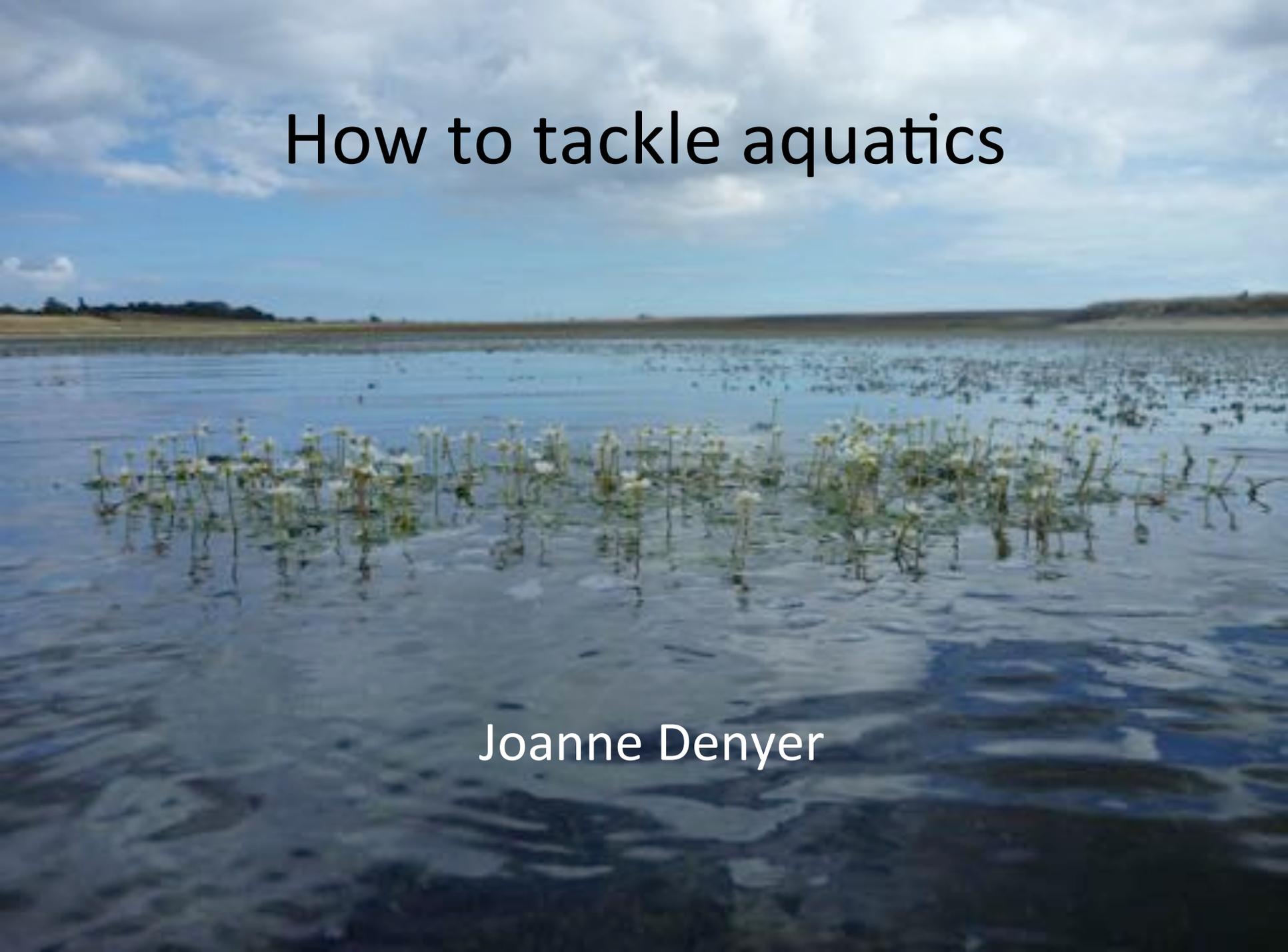


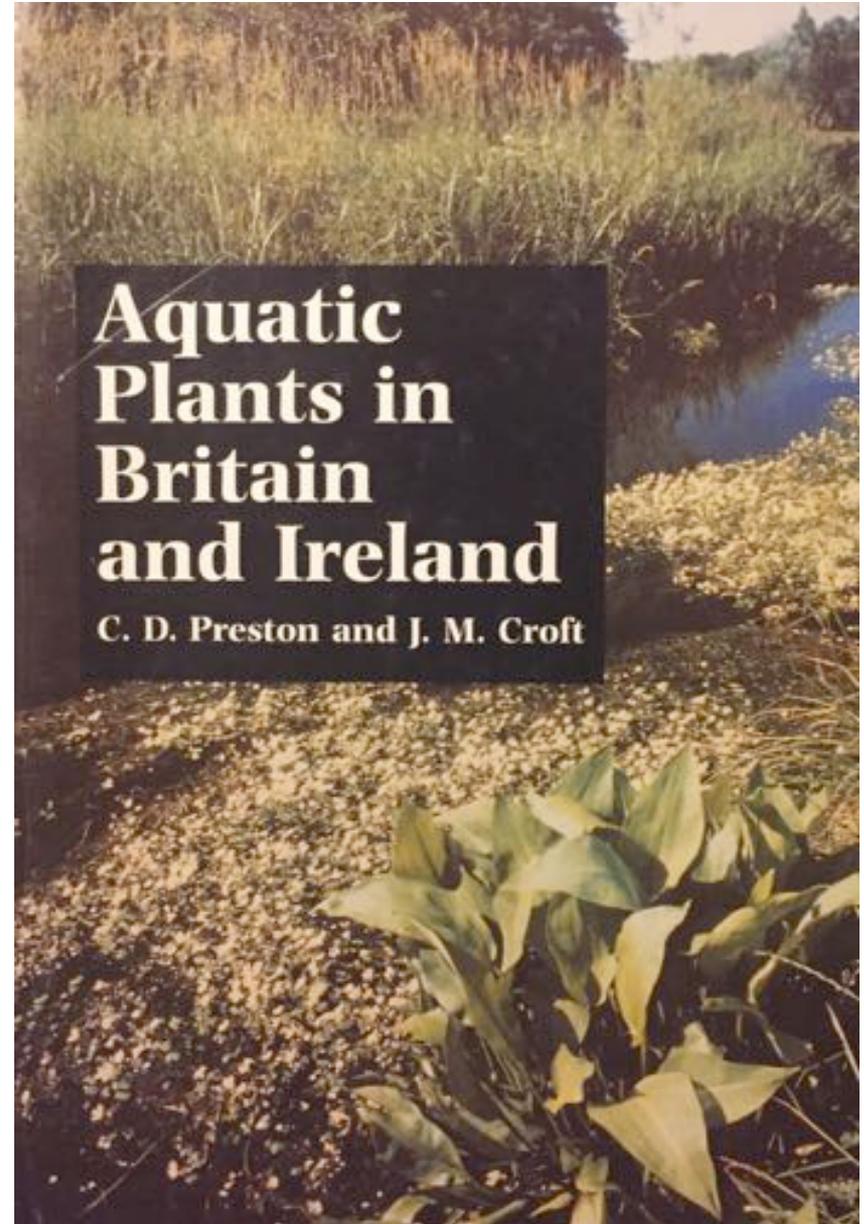
# How to tackle aquatics



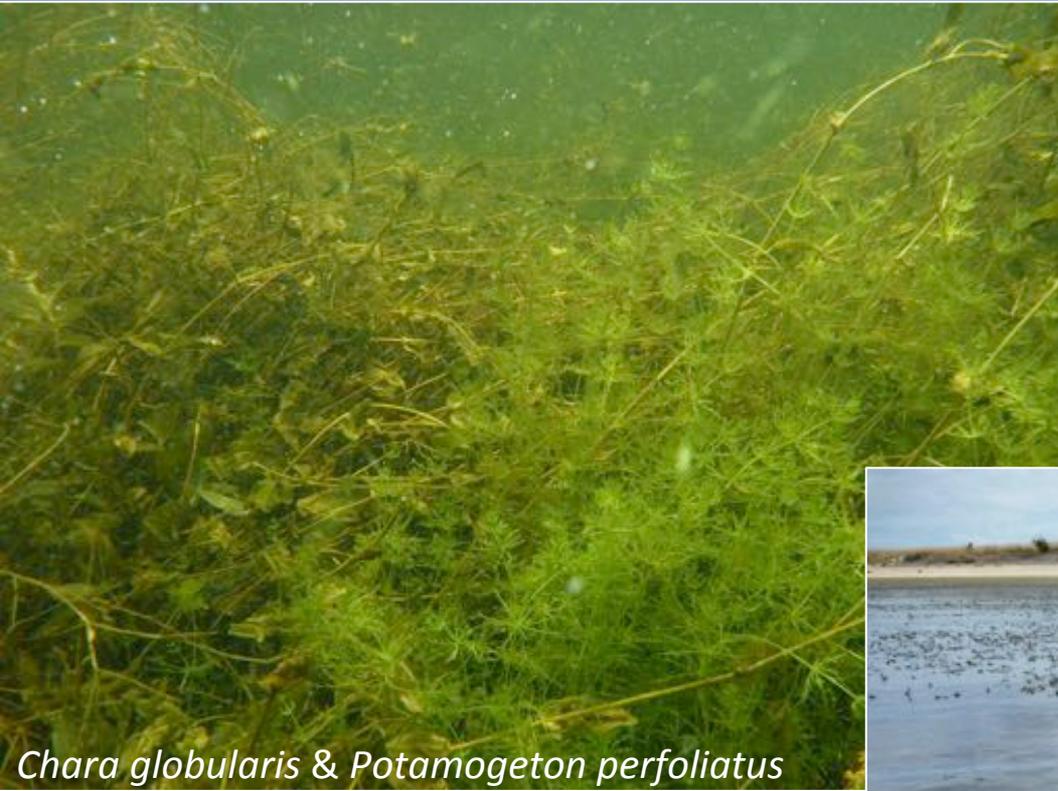
Joanne Denyer

# What is an aquatic plant?

- Aquatic plants form an ecological rather than taxonomic group
- No firm boundaries dividing aquatic and non-aquatic species
- *'Species which characteristically grow in water which persists throughout the year'*



