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MACROPHYTE PLANT IDENTIFICATION GUIDE:

A Document to Support a Training Course

for NRA WESSEX REGION

1992

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CONTENTS

INDEX FOR SPECIES INCLUDED

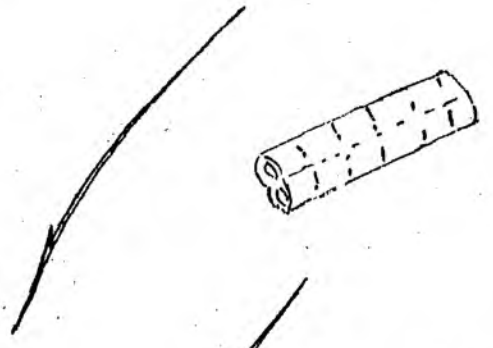
1. SUBMERGED FINE-LEAVED MACROPHYTES

1.1 Leaves unbranched, linear and forming grass-like growths underwater or exposed under low flows.

Leaves about 1mm wide and tapering to fine hair-like tip; many leaves on a short stem making it difficult to tell if leaves opposite or alternate; leaves with two tubes visible in cross-section; leaves pulled apart from each other to reveal short protruding 'ear'.

JUNCUS BULBOSUS (Bulbous Rush)

Soft Acidic Waters, Uplands in Region

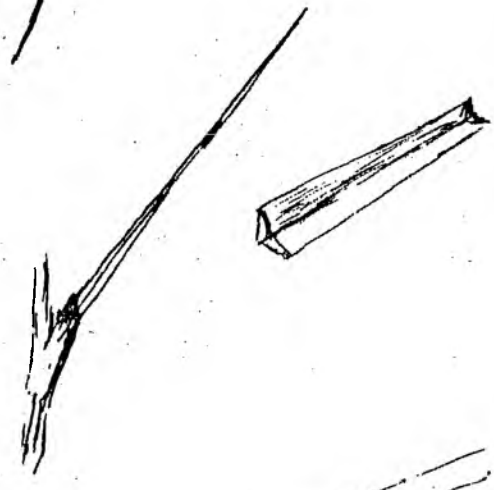


As above but stems are compressed and leaves are channelled (lacking midrib thickning); sheathing inflated leaf bases tear from stem.

SCIRPUS (ELEOGITON) FLUITANS

Floating Club-rush

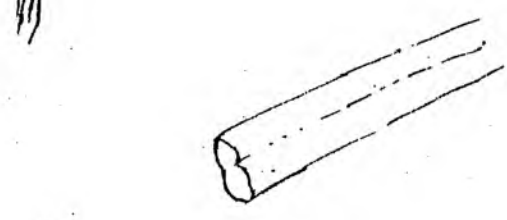
Confined to Acid/Upland Areas in Region



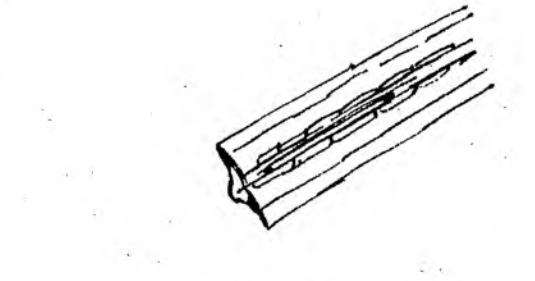
Leaves c1mm wide, tapering to fine point; in pairs but rarely clearly so; flattened with central area shallow (lacking midrib). Small translucent stipules present.

ZANNICHELLIA PALUSTRIS

(Horned Pondweed)

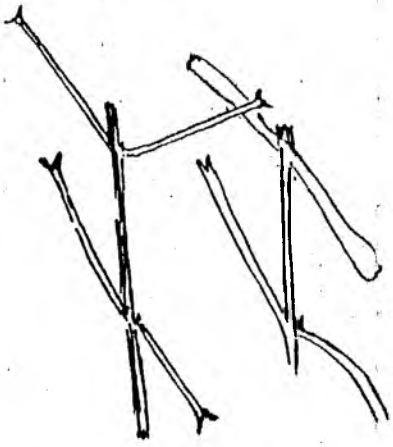


Leaves 1-4mm wide, irregularly arranged but clearly alternate on close inspection; translucent with obvious mid-ribs **FINE-LEAVED POTAMOGETON (ie BERCHTOLDII)**



Leaves as above BUT opaque, no midrib, clear cross-septa and leaf bases pulling away from stem to reveal 'ear' ligule

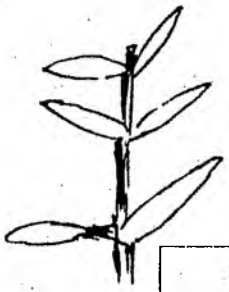
POTAMOGETON PECTINATUS
(Fennel Pondweed)

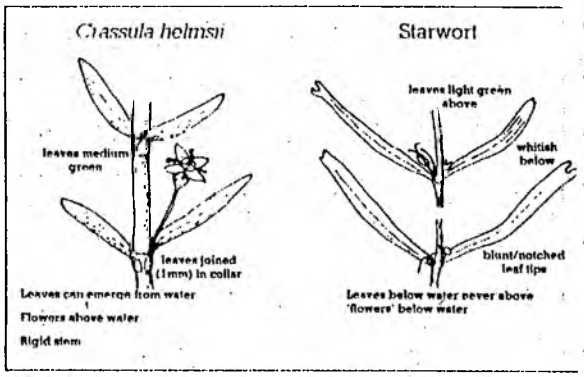


1.2 Leaves in obvious pairs, never (rarely!) more than 5cm long

Tips end in expanded 'spanner-like' expansions, become club-headed or indented. Deep water form of **CALLITRICHE (Starwort)**

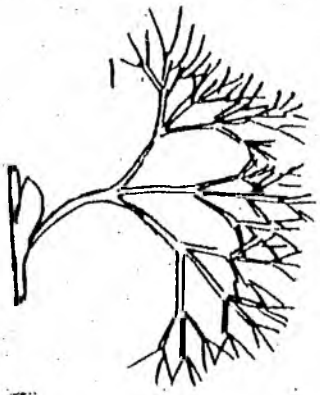
Tips narrower than blades of leaves, often pointed; fleshy.
CRASSULA HELMSII (Australian Swamp Stonecrop)





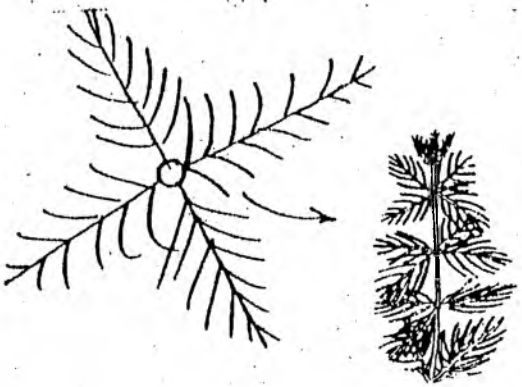
The distinguishing features of *Crassula helmsii* and Starwort.

1.3 Leaves comprised of repeateddly divided fine segments attached to the stem by a distinct stalk; ALWAYS initially dividing in threes, each segment of the division being of variable lengths in different species. Some species with floating (laminate) laeves also.
RANUNCULUS (Water Crowfoot).



1.4 Leaves not grass-like, fine and in WHORLS around the stem.

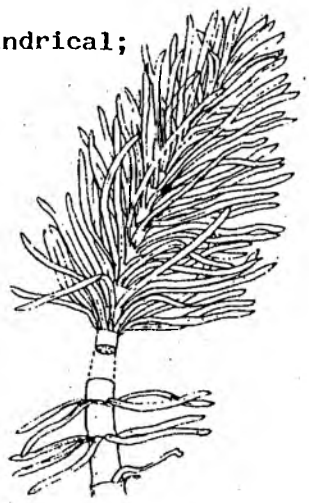
Leaflets of fine capillary segments branching simply from 3-5 whorls
MYRIOPHYLLUM (Water-milfoil)



Leaflets in whorls numerous, dividing 2-3 times with stiff and horny pointed segments
CERATOPHYLLUM (Hornwort)

1.5 Leaves in whorls, or appearing to be; flattened and not cylindrical; numerous and rarely divided:

Leaves numerous, obviously flattened and with blunt tips; never divided (plants emergent in shallow water)
HIPPURUS (Mare's-tail)

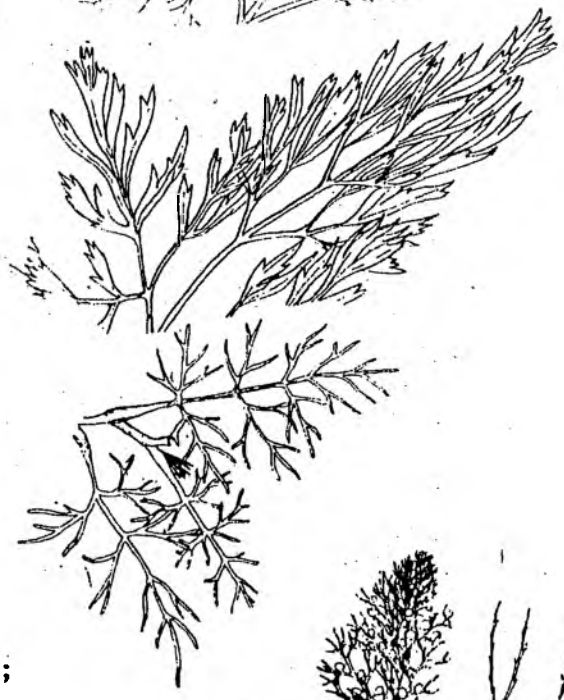


Leaves appearing to be in whorls of 3-5 (but not); occasionally single or in pairs. Leaves rarely divided more than once
HOTTONIA (Water Violet)

1.6 Leaves repeatedly divided, often very irregularly; fine or flattened; not in whorls (all potentially with emergent stems with thicker leaves and umbel flowers.

Very very finely divided leaves (5-10 divisions); cylindrical to almost hair-like final tips - peaty still water or dykes
OENANTHE AQUATICA (Fine-leaved Water-dropwort)

Flattened divided leaves which are very irregularly and scruffily branched - always calcareous running water
OENANTHE FLUVIATILIS (River Water-dropwort)



Flattened leaves of intermediate thickness which are more regularly divided - usually or neutral still or slow waters
APIUM INUNDATUM (Lesser Marshwort)

Very finely divided leaves with small 'bladders'; yellow aerial flowers - still waters
UTRICULARIA (Bladderworts)

SCIRPUS FLUITANS (Eleogiton fluitans)

- stems compressed
- leaves linear < 1mm wide and up to 5cm long
- leaves channelled on upper surface, keeled below
- spikes solitary, terminal and not over-topped by bracts

Superficially very similar to certain forms of Juncus bulbosus but close inspection reveals that species has round stems and leaves with 2 parallel tubes obvious in x section.

JUNCUS BULBOSUS

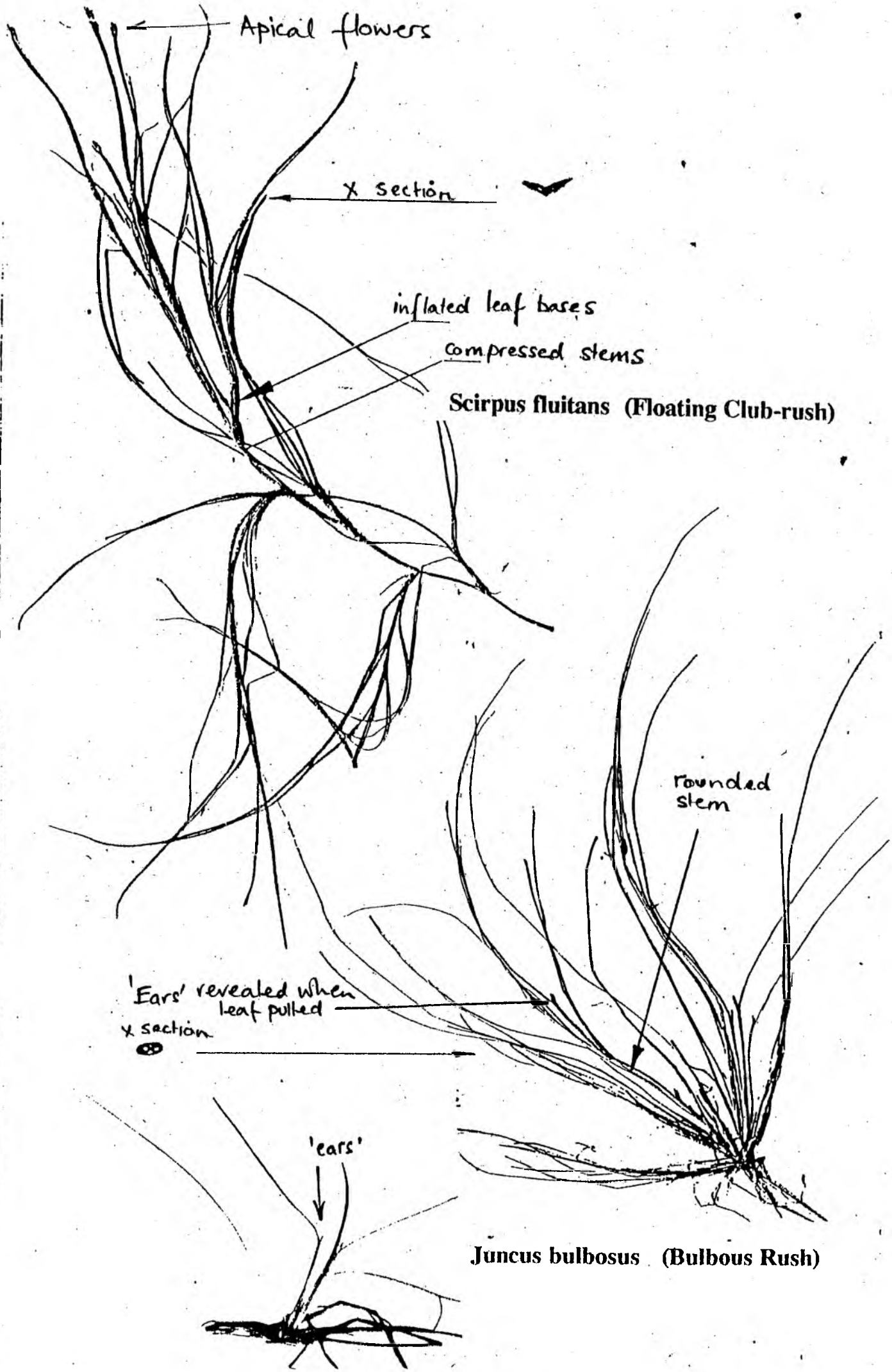
- submerged leaves less than 1mm wide
- stems cylindrical
- leaves of two parallel tubes
- leaves with numerous indistinct septa

