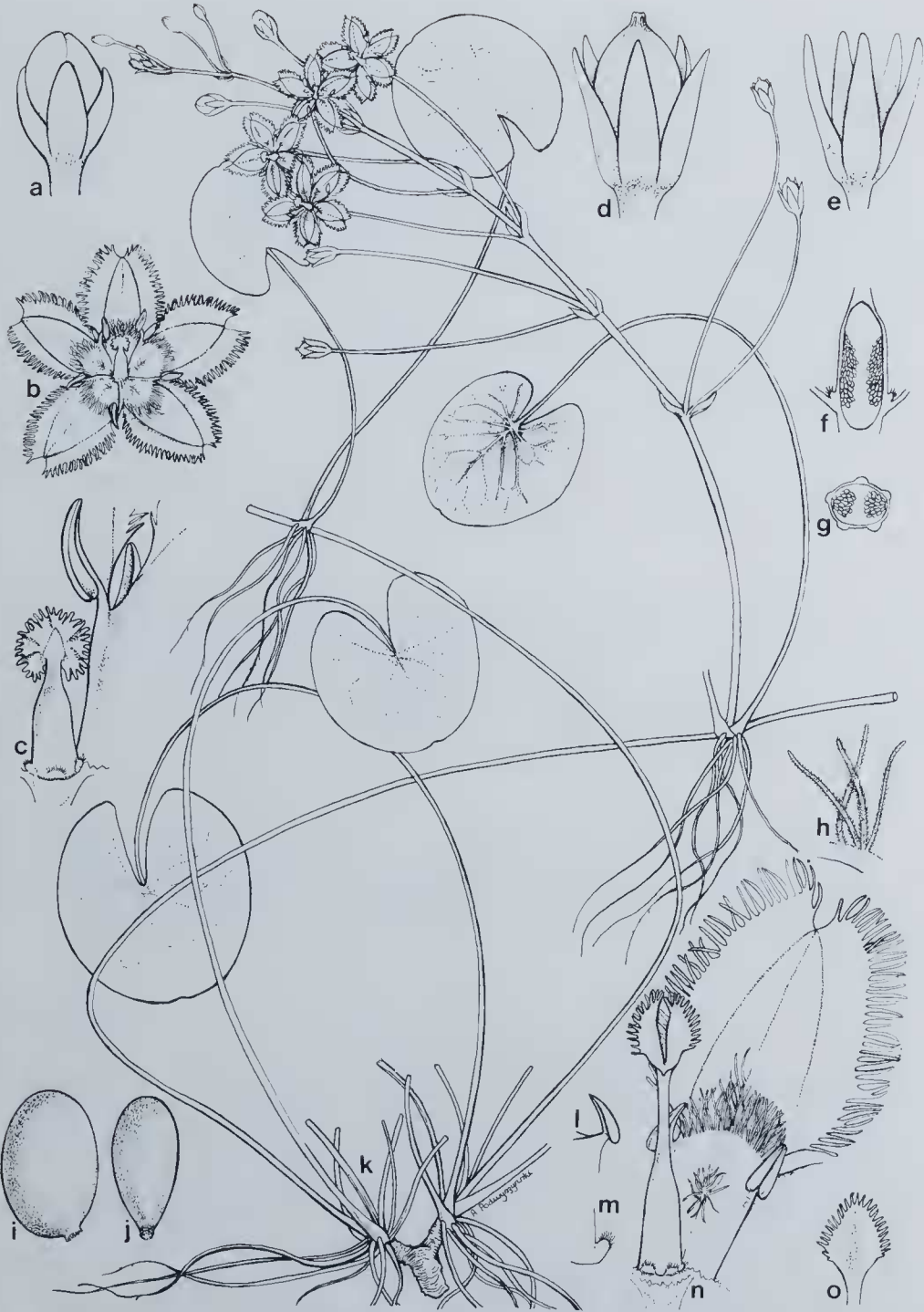


Fig. 1. *Nymphoides montana*. a—bud, x 3; b—flower, x 1.5; c—portion of short-styled flower showing relative proportions of stamen and gynoecium, x 4; d—capsule and persistent calyx, x 3; e—calyx, x 3; f—L.S. of ovary showing its partially-inferior structure and long parietal placentas, x 5; g—T.S. of ovary, x 5; h—papillae from the transverse fringe on the corolla lobe, x 12; i—seed, face view, x 15; j—seed, edge view, x 15; k—habit, x 0.4; l—stamen from long-styled flower, edge view, showing the dorsal connective, x 4; m—nectary, lateral view, x 8; n—portion of long-styled flower, x 4; o—stigma from long styled flower, face view, x 4. All from Aston 1852 (MEL).

Corryong road, 36°52'S, 147°42'E, Victoria, 12.iii.1975, *Aston 1852* (MEL 1504989-999, NSW).

SELECTED SPECIMENS EXAMINED (total 37):

New South Wales—Delegate River, c. 0.7 km west of Delegate, 37°31'S, 148°55'E, 19.ii.1975, *Aston 1819* (CANB, MEL 1504984-88, NSW), Umaralla River, c. 1 km upstream from Newmeralla, 36°11'S, 149°21'E, 20.ii.1975, *Aston 1821* (MEL 1504947-51, NSW). Black Bobs Creek, c. 13 km direct line SSW of Nerriga, 35°13'S, 150°01'E, 24.ii.1975, *Aston 1823* (BRI, CANB, MEL 1504938-42, NSW). Ner-runga Creek, c. 40 km SSE. of Goulburn, 35°05'S, 149°53'E, 24.ii.1975, *Aston 1824* (MEL 1504975-77, NSW). Wingecarribee River, between Bowral and Moss Vale, 34°32'S, 150°23'E, 25.ii.1975, *Aston 1827* (MEL 1504971-74). Dumaresq Dam, 30°25'S, 151°36'E, 1.iii.1975, *Aston 1836* (MEL 1504978-83, NSW). Walcha district, xii.1898, *Betche s.n.* (NSW 136699). Upper Shoalhaven River near Kain, 27.xii.1965, *Briggs s.n.* (NSW 91535). Wingecarribee swamp, c. 10.4 km ENE. of Moss Vale, 26.ii.1969, *Coveny 898* (MEL 1504953-54, NSW).

Australian Capital Territory—Smokers Gap, Tidbinbilla Range, 19.ii.1967, *Adams 1678* (CANB 166808-09). Paddys River on Tidbinbilla road, 6.iv.1955, *Burbidge 3965* (CANB 251843). "Booroomba", 9.iii.1954, *Moore 2889* (NSW).

Victoria—Little River, on Rockbank Station, c. 6 miles north of Wulgulmerang P.O., 27.i.1965, *Aston 1335* (MEL 1504927-30). About 1 mile west of Wulgulmerang-Suggan Buggan road, on K. C. Roger's property [Rockbank Station], 7.i.1970, *Beaglehole, Rogers & Finck ACB 33364* (MEL 1504961). Sailors Lake, c. 2 miles SW. of Wulgulmerang P.O., 12.i.1971, *Beaglehole & Rogers ACB 36047* (ACB, MEL 1504955-57). Bentleys Plain, 23.ii.1971, *Beaglehole ACB 36998* (MEL 1504966-67, NSW). Bentleys Flat, below Mt. Nugong, c. 12 miles NNE. of Ensay, 26.i.1953, *Melville 3124 & Wakefield* (MEL 1504924, NSW). Morass Creek, near The Brothers, Benambra, 31.i.1946, *Willis s.n.* (MEL 1504937).

DISTRIBUTION:

Mid-altitude plains and Tableland regions of eastern Victoria and eastern New South Wales, including the Australian Capital Territory, from about Omeo (Vic.) to Armidale (N.S.W.). Most frequent through the Benambra—Ensay—Wulgulmerang—Bonang area of Victoria and the Southern Tablelands of New South Wales, continuing north to about Bowral—Moss Vale and Yerranderie, then re-appearing in the Northern Tablelands around Armidale—Walcha. Altitudinal range c. 600-1300 (-1400) metres.

HABITAT:

Typically edging creeks and rivers in slow-flowing, fresh, clear water to one metre deep or in still backwaters or river pools; occasionally in still clear swamps or briefly surviving on saturated soil following a fall in water level. Persistent in creeks flowing through long-established grazing lands. Mostly in sand or light gravel, occasionally soft mud. Fl. and Fr. recorded December—6 April.