# Habitats are varied and unexpected....



*Chara globularis* & *Potamogeton perfoliatus*

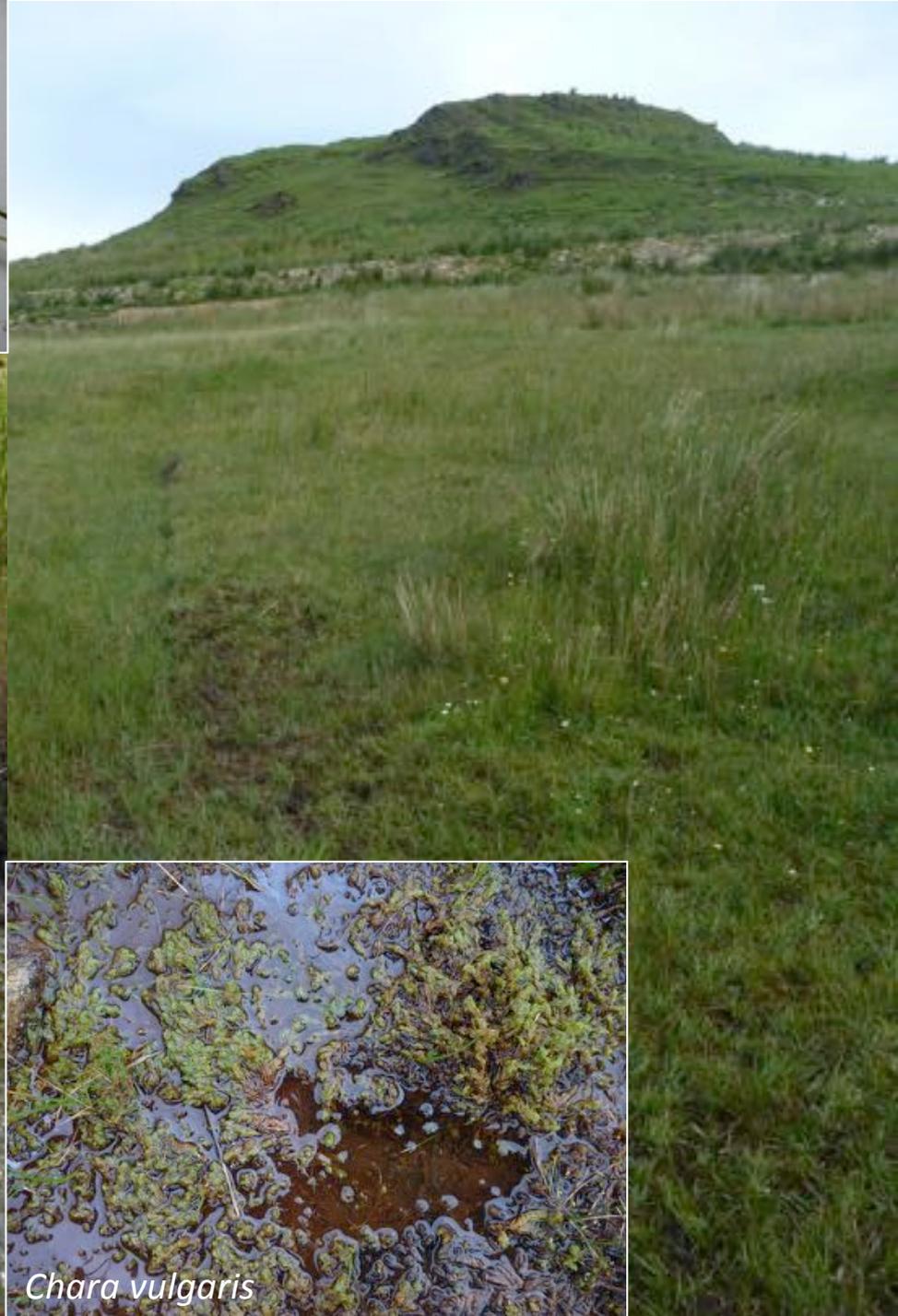


*Ranunculus baudotii*





*Ruppia maritima*



*Chara vulgaris*

*Elodea nuttallii*



*Elodea nuttallii*

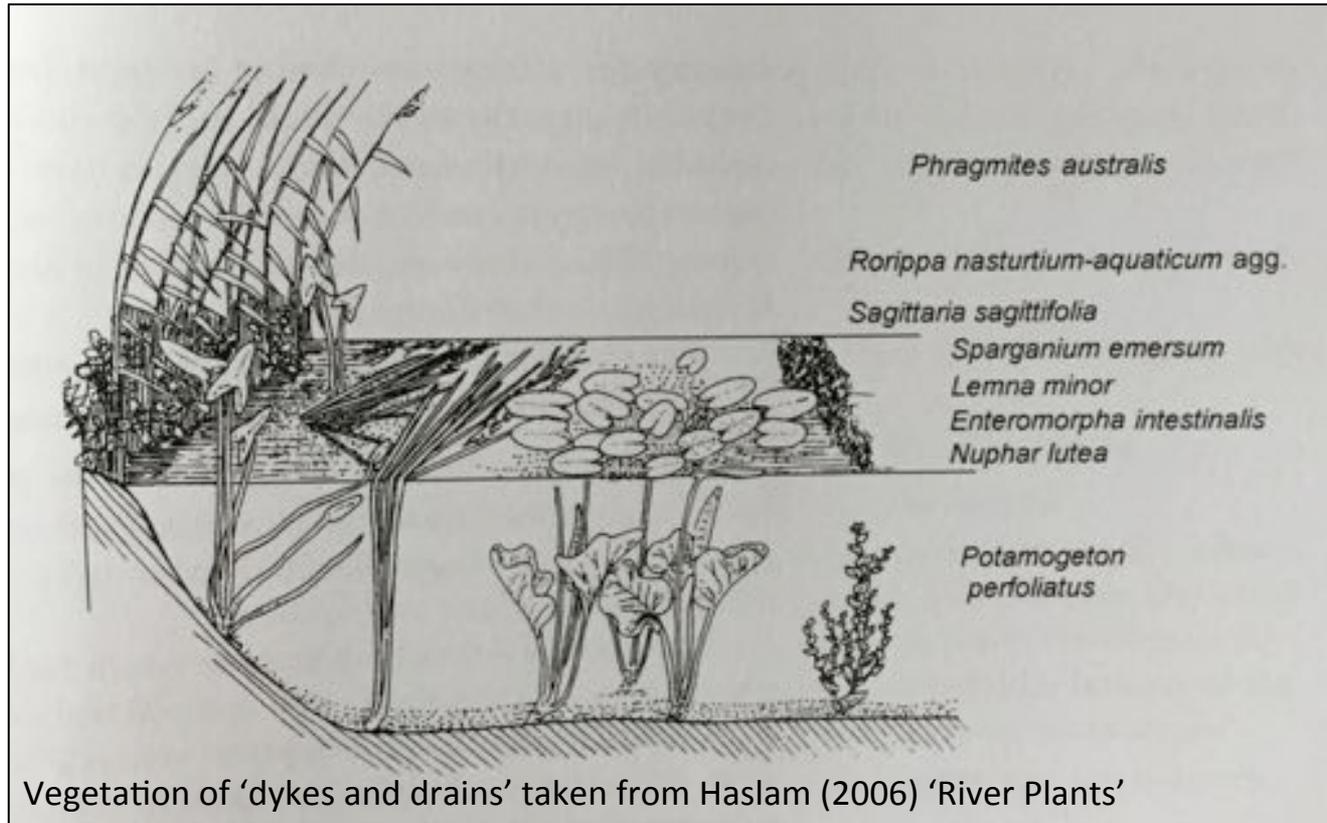




*Callitriche stagnalis*



# Main groups of 'aquatic plants'



## 'Aquatic plant' families

### FERNS & FERN ALLIES

- 3. **Isoetaceae**
- 5. Equisetaceae
- 8. **Marsileaceae**
- 9. **Azollaceae** (in Salvinaceae)

### PRE-DICOTS

- 24. **Cambombaceae**
- 25. **Nymphaeaceae**

### EU-DICOTS

- 29. **Ceratophyllaceae**
- 32. **Ranunculaceae**
- 39. Crassulaceae
- 40. **Haloragaceae**
- 44. Rosaceae
- 61. **Elatinaceae**

- 67. Lythraceae
- 68. Onagraceae
- 81. Brassicaceae
- 86. Polygonaceae
- 99. Primulaceae
- 107. Boraginaceae
- 114. Plantaginaceae
- 115. **Hippuridaceae**
- 116. **Callitrichaceae**
- 117. Scrophulariaceae
- 122. **Lentibulariaceae**
- 126. Campanulaceae
- 127. Menyanthaceae
- 137. Hydrocharitaceae
- 138. Apiaceae

- 141. **Lemnaceae**
- 143. **Alismataceae**
- 144. **Butomaceae**
- 145. **Hydrocharitaceae**  
(inc. **Najadaceae**)
- 150. **Potamogetonaceae**  
(inc. **Zannichelliaceae**)
- 151. **Ruppiaceae**
- 159. Iridaceae
- 165. **Typhaceae**  
(inc. **Sparganiaceae**)
- 167. **Eriocaulaceae**
- 168. Juncaceae
- 169. Cyperaceae
- 170. Poaceae

## ‘Handy guide to identifying Aquatic plants in Ireland’

‘Waterlillies’  
e.g. *Nuphar*,  
*Nymphaea*,  
*Nymphoides*,  
*Hydrocharis*



*Hydrocharis morsus-ranae*

Duckweeds  
e.g. *Lemna*,  
*Spirodela*



*Lemna minor*

Starworts  