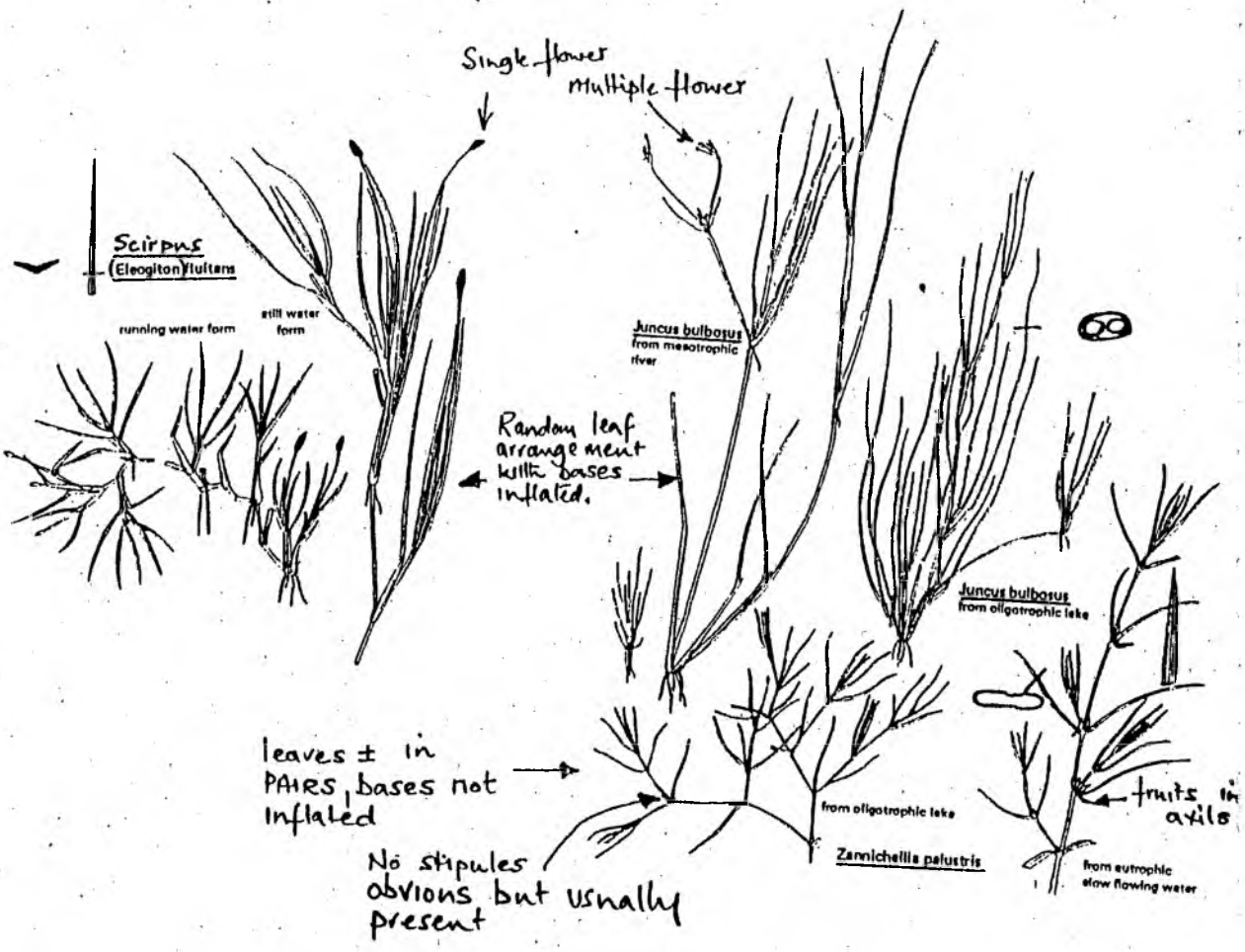
Emergent J. bulbosus provides no problems but submerged forms may superficially resemble Potamogeton pectinatus (which has ensheathing stipules), Scirpus (Eleogiton) fluitans which has compressed stems and leaves without parallel tubes which are flattened and keeled.

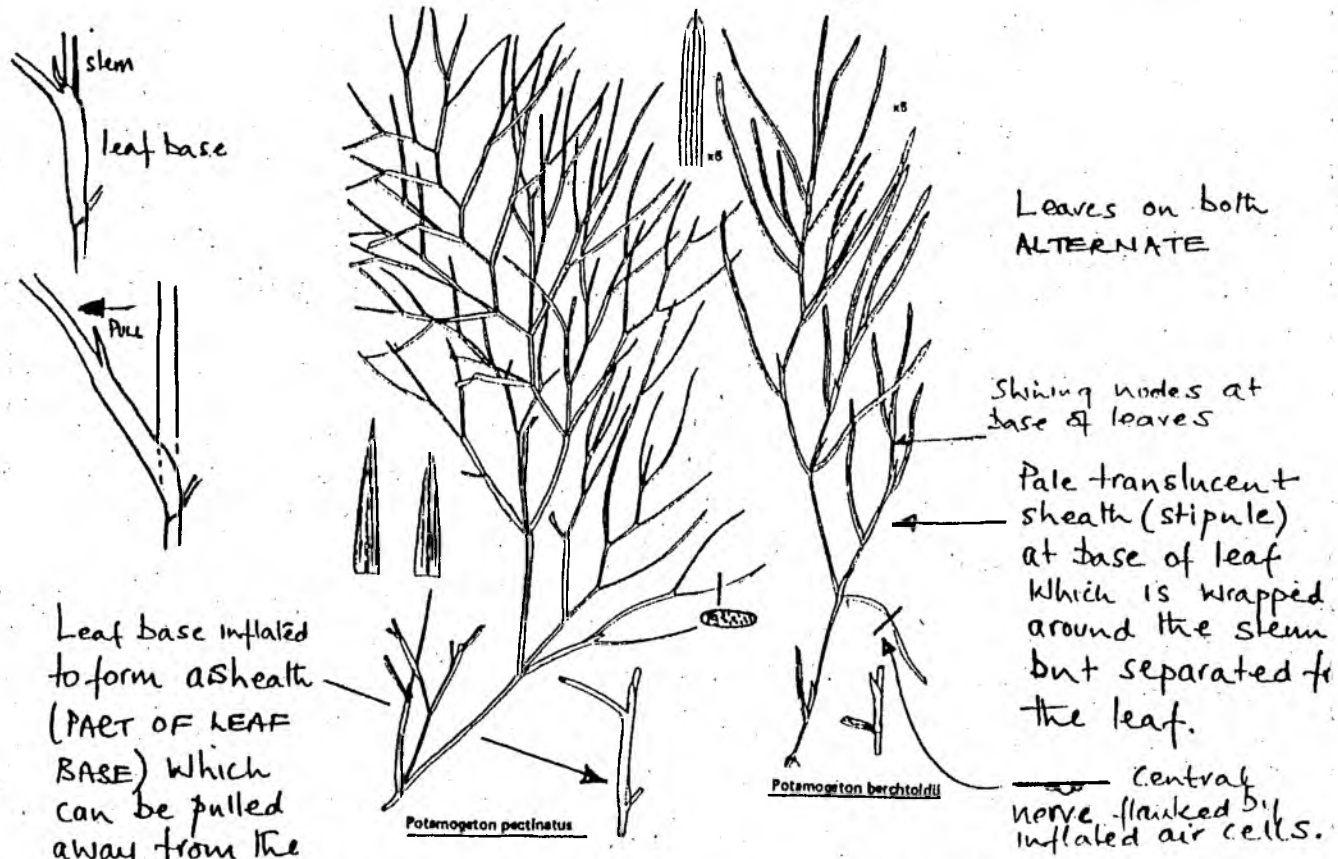
ZANNICHELLIA PALUSTRIS

- leaves ± opposite, linear, entire, tapering to a fine point
- leaves parallel veined, translucent and less than 1mm wide
- stipules amplexical, soon falling
- 2-6 achenes with obvious beaks in axils of leaves

Separated from narrow leaved Potamogeton species which have alternate leaves by the predominantly opposite pairs of leaves and the x section of the leaf is slightly grooved in the middle.


Apical flowers
X section
inflated leaf bases
compressed stems
Scirpus fluitans (Floating Club-rush)
rounded stem
'Ears' revealed when leaf pulled
X section
'ears'
Juncus bulbosus (Bulbous Rush)