NOTES:

Readily recognised as a member of the "geminata group" by the yellow flowers and open inflorescence with twinned pedicels. Its smooth, ellipsoid but strongly compressed seeds (length equals about one and a half times the width and twice the thickness) are quite different to the highly-sculptured, \pm globular and only slightly compressed seeds of all other species of that group except *N. crenata* (F. Muell.) Kuntze. The latter species has compressed-ellipsoid seeds which are only slightly smaller than those of *N. montana* and which, in some populations, are smooth, but they lack a caruncle. In other characters *N. crenata* is quite distinct.

The epithet *montana* is selected because of the typically montane distribution. Of two collections which purport to have originated from lowland regions of Victoria near Orbost, one (MEL 1504908), although with seed which confirms its identity as *N. montana*, is of doubtful locality and the other (MEL 1504917-919) lacks seed and is of both doubtful identity and doubtful locality.

Fully-formed seeds are at first cream- to straw-coloured then darken through grey-browns to black. Because older capsules frequently become detached through pedicel decay mature black seeds are often missing from collections. As seeds provide the chief diagnostic distinctions of *N. montana* I have chosen as type collection the only one available which has enough mature seeds to provide isotypes for

distribution and to withstand the ravages of time. However, this collection (ACB 36345) is deficient in other respects, particularly in having only small, thin-textured leaves, some of which (including two on the holotype) are atypically deeply emarginate. I have cited, therefore, a paratype (Aston 1852) which complements the type collection by illustrating the typical large thick-textured leaves, the stoloniferous habit and elongated inflorescences of deepwater plants and also the reduced state of plants on mud.

Collections from the Bentley Plains, Victoria (ACB 36998; Melville 3124) show a slight tendency towards a tuberculate seed. This is more pronounced in the latter collection where the external surfaces of some of the seed cells form semi-circular domes and a very few form small tubercles about once to twice as long as broad. These extrusions are confined to the seed edges and only noticeable under magnification.

At some localities both long- and short-styled flowers are found on intermingled stolons but at others only one style type is present over an extensive area or throughout the population. The latter situation is possibly due to the stoloniferous nature of the species and the consequent vegetative spread and formation of large clones.

***Nymphoides planosperma* H. I. Aston, sp. nov.**

Nymphoides sp. nov. "R", Aston in litt.

Plantae annuae. Laminae foliorum sagittata, \pm ovate-triangularis, 8-17 x 9-16 mm, sino profundo acutoque (ad 60(-70%) totae folii longitudinis), lobae basales elongatae, angustae, 2-6 mm latae; laminae infra spongiosae rugosaeque, stellatis trichomis furcatis in cavernulis aëriis. Inflorescentia fasciculus pedicellarum densus, ad basin sinu folii ortus. Flores heterostyli, 5-partiti. Corolla 6-10 mm diametro, alba, fauce flavo; lobae cum alis latis lateralibus in distali $\frac{1}{2}$ - $\frac{3}{4}$, atque fimbria sparsa transversa papillarum tenuium prope lobae basin; alae laterales undulatae ad apicem laciniatae alibi integrae. Capsula ellipsoidea ad late ovoidea, ad $1\frac{1}{2}$ longior quam calyx, 1.5-2.5 x 1.5-2 mm; placentae duae, subapicales, minutae. Semina 1-4 per capsulam, anguste-ellipsoidea sed valde compressa, (1-) 1.42-2.25 x (0.5-) 0.8-1.05 x (0.35-) 0.45-0.6 mm (longitudo latitudine diplo longior, crassitie 3-4 plo longior) nigra maturitate, typice cum superficiebus \pm laevibus, cumque margine incrassata, obtusituberculata, rotundata; caruncula crassa, semicircularis, conspicua, in margine seminis circa $\frac{1}{4}$ longitudinis ab apice.

Annual. *Petiole-like stems* few to many, arising from the plant base, flexuose, threadlike, 7-34 cm long x < 0.5 mm diam., with scattered, flat, often dark callosities; true petiole minute or absent. *Leaf blades* \pm ovate-triangular in outline with slightly convex, straight, or slightly concave edges and a usually deep and acute basal sinus; sinus (30-)50-60(-70)% of total blade length, of 50°-100° (-125°) angle, the basal lobes \pm elongated and narrow, 2-6 mm wide; blades 8-17 mm x 9-16 mm, widest across the basal lobes close to their extremities, spongy and rugose beneath with deep air cavities and with \pm stellate/forked clear-translucent trichomes projecting into the cavities from the inside of the upper leaf surface. *Inflorescence* as for the "indica group"; true petiole apparently absent; pedicels subtended by broad-obovate to \pm rounded, white-translucent, membranous bracts to 2 mm long. *Pedicels* 5-12, emerging erect through the sinus when in flower, very slender, 5-18 x c. 0.2 mm, with scattered flat callosities. *Flowers* 5-partite. *Calyx lobes* linear-lanceolate to narrow elliptic-lanceolate, slightly mucronate, membranous, 1-nerved, remaining closely appressed to the capsule, with 1-several flat, often dark, callosities particularly along the nerve, 1-1.5(-1.9) mm long. *Corolla* 6-10 mm span, 3-5 mm long, white with a yellow throat. *Corolla lobes* distally broad-elliptic, basally linear; mid-section glabrous except for a sparse transverse fringe of fine papillae near its base; side-wings broad, undulate, laciniate at the apex but otherwise entire, extending from the apex down the distal half to two-thirds of the lobe. *Corolla tube* papillae clustered at the apex of a pronounced common stalk. *Stamens* with filaments c. 0.3-0.5 and 1.2 mm long in long-styled and short-styled flowers respectively; anthers versatile, \pm broad-oblong, only slightly longer than broad, c. 0.45-0.5 mm long. *Gynoecium (long-styled flower)* c. 2.5-3 mm long; ovary globular-obovoid, contracted \pm abruptly into the style; placentas 2, minute,