(*Callitriche*)



Rooted submerged rosette plants



*Lobelia dortmanna*



*Isoetes echinospora*

Canadian Pondweeds  
e.g. *Elodea*,  
*Lagarosiphon*, *Crassula*



*Elodea canadensis*



*Hippuris vulgaris*

## Hair-like leaves



## Divided leaves



And....

## Water-plantains & Arrowheads



## 'True' Pondweeds



# Basic field equipment

Grapple/ weed rake

Plastic, sealable bags



# Other survey methods.....





## - Irish Law

- Wildlife Act, 1976
- Wildlife (Amendment) Act, 2000
- EU Regulations
- Flora (Protection) Order, 2015
- Whale Fisheries Act, 1937
- EU Birds Directive Derogations

## Flora (Protection) Order, 2015

The current list of plant species protected by Section 21 of the [Wildlife Act, 1976](#) is set out in the [Flora \(Protection\) Order, 2015](#), which supercedes orders made in 1980, 1987 and 1999.

It is illegal to cut, uproot or damage the listed species in any way, or to offer them for sale. This prohibition extends to the taking or sale of seed. In addition, it is illegal to alter, damage or interfere in any way with their habitats. This protection applies wherever the plants are found and is not confined to sites designated for nature conservation.

If you have a special requirement to take specimens of these plants, or to interfere or alter their habitat, click [here](#) for further information and to download the relevant licence application form.

*e.g. Callitriche truncata*  
*Carex divisa*  
*Groenlandia densa*  
*Limosella aquatica*  
*Lycopodiella inundata*  
*Najas flexilis*  
*Pilularia globulifera*  
*Schoenoplectus triqueter*