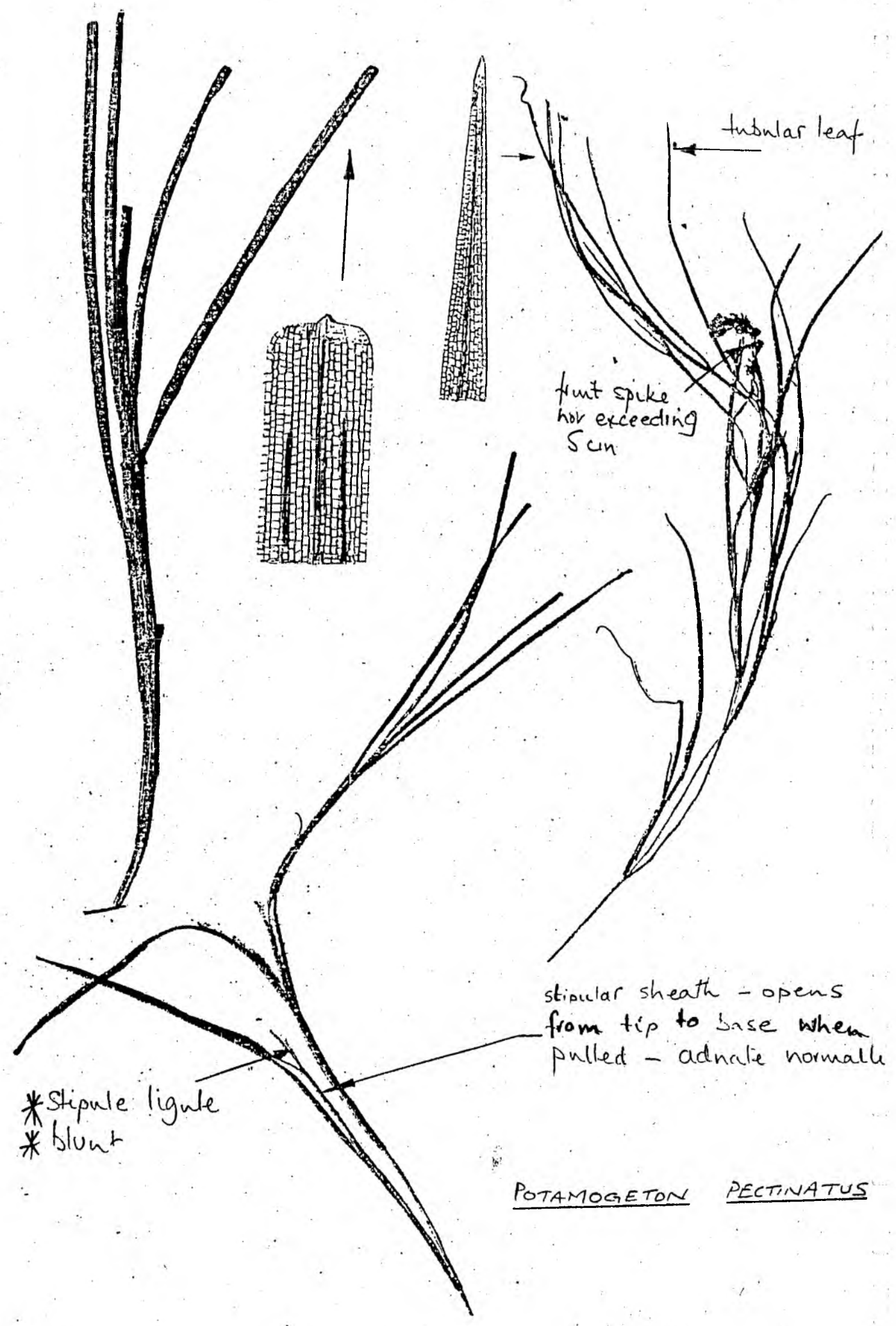
P. trichoides - no nodes & v wide nerve

P. pusillus - no nodes & obvious thin nerve

FINE LEAVED PONDWEEDS

	Air filled canals occupying most of the leaf volume +, not - (1)	Stems compressed +, not - (2)	Leaf length (cm) (3)	Leaf width (cm) (4)	Number of longitudinal veins including the midrib (5)	Faint intermediate veins present +, not - (	Lateral veins closer to the margin than the midrib +, nearer the midrib - (7	Distance from the tip of the junction of veins (in number of leaf widths) (8)	Variation and shape of leaf tip (9)	Very obvious lacunes alongside midrib +, (1C absent -, occupying most of leaf ●	Stipule length (cm) (11)	Stipule open +, closed (tubular) - (12)	Stipules, if closed, proportion tubular (13)	Shape of stipule tip (14)	Shining glands at nodes (15)	Length of fruit spike (mm) (16)	Number of flowers per spike (17)	Stalk length (cm) (18)	Fruit size (mm) (19)	Fruit colour (20)	Fruit shape (from CTW) (21)
PECTINATUS	+	-	5-20	.25-2(5)	3-5	-	+	.		⊕	2-5	+	.	blunt (ligule)	-	20-50	4-8 x 2	3-10(25)	3-5 x 2-4	Olive	
FILIFORMIS	+	-	5-20	.25-1	3	-	+	.		⊖	0.5-3	-	whole	acute (ligule)	-	40-120	2-5 x 2	5-25	2-3 x 2	Pale olive	
ACUTIFOLIUS	-	+	5-13	2-3(4)	3	+	-	free (usually)		+	1.5-2.5	+	.	acute	-	4-10	4-8	5-15(35)	3-4 x 2	Green brown	
COMPRESSUS	-	+	10-20	2-4	5	+	-	½		+	2.5-3.5	+	.	blunt	-	10-30	many	3-6	3-4.5 x 2-3	Dark green brown	
FREISII	-	+	4-6.5	2-3	(3)5(7)	-	+	¼-½		-	0.7-1.5	-	¾	laciniate	+	7-15	3-4	1.5-5	2-3 x 1.5-2	Reddish brown	
OBTUSIFOLIUS	-	+	3-9	2-4	3-5	-	+	¼-½		+	1.3-2	+	.	blunt or mucronate	+	6-13	many	0.8-2(3.5)	3-4 x 2	Brown olive	
BERCHTOLDII	-	-	2-5.5	.5-2	5 at base 3	-	+	½-1		+	0.3-1	+	.	blunt	+	2-8	many	0.5-3(10)	2-2.5 x 1.5	Dark olive	
PUSILLUS	-	-	1-4(7)	.3-1(3)	3(5)	?	-	2-3		-	0.6-1.7	-	¾ splitting	blunt	-	6-12	2-8	1.5-3	2-2.5 x 1.5	Pale olive	
RUTILIS	-	-	3-6	.5-1	3(5)	-	-	>5	→	-	1-2	-	¼	acuminate (veined)	-	5-10	6-8	2-4	1-2 x 1-2	Reddish brown	
TRICHOIDES	-	-	2-4(6)	.5-1	(1)3	-	-	indistinct free	→	-	0.7-1.1(2)	+	.	acute	-	1-15	3-6	5-10	2.5 x 2	Yellow brown	

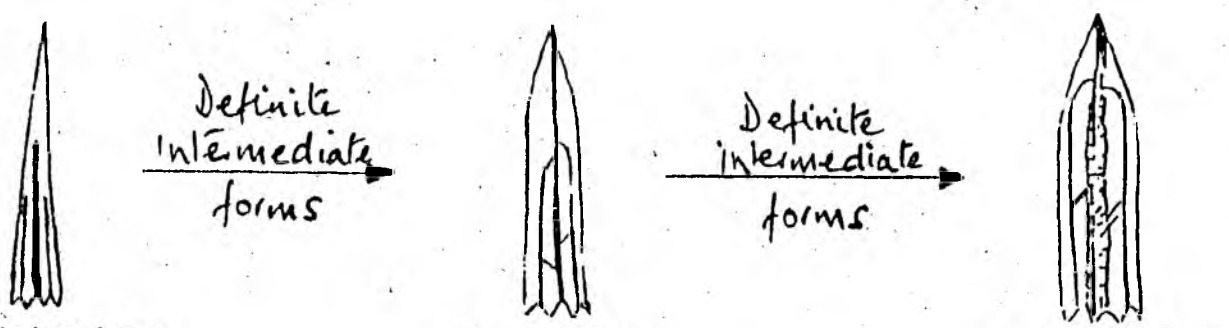
Summary of characteristics used to seperate grass-leaved British Pondweeds.



POTAMOGETON PECTINATUS

Several fine-leaved Potamogeton species show a continuum of forms, some of which are clearly related to ecologically distinct habitat preferences.

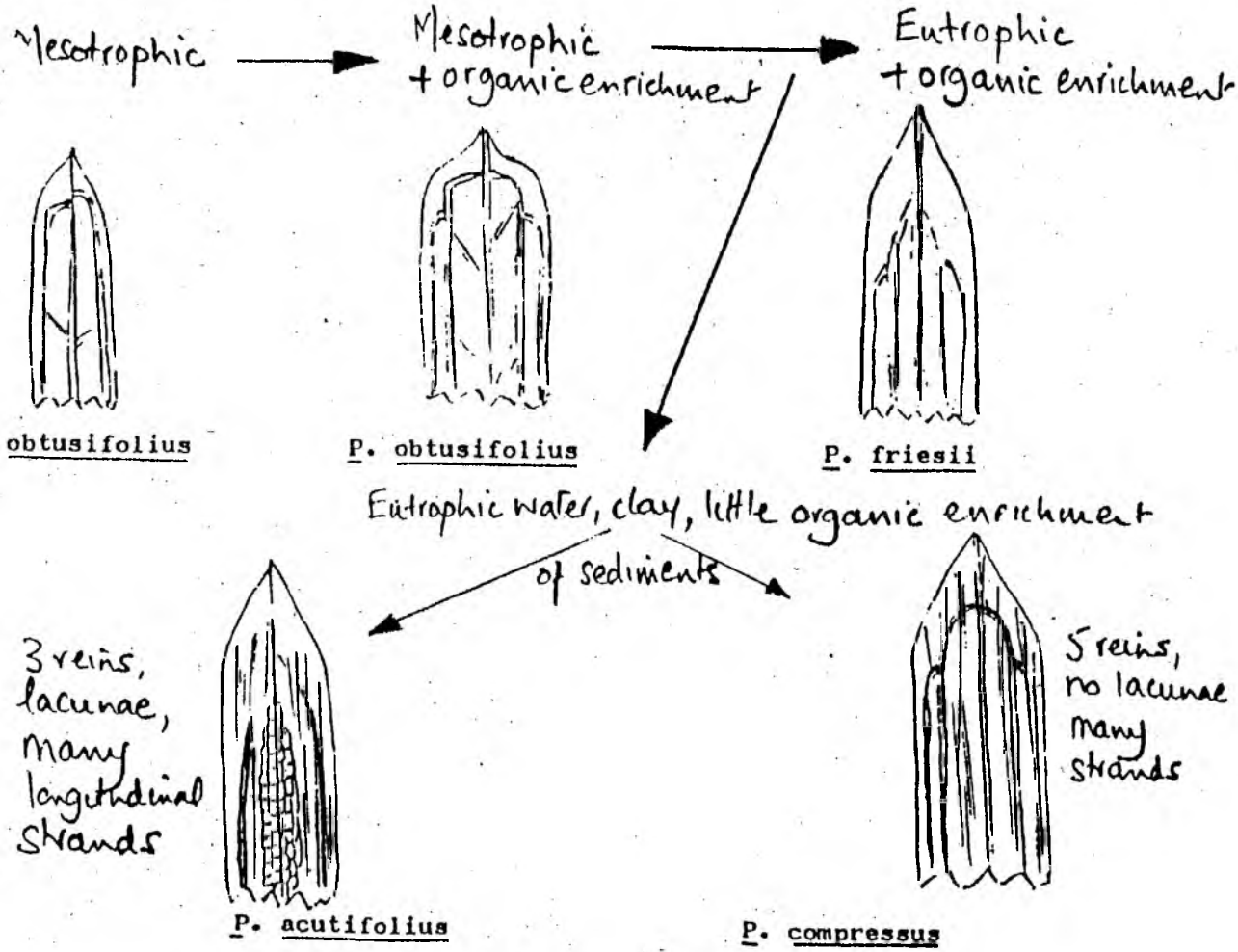
1. P. trichoides, P. pusillus, P. berchtoldii continuum of species



P. trichoides — P. pusillus — P. berchtoldii

all with oral stems

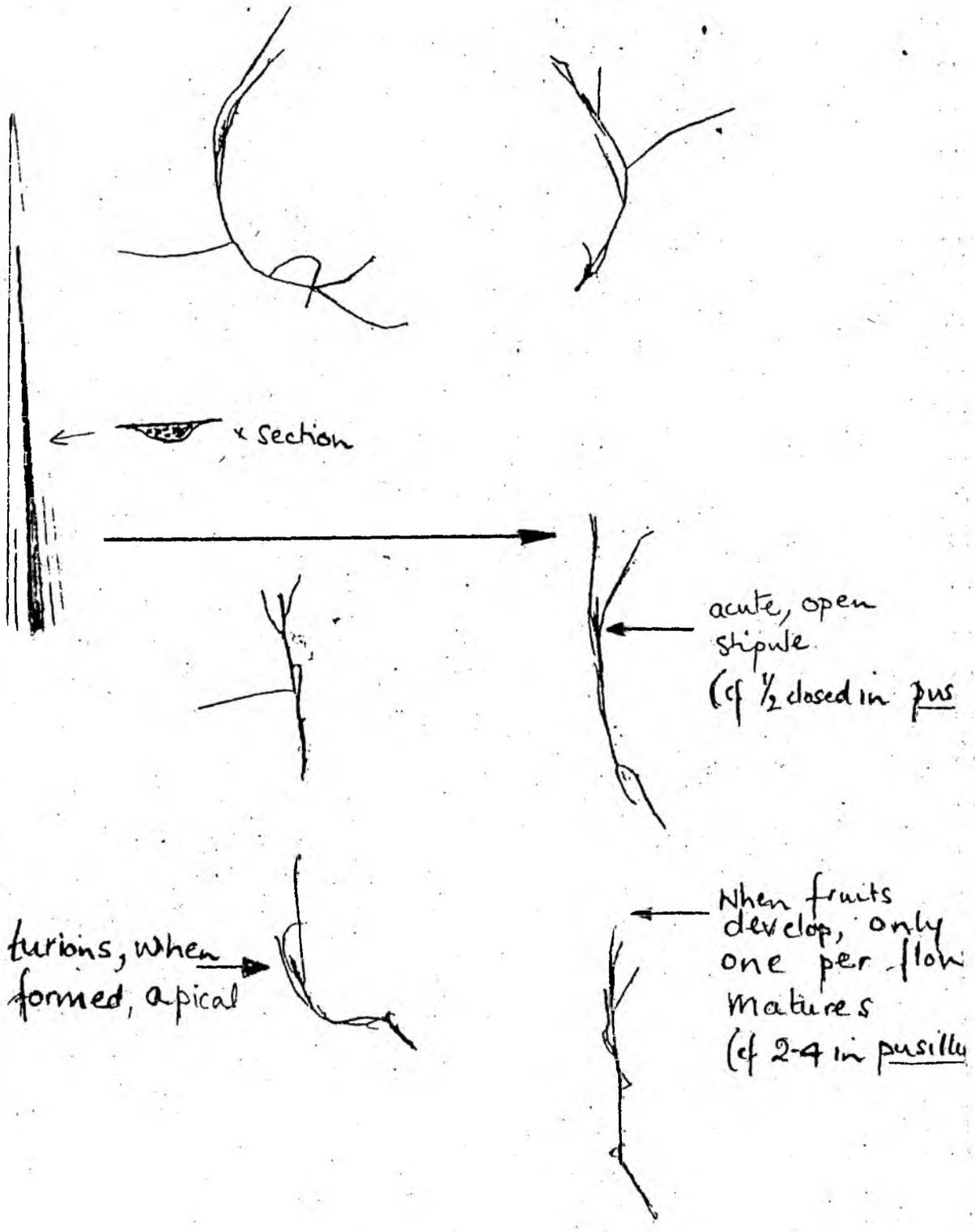
2. P. obtusifolius, P. friesii, P. acutifolius, P. compressus ecological gradient.



