

A7

Nymphaea alba community

Nymphaeetum albae Oberdorfer & Mitarb. 1967

Synonymy

Nymphaea alba consociés Pearsall 1918; *Nymphaea occidentalis* consociés Pearsall 1918; *Nymphaeetum albae* Tansley 1939; *Nymphaeetum occidentalis* Tansley 1939; *Nymphaeetum minoris* Vollmar 1947; *Nymphaea alba* sociations Spence 1964.

Constant species

Nymphaea alba.

Rare species

Nuphar pumila, *Nymphoides peltata*.

Physiognomy

Nymphaea alba is a native water-lily, but a plant widely introduced to lakes and ponds because of the ornamental character of its large white flowers, appearing above water in mid-summer and attractively set off against the dark green floating pads which are put up from the stout rhizomes some two months earlier (Heslop-Harrison 1955d). Some authorities (Clapham *et al.* 1962, but Tutin *et al.* 1964) distinguish a ssp. *occidentalis*, to include altogether smaller plants than those reserved for a ssp. *alba*, but there is continuous variation between the extremes of size, and the taxa have only rarely been separately recorded in the available data. For these reasons, it is difficult to give a precise indication of the natural floristic affinities of the plant or to know how taxonomic differences within it are reflected among the associates. But there seem to be three kinds of floating-leaved vegetation dominated by water-lilies in which *N. alba* plays a prominent role. Quite commonly, and particularly in the English lowlands, it occurs in abundance among *Nuphar lutea*, and in this scheme such stands are included within the *Nuphar* community. In many situations, though, *N. lutea* is extremely rare among abundant *N. alba* and it is such vegetation that forms the basis of the *Nymphaeetum albae*, of which two types have been distinguished. Few other plants occur with any frequency throughout the community, indeed

many stands are very species-poor, but *Potamogeton natans* varies from occasional to very common, and there is quite often some submerged *P. obtusifolius*. *Lemna minor* can also be found, although extensive covers of this are best seen as representing mosaics of the *Lemnetum minoris* among the water-lily vegetation.

Sub-communities

Species-poor sub-community. Very often, *N. alba* is the only plant in this vegetation, with just occasional *P. natans* or *P. obtusifolius*, but the rare *Nuphar pumila* has been recorded here in some of its Scottish localities and, in lowland England, *Nymphoides peltata*, another rarity that may have been introduced to parts of its present range (Perring & Walters 1962, Perring 1968). *Elodea canadensis*, a plant more often found beneath *N. lutea*, is sometimes found, and there can be some *Nitella* spp. *Juncus bulbosus* and *Utricularia* spp. can also occur but these are much more characteristic of the next sub-community.

***Juncus bulbosus*-*Potamogeton polygonifolius* sub-community:** *Nymphaea alba* ssp. *occidentalis* sociation Spence 1964. *N. alba* is still the dominant plant here, though it is in this kind of *Nymphaeetum* that the smaller ssp. *occidentalis* has been most commonly distinguished. Moreover, the floating-leaved layer is generally supplemented by *P. natans* and *P. polygonifolius*, sometimes growing in abundance and often hard to distinguish without close examination. Commonly, too, there is a submerged mass of *Juncus bulbosus* var. *fluitans*, with occasional *Myriophyllum alterniflorum*, *Utricularia* spp. (usually *U. minor* and/or *U. intermedia*) and *P. obtusifolius*. *Sparganium minimum*, *S. angustifolium* and *Hippuris vulgaris* can also be locally prominent and, where this vegetation occurs over the *Littorella-Lobelia* community, *Littorella uniflora* and *Lobelia dortmanna* may be recorded.

Habitat

The *Nymphaetum* occurs widely in the deeper vegetated zones of standing and slow-moving waters in many parts of Britain, but seems most naturally characteristic of oligotrophic and base-poor conditions, and is most strikingly developed in acidic, often peaty, basins through the upland fringes of the north and west.

N. alba seems to be fairly catholic in its nutrient and base requirements and can grow vigorously in the more eutrophic open waters, such as ponds and lakes, canals and very sluggish rivers, that occur widely in the lowlands of the south and east of the country. Often, in such situations, it is an integral part of the *Nuphar* community, water-lily vegetation of more generally enriched waters, but, where it comes to dominate the floating-leaved element alone, stands of the Species-poor *Nymphaetum* can develop. Unfortunately, because of the widespread planting of *N. alba*, we just do not know how many such stands are of natural origin.

However, this kind of vegetation also extends widely into the north and west of Britain, where populations of this water-lily are more likely to be native, and its associates a better reflection of natural environmental conditions. Here, too, Species-poor *Nymphaetum* can be found in less impoverished open waters such as lakes and pools on less acidic rocks or with some local enrichment from input streams, where the substrate can be fine to coarse mineral material, and where the conductivity can exceed 100 μmho and the alkalinity be over 25 mg l^{-1} calcium carbonate (Spence 1964, Palmer 1992, Palmer *et al.* 1992). Such vegetation can extend into fairly deep places, the petioles readily raising the floating laminae through up to 2 m of water or so; but *N. alba* will not tolerate much turbulence or scouring, despite its extensive rhizomes and deep roots, so stands are typically found away from strong currents and pronounced wave action, occupying sheltered shores and bights, and sometimes extending into sluggish input and outflow streams.