*Najas flexilis*



*Pilularia globulifera*

# 'Lab' Equipment



*Potamogeton pusillus*

*Chara aspera*

*Isoetes echinospora*

# Herbarium specimens





*Myriophyllum spicatum*



*Myriophyllum spicatum*



*Myriophyllum spicatum*



*Myriophyllum spicatum*

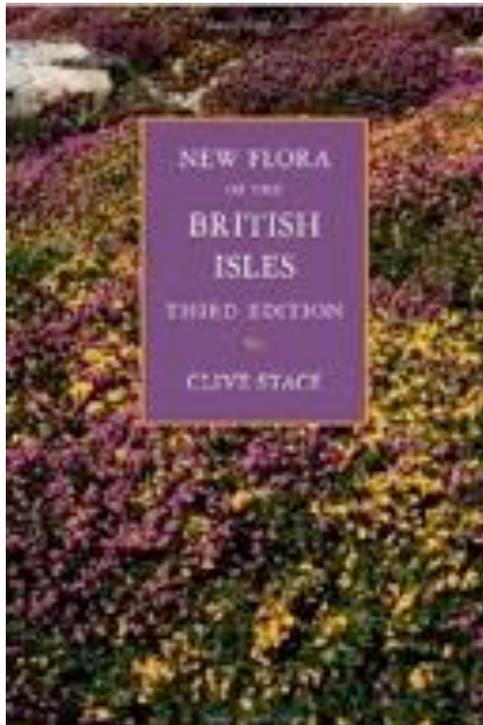
*Myriophyllum spicatum*



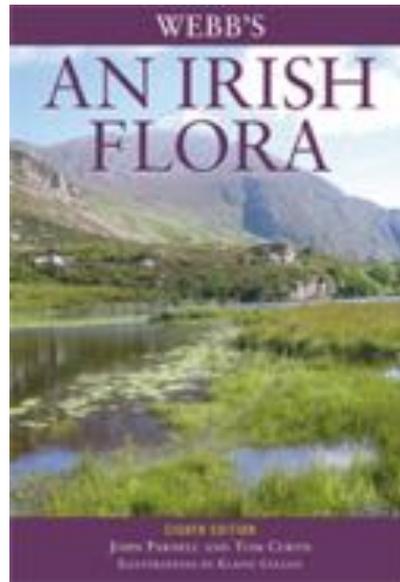
*Myriophyllum spicatum*



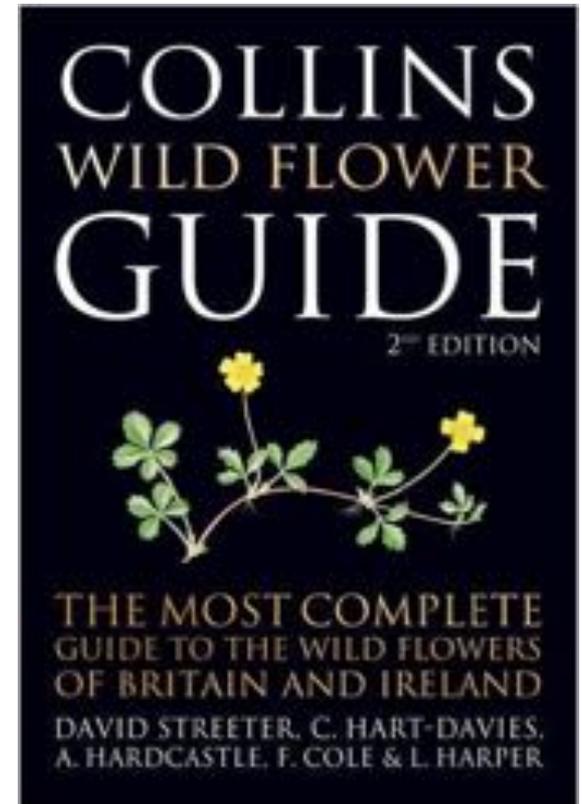
# General floras



Stace (2010)

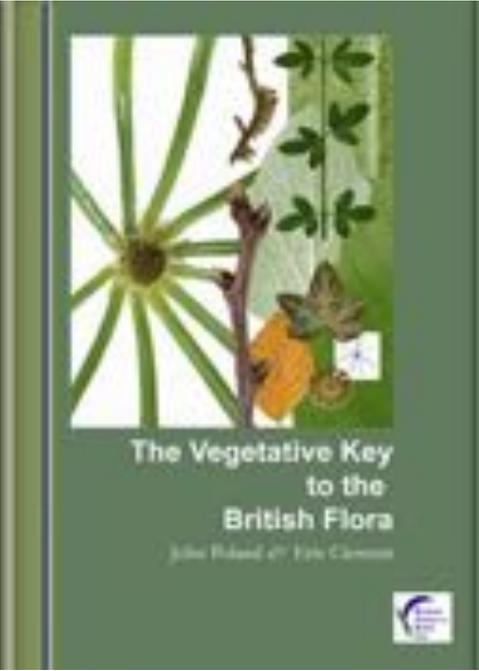


Parnell & Curtis (2012)



Streeter (2016)

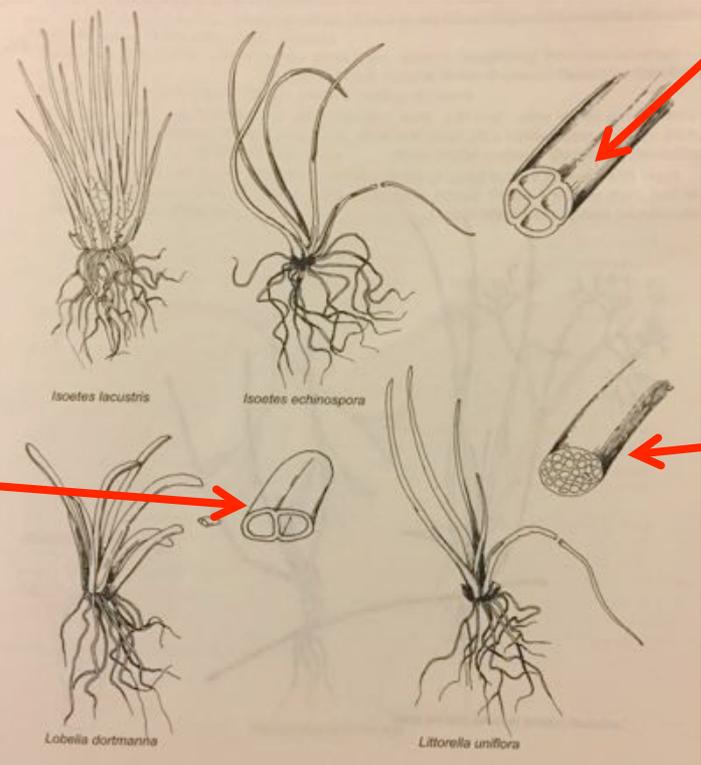
Division F - Obligate water plants



Poland & Clement (2009)



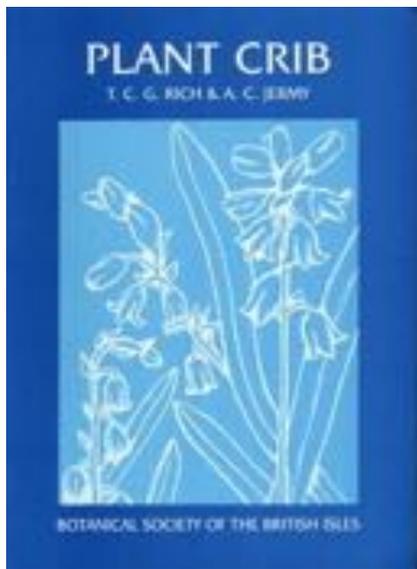
*Isoetes echinospora*



*Lobelia dortmanna*

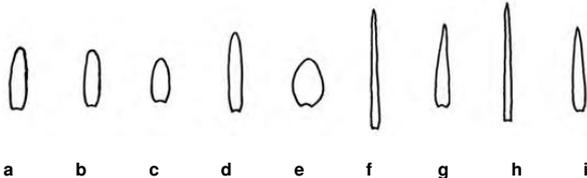


*Littorella uniflora*

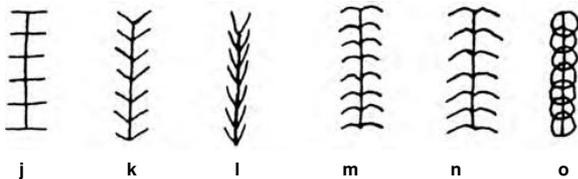


<http://bsbi.org/identification>

## Plant Crib



Outlines of leaves of *Elodea* species (a-e) *E. canadensis*, (f-g) *E. nuttallii*, (h-i) *E. callitrichoides*.



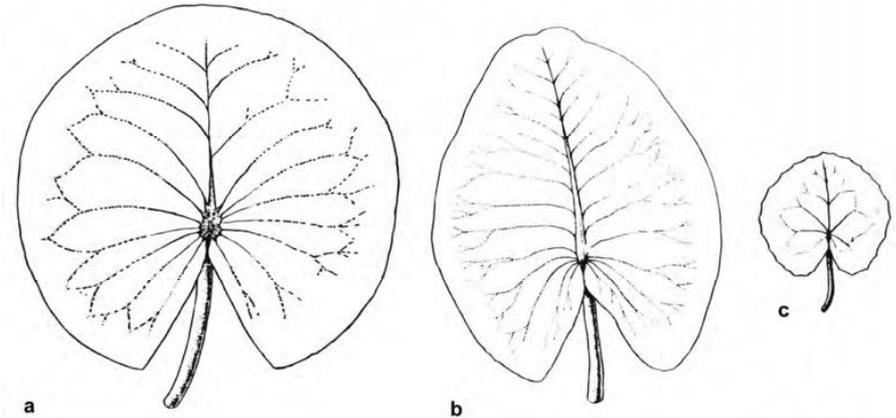
Leaf posture types. (j) spreading, (k) patent, (l) erecto-patent, (m) arcuate-deflexed, (n) slightly deflexed c.24 mm from the leaf base, (o) strongly recurved, with leaf bases often touching or overlapping the stem.