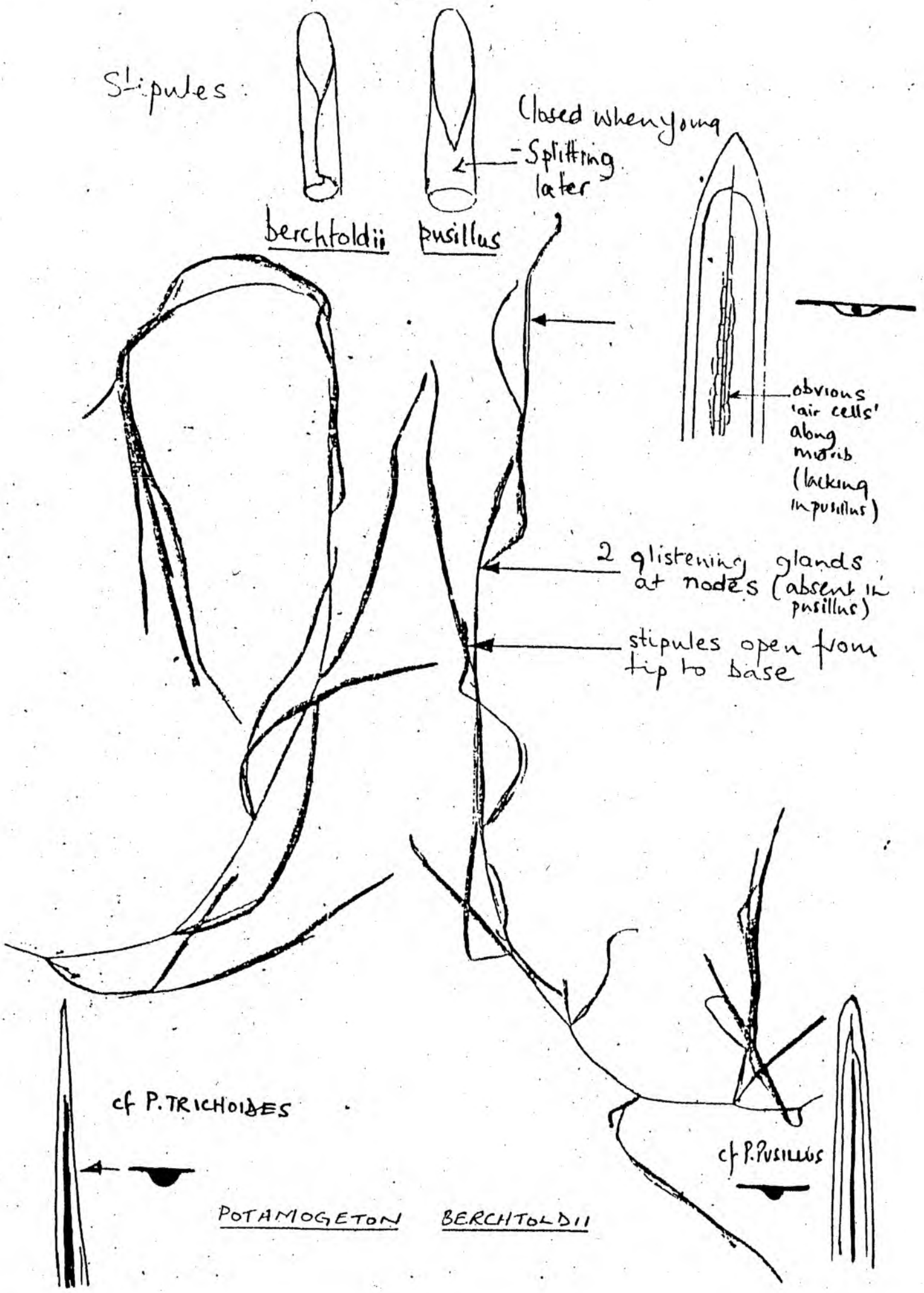
P. obtusifolius — P. obtusifolius — P. friesii

P. acutifolius — P. compressus

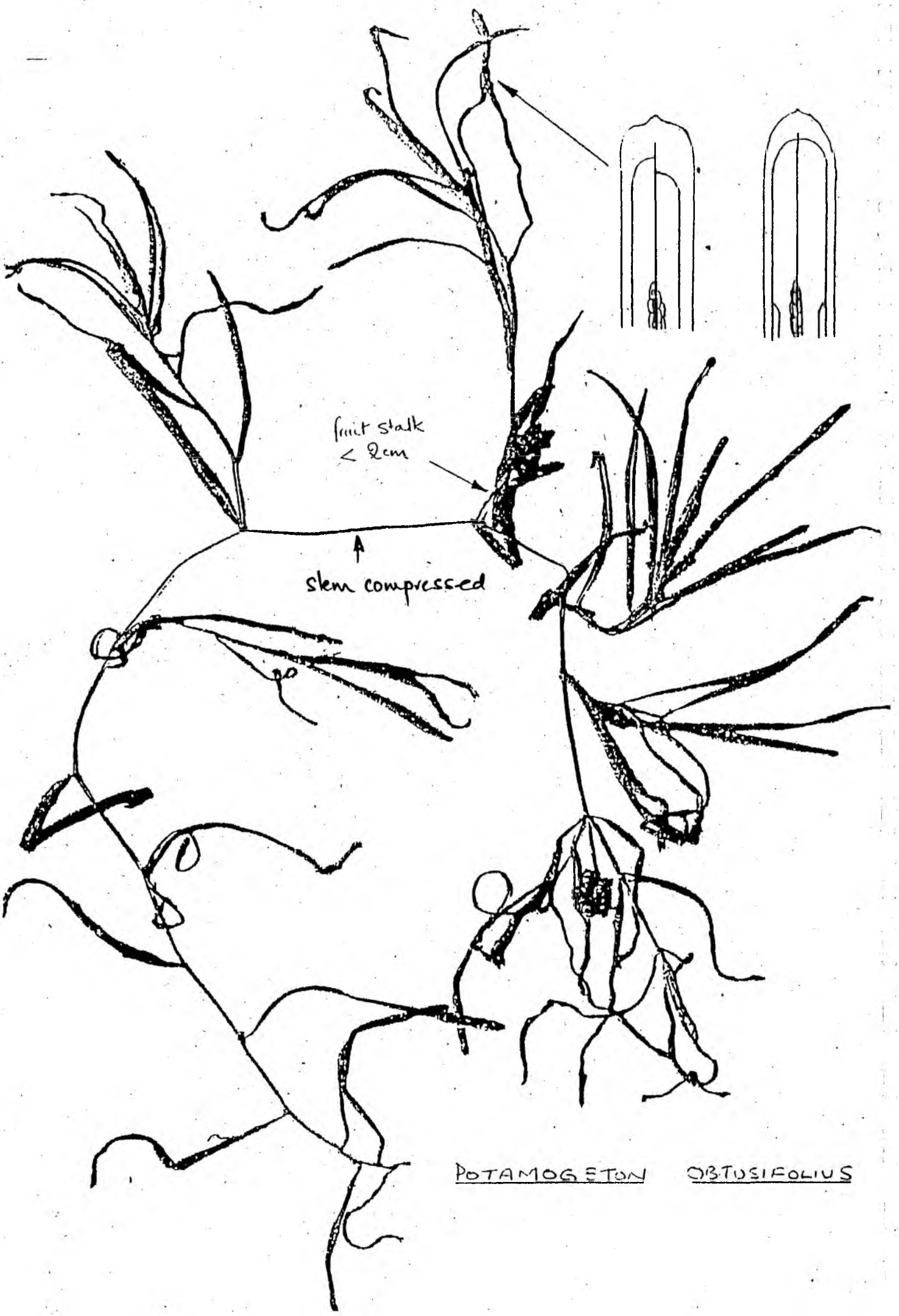
all with flat stems



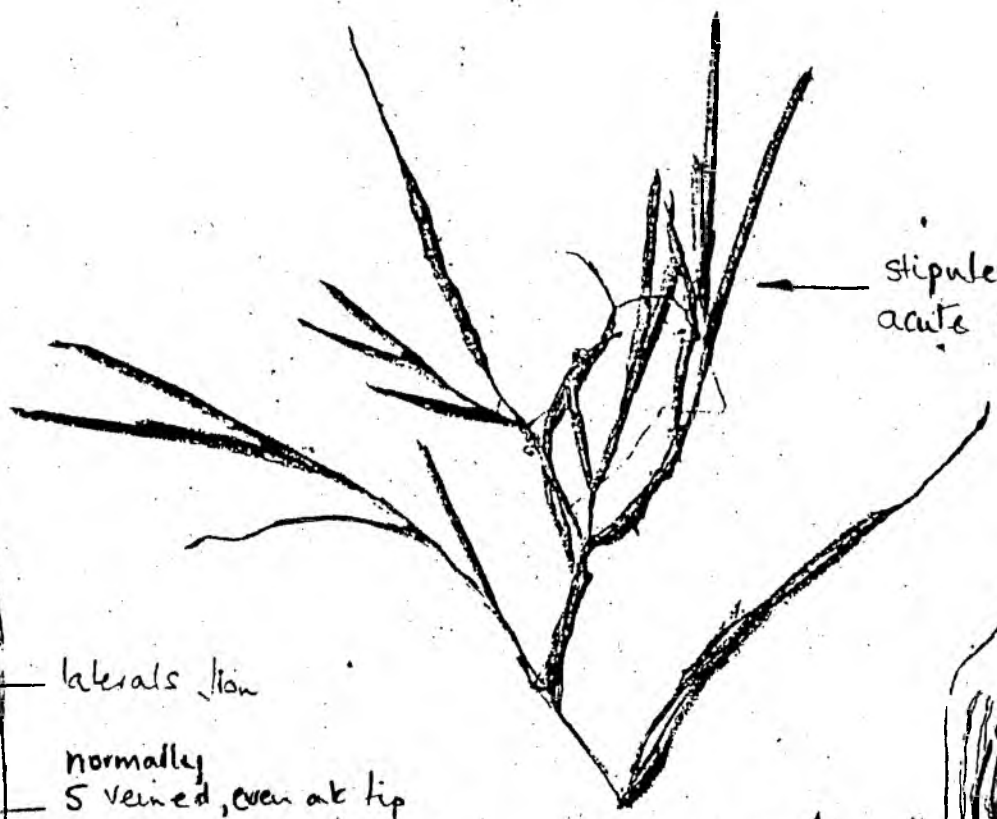
POTAMOGETON TRICHOIDES



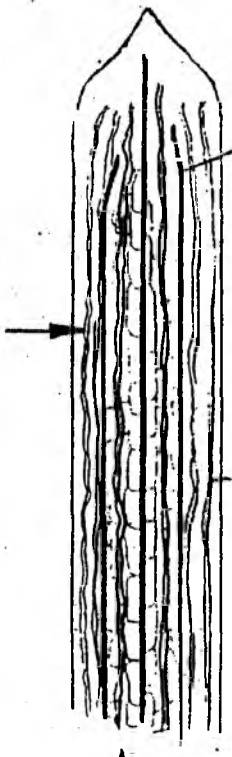
POTAMOGETON BERCHTOLDII



POTAMOGETON OBTUSIFOLIUS



cf Venation of P. compressus

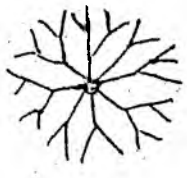


very broad band of air tissue along mid-rib

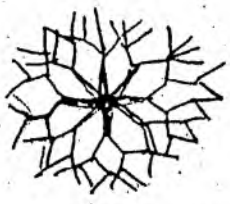
POTAMOGETON ACUTIFOLIUS

CERATOPHYLLUM

2 spp. Submerged. very stiff plants that remain stiff when shaken to remove surplus water. Leaves are in whorls with segments once or twice forked in C. demersum and twice or thrice forked in C. submersum. Segments of the leaves in the former are irregularly denticulate.



C. demersum



C. submersum

May superficially resemble: Hottonia palustris - this has submerged leaves not in whorls and flattened (); Ultricularia spp. in which leaves are similar but alternate rather than in whorls, Myriophyllum spp. in which leaves are in whorls but are flaccid and pinnate (); and submerged, trailing Hippurus which has whorls of unbranched leaves.

