



POTAMOGETON AND RUPPIA

The BSBI Handbook *Pondweeds of Great Britain and Ireland* by C. D. Preston (1996) is the essential reference work to these two genera. Two updates are included here, with reminders about collecting and examining stipules. A key to taxa with opaque leaves is also included as useful supplementary information. Recent maps are given in both the *Pondweed Handbook* and in *Aquatic Plants*.

Collecting material

If possible collect a whole stem from the base. Flowers or fruits are usually not essential in *Potamogeton*, but collect a few additional separate ones to supplement the specimen if they are available. For broad-leaved species try to collect main-stem leaves as well as branch leaves. For narrow-leaved species, ensure that the material includes enough young shoots to permit dissection of young stipules. Shape of stem in cross-section and of leaf apex should be noted before pressing, as well as characters of stipules including whether open or closed and presence or absence of keels. Narrow-leaved species, along with all other delicate aquatics, are best floated out before pressing. The specimen is arranged under water on a sheet of paper in a tray (plastic photograph trays are ideal); the sheet is slowly lifted out from one end, minor rearrangements being made with forceps if the specimen is disturbed by the flowing water. Fine nylon curtain mesh is even easier to use as the water drains through the mesh and leaves the specimen undisturbed. The paper or mesh is then placed in a flimsy and dried in the usual way, but remember that aquatics dry rapidly and overheating can make the specimens very brittle.

Examination of stipules

In identifying linear-leaved *Potamogeton* species it is essential to establish the structure of the stipules; failure to do this is a common cause of misidentification. Stipules can only be seen with ease under a binocular microscope. Fresh material is the easiest to work with, but portions of pressed specimens can also be examined if they are first soaked in water for 10-15 minutes.

To examine the stipules, detach the end of a stem which bears several young leaves. Place this in a few drops of water on a microscope slide. The stipules are translucent and clasp the stem above the point of insertion of the leaves. With a sharp razor cut the stem immediately above the point where the leaf joins. The lower stem, with the attached leaf, can be then discarded. Hold the upper stem and gently pull the stipule over the cut end of the upper stem using a fine pair of forceps. To examine a second stipule, repeat the process on the next leaf towards the stem apex.

The stipules of some species are tubular and form an unbroken cylinder. Often the easiest way to see this is to turn the lower end of the stipule up towards the microscope, so that you look straight down on the cut end. Another method is to cut a thin section of the stipule at its lower end and examine face-down on the microscope slide. The stipules of other species do not form a closed tube, but the free ends overlap; they are therefore said to be open and convolute. A simple way to remember that

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P. berchtoldii and *P. trichoides* have open stipules is that the names *berchtoldii* and *trichoides* contain the letter 'e' which is rolled like an open stipule.

Tubular stipules tend to split from the top as they age, hence the need to choose young stipules towards the stem apex and to examine the lower end of the stipule. Once a little practice has been gained, the stipular morphology can be established on almost all specimens. Decaying plants collected in autumn once active growth has ceased are the most troublesome.



a **b**
Cross section of sheaths (a) stipule closed (tubular), (b) stipule open (convolute).

1. *Potamogeton* × *gessnacensis* (*P. natans* × *P. polygonifolius*)

P. × gessnacensis has been recorded in V.c. 49, 106 & 112, and could well occur elsewhere. The hybrids are variously intermediate between the parents and are highly sterile. The inflorescences of the hybrid are narrow (as the stamens protrude through closed perianth segments) and relatively short (Preston *et al.* 1988). Suspected hybrids should be collected for confirmation.

| | <i>P. natans</i> L. | <i>P. × gessnacensis</i> G. Fisch. | <i>P. polygonifolius</i> Pourr. |
|---|---|---|--------------------------------------|
| Stipules | 40-170 mm long, green or buff, opaque | 20-88 mm long, brown, buff, green or greenish brown, opaque to translucent | 10-50 mm long, brown, translucent |
| Longitudinal veins of fresh floating leaves | Translucent | Opaque or translucent (if translucent usually very narrow) | Opaque |
| Discoloured junction between petiole and lamina | Usually present, rarely absent | Absent or trace visible | Absent |
| Inflorescence | 20-60 mm long | 8-28 mm long | 10-42 mm long |
| Fertility | Fertile | Sterile | Fertile |

Reference Preston, C. D., Bailey, J. P. & Hollingsworth, P. M. (1998). *Watsonia* **22**: 61-68.