*E. canadensis* j, k, l, m  
*E. nuttallii* j, k, l, m, n, o  
*E. callitrichoides* j, k, l, m, n

References Simpson, D. A. (1984). *Watsonia* 15: 1-9.  
 Simpson, D. A. (1986). *Watsonia* 16: 1-14.  
 Simpson, D. A. (1988). *Watsonia* 17: 121-132.

## Leaves

- 1 Lateral veins of leaves arranged  $\pm$  like a herring bone, branching dichotomously (the branches sub-parallel and separate from each other; Fig. a); petiole angled (trigonous in *N. lutea*, compressed in *N. pumila*); thin translucent underwater leaves present ***Nuphar***
- 1 Lateral veins mostly radiating from the point of insertion of the petiole, breaking into a reticulum towards the edge of the leaf; petiole terete; translucent underwater leaves absent **2**
- 2 Leaves 4-30 cm, the margin entire or at most slightly wavy, the basal lobes rounded or more or less angled (Fig. b); leaves all arising from the base; lower side of leaf without brownish dots ***Nymphaea***
- 2 Leaves 2-14 cm, the margin slightly scalloped, the basal lobes rounded (Fig. c); leaves arising from the base, or from long trailing stems where they are often grouped; brownish dots present on lower side of leaf ***Nymphoides***



Leaves (a) *Nymphaea alba*, (b) *Nuphar lutea*, (c) *Nymphoides peltata*. Not to scale.



*Elodea canadensis*



*Elodea nuttallii*

**AQUATICS WITH FINE, LINEAR LEAVES (*ELEOGITON*, *JUNCUS*, *NAJAS*, *PILULARIA*, *POTAMOGETON*, *RUPPIA* AND *ZANNICHELLIA*)**

Species of these genera can appear very similar in water, but are readily separated when flowering or fruiting (Figs. a-f). The following key may help with vegetative material:

- |   |  |   |
|---|--|---|
| 1 | Leaves with 2 obvious hollow tubes, at least when mature (look at middle of leaf end-on with $\times 20$ lens)   | 2   |
| 1 | Leaves solid, lacking 2 hollow tubes   | 5   |
| 2 | Ligule 5-15 mm long  | <i>Potamogeton pectinatus</i> / <i>P. filiformis</i> (see page 320) |
| 2 | Ligule absent (NB: auricles may be present which can look like a ligule in pressed material)   | 3   |
| 3 | Apex minutely toothed ( $\times 20$ lens); roots at stem nodes absent  | <i>Ruppia</i>   |
| 3 | Apex entire; roots often present at stem nodes   | 4   |
| 4 | Hollow tubes with transverse septae (may be inconspicuous); auricles present at top of sheath; untidy habit with clusters of leaves arising at intervals along the stem (note 1) | <i>Juncus bulbosus</i><br><i>Eleogiton fluitans</i>                 |
| 4 | Septae absent; auricles absent; stem leaves not in specific clusters   |   |
| 5 | Leaves spinulose-serrate ( $\times 20$ lens)   | <i>Najas flexilis</i>   |
| 5 | Leaves entire  | 6   |
| 6 | Young leaves and shoot apices curled at apex like shepherds crook  | <i>Pilularia globulifera</i>  |
| 6 | Young leaves straight  | 7   |
| 7 | Some leaves in opposite pairs, at least above; plant often tufted, untidy in appearance  | <i>Zannichellia palustris</i><br><i>Potamogeton</i>                 |
| 7 | Leaves alternate   |   |

**Note**

- Strictly speaking the aquatic state of *J. bulbosus* does not merit taxonomic recognition as it is simply a phenotype which develops under particular conditions. However it is useful to have a name for it, and "var. *fluitans*" is available as a convenient label.



*Potamogeton filiformis*

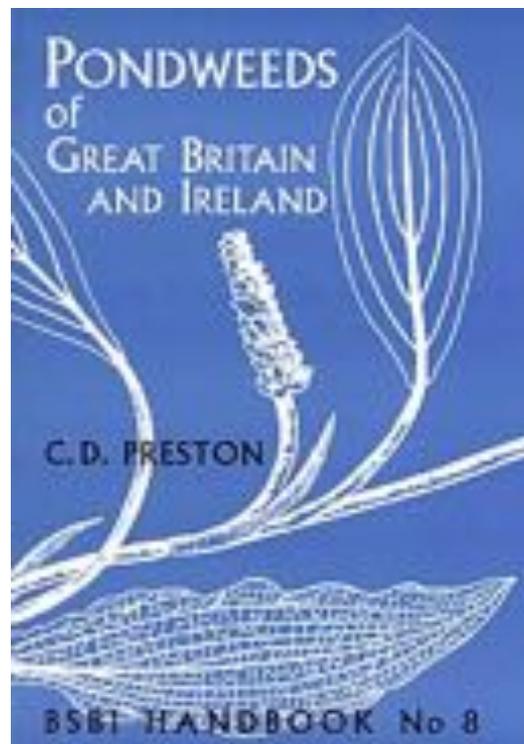


*Ruppia maritima*

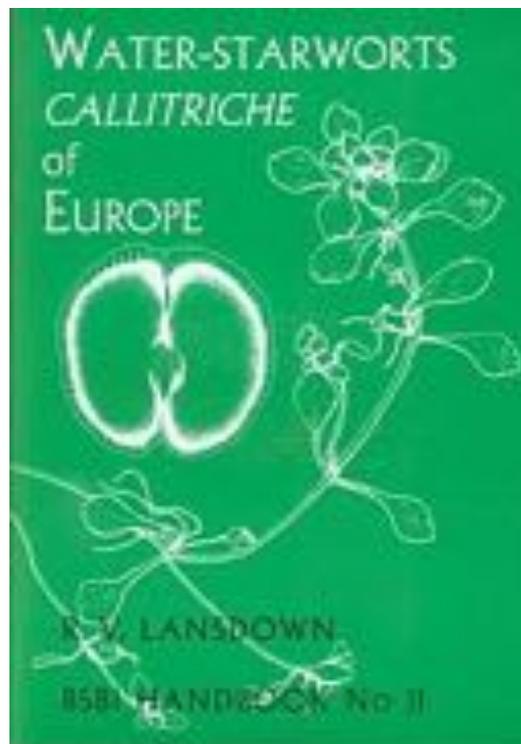


*Eleogiton fluitans*

# BSBI Handbooks



Preston (1995)

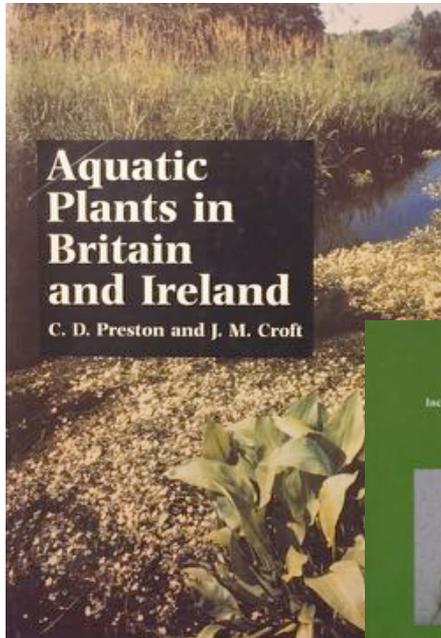


Lansdown (2008)



Moore (1986)