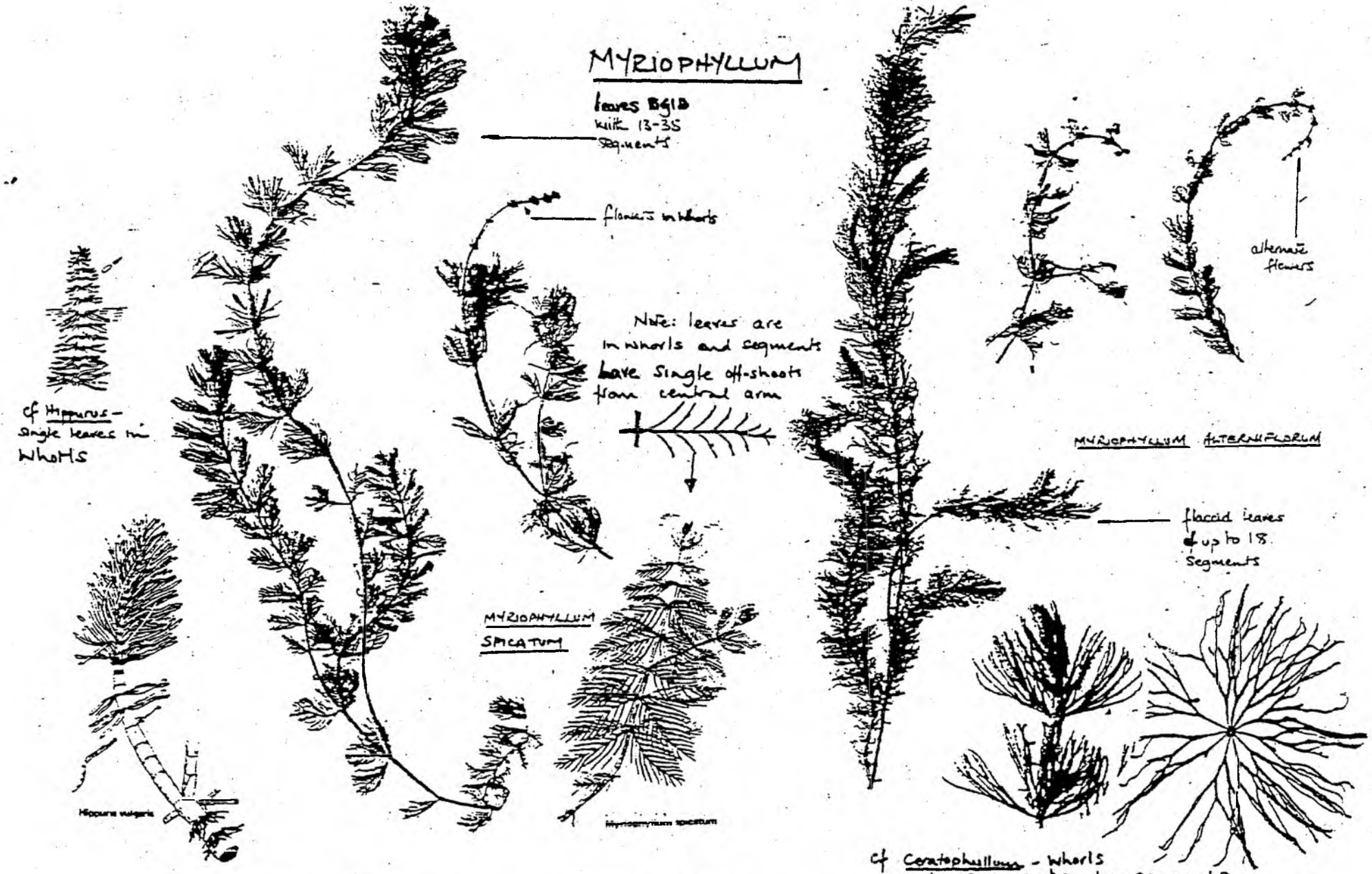
MYRIOPHYLLUM

A genus of submerged plants with pinnate leaves of unbranched capillary segments in whorls. There are two native spp. which are widespread (M. alterniflorum and M. spicatum), one native spp. which is restricted in range (M. verticillatum) and two V. rare introduced spp.

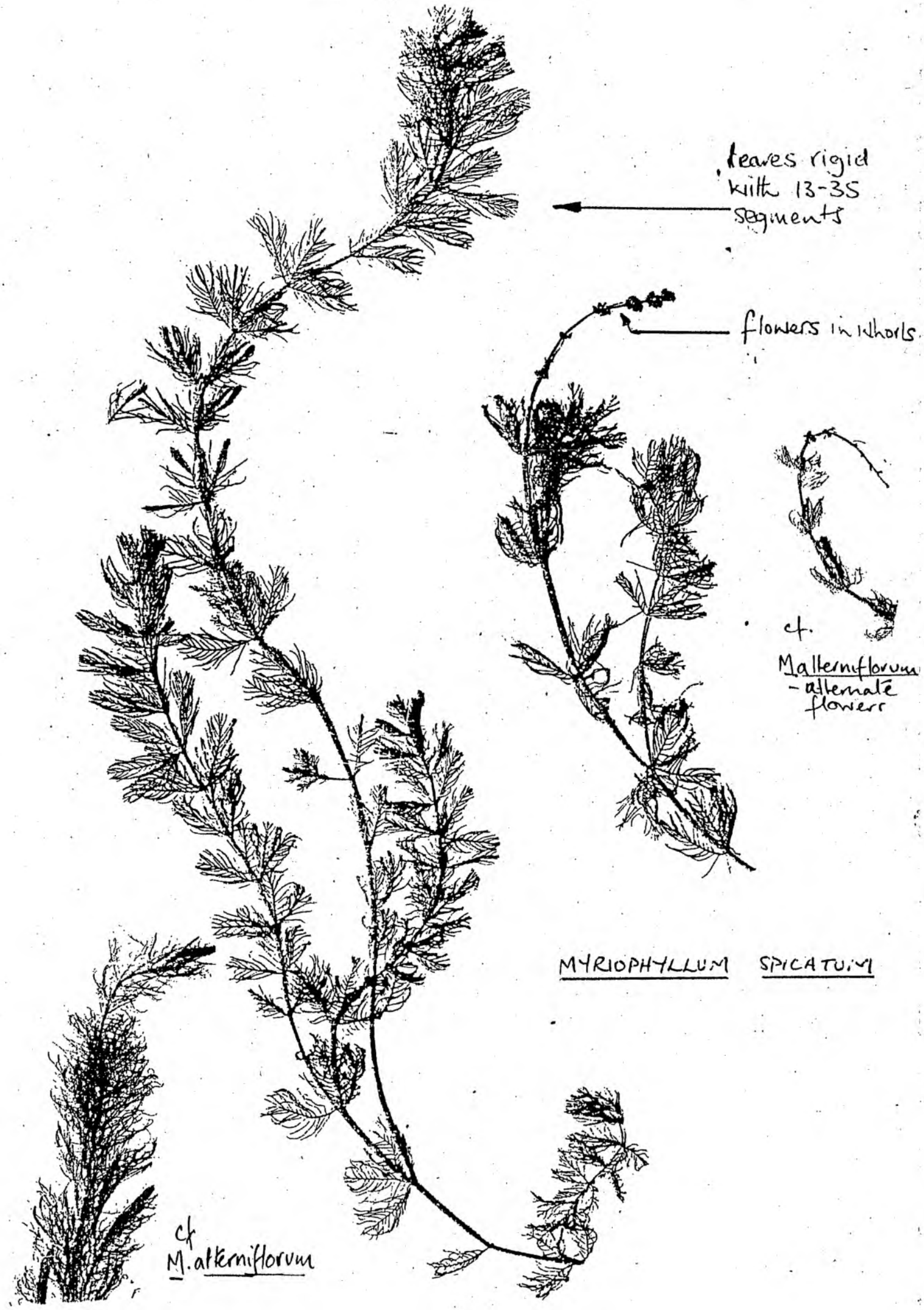
M. verticillatum usually has whorls of 5 which exceed the internodes. In the autumn turions are formed, a feature not known for the other spp. The bracts are as long as the flowers whereas in other spp. they are shorter. Local in South-east, rare elsewhere.

Both M. alterniflorum and M. spicatum have whorls of 4 leaves (rarely 3 or 5) and have narrow, entire bracts. The former normally has 6-18 capillary segments, and each leaf not exceedin 2-5cm. The latter normally has at least 13 and up to 35 segments and each leaf may be as long as 4cm. The latter is usually a stiffer plant and if a leaf is removed and shaken to remove surp water it will be erect to the tip if held up vertically; the former will bend at the tip. Flowering material present no problems since M. spicatum has whorled flowers with dull red petals and M. alterniflorum has upper flowers alternate which have petals yellow with red shreaks.

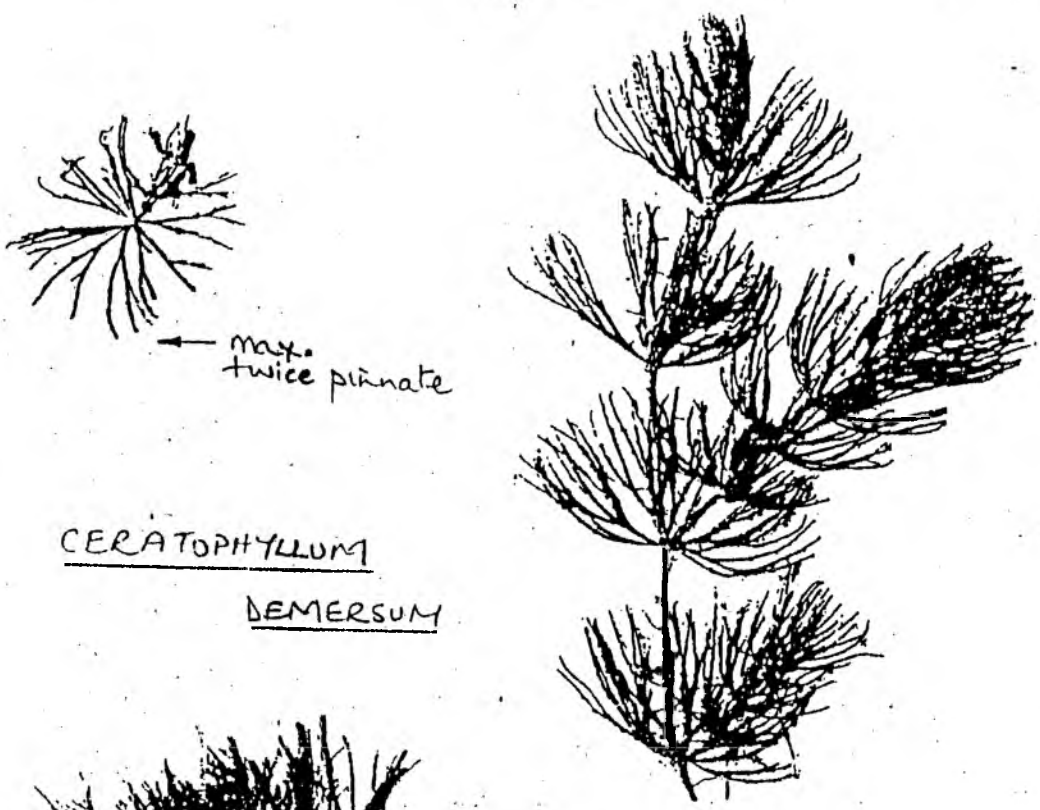
The Introduced spp. are characteristic in that M. heterophyllum has leaves in distinct whorls of 4 and 6 and M. verrucosum has whorls of 3, very small (to 1cm) leaves. Both remain very rare.