Author C. D. Preston, December 1997.

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2. *Potamogeton* × *bottnicus* (*P. pectinatus* × *P. vaginatus*)

A hybrid *Potamogeton* in the Rivers Till and Tweed (V.c. 68 & 81) is apparently referable to *P. × bottnicus*, a cross between *P. pectinatus* and the Scandinavian *P. vaginatus* Turcz. (Preston *et al.* 1998).

Characters distinguishing *P. vaginatus* are given in the *Pondweed Handbook* on page 133, and the hybrid can be keyed out as follows (this key can replace leads 2-4 in the key to Group F on the same page, and is numbered following the *Pondweed Handbook*):

- | | | |
|----|---|-----------------------------------|
| 2a | All sheaths open to the base | 3 |
| 2b | Some or all sheaths tubular at the base | 4 |
| 3a | Mature leaves on the vegetative stems usually acute to finely acuminate at the apex; stigmas borne on a distinct style c. 0.2 mm long; pollen well formed; fruits 3.3-4.7 mm | 21 <i>P. pectinatus</i> L. |
| 3b | Mature leaves on the vegetative stems more or less truncate, rounded or obtuse at the apex; stigmas sessile; pollen misshapen; fruits not developing | <i>P. × bottnicus</i> Hagstr. |
| 4a | Stems branched at base, otherwise unbranched or very sparingly branched; all sheaths tubular at the base; stigmas sessile; pollen well formed; fruits 2.2-2.8(-3.2) mm | 20 <i>P. filiformis</i> Pers. |
| 4b | Stems usually sparingly or richly branched above the base; all sheaths tubular at the base or some tubular and others open and convolute; stigmas sessile or borne on a distinct style; pollen misshapen; fruits not developing | 47 <i>P. × suecicus</i> K. Richt. |

Reference Preston, C. D., Hollingsworth, P. M. & Gornall, R. J. (1998). *Watsonia* **22**: 69-82.

Author C. D. Preston, December 1997.

3. Taxa with opaque leaves

The ± opaque, ± floating leaves of pondweeds are not usually used for identification. Yet there are occasions when these are the only leaves available, and certain features can be used to make a positive identification. However, this will not be possible on every occasion particularly with small fragments, and a combination of characters should be considered before making a decision. Most confusion will be with *P. polygonifolius* which overlaps in many of its characters with the other species considered here. *P. coloratus* never has fully opaque leaves, but occasionally they can be nearly so, and hence is also given in the key. The key should be used with caution on leaves which have developed in exposed dried-up situations.

Three other British species can have opaque floating leaves, but these always have translucent underwater leaves as well, except the rare *P. nodosus* which has translucent leaves which may rot away completely. This species has long (up to 20 cm) lanceolate leaves with cuneate bases, and long stipules (5-9 cm). In *P. alpinus* the floating leaves are not usually fully opaque, and are often nearly translucent at their bases. Floating leaves of *P. epihydrus* are indistinguishable from *P. polygonifolius*, though in transitional leaves the petioles are flattened and have a thin band of translucent tissue along their length. Several hybrids with opaque leaves occur, but these are uncommon, and they cannot be differentiated from the true species on the characters of the opaque leaves alone.