# Specialist publications



## Aquatic Plants in Britain and Ireland

C. D. Preston and J. M. Croft



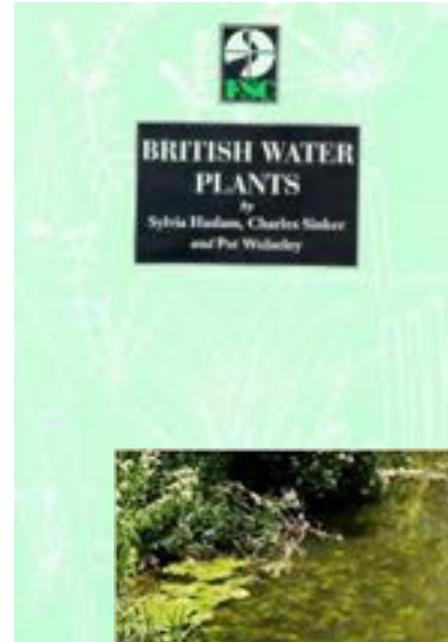
## A FIELD GUIDE TO THE RIVERINE PLANTS OF BRITAIN AND IRELAND

Including selected vascular plants, bryophytes, lichens and algae

R.V. Lansdown



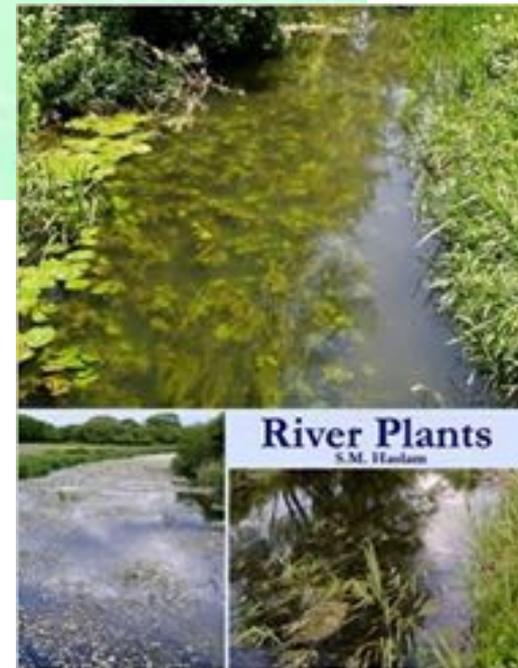
Arborea Environmental Services  
43 The Belms, Ipswich  
Suffolk IP1 3 6JG  
Phone: 01473 76118



## BRITISH WATER PLANTS

by  
Sylvia Haslam, Charles Sinker  
and Paul Wainwright

Haslam (1982)

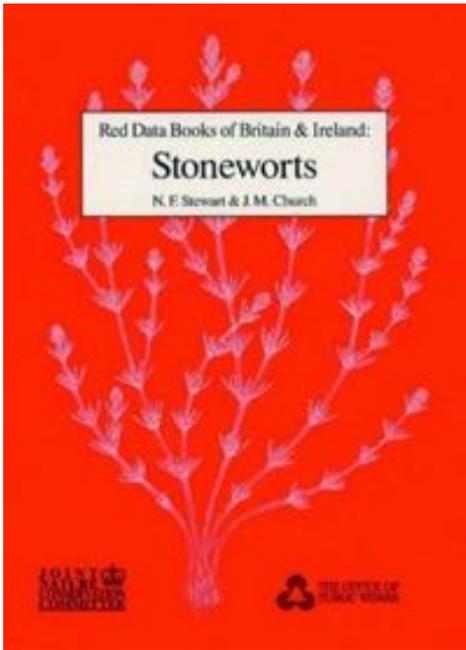


## River Plants

S.M. Haslam

Haslam (2006)

Lansdown (2009) A Field Guide to the  
Riverine Plants of Britain and Ireland



BSBI website: <http://bsbi.org/identification>

## Stonewort ID key - Nick Stewart

### KEY TO COMMON SPECIES OF STONEWORT

This key covers over 99% of stoneworts encountered in Britain and Ireland. Species not included are Red Data Book or "near threatened". An asterisk indicates that a binocular microscope is normally required. A x20 hand lens is recommended for other characters.

- 1 Main stem corticate, often spiny 2  
 Main stem without cortex 8  
 (Non-corticate species have semi-translucent stems, like looking through a green bottle; corticate species have more opaque stems with stripes of cells running down them.)

## Stewart & Church (1992)

### Short-cut key for common species

#### Main Key

- 1 Stem corticate, often spiny
- 2 Stem without cortex, or with only some residual cortical cells and never spiny
- (NB Even when the cortical cells are so fine that they are difficult to see, the extra layer of cells makes the stem more or less opaque, and stems of non-corticate species have a translucent green appearance even when moderately encrusted.)
- 2 Spines rudimentary or present as minute raised bumps
- Spines well developed, at least on the youngest parts of the plant

	<i>Chara virgata</i>	<i>Chara globularis</i>	<i>Chara vulgaris</i>	<i>Chara contraria</i>
<b>Spines</b>	Minute raised bumps	Rudimentary; difficult to see even under low-power microscope	Raised bumps to elongate and obtuse; when elongate,	Raised bumps to elongate and obtuse; when elongate,
<b>Stipulodes</b>	Only upper row developed, shortly conical (rarely more elongate with obtuse tips and lower row developed but less than half length of upper ones)	Not minute (rarely slightly young)		
<b>Cortex *</b>	Two rows between each spine-bearing	Two		





<http://www.botanicalkeys.co.uk/flora/>

## Find Wild Flowers

You can find interesting plants everywhere in Britain and Ireland. This site is intended to help you identify them.

On the following pages you will be presented with a **questionnaire** on the characteristics of the plant you are trying to identify. Fill in the form and press search, the computer will then try and identify the plant you have found.

You may also like to use the system to obtain a check-list of plants from a particular habitat or perhaps find flowers of a particular colour to grow in your garden. Feel free to experiment, there are many uses for the system.

Please feel free to send me your comments, particularly where improvements can be made.

Quentin Groom

### Abundant

- *Alnus glutinosa* (Alder) \*

### Frequent

- *Alisma plantago-aquatica* (Water Plantain) \*
- *Apium nodiflorum* (Procrumbent Marshwort) \*
- *Carex viridula* subsp. *brachyrhyncha* (Low Sedge) \*
- *Carex viridula* subsp. *pedocarpa* (Low Sedge) \*
- *Elodea canadensis* (Canadian Pondweed) \*
- *Glyceria maxima* (Reed sweet-grass) \*
- *Hydrocotyle vulgaris* (Marsh Pennywort) \*
- *Iris pseudacorus* (Yellow flag) \*
- *Lemna minor* (Lesser Duckweed) \*
- *Lysimachia vulgaris* (Yellow Loosestrife) \*
- *Oenanthe crocata* (Hemlock Water Dropwort) \*
- *Persicaria amphibia* (Amphibious Bistort) \*
- *Phalaris arundinacea* (Reed Canary-grass) \*
- *Phragmites australis* (Common Reed) \*
- *Potamogeton bertholdii* (Small Pondweed) \*
- *Potamogeton natans* (Broad Leaved Pondweed) \*
- *Potamogeton perfoliatus* (Perfoliate Pondweed) \*
- *Salix fragilis* (Crack Willow) \*
- *Silene uniflora* (Sea Campion) \*
- *Typha latifolia* (Bulrush) \*