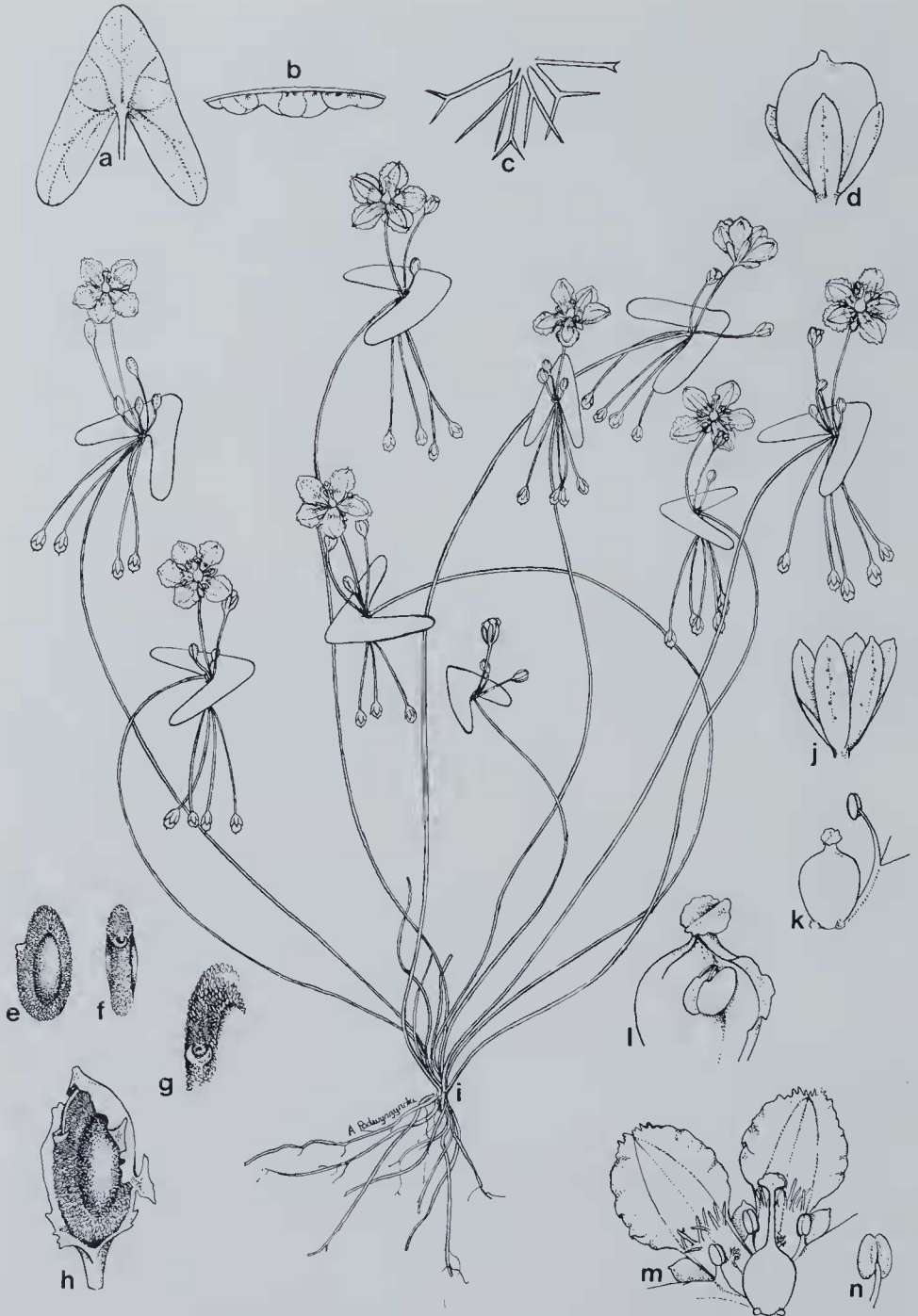


Fig. 2. *Nymphoides planosperma*. a—leaf, showing spongy rugose undersurface, x 2; b—leaf, T.S. showing air cavities and trichomes, x 3; c—trichome from leaf cavity, x 200; d—capsule and persistent calyx, x 9; e—seed, face view, x 8; f—seed, edge view, x 8; g—seed, caruncular area, x 16; h—seed in situ in torn capsule, showing funicle extending from the near-apical placenta to the lateral caruncle, x 12; i—habit, x 1; j—calyx, x 10; k—portion of short-styled flower showing relative positions of stamen and gynoecium, x 8; l—ovary, opened distal portion showing one of the near-apical placentas with its two ovules, x 14; m—portion of long-styled flower, x 8; n—anther, dorsal view, showing connective and versatile attachment, x 16. All from Craven 6607 (MEL).

parietal but near-apical; ovules 2-4, i.e. 1-2 per placenta; style c. 1-1.5 mm long; stigmas 2, each a broad, papillate, irregularly-shaped, somewhat lacinate wing c. 0.4-0.5 mm long. *Gynoecium (short-styled flower)* c. 1.4-1.5 mm long; style c. 0.2 mm long; stigmas c. 0.2-0.3 mm long, condensed. *Capsule* ellipsoid to broad-obovoid, distorted when the ovules of one placenta fail to develop, from a little longer than to one and a half times as long as the calyx, 1.5-2.5 x 1.5-2 mm. *Seeds* 1-4 per capsule; body of seed narrow-ellipsoid, strongly laterally compressed, (1-)1.42-2.25 mm long x (0.5-)0.8-1.05 mm wide x (0.35-)0.45-0.6 mm thick, black when mature, typically with \pm smooth and slightly convex faces and a thickened, tuberculate, \pm round-edged perimeter, the perimeter projecting laterally to almost the same plane as the centre-face and thereby giving an impression of flatness to the seed; tubercles short and blunt; caruncle pale, thick, semicircular, positioned on the seed edge about one-third of the seed length from the apex; seed about as long as the capsule, attached by a short straight funicle; typical edges not always developed and seeds then smooth and wholly biconvex.

TYPE COLLECTION:

Northern Territory, Kakadu National Park, c. 22 km north-east of Jabiru, 12°31'S, 132°58.5'E, 30.iii.1981, *Craven 6607* (Holotype: MEL 1520239. Isotypes: MEL 1520238, also (not seen) at CANB and to be distributed).

SPECIMENS EXAMINED:

Northern Territory—Kakadu National Park (stage 2 of park not gazetted at time of collecting), c. 15 km NNE. of Jabiru, 12°31.5'S, 132°55'E, 22.iii.1980, *Craven 6544* (CANB (not seen); MEL 1520373). Jabiluka Outlier, "Cannon Rock" Creek, pool number 1, 30.iii.1980, *Sanderson 9635* (Univ. New South Wales). Ibidem, pool number 2, 30.iii.1980, *Sanderson & Waterhouse 9634* (Univ. New South Wales). Just north of "Cannon Rock", Jabiluka Outlier, 23.iii.1980, *Sanderson & Waterhouse 9574* (Univ. New South Wales).

DISTRIBUTION:

Northern Territory—Known only from an area of about 6-10 kilometres width just north and north-north-east of Jabiru and west of the East Alligator River. Possibly widespread but uncollected over the escarpments of Arnhem Land.

HABITAT:

Temporary seasonal freshwaters of shallow rockpools on the exposed plateaus of rocky sandstone escarpments. In water to 25 cm deep.

NOTES:

Readily recognised as a member of the "indica group" by the white flowers (yellow only in the throat) and the clustered inflorescence arising from the apparent petiole against the leaf blade. It differs from all other species of that group in its distinctive seed characters (elongated and \pm flattened; length approximately twice the width and 3 to 4 times the thickness; caruncle lateral instead of basal) and in the placentas being near-apical and minute rather than centrally-positioned and \pm elongated down the length of the ovary wall. The spongy and rugose (not smooth) leaf undersurface is distinct from that of all species except *N. minima* (F. Muell.) Kuntze. However, the leaf of *N. minima* is \pm ovate, cordate, and broad-obtuse whereas that of *N. planosperma* is more arrow-shaped with a deeper basal sinus, longer narrow spreading basal lobes, and narrow-obtuse apex. Some of the more concave-sided leaves of *N. planosperma* are similar in shape to those of *N. furculifolia* Specht. The very few ovules and seeds of *N. planosperma* and the \pm stellate/forked hairs within the leaf cavities should also be noted.

The epithet *planosperma* is chosen because of the comparative flatness of the typical seeds in relation to those of other Australian species. The impression of flatness is greatest when the thick rounded edges are developed to the maximum extent (type collection) and it is quite absent where the seed edges fail to develop (*Sanderson & Waterhouse 9634*).

Although I have only dissected long-styled and short-styled flowers N. T. Sanderson and J. T. Waterhouse report (pers. comm.) three style types from field observations—long, medium and short. Medium-styled plants only were found in one pool and both long- and short-styled plants were found together in another. The medium-styled plants produced 3 or 4 of the smallest known seeds per capsule whereas the long- plus short-styled population produced 1 or 2 larger seeds per capsule. Observed populations are insufficient to determine if this distinction is constant.

***Nymphoides quadriloba* H. I. Aston, sp. nov.**

Nymphoides sp. nov. "P", Aston in litt.

Plantae annuae vel ?perennes. Laminae saepe foliorum hippocrepiformes vel late sagittiformes (1-)-3-9.5(-11) x (0.8-)-2-8 cm, late ellipticae ad \pm rotundae vel late deltoideae sed cum sino basali plerumque lato convexoque; lobae basales obtusae, marginibus interioribus vulgo concavis. Inflorescentia fasciculus pedicellorum densus, ad basin sinus folii ortus. Flores heterostyli, 4(5)-partiti. Corolla (6-)-11-17(-19) mm diametro, vel alba vel pallide erubescens vel pallide malvinus-erubescens, fauce flavo; lobae cum duabus alis latis lateralibus profunde laciniatis, ab apice paene usque ad basin, atque cum carina verticali lata laciniata, longitudinali in superficie interiore; carina plerumque ab apice ad $\frac{1}{3}$ - $\frac{2}{3}$ lobae longitudinem, nonnumquam valde deminuta; loba et cum fimbria conspicua proxime super basin papillarum tenuium. Capsula ellipsoidea ad late-ellipsoidea, 2.5-5 x 1.7-3 mm. Semina (5-)-10-44(-61) per capsulam, paene globosa sed compressa (typice superficiebus laevibus convexis cum protuberatione centrali, marginibus dense tuberculis brevibus obtusis velatis; tubercula nonnumquam desunt, nonnumquam autem et in superficiebus lateralibus et in marginibus tubercula adsunt), 0.67-1.02 x 0.6-0.95 x 0.35-0.57 mm (longitudo latitudinem \pm aequans, crassitie duplolongior), straminea ad atrofusca vel nigra maturitate; caruncula basalis, circularis, plerumque tenuis inconspicuaque.