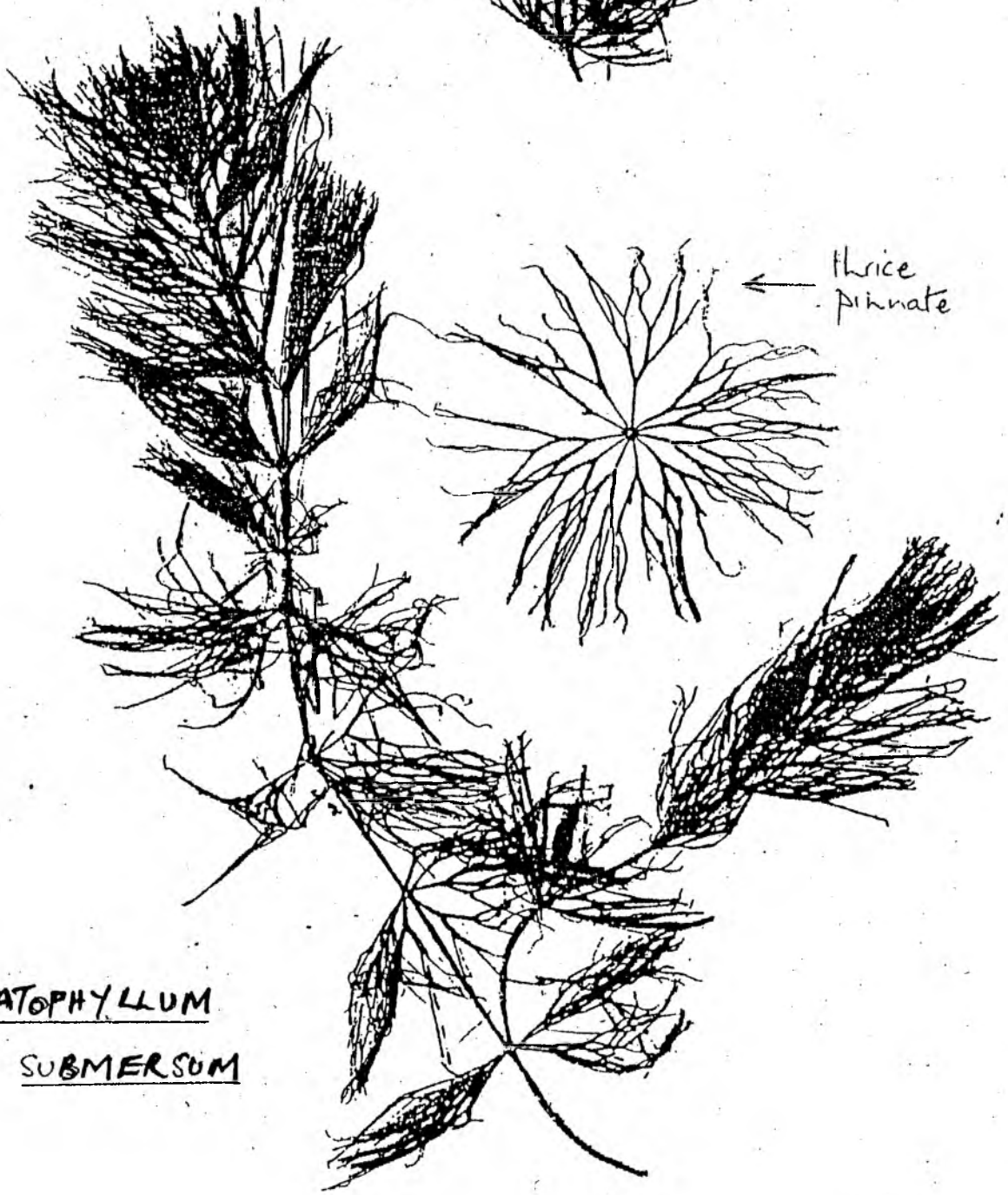
HIPPORUS / MYRIOPHYLLUM / CERATOPHYLLUM



MYRIOPHYLLUM SPICATUM



CERATOPHYLLUM DEMERSUM



CERATOPHYLLUM SUBMERSUM

HOTTONIA PALUSTRE

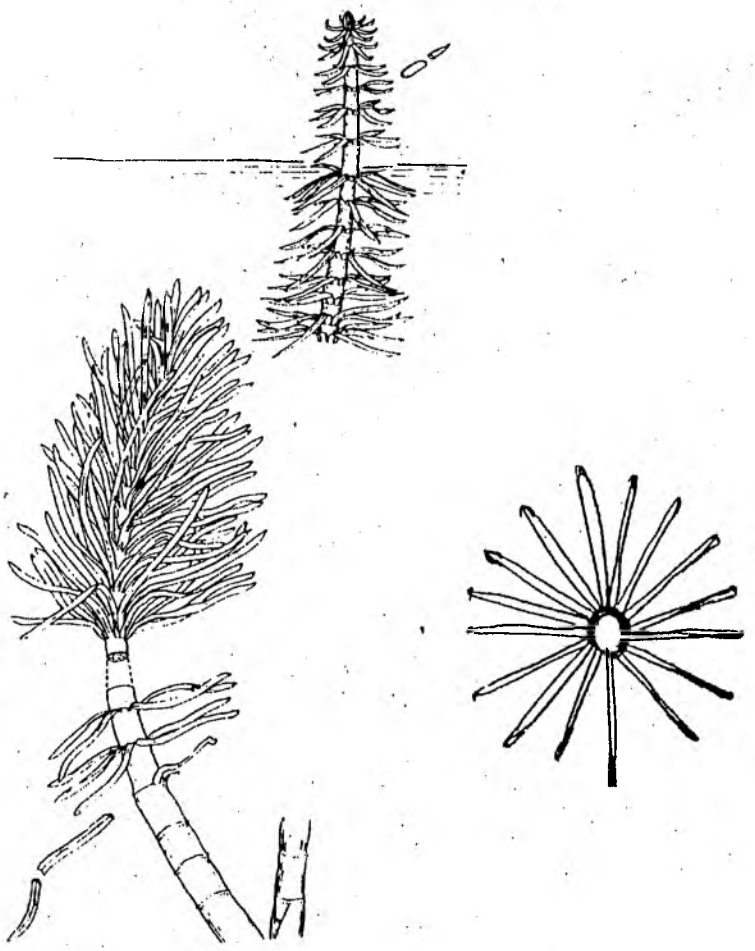
- pinnate leaves apparently in whorls of 3 to 5 or occasionally in pairs
- characteristic pink flowers also in whorls

Could only be confused with Myriophyllum spp. which have leaves in fine whorls. Leaves of Hottonia are occasionally bi-pinnate (never in Myriophyllum) and flattened dorso-ventrally whereas in the latter they are capillary segments. Although Hottonia may appear to be in whorls, these are never perfect in the sense that the leaves are staggered slightly up the stem and not radiating from the same point on the stem.

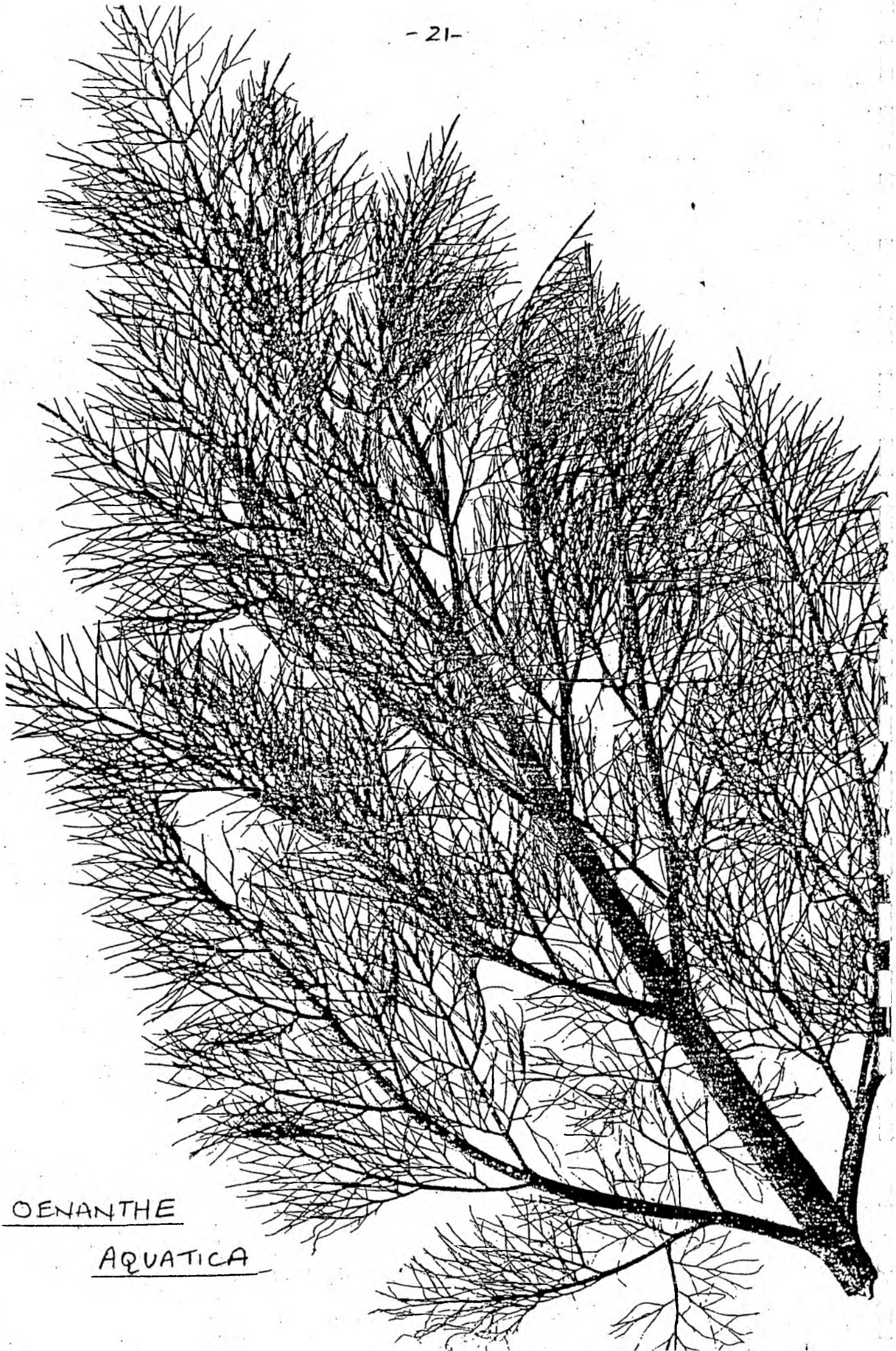
HIPPURUS VULGARIS

- leaves in whorls of more than six
- leaves linear, flat, sessile, entire and with acute tip
- above features in submerged or emergent shoots

See notes on Ceratophyllum for other genera with leaves in whorls.

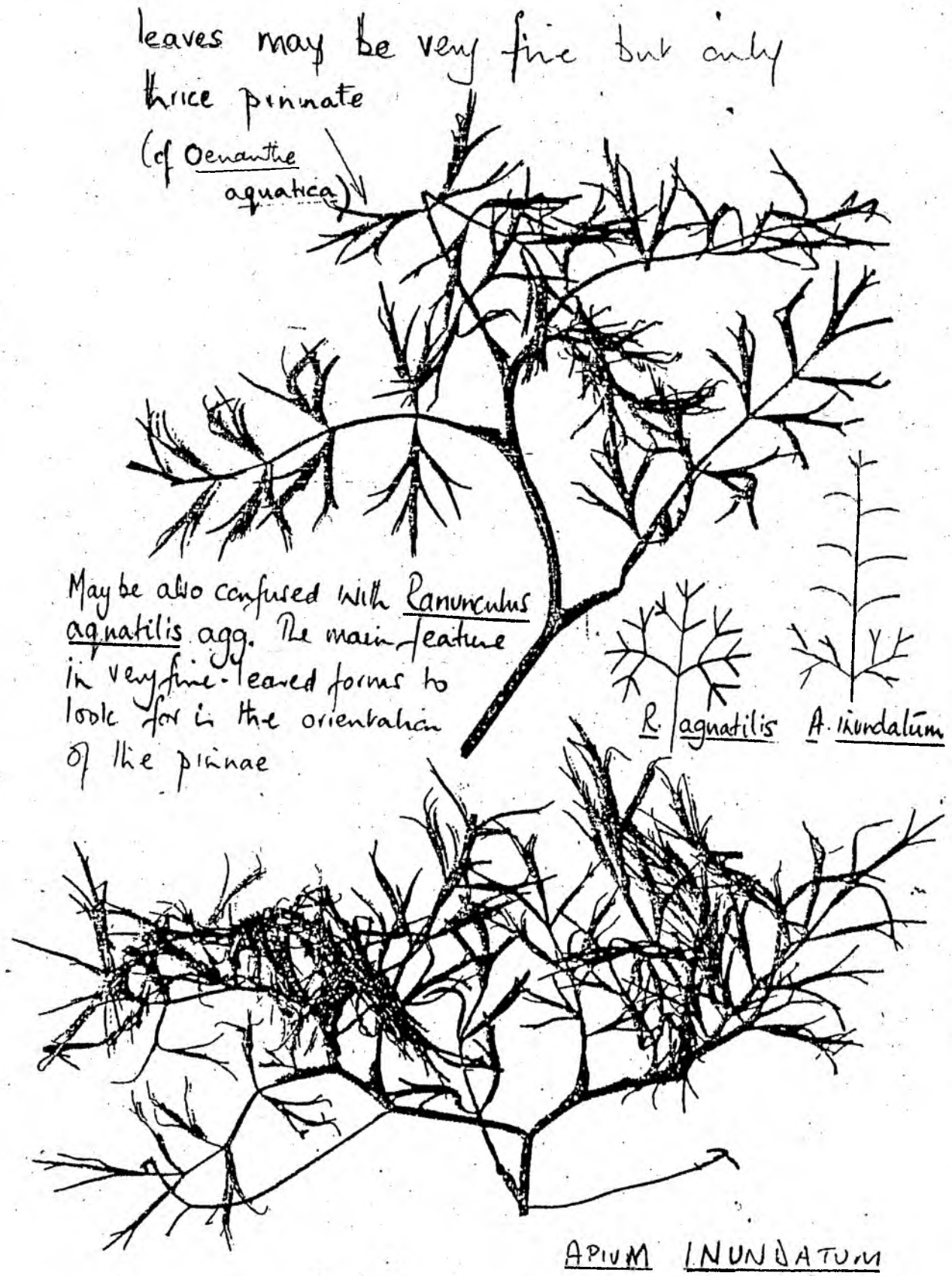


HOTTONIA



OENANTHE AQUATICA

OENANTHE FLUVIATILIS


leaves may be very fine but only thrice pinnate
(cf Oenanthe aquatica)
May be also confused with Ranunculus aquatilis agg. The main feature in very fine-leaved forms to look for is the orientation of the pinnae
R. aquatilis
A. inundatum
APIUM INUNDATUM