### Occasional

- *Baldella ranunculoides* (Lesser Water Plantain) \*
- *Berula erecta* (Narrow-leaved Water Parsnip) \*
- *Callitriche hermaphrodita* (Autumnal Water Starwort) \*
- *Carex aquatilis* (Mountain Water Sedge) \*
- *Ceratophyllum demersum* (Hornwort) \*
- *Eleocharis acicularis* (Slender Spike-rush) \*
- *Eleogiton fluitans* (Floating Club-rush) \*
- *Glyceria notata* (Plicate Sweet-grass) \*
- *Littorella uniflora* (Shoreweed) \*
- *Lobelia dortmanna* (Water Lobelia) \*
- *Meryanthes trifoliata* (Bogbean) \*
- *Myriophyllum alterniflorum* (Alternate-flowered Water Milfoil) \*
- *Myriophyllum spicatum* (Spiked Water Milfoil) \*
- *Nuphar lutea* (Yellow Water Lily) \*
- *Nymphaea alba* (White Water Lily) \*
- *Potamogeton alpinus* (Reddish Pondweed) \*
- *Potamogeton friesii* (Flat-stalked Pondweed) \*
- *Potamogeton gramineus* (Various-leaved Pondweed) \*
- *Potamogeton lucens* (Shining Pondweed) \*
- *Potamogeton praelongus* (Long-stalked Pondweed) \*
- *Potamogeton pusillus* (Lesser Pondweed) \*
- *Rumex hydrolapathum* (Great Water Dock) \*
- *Rumex maritimus* (Golden Dock) \*
- *Schoenoplectus lacustris* (Common Club-rush) \*
- *Scutellaria galericulata* (Skull-cap) \*
- *Solidago gigantea* (Early Goldenrod) \*
- *Sparganium natans* (Small Bur-reed) \*
- *Typha angustifolia* (Lesser Reed-mace) \*

# Courses



Field Studies Council: Bringing Environmental Understanding to All

## Identifying Aquatic Plants

Centre	Dates	Tutor	Level
Preston Montford	Fri 07 July - Mon 10 July 2017	Nick Law	Intermediate

## Aquatic Plant Identification: Beginners

Centre	Dates	Tutor
Epping Forest	Thu 20 July - Thu 20 July 2017	Ken Adams, Essex Botanical Society

Level  
Beginners

## Aquatic Plants

Centre	Dates	Tutor	Level
Slapton Ley	Fri 21 July - Sun 23 July 2017	Nick Stewart	Intermediate

## Aquatic Plant Identification: Advanced

Centre	Dates	Tutor	Level
Epping Forest	Fri 21 July - Fri 21 July 2017	Ken Adams, Essex Botanical Society	Level

## Plants of Bogs and Mires

Centre	Dates	Tutor	Level
Preston Montford	Fri 28 July - Mon 31 July 2017	Hilary Wallace	Intermediate

## Aquatic Plants

Centre	Dates	Tutor	Level
Kindrogan	Fri 11 August - Fri 18 August 2017	Nick Stewart	Intermediate



## Referees

Members of the BSBI can make use of our expert Plant Referees, who will name difficult plants for you. Details are in the BSBI Yearbook, which is sent out to members each year in January and is available via our [members-only area](#) (log-in required).

If you're not a member, and you are interested in plant identification, you may want to think about [joining BSBI](#).

# Potamogetonaceae

## POTAMOGETON

*P. natans*

*P. polygonifolius*

*P. coloratus*

*P. lucens*

*P. gramineus*

*P. alpinus*

*P. praelongus*

*P. perfoliatus*

*P. obtusifolius*

*P. friesii*

*P. berchtoldii*

*P. pusillus*

*P. crispus*

*P. pectinatus*

*P. filiformis*

(and hybrids)

## GROENLANDIA

*Groenlandia densa*

## ZANNICHELLIA

*Zannichellia palustris*



# *Potamogeton* key characters



*Potamogeton filiformis*

Filiform leaves



*Potamogeton obtusifolius*

Linear leaves



*Potamogeton alpinus*

Linear oblong leaves

Opaque floating leaves with long petiole



Curled leaf margins, translucent leaves



Submerged leaves = opaque, linear 'phyllodes'

Sessile leaves

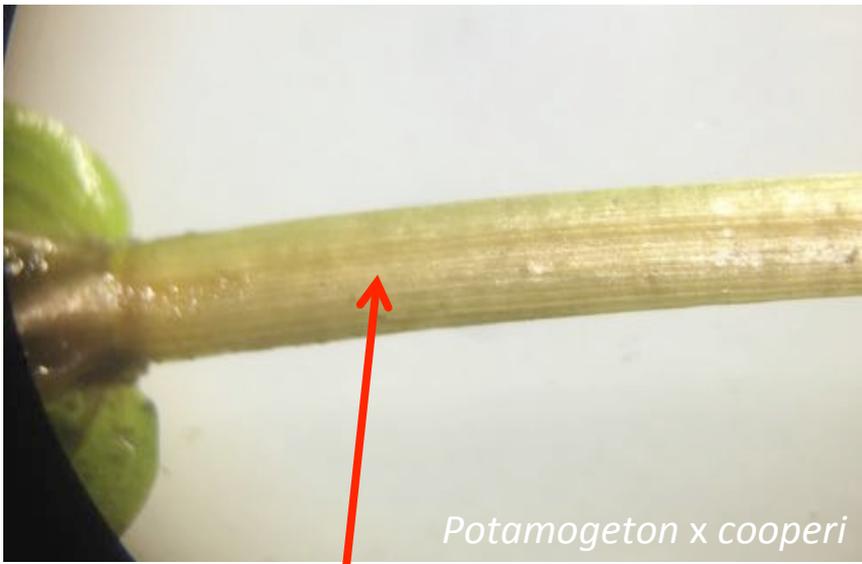


*Potamogeton perfoliatus*



*Potamogeton perfoliatus*

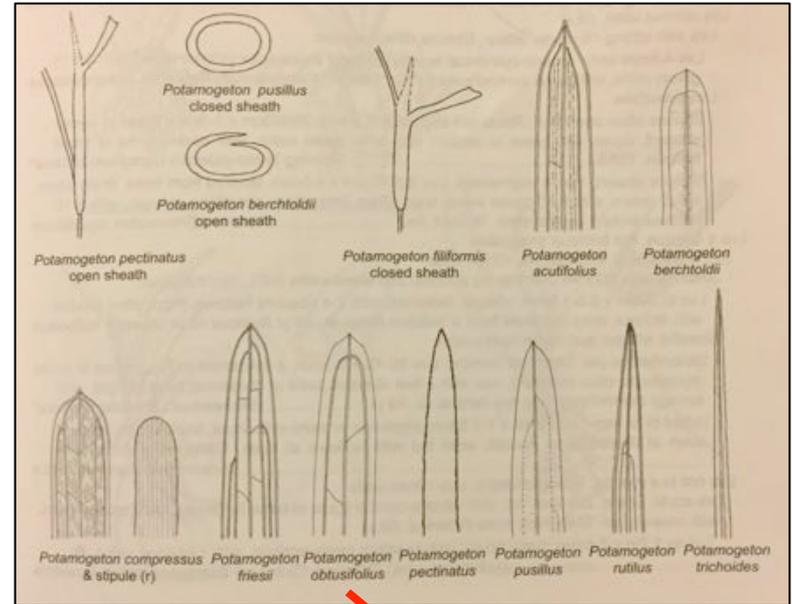
Leaf base 'amplexicaul' (clasp stem)



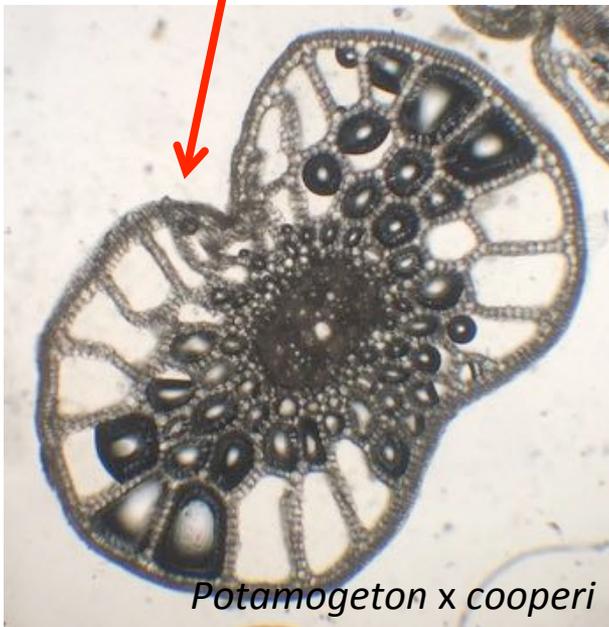
*Potamogeton x cooperi*

Grooved stem

## Leaf tip, midrib and lateral veins



Poland & Clement (2009)