Annual, perhaps perennial where water persists. *Petiole-like stems* few to many, arising from the plant base, slender, flexuose, 7 cm (plants on mud) to 85 cm (plants in water) long x 1 mm or less diam.; true petiole c. 1-3 mm long. *Leaf blades* very variable, typically horseshoe- or broad arrow-shaped, obtuse to rounded, entire-margined, broad-elliptic to \pm broad-deltoid in outline but with a shallow to deep, often broad, generally convex basal sinus (sinus mostly (25-)-40-60% of the total blade length and of (30°-) 55°-100°(-130°) angle); basal lobes obtuse, their inner margins generally concave, their outer margins a continuation of the convex curve of the whole leaf edge; leaves (1-)-3-9.5(-11) cm long x (0.8-)-2-8 cm wide, (length =, >, or < width) green and shining above, not spongy. *Juvenile leaves* sometimes present on mature plants, submerged, near-sessile at the plant base, very thin-textured, deltoid to rhomboid. *Inflorescence* as for the "indica group". *Pedicels* (8-)-14-25(-35), emerging erect through the sinus when in flower, very slender, 17-52 x <0.5(-1) mm. *Flowers* 4(5)-partite. *Calyx lobes* lanceolate to narrow-ovate, acute, thin-textured, greenish or purplish with translucent margins, outcurved at the apex in fruit, 2.5-4.5 mm long. *Corolla* (6-)-11-17(-19) mm span, white or very pale pink or pale mauve-pink except for a yellow throat; colours also grading (see notes below). *Corolla lobes* broad-elliptic, emarginate; mid-section with a broad, lacinate, vertical keel on its upper surface and with a conspicuous transverse fringe of fine papillae just above its base; keel extending longitudinally down the distal one- to two-thirds of the lobe length and continuing proximally as a line of individual fine papillae, but sometimes (even on the same flower) reduced to a very small keel on the distal or near-central portion of the lobe; side-wings broad, undulate, deeply-lacinate, extending from the apex almost to the lobe base. *Corolla tube* papillae short, \pm thick and blunt, free and sessile or arising from the apex of a short thick common stalk. *Stamens* with filaments c. 0.5-0.75 and 1.2-1.3 mm long in long-styled and short-styled flowers respectively; anthers \pm broad-linear to elliptic, c. 1.5 times as long as broad, 0.7-1.3 mm long. *Gynoecium (long-styled flower)* c. 3-4.5 mm long; ovary ellipsoid to broad-ellipsoid, contracted into the style but not abruptly so; placentas 2, about one-quarter to one-third of the capsule length, positioned centrally down the ovary wall; ovules c. (16-)-23-50(-62); style c. 1.5-1.8 mm long; stigmas 2, each a broad, papillate, irregularly-shaped and moderately lacinate wing c. 1 mm long. *Gynoecium (short-styled flower)* c. 2-3 mm long; style c. 0.3-0.6

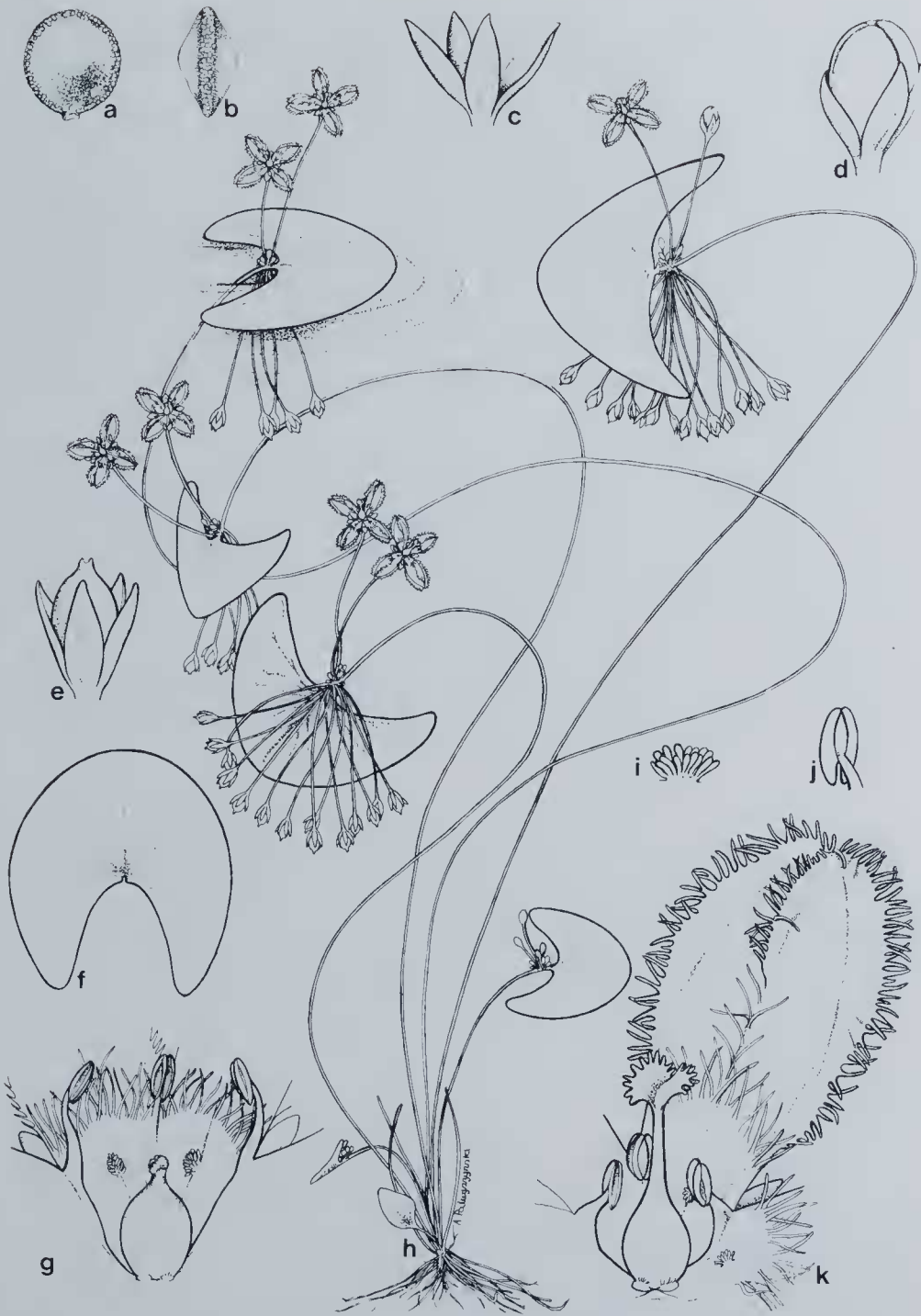


Fig. 3. *Nymphoides quadriloba*. a—seed, face view, x 22; b—seed, edge view, x 22; c—calyx, x 4; d—bud, x 4; e—capsule and persistent calyx, x 4; f—leaf, horseshoe-shaped, x 0.7; g—portion of short-styled flower showing relative positions of stamens and gynoecium, x 11; h—habit, plant with \pm arrow-shaped leaves, x 0.7; i—cluster of papillae from corolla tube, x 25; j—anther, dorsal view showing connective, x 16; k—portion of long-styled flower, x 11. f from Aston 1944 (MEL); remainder from Aston 1898 (MEL).

mm long; stigmas 0.2-0.65 mm long, condensed, rather lobed and undulate. *Capsule* ellipsoid to broad-ellipsoid, from a little < to a third as much again as the calyx, 2.5-5 x 1.7-3 mm. *Seeds* (5-)10-44(-61) per capsule, shaped as described below, 0.67-1.02 mm long x 0.6-0.95 mm wide x 0.35-0.57 mm thick, cream-straw to brown-black or black when mature, with a circular basal caruncle. *Seed from typical populations* near-globose but moderately laterally-compressed with the faces smooth and convex and with a pronounced central bulge, the edges densely covered with short obtuse tubercles which are directed diametrically outwards and together give a \pm square-cut appearance to the edge; may be modified by absence of the tubercles to give a fully-smooth seed or by greater spread of the tubercles so that they cover the side-faces (rarely also the centre-faces) as well as the edges; caruncle \pm thin and inconspicuous. *Seeds from Carpentaria populations* (see distribution and notes) have faces uniformly biconvex instead of centrally-bulged; tubercles mostly moderately to densely placed over the whole surface but variously reduced in extent, sometimes almost absent thus giving smooth seeds; caruncle usually thick and conspicuous.