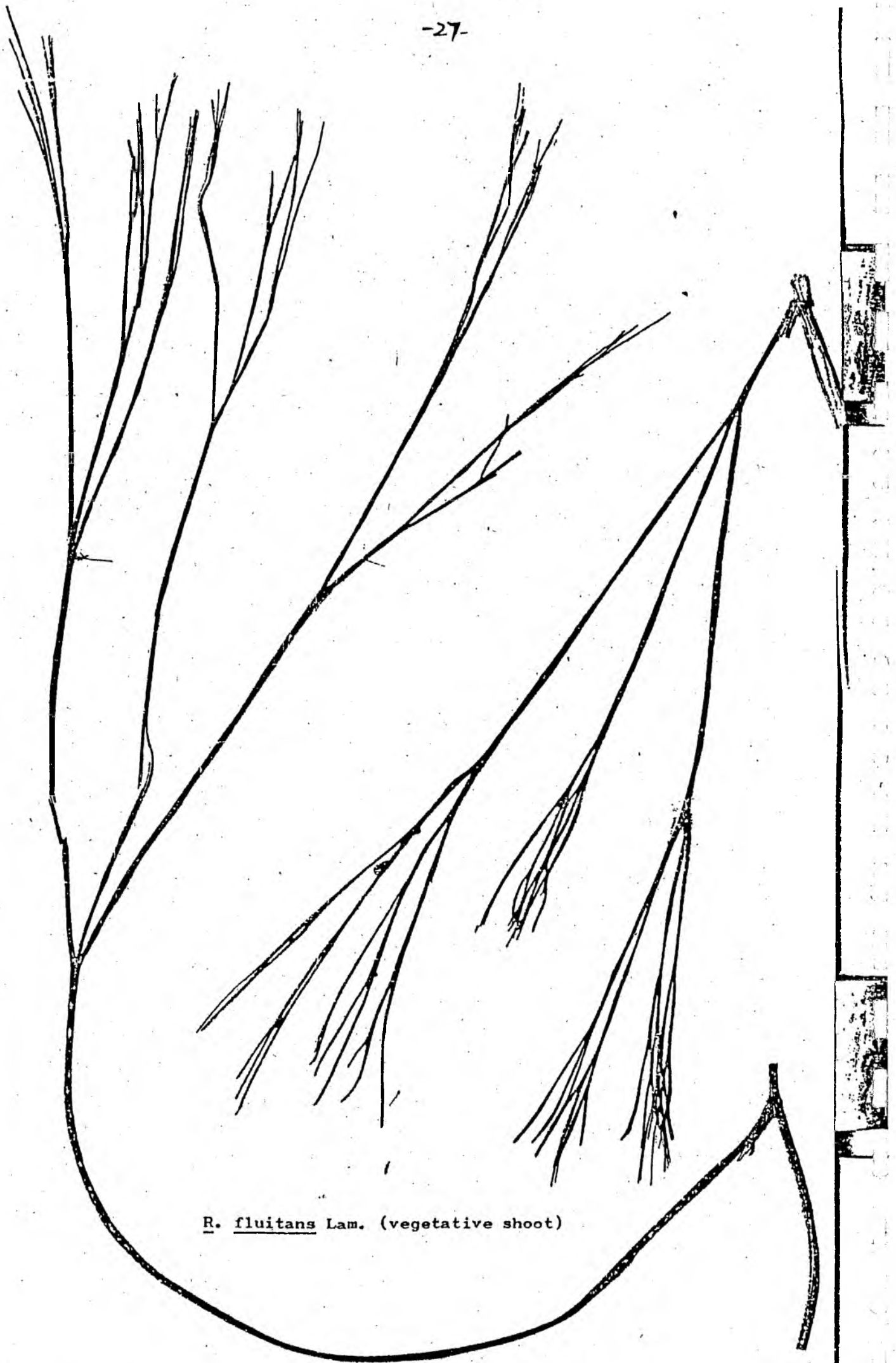
RANUNCULUS — CROWFOOT
species name
characters
divided leaves only ; both (o)
entire leaves only ; not
divided leaves in one plane only ; not
divided leaves fine, hair-like ; not
divided leaves rigid ; flaccid ; either (o)
divided leaves longer than mature internodes ; shorter ; either (o).
divided leaves 8-50cm, 4 times forked ; never as above ; occasionally as above (o)
dividel leaves divergent ; subparrallel ;
margin of entire leaves angular, sharply toothed ; dentations smooth
internediate leavos fine at base ; fine at distal ends of leaf
peduncle longer than petiole of opposed entire leaf ; shorter ; approximately equal (o)
petals not contiguous at antheria ; contiguous
sepals reflexed ; not reflexed
nectar pits lunate ; pyreform ; circular (o)
achenes winged ; not winged
immature carpels glabrous ; pubescent
receptacle glabrous ; densely pubescent
receptacle elongates at maturity ; remains globose
usual peduncle length <50mm ; >50mm ; apx. 50mm(o)
usual sepal length <3mm ; 3-5mm ; 4-7mm (o)
usual petal length <5mm ; 5-10mm ; >10mm (o)
sepal/petal ratio approx. 1:1 ; approx.1:1.5 ; approx. 1:2 or more (o)
sepals blue tipped ; not
stamen number usually <15 ; 15-30 ; 20-40 (o)
carpel number usually <30 ; 30-50 ; 50-80 (o)
position of style on achene terminal ; lateral ; either (o)
HEDERACEUS
OMIOPHYLLUS
TRIPARTITUS
BAUDOTII
TRICHOPHYLLUS
AQUATILIS
PELTATUS
PEN. var. PENICILLATUS
PEN. var. CALCAREUS
FLUITANS
CIRCINATUS

RANUNCULUS — A VARIETY OF FORMS

R. fluitans Lam.

KEY FEATURES:

a) Divided leaves only.
b) Segments of divided leaves flaccid, obconical.
c) Leaves longer than mature internodes, usually 8 cm and up to 50 cm.
d) Leaves rarely more than 4 times forked.
e) Receptacle and carpels usually glabrous.
f) Style positioned consistently on the lateral side of achene.
g) Upper nodal roots rarely formed during summer growth phase.

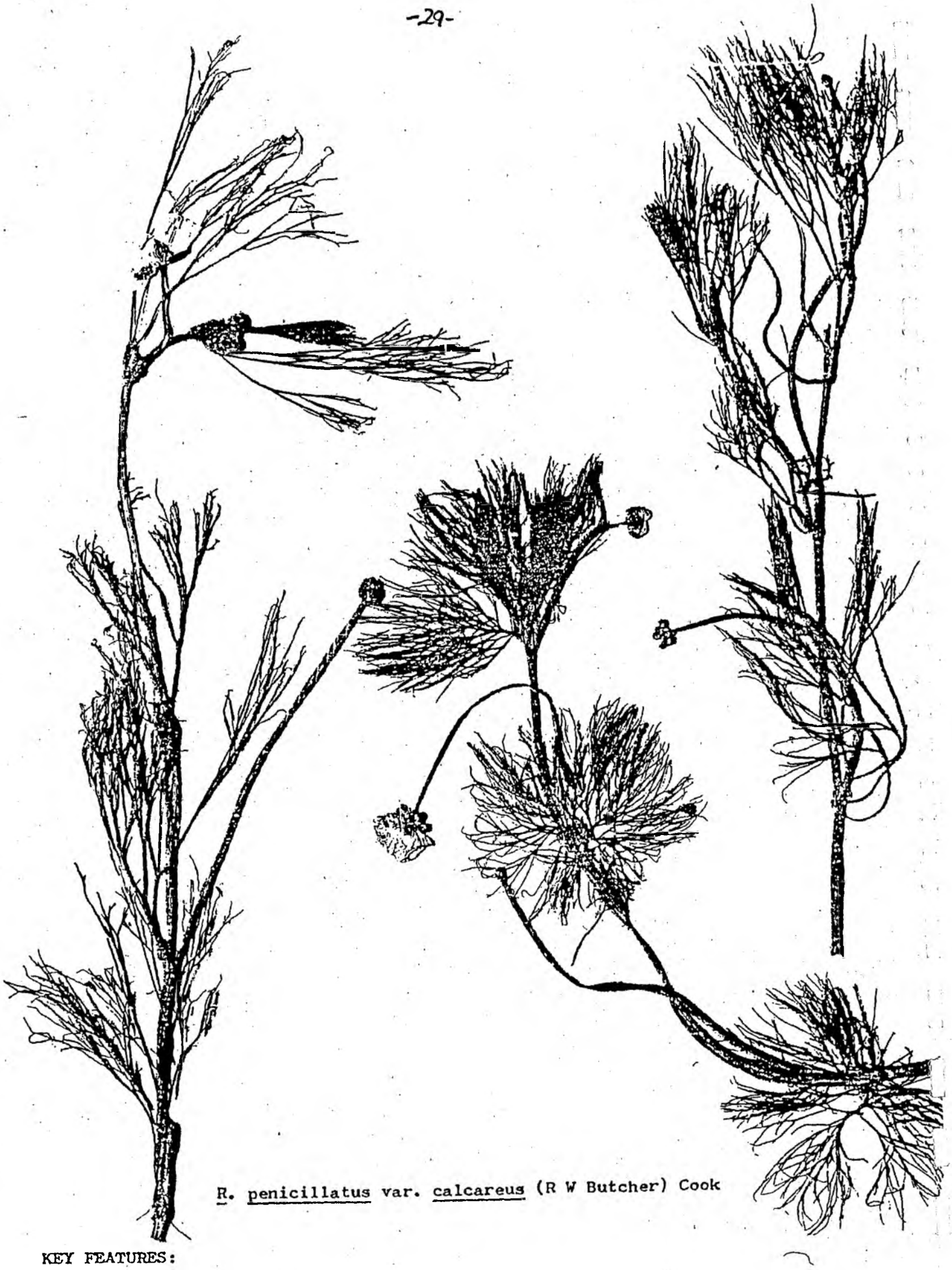


R. fluitans Lam. (vegetative shoot)

R. circinatus Sibth.

KEY FEATURES:

a) Entire leaves never formed.
b) Leaf segments fan-like, lying in one plane only, frequently dividing several times within the stipule.
c) Nectar pits lunate.