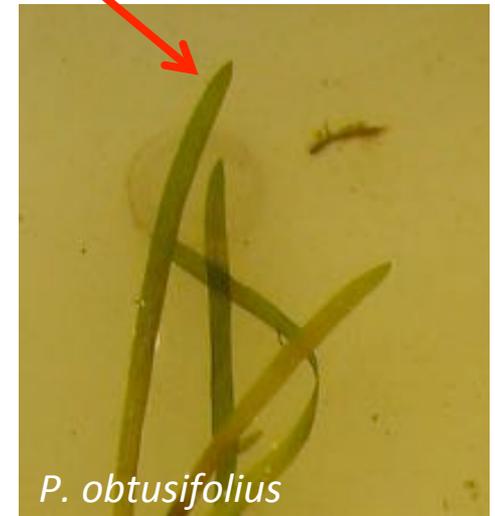


*Potamogeton x cooperi*

## Midrib and lateral veins



*P. gramineus*



*P. obtusifolius*



*Potamogeton x nitens*

Stipules



*Potamogeton x cooperi*

# *Ranunculus* subgenus *Batrachium*

*R. hederaceus*

*R. omiophyllus*

*R. tripartitus*

*R. fluitans*

*R. aquatilis*

*R. peltatus*

*R. penicillatus* subsp.  
*pseudofluitans*

*R. circinatus*

*R. baudotii*

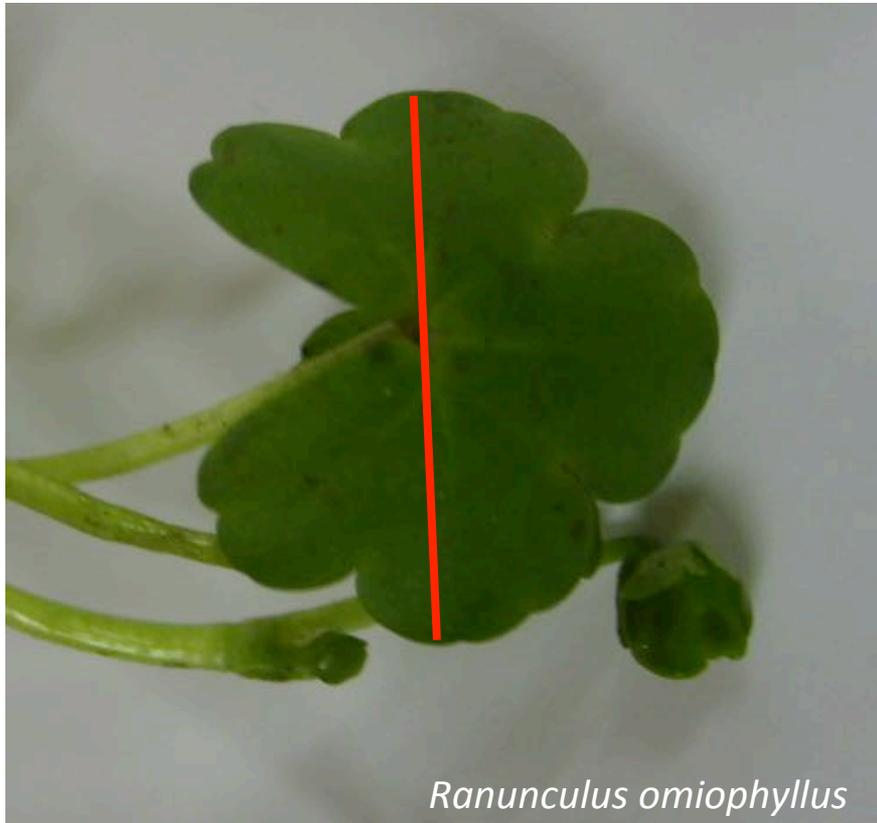
*R. trichophyllus*

(and hybrids)



# *Ranunculus* subgenus *Batrachium* key characters

Leaves all undivided (laminar leaves only, floating or aerial)



# Laminar & capillary leaves



# Capillary leaves only





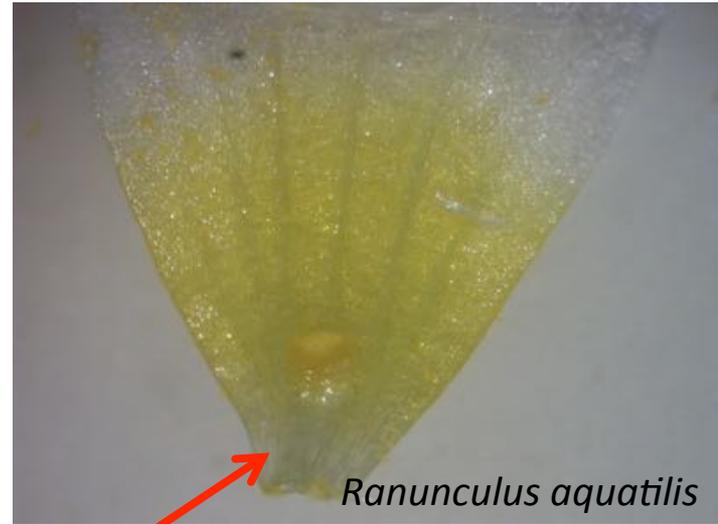
*Ranunculus baudotii*

Leaves not all in one plane

e.g. *R. baudotii* and  
*R. circinatus*



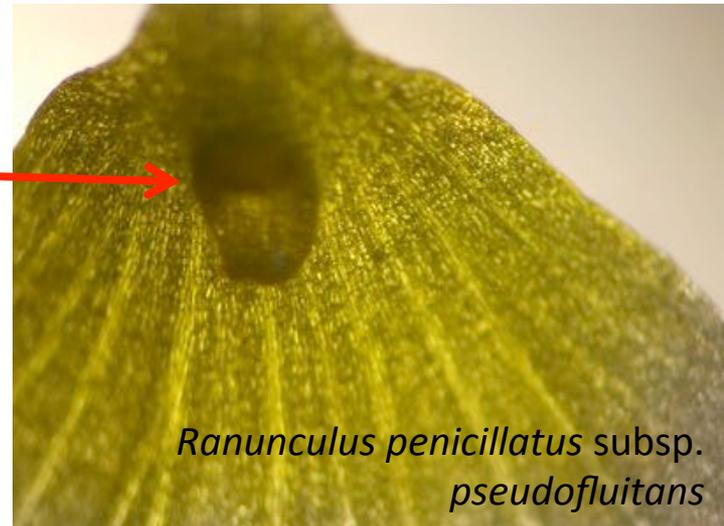
*Ranunculus circinatus*



Circular nectar pit

Petal length

Nectar pit



Pear-shaped nectar-pit

# Leaf length (dissected) relative to adjacent stem internode



Leaf < internode



Leaf usually > internode



Pedicel length in fruit  $\leq$  50mm  
(& length in relation to opposed laminar leaf if present)

NB Taxonomy of *Ranunculus* subgenus *Batrachium* is not well understood. Recent molecular work in Poland suggests that:

- *R. penicillatus* subsp. *pseudofluitans* – very likely that this isn't a species but a repeatedly arising hybrid combination between *R. fluitans* and *R. circinatus*.
- *R. trichophyllus* – possibly 13 genetic entities within this group

(Richard Lansdown pers.comm.)

# Acknowledgements

- Richard Lansdown, Paul Green and Diane Dobson for information and advice on identification of *Ranunculus* subgenus *Batrachium*

(All photos by Joanne Denyer)