TYPE COLLECTION:

About 3 miles NNE. of Katherine, Northern Territory, 10.iv.1967, *Adams 1747* (Holotype: CANB 172340. Isotypes: CANB 172339, K, NSW, NT 39334, also (not seen) at A, E, L, US). The locality on the K and NT sheets, and probably also on the unseen isotypes, is given as about 2 miles north of Katherine, but this has been corrected on the CANB sheets to that cited above. The location is on the property of L. J. Phillips (Adams, pers. comm.).

PARATYPE:

Property of L. J. Phillips, about 5-8 km NNE. of Katherine, c. 14°25'S, 132°18'E, Northern Territory, 7.v.1976, *Aston 1898* (BRI, CANB, MEL 1505244-45, PERTH).

SELECTED SPECIMENS EXAMINED (total 27):

Western Australia—Lake Gilbert, North Beverley Springs Homestead, West Kimberley, 16°35'S, 125°29'E, 1.ix.1974, *Kenneally 2193* (PERTH).

Northern Territory—Arnhem Highway, 10 km ESE. of its junction with the Stuart Highway, 12°36'S, 131°11'E, 18.v.1976, *Aston 1940* (MEL 1505242-43, NT). Survey Creek, 10.iii.1970, *Byrnes 1818* (DNA 2767, NT 24449). 2.5 miles SW. of Fountain Head, 17.iii.1961, *Chippendale 7697* (MEL 1505250, NT 7697). 12°36'S, 133°15'E, 19.ii.1973, *Craven 2286* (CANB 240521-22, MEL 537848). Lagoon west of Round Billabong, Kapalga study area, 12°27'S, 131°19'E, 1.vii.1977, *Craven 4511* (CANB 271651). Cox River Station, lagoon near Arnold River, 15°49'S, 134°36'E, 30.vi.1977, *Henshall 1567* (MEL 521380, NSW, NT 52204). Arnhem Highway, 2 km east of Mary River, 12°39'S, 131°50' [240] E, 5.iii.1978, *Henshall 1938* (NT 54816). 4 km west of Fogg Creek Dam, 12°18'S, 131°16'E, 30.v.1974, *Jacobs 1771* (MEL 1505248, NSW). c. 12 miles NE. of Edith River Siding, 9.iii.1965, *Lazarides & Adams 122* (CANB 160506, NT 39416).

Queensland—About 40 km from Normanton on the Croydon road, c. 17°55'S, 141°20'E, 19.iv.1975, *Craven 3308 A* (CANB; MEL 1519900). Corinda, 17°53'S, 138°35'E, 6.v.1974, *Jacobs 1484* (MEL 565162, NSW).

DISTRIBUTION:

Typical populations occur in the Northern Territory from the Darwin to Mary River region south to the Daly River and Katherine, with an eastern record from the vicinity of the East Alligator River. Six populations from areas south of the Gulf of Carpentaria, from the Arnold River, Northern Territory, to the Norman-ton/Croydon region, Queensland, are somewhat different from the typical. *Kenneally 2193* from West Kimberley, Western Australia, agrees with those from the Gulf country. Six other widespread Kimberley collections are at present only doubtfully referable to *N. quadriloba*. See under notes, also seed descriptions.

HABITAT:

Lagoon edges and ephemeral swamps, in still shallow freshwaters; once recorded from irrigation channels of rice bays and once from clear, slow-flowing water

in a creek. On sand and sandy-humus substrates; rarely grey mud or grey clay. Flowers and fruits well in water 5-50 cm deep and where stranded on saturated soil. Fl. and Fr. recorded 31 January—20 July, with one record 1 September.

NOTES:

Readily recognised as a member of the “indica group” by the white/pale pink/pale mauve flowers (yellow only in the throat) and the clustered inflorescence arising from the apparent petiole close against the leaf blade. It differs from all other species of that group in having keeled corolla lobes and in the characteristic seed of typical populations. The mostly 4-partite flowers, the deeply lacinate margins of the corolla-lobe wings and keel, the varied leaf shape with convex basal sinus and, when present, the pale pink or mauve colour of the corolla are also important characters.

The epithet *quadriloba* refers to the four-lobed corolla which is very noticeable in the field.

Corolla colour varies between and within populations and there is sometimes intergrading of colours on the same flower. Corollas of *Aston 1944* were wholly white except for the yellow throat, while those of the paratype population were “very pale pink grading to deeper mauve-pink at base of lobes and upper throat; yellow in the throat. Occasionally the deeper mauve-pink absent and corolla then very very pale pink (or almost white) with yellow throat”.

In edge view the seed of typical populations from the Northern Territory is top-shaped and distinctive. That of Carpentaria populations (see distribution, also seed descriptions) is broadly and evenly biconvex in cross-section and, together with the larger caruncle, often similar to seed of *N. spongiosa*. There is some gradation between the two seed types of *N. quadriloba* and the regional distinction may prove more apparent than real when further fully-adequate collections are available.

Several collections from the Kimberleys which have seeds with more clustered, dome-based tubercles possibly belong to *N. quadriloba* but material seen is inadequate for conclusions.

***Nymphoides spongiosa* H. I. Aston, sp. nov.**

Nymphoides sp. nov. “M”, Aston in litt.

Plantae annuae. Laminae foliorum ellipticae-oblongae ad late ovatae, integrae, profunde cordatae, (1-)2-5.5 x (0.8-)1.5-4.5 cm, infra spongiosae sed laeves (haud rugosae). Inflorescentia fasciculus pedicellorum densus, ad basin sinus folii ortus. Flores heterostyli, (4)5(6)-partiti. Corolla (7-)10-18(-20) mm diametro, alba, fauce flavo; lobae late ellipticae, alis lateralibus undulatis integris, fimbriae transversa proxime super basin lobae papillarum tenuium formata, praeditae. Ovarium ± globosum, in stylam abrupte contractum. Capsula latissime ellipsoidea ad ± globosa, 2.25-4 x 1.75-3 mm. Semina (5-)8-14(-25) per capsulam, ± globosa, parce compressa, tuberculis convexis brevissimis dense velata (vel tubercula nonnisi in marginibus seminum) 0.65-1.1 x 0.6-0.97 x 0.35-0.7 mm (longitudo latitudinem aequans, crassitie sesquialongior ad duplongior), straminea ad pallide cinereo-fusca maturitate: caruncula basalis, circularis, typice crassa conspicuaque.