R. penicillatus var. calcareus (R W Butcher) Cook

KEY FEATURES:

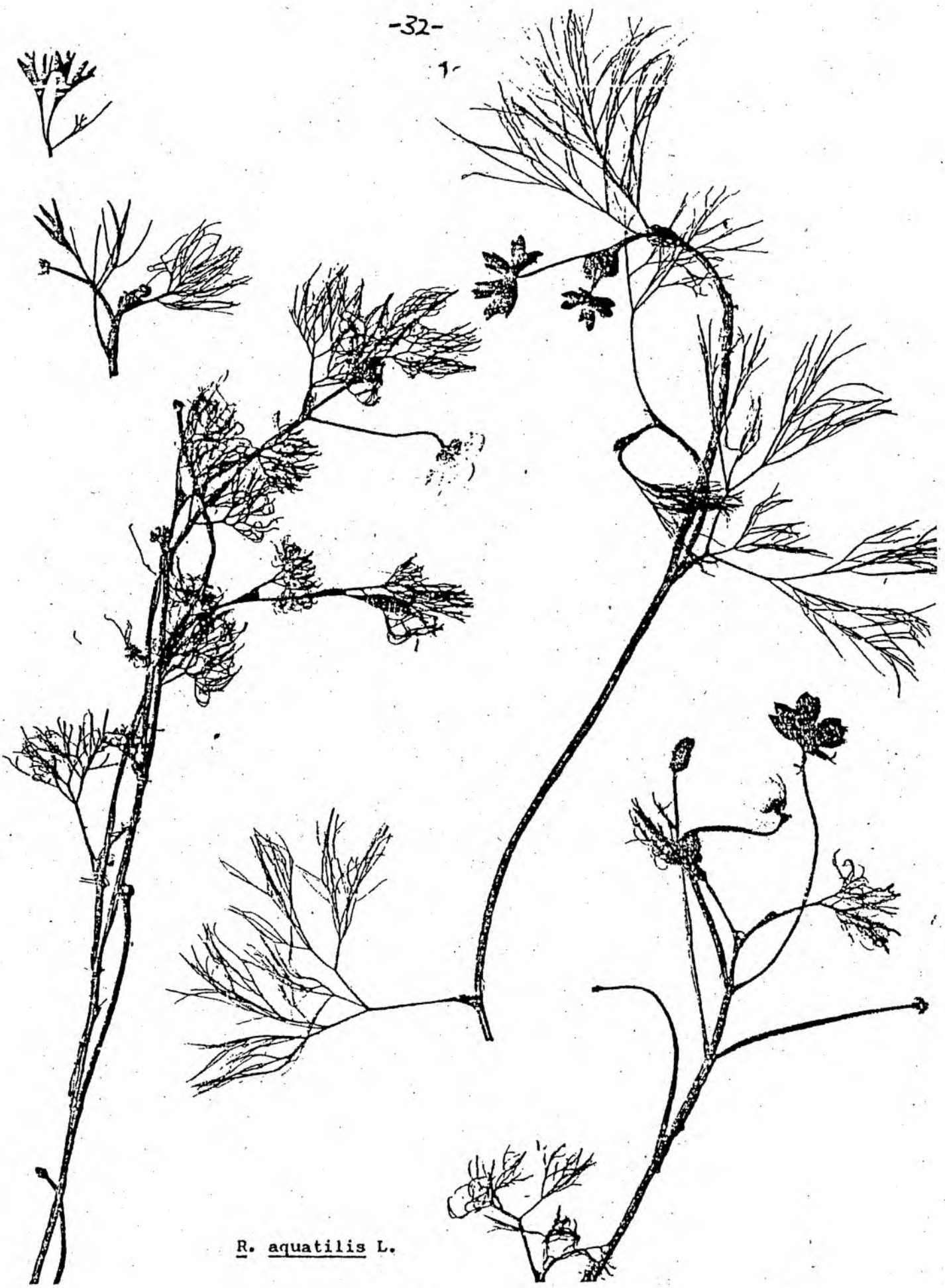
a) Divided leaves only.
b) Mature divided leaves about equalling the length of the internodes.
c) Nectar pits pyriform.
d) Receptacle densely hairy.
e) Prostrate summer growth with nodal roots.

R. peltatus Schrank

KEY FEATURES:

a) Divided and entire leaves, intermediate leaves also formed.
b) Entire leaves usually 5 lobed.
c) Intermediate leaves feathery at distal ends.
d) Divided leaves shorter than mature internodes, segments divergent and usually rigid.
e) Peduncle in fruit greater than 50mm, longer than petiole of the opposed entire leaf.
f) Nectar pits pyriform.

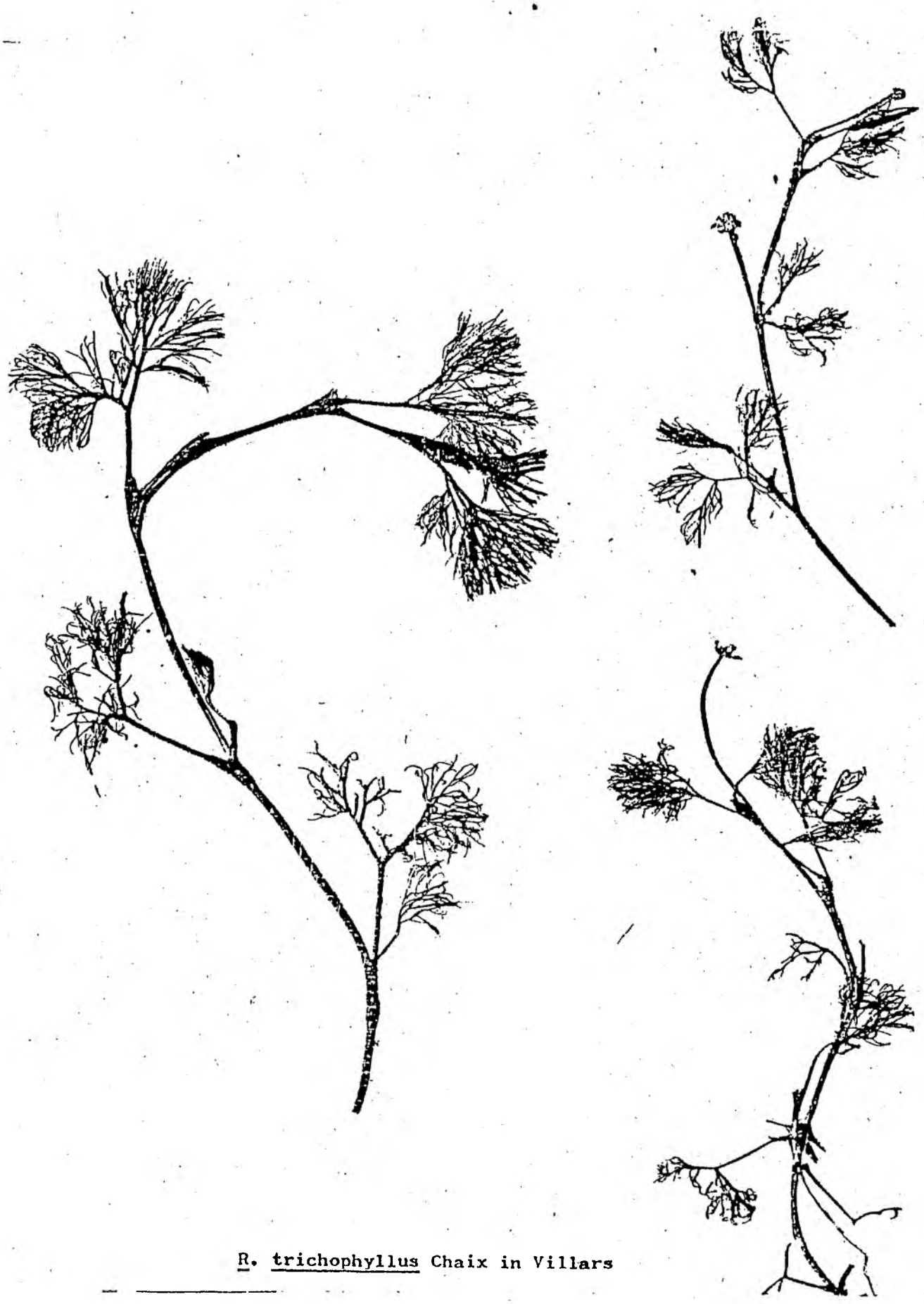
R. peltatus Schrank (vegetative shoot)



R. aquatilis L.

KEY FEATURES:

a) Entire and divided leaves, intermediate leaves also develop.
b) Margin of entire leaves usually sharply toothed.
c) Peduncle in fruit usually less than 50mm, shorter than the petiole of the opposed entire leaf.
d) Nectar pits circular.
e) Petals more than 10mm, contiguous at antheses and at least twice as long as sepals.



R. trichophyllus Chaix in Villars

KEY FEATURES:

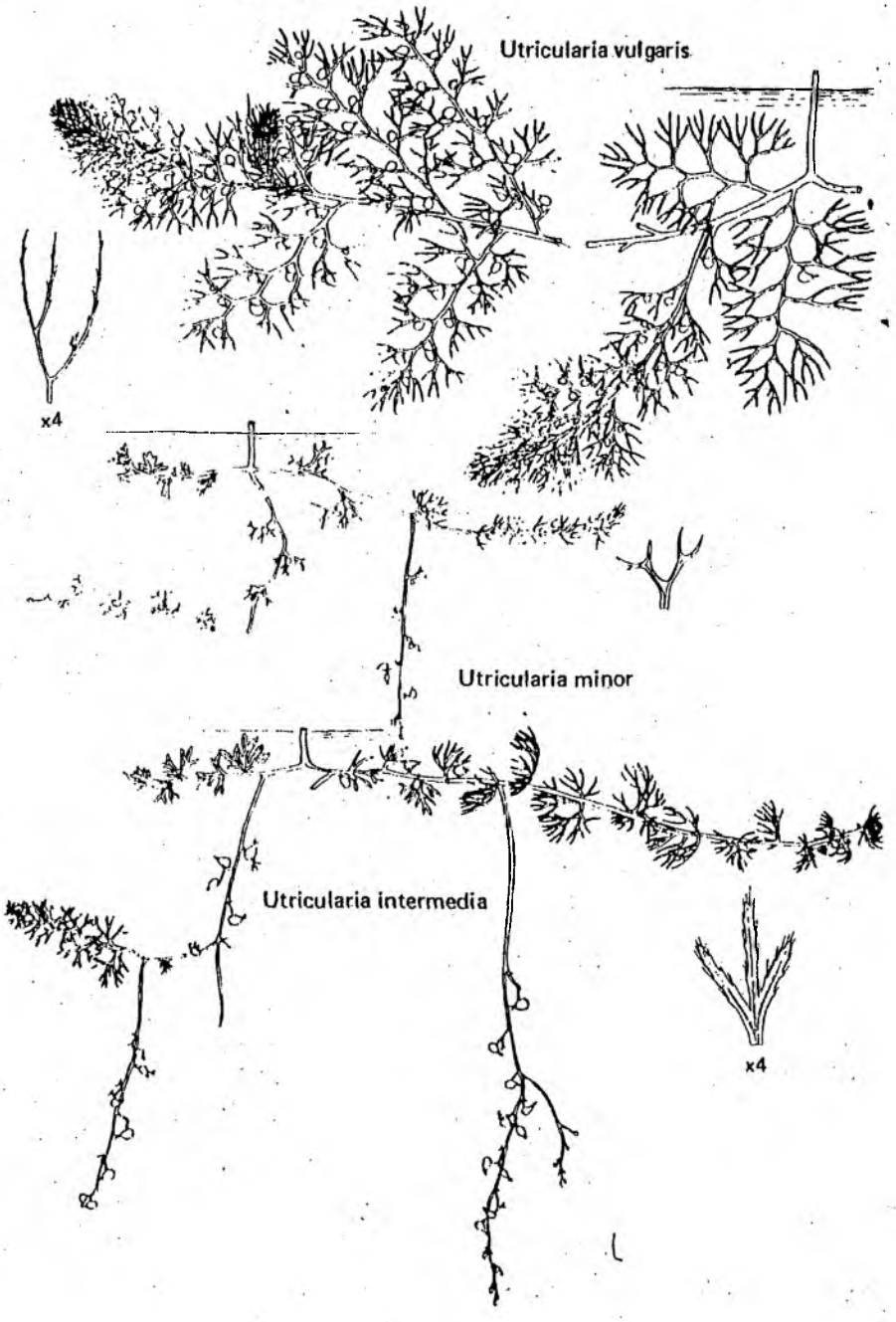
a) Divided leaves only.
b) Petals not contiguous during anthesis.
c) Nectar pits lunate.
d) Peduncle in fruit less than 50mm.
e) Petals usually less than 5mm long, only marginally larger than sepals.
f) Less than 15 stamens.

UTRICULARIA

A characteristic genus, the bladderworts, which overwinter by turions. The leaves are divided into filiforme segments which bear small animal traps (the bladders). There are two distinct groups within the genus, one with all stems of similar character and a second group with stems of differing character.

UTRICULARIA INTERMEDIA and U. MINOR have upper stems with green capillary leaves and few bladders and lower stems which have few colourless leaves and many bladders. The two species can be separated confidently using leaf characters. The former species has denticulate leaf segments which are bristled with hairs. The latter species has entire leaf segments without bristles and bladders commonly occur on both stems and leaves.

UTRICULARIA VULGARIS agg - characterised by stems of uniform character, all leaves green and bearing numerous bladders. Two spp. are recognised, U. vulgaris and U. australis (neglecta) which have distinct flora characters. Since Utricularias are frequently found without flowers it is difficult to be certain of a determination when the only vegetative difference is that the former species has leaf segments with groups of bristles and the latter has leaf segments usually with solitary bristles but may rarely occur with grouped bristles.



2. BROAD-LEAVED AQUATIC MACROPHYTES

Submerged leaves expanded, generally no more than five time longer than broad; linear floating leaves may be present.

2.1 Submerged leaves in whorls of 3-4	**ELODEA**
2.2 Submerged leaves in pairs	
a) submerged leaves broadest at base, stipules present, no rosettes formed, weak stems and no emergent shoots	**GROENLANDIA**
b) submerged leaves broadest at base, often almost clasping around the stem, no stipules, no rosettes, strong stems often producing emergent shoots	**VERONICA A--A**
c) submerged leaved broadest at tip, upper leaves often forming distinct rosettes	**CALLITRICHE**
2.3 Submerged leaves broad, translucent, and attached to the stem in alternate ranks, stipules always present	**POTAMOGETON ie crispus, lucens perfoliatus**
2.4 Leaves broad and distinctly stalked. Thick opaque leaves floating on surface when mature but not rounded or lily-like	**POTAMOGETON**
a) with no translucent submerged leaves and stipules > 5cm long	**natans**