The *Juncus-Potamogeton* sub-community, with its richer submerged element, is even more a vegetation type of undisturbed situations, and it can be found in shallower waters than the Species-poor *Nymphaetum*, less than 1 m or so deep, and grows closer to lake shorelines, provided waves are not breaking there. But it is also more obviously associated with base-poor and oligotrophic conditions than the other sub-community, being often found on peaty substrates, and in waters with conductivities between 10 and 200 μmho and alkalinities below 25 mg l^{-1} calcium carbonate (Palmer 1989). It is confined to the north and west and typical of both larger, nutrient-poor lakes cut into acidic rocks, and also smaller, peaty basins, often associated with extensive tracts of blanket mire (Tansley 1939, Spence 1964, Palmer 1989). It can also be found in very slow-

moving soakways in soligenous areas of mire vegetation (Haslam 1978).

Zonation and succession

The *Nymphaetum* often occurs towards the limit of the zone of floating-leaved vegetation in open waters, sometimes comprising the only member of this element, or being accompanied by other floating-leaved or floating communities. Submerged aquatic vegetation can occur beneath it where the shading effect of the leaf laminae is not too intense, and the community sometimes persists among more open stands of emergents colonising the margins of open waters.

In more mesotrophic lakes and pools in lowland Britain, the *Nymphaetum* can monopolise the water surface, or occur intermixed with remnants of a floating mat of the *Lemnetum minoris* or, much more locally, of the *Spirodela-Hydrocharis* community, persisting from an earlier stage in colonisation. Sometimes, too, there can be a mosaic with patches of the *Potamogeton natans* community, another floating-leaved vegetation type able to extend into deeper water. Then, beneath, there is occasionally some *Elodea canadensis* vegetation, though this is more often associated with the *Nuphar* community. Even in deeper places, emergents can begin to colonise waters with the *Nymphaetum*, and it is quite often seen growing among the shoots of the *Scirpetum lacustris* or, in shallower areas, among open stands of the *Typhetum angustifoliae*, the *Typhetum latifoliae* or the *Phragmitetum*. Denser zones of these swamps or, in other places, of the *Caricetum ripariae*, can then replace the aquatic vegetation around the water margins.

In open waters towards the north and west, surface mats of duckweeds are scarce and the *Nymphaetum*, sometimes mixed with the *Potamogeton natans* community, is often the only aquatic vegetation breaking the surface. In less nutrient-poor lakes, the *Elodea canadensis* community can again be present beneath or, more locally, the *Potamogeton perfoliatus-Myriophyllum alterniflorum* vegetation. The species-poor *M. alterniflorum* community can also grow under the *Nymphaetum* canopy in more oligotrophic lakes and pools, but quite a common pattern in such situations is for the water-lily vegetation, often the *Juncus-Potamogeton* sub-community, to grow through some kind of *Littorella-Lobelia* sward. Emergent stands of the *Scirpetum lacustris* can complicate such zonations, even in quite deep water, and this kind of *Nymphaetum* often extends back into shallower places, where other swamp communities, notably the *Caricetum rostratae* and the *Equisetum fluviatile*, are colonising the margins.

Where the *Juncus-Potamogeton* sub-community occurs in peaty pools and bog soakways, it is often found in association with the *Juncus bulbosus* community.

In more nutrient-rich waters, the *Nymphaeetum* should eventually be succeeded by some kind of Phragmitetalia swamp, but the kinds of zonation seen in more oligotrophic open-water transitions seem to change little over many decades and cannot really be said to represent a simple hydrosere.

Distribution

The Species-poor sub-community occurs throughout the range, but is especially common towards the lowland south and east, where it may often have a planted origin. The *Juncus-Potamogeton* type is confined to the north and west, where it is local but quite widespread.

Affinities

The *Nymphaeetum* as described here can subsume the consocieties and sociations characterised among the various kinds of *N. alba* vegetation in Britain (Pearsall 1918, Tansley 1939, Spence 1964) and is essentially the same as white water-lily associations diagnosed from mainland Europe (Vollmar 1947, Oberdorfer 1977). Stands with both *N. alba* and *N. lutea* are placed in the *Nuphar* community, which takes in vegetation similar to the Continental *Myriophyllo-Nupharetum* Koch 1926 and the *Potameto-Nupharetum* Müll & Gors 1960 *emend.* Segal 1965 (Westhoff & den Held 1969, Oberdorfer 1977). Traditionally, floating-leaved communities of this kind have been grouped in the Nyphaeion alliance of the Potametalia.

Floristic table A7

	a	b	7
<i>Nymphaea alba</i>	V (4–8)	V (4–10)	V (4–10)
<i>Nuphar lutea</i>	I (4–9)		I (4–9)
<i>Nuphar pumila</i>	I (4–5)		I (4–5)
<i>Elodea canadensis</i>	I (2–5)		I (2–5)
<i>Nitella</i> spp.	I (1–9)		I (1–9)
<i>Potamogeton natans</i>	II (4–9)	IV (4–10)	III (4–10)
<i>Juncus bulbosus</i>	I (4–7)	IV (4–8)	II (4–8)
<i>Potamogeton polygonifolius</i>		IV (1–7)	II (1–7)
<i>Myriophyllum alterniflorum</i>	I (4)	II (4–5)	I (4–5)
<i>Utricularia vulgaris</i>	I (4–6)	II (1–4)	I (1–6)
<i>Sparganium minimum</i>		II (4–8)	I (4–8)
<i>Hippuris vulgaris</i>		II (4–6)	I (4–6)
<i>Sparganium angustifolium</i>		II (1–8)	I (1–8)
<i>Potamogeton berchtoldii</i>		I (1–4)	I (1–4)
<i>Potamogeton obtusifolius</i>	II (2–6)	II (2–8)	II (2–8)
<i>Lemna minor</i>	I (1–4)	I (1–5)	I (1–5)
Number of samples	36	18	54
Number of species/sample	2 (1–3)	6 (3–14)	3 (1–14)

a Species-poor sub-community

b *Juncus bulbosus*-*Potamogeton polygonifolius* sub-community

7 *Nymphaea alba* community (total)