Apparently annual. *Petiole-like stems* few to many, arising from the plant base, slender, flexuose, 3 cm (plants on mud) to 90 cm (plants in water) long x 1 mm or less diam.; true petiole minute or apparently absent. *Leaf blades* elliptic-oblong to broad-ovate in outline, deeply cordate (the lobes mostly (30-)40-50% of the total blade length and separated by a sinus of 40°-70°(-90° angle), obtuse, entire, (1-)2-5.5 x (0.8-)1.5-4.5 cm, green and shining above, white-translucent and spongy beneath; spongy tissue thickest at the centre and grading to thin or absent at the blade edges, smooth-surfaced, not rugose. *Inflorescence* as for the “indica group”; pedicels subtended by ± ovate, membranous, translucent bracts 3-6 mm long. *Pedicels* (10-)12-30, emerging erect through the sinus when in flower, very slender, (8-)14-40 x < 0.5 mm. *Flowers* (4)5(6)-partite. *Calyx lobes* lanceolate, acute, membranous, mostly purplish-translucent, usually slightly outcurved at the apex particularly in fruit. *Corolla* (7-)10-18(-20) mm span, white with a yellow throat. *Corolla lobes* broad-elliptic; mid-section glabrous except for a conspicuous transverse fringe of fine papillae just above its base; side-wings broad, undulate, entire (1-few

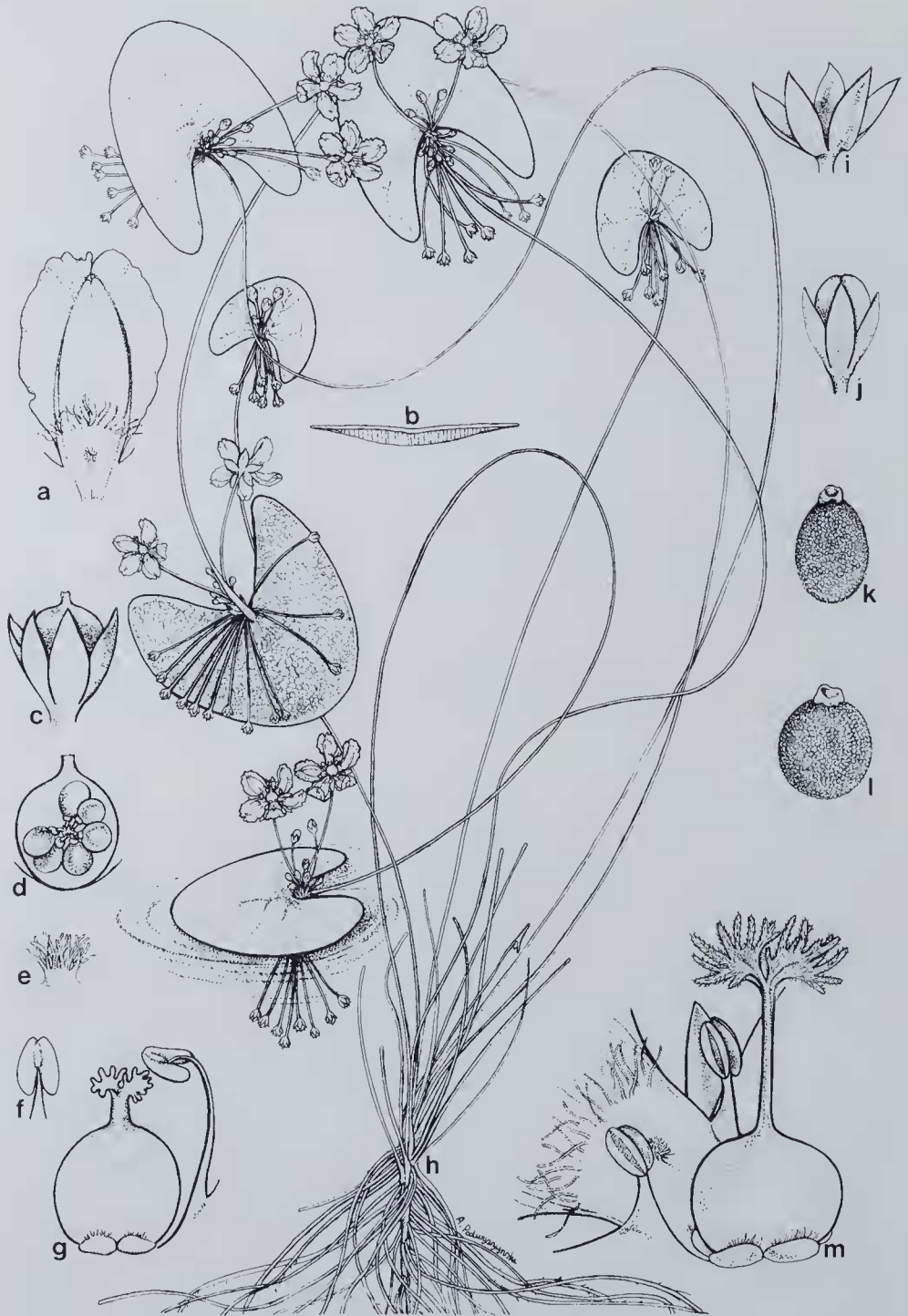


Fig. 4. *Nymphaeoides spongiosa*. a—portion of corolla, x 4.5; b—leaf, T.S. showing spongy underside, x 1; c—capsule and persistent calyx, x 5; d—capsule, L.S. showing the position of one of the short placentas, x 5; e—cluster of papillae from corolla tube, x 25; f—anther, dorsal view, showing connective and versatile attachment, x 14; g—portion of short-styled flower showing relative positions of stamen and gynoecium, x 14; h—habit, x 0.7; i—calyx, x 5; j—bud, x 6; k—seed, edge view, x 14; l—seed, face view, x 14; m—portion of long-styled flower, x 14. a, e—g, and m from Aston 1903 (MEL); b—d, and h—j from Aston 1936 (MEL); k—l from Must 1123 (BRI).

lacinae at the apex), extending from the apex of the lobe almost to its base. *Corolla tube* papillae clustered at the summit of a short common stalk. *Stamens* with filaments c. 0.3-0.6 and 1-2.4 mm long in long-styled and short-styled flowers respectively, strongly incurved above the stigma in short-styled flowers; anthers versatile, \pm broad-linear to elliptic, c. 1.5 times as long as broad, c. 0.5-0.7 mm long. *Gynoecium (long-styled flower)* c. 3-3.2 mm long; ovary \pm globose, abruptly contracted into the style; placentas 2(-3), very short, less than one-quarter of the capsule length, positioned centrally down the ovary wall; ovules c. (5-)11-28(-37); style c. 0.8-1.5 mm long; stigmas 2(-3), each a broad, papillate, irregularly-shaped, usually strongly lacinate, semi-spreading wing c. 0.7 mm long. *Gynoecium (short-styled flower)* c. 1.5 mm long; style c. 0.2-0.45 mm long; stigmas c. 0.2-0.5 mm long, condensed, rather lobed and undulate. *Capsule* very broad-ellipsoid to globose, from a little less than to equal to the calyx, 2.25-4 x 1.75-3 mm. *Seeds* (5-)8-14(-25) per capsule; body of seed very broad-ellipsoid, near-globose but slightly to moderately laterally compressed, 0.65-1.11 mm long x 0.6-0.97 mm wide x 0.35-0.7 mm thick, cream-straw to light brown-grey when mature, densely covered with very short convex tubercles or else having the faces smooth with the tubercles present only on and close to the seed edges and gradually diminishing in length from the edge towards the face; basal caruncle present, circular, pale, typically thick and conspicuous, sometimes thin. (Seeds of many capsules are shallowly pitted, the pits consisting of incipient tubercles not yet extruded. It is often difficult to locate capsules with seeds showing the maximum degree of tubercle development for the population concerned.)

TYPE COLLECTION:

About 6 km east of the Howard River crossing of the Howard Springs to "Koolpinyah" road, 12°26'S, 131°08'E, Northern Territory, 17.v.1976, *Aston 1936* (Holotype: MEL 1505146. Isotypes: CANB, MEL 1505145, NT).

SELECTED SPECIMENS EXAMINED (total 14):

Northern Territory—c. 2 km NE. of the Jim Jim Creek crossing of the Pine Creek to Oenpelli road, 12°57'S, 132°34'E, 9.v.1976, *Aston 1903* (MEL 1505142-43, NSW, NT). Yellow Waterhole at Jim Jim (=Cooinda) Camp, 12°55'S, 132°32'E, 9.v.1976, *Aston 1905* (BR1, MEL 1505144). Georgetown Waterhole, on the Magela Creek system, c. 6 km SE. of Jabiru, 12°42'S, 132°56'E, 10.v.1976, *Aston 1912* (K, MEL 1505147-49, NSW). Lagoon near South Alligator River, 12°56'S, 132°24'E, 4.vii.1977, *Craven 4593* (CANB 271633, MEL 537853, NT 56386). Overflow of "Mudginbarry" Lagoon, 12°35'S, 132°52'E, 1.vi.1974, *Jacobs 1801*(NSW). Nourlangie Rock area, 23.v.1973, *Must 1123* (BR1 169980, CANB 244197, DNA 6806, NT 41699).