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- 1 Petiole widening towards the apex (normally at least twice the width of the base of the petiole), usually less than half the length of the blade, but sometimes equalling the leaf blade in deeper water; some leaf blades, at least in the upper summer leaves, rounded or truncate at base, and decurrent onto the petiole for up to 1.5 cm, with some main lateral veins separating from the midrib in the decurrent part of the leaf; leaves with rounded / truncate bases often broadest markedly below the middle; midrib narrowing as the major lateral veins branch off from it, becoming only slightly stronger than the major laterals through the remaining part of the leaf
P. coloratus Hornem.
- 1 Petiole of constant width, or only slightly widening near the apex (less than twice the width of the base), only less than half the length of the leaf blade in some of the youngest unopened leaves; base of leaf blade rounded or truncate and decurrent on the petiole for less than 0.5 cm, or cuneate; major lateral veins not separating from the midrib in the decurrent part of the blade; leaves broadest near the middle; midrib narrowing gradually throughout the length of the leaf 2
- 2 Flexible joint (section of paler tissue up to 2.5 cm long) often present at the apex of the petiole; veins of aquatic leaves more translucent than the blade, cross-veins obscure (see note 1); leaf veins (6-)9-14(-16); stipules long (4-17 cm), closely veined (c. 4 veins per mm when fresh), keeled
P. natans L.
- 2 Flexible joint at the apex of the petiole never present; veins of leaves less translucent than the blade, and cross-veins distinct (see note 1), leaf veins (5-)6-8(-12); stipule short or intermediate (less than 5 cm), closely or sparsely veined, usually with two more prominent strengthening veins and sometimes ± keeled 3
- 3 Stipule short (less than 2.5 cm), closely veined (c. 4 veins per mm when fresh), the upper sometimes ± keeled; translucent leaves absent only in terrestrial plants (reduced to short bladeless phyllodes); opaque leaves cuneate at base *P. gramineus* L.
- 3 Stipule intermediate (1-5 cm), sparsely veined (c. 2 veins per mm when fresh), with two more prominent strengthening veins, but not keeled; translucent leaves frequently absent in aquatic plants and never reduced to bladeless phyllodes; opaque leaves cuneate, rounded or truncate at base
P. polygonifolius Pourr.

Notes to *Potamogeton* Table on next page

1. The leaf vein characters are best viewed by holding the leaves up to the light. Only leaves of aquatic plants should be used; in terrestrial plants the leaf veins of *P. natans* become more opaque, but these plants should be identifiable by the presence of long phyllodes.
2. Adjacent to the midrib the cross veins ascend at an angle but become more transverse towards the leaf edge.
3. The differentiation of a decurrent wing from the main part of the leaf blade is only possible when the blade is rounded or truncate at base. This character is therefore not applicable to *P. gramineus* which always has cuneate leaf bases.

Author N. F. Stewart, February 1988, minor updates January 1998.

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| | <i>Potamogeton natans</i> | <i>P. polygonifolius</i> | <i>P. coloratus</i> | <i>P. gramineus</i> |
|--|-----------------------------------|--|--|---|
| Opaque leaves | | | | |
| Lateral veins | (6-)9-14(-16) pairs | (5-)6-8(-12) pairs | 4-10 pairs | 5-10 pairs |
| Veins of floating leaves (note 1) | Lighter than rest of leaf | Darker than rest of leaf | Darker than rest of leaf | Darker than rest of leaf |
| Cross veins of floating leaves | Obscure | Visible | Visible | Visible |
| Extent of ascending cross-veins (note 2) | c. 0.25 of leaf width | c. 0.75 of leaf width | c. 0.25 of leaf width | c. 0.75 of leaf width |
| Where broadest | ± Middle | ± Middle | Often broadest markedly below the middle | ± Middle |
| Leaf base | Rounded / cuneate / truncate | Rounded / cuneate / truncate | Rounded / cuneate / truncate | Cuneate |
| Petioles of opaque leaves | | | | |
| Widening near apex | Not widening | Slightly less than 2× width at base | More than 2 × width at base | Not widening |
| Distinctly winged (note 3) | Sometimes a few mm | Sometimes a few mm | Up to 1.5 cm | Not applicable |
| Length v.s. leaf blade length | > 1 times as long as blade | >0.5 times as long as blade (rarely <0.5 in 1-2 unopened leaves) | 0.1-0.5 times as long as blade (rarely >0.5 in deep water) | 0.5-5 times as long as blade |
| Flexible node | ± Present at apex | Absent | Absent | Absent |
| Stipules | | | | |
| Length | 4-7 cm | 1-5 cm | 2-5 cm | 0.5-2.5 cm |
| Apex | Acute / subacute | Obtuse, often hooded | Obtuse and hooded | Obtuse to subacute; often rolled and appearing acute |
| Vein spacing when fresh | c. 4 per mm | c. 2 per mm | c. 2 per mm | c. 4 per mm |
| Keeled | Yes | No | No | Yes / no |
| Phyllodes | Longer than true leaves + petiole | Absent | Absent | Present on terrestrial plants, and sometimes on aquatic plants, to as long as true leaves + petiole |