DISTRIBUTION:

Northern Territory—Prolific in the Jim Jim Creek—Nourlangie—Jabiru—Mudginbarry region between the South and East Alligator Rivers and also recorded from the Howard River—Koolpinyah area east of Darwin.

HABITAT:

Seasonal swamps, lagoons and backwaters of creeks, in still shallow freshwaters. On sandy-humus, sandy-mud and heavy clay substrates. Flowers and fruits well in water 5-60 cm deep and where stranded on saturated soil. Fl. and Fr. recorded 8 April—21 July, with one collection in November.

NOTES:

Readily recognised as a member of the "indica group" by the white flowers (yellow only in the throat) and the clustered inflorescence arising from the apparent petiole against the leaf blade. It differs from all other species of that group in its spongy but smooth underleaf surface and in its corolla lobes (side-wings entire, broad, extensive). The mostly 5-partite flowers, the lack of keels on the corolla lobes, the \pm globose ovary abruptly contracted into the style, the shortness and position of the placentas and the seed characters should also be noted.

The epithet *spongiosa* refers to the leaf sponginess which is very noticeable in the field and also discernible in dried collections.

***Nymphoides subacuta* H. I. Aston, sp. nov.**

Nymphoides sp. nov. 'D', Aston in litt.

Plantae annuae vel ?perennes. Laminae foliorum angustissime ad late ovatae, aliquando quasi-circulares, integrae, profunde cordatae, acutae vel late obtusae, (1-)-3-11 x (0.5-)-2-9 cm. Petiolus compressus, in sectione oblongus. Inflorescentia laxa, binis floribus pedicellatis binisque bracteis ad nodos; internodis 0.2-5(-9) cm longis. Flores heterostyli, (4)5(6)-partiti. Calyx projecturis labiformibus, incrassatis minutis ad loborum juncturas praeditus. Corolla (20-)-26-40(-45) mm diametro, flavo-aurantiacea; lobae alis lateralibus latis perlaciniatis fimbriaque transversa prope lobae basin papillarum tenuium liberarum formata praeditae. Papillae liberae, vel in fasciculis ad basin incrassatis semi-connatae, in medium marginemque fimbriam. Capsula ellipsoidea-ovoidea, 3-6 x 2.5-4 mm. Semina 2-8 per capsulam, \pm globosa, leviter autem compressa, 1.4-1.9 x 1.3-1.7 x 1-1.4 mm (longitudo latitudinem aequans, crassitie $1\frac{1}{2}$ - $1\frac{1}{2}$ longior), nigrescentia-atrofusca maturitate, tholiformibus-projecturis velata; tholi de tuberculis tenuibus obtusis densi-appressis formati; depressiones inter tholis tuberculis similaribus brevioribus vestitae; caruncula basalis, circularis, pallida, crassa, conspicua.

Annual, perhaps perennial where water persists. *Branches* several from the plant base, slender, flexuose, floating, simple or forked once or twice, to 70 cm long, their terminal portions developing the inflorescences. *Basal leaves* several; petioles slender, compressed, oblong in cross-section, to 75 cm long; blades narrow- to broad-ovate or occasionally near-rounded in outline, deeply cordate (the lobes mostly 30-40% of the total blade length and separated by a sinus of 12° - 40° (-60°) angle or rarely slightly overlapping), acute to broad-obtuse, entire, (1-)-3-11 x (0.5-)-2-9 cm. *Cauline leaves* similar, becoming progressively smaller and shorter-petioled toward the inflorescence. *Inflorescence* as for the "geminata group", the internodes 2-50(-90) mm long; bracts lanceolate-ovate, e. 2-7 mm long, one bract of the lower node often replaced by a leaf; pedicels 20-70(-100) mm long. *Flowers* (4)5(6)-partite. *Calyx lobes* narrow-ovate, (3.5-)-5-6 mm long, thick-textured with narrow translucent margins and basally with a minute, thickened, lip-like projection formed at each junction of contiguous lobes. *Corolla* (20-)-26-40(-45) mm span, "orange-yellow" to "deep bright golden-orange". *Corolla lobes* broad-elliptic; mid-section glabrous except for a conspicuous transverse fringe of fine papillae at its base and sometimes a few papillae along its midline above the fringe; fringe papillae e. 1-2.5 mm long, all free or else some partially-united to form thick-based clusters of shorter (sometimes hair-tipped) papillae, the clusters 1-several at the edges and centre of the fringe; side-wings broad, undulate, strongly-lacinate, extending from the apex of the lobe almost to the base. *Corolla tube* papillae free within the cluster and sessile, or else arising from a common stalk. *Stamens* with filaments c. 0.3 and 1.3 mm long in long-styled and short-styled flowers respectively; anthers \pm linear-ovate, e. 1.5-2 times as long as broad, 1.5-1.75 mm long. *Gynoecium (long-styled flower)* e. 7.5 mm long; ovary free except at the base, \pm linear-conical, gradually tapered into the style; placentas 2, short, extending down perhaps one-quarter of the length of the ovary wall; ovules c. 10; style c. 1.5 mm long; stigmas 2, each a broad, lobed, papillate, \pm semicircular, erect wing e. 3 x 3.5 mm, the lobes sometimes deep-cut and undulate and simulating additional stigmas. *Gynoecium (short-styled flower)* e. 3.5 mm long, style c. 0.75 mm long; stigmas c. 1.25 x 1.8 mm, condensed, deeply-lobed and undulate thus obscuring the basic wings. *Capsule* ellipsoid-ovoid, equal to or a little longer than the calyx, 3-6 x 2.5-4 mm, opening irregularly underwater or sometimes (on plants stranded on mud) becoming dry and chartaceous and splitting at the summit into usually 4 recurved valves. *Seeds* 2-8 per capsule; body of seed \pm globose but slightly laterally compressed, 1.4-1.9 mm long x 1.3-1.7 mm wide x 1.1-1.4 mm broad, dark brown-grey-black when mature, covered with regular dome-like projections, each dome consisting of closely-appressed slender obtuse tubercles, the inter-dome depressions densely covered with shorter non-appressed but otherwise similar tubercles; basal caruncle present, circular, pale, thick and conspicuous.

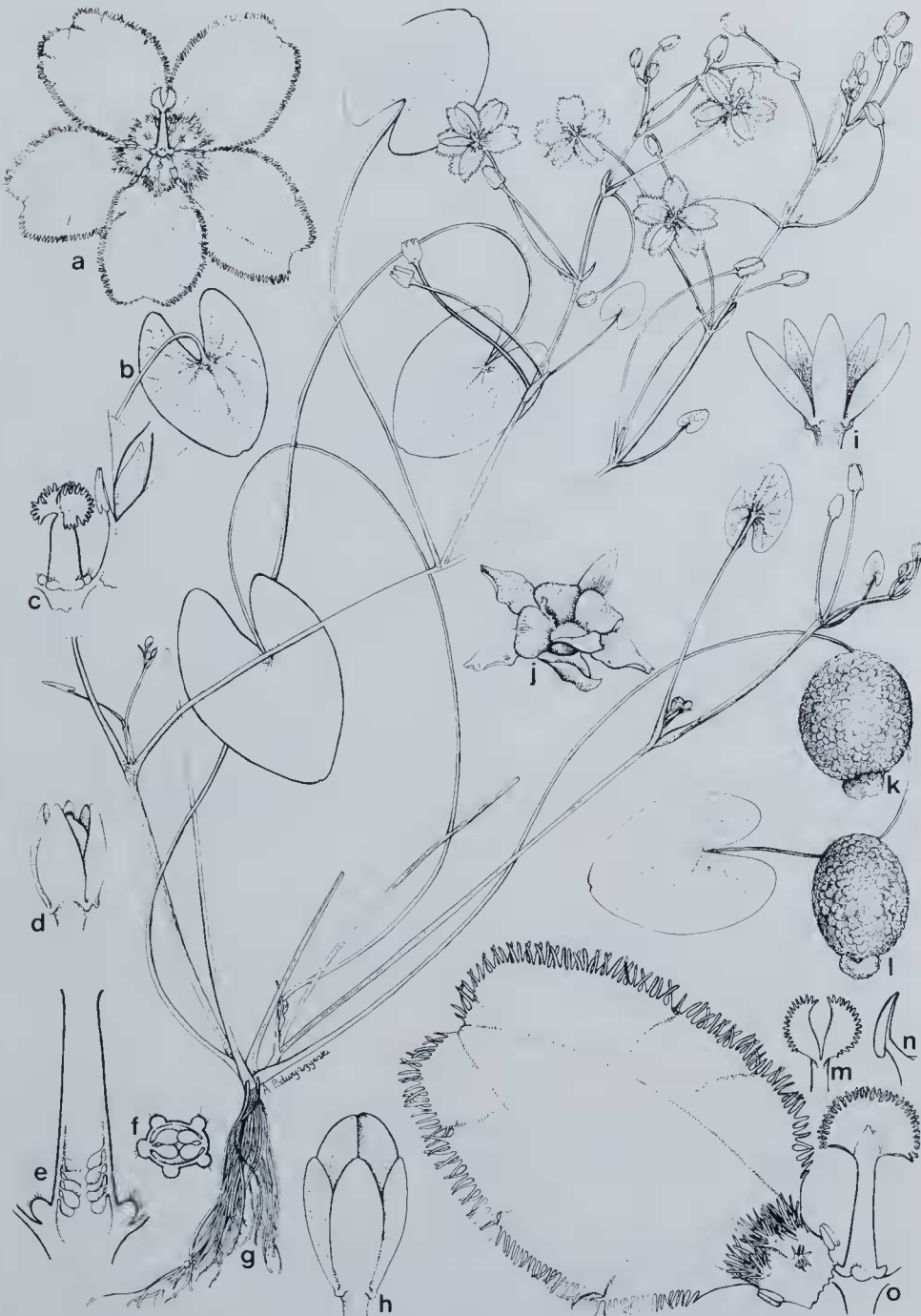


Fig. 5. *Nymphaoides subacuta*. a—flower, long-styled, x 1.5; b—leaf undersurface, x 0.3; c—portion of short-styled flower, x 4; d—calyx, showing basal projections, and enclosing a semi-mature capsule, x 2; e—ovary, L.S. showing its partially-inferior structure and short parietal placentas, x 8; f—ovary, transverse section, x 8; g—habit, x 0.3; h—bud, x 3.5; i—calyx, showing basal projections, x 2; j—dehiscent capsule from plant stranded on mud, the valves recurved, calyx persistent but spread, x 2.5; k—seed, face view, x 12; l—seed, edge view, x 12; m—stigma from long-styled flower, edge view, x 4; n—stamen, lateral view, x 7; o—portion of long-styled flower, x 4. All from Aston 1935 (MEL).

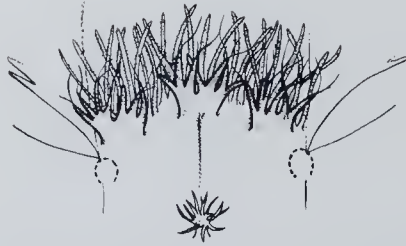


Fig. 6. *Nymphoides subacuta*. Papillate fringe of the corolla lobe, semi-diagrammatic, showing some clustering, x 8. From Aston 1935 (MEL).

TYPE COLLECTION:

McMinns Lagoon, approximately 30 km ESE. of Darwin city centre, 12°31'S, 131°05'E, Northern Territory, 20.v.1976, *Aston 1954* (Holotype: Long-styled plant 1954A (MEL 1505123). Isotype: CANB. Paratypes: Short-styled plant 1954B (DNA); Short-styled plant 1954C (MEL 1505122 and 124); Style unspecified, leaves only, showing variation (MEL 1505125). All plants of *Aston 1954* collected within 3 metres of each other.

SELECTED SPECIMENS EXAMINED (total 12):

Northern Territory—Lagoon 10 miles from Darwin, v. 1922, *Allen 539* (NSW). Adelaide River, 1890, *Anonymous 1117* (MEL 1505126-28). Point Stuart road, 11 km south of Jimmys Creek, 12°39'S, 131°48'E, 13.v.1976, *Aston 1930*, (CANB, K, MEL 1505119-21). Knuckeyes Lagoon, 12°27'S, 130°57'E, 17.v.1976, *Aston 1935* (CANB, MEL 1505109 and 111-115, NSW, NT). Scotch Creek, 12°41'S, 131°28'E, 19.v.1976, *Aston 1948* (DNA, MEL 1505116). Point Stuart, [12°15'S, 131°55'E], 5.v.1967, *Byrnes 265 or 265a* (AD 96942177, DNA 1070, NT 14169). Port Darwin, 1885, *M. Holtze 485* (MEL 1505130). Koongarra, 12°53'S, 132°50'E, 19.iv. 1979, *Rankin 2030* (MEL 558461! DNA n.v.).

DISTRIBUTION:

Northern Territory—recorded only from the region between Darwin and the East Alligator River. Frequent from near Darwin east to Jimmy's Creek and Point Stuart, with one outlying record from south-east of Nourlangie Rock.

HABITAT:

Seasonally flooded still, shallow, freshwater swamps, backwaters, or roadside depressions; once recorded from a permanent lagoon. On sandy, sandy-loam or sandy-humic substrate; once recorded from black soil plain. Flowers and fruits well in water 2-50 cm deep and where stranded on saturated soil. Fl. and Fr. recorded 19 April—18 July.

NOTES:

Readily recognised as a member of the "geminata group" by the yellow-orange flowers and open inflorescence with twinned pedicels. It differs from all other species of that group in its more pointed leaf blades, its compressed petioles, the presence of the small protruberances at the junctions of the calyx lobes and in the very distinctive seeds.

The epithet *subacuta* refers to the comparatively pointed and sometimes quite acute apex of the leaf blades. This feature is conspicuous in the field and allows at least tentative identification of a population of the species at first glance.

Individuals (*Aston 1930*) from only 2-7 cm water in a temporarily-flooded table drain exhibited the smallest, most acute leaves of any plants seen. Many blades were only 1-2 cm long (maximum 3.5 cm) whereas those on a nearby plant from 20 cm water were 3.5-7 cm long. In *Aston 1935* the corolla span of both long- and short-styled flowers on stranded plants was (20-)28-32(-35) mm while that of flowers developed on adjacent plants in water was (28-)32-40(-45) mm. These examples illustrate the reduction in size of both vegetative and floral parts where they develop

in very shallow water or on plants stranded on saturated soil. This reduction is noticeable in *Nymphoides* species as well as in other aquatic genera.

ACKNOWLEDGEMENTS

Mr C. R. Dunlop, Darwin Herbarium, Department of Primary Production, Darwin, and Mr B. P. M. Hyland, Queensland Research Station, CSIRO, Atherton, provided invaluable assistance and support during my field work on *Nymphoides* in 1976 in the Northern Territory and Queensland respectively. Mr L. G. Adams, Herbarium Australiense, CSIRO, Canberra, provided material of *N. quadriloba* with the suggestion that it could be a new species and directed me to what is now its type location. Mr L. A. Craven, also of Herbarium Australiense, has been consistently helpful over several years in gathering good collections from the Northern Territory and in alerting me to the presence of *N. planosperma*. Messrs N. T. Sanderson and J. T. Waterhouse, School of Botany, University of New South Wales, Sydney, have forwarded their own collections and field notes, those of *N. planosperma* being particularly appreciated because of the few collections yet made of this species. Drs B. R. Jackes (JCT), S. W. L. Jacobs (NSW) and R. C. Carolin (SYD) have all made special collections for my examination. Dr. G. A. M. Scott, Botany Department, Monash University, Melbourne, has kindly prepared all latin descriptions and Miss A. Podwyszynski of the National Herbarium of Victoria has provided the illustrations. I am very grateful to all these people for the great assistance they have given.

Full acknowledgement to herbaria for the loan of specimens and the use of facilities will be given in the subsequent generic revision.

REFERENCES

- Aston, H. I. (1973). 'Aquatic Plants of Australia'. (Melbourne University Press: Melbourne).
 Ornduff, R. (1969). Neotropical *Nymphoides* (Menyanthaceae): Meso-American and West Indian species. *Brittonia* 21: 346-352.
 Ornduff, R. and Mosquin, T. (1970). Variation in the spectral qualities of flowers in the *Nymphoides indica* complex (Menyanthaceae) and its possible adaptive significance. *Canad. J. Bot.* 48: 603-605, t.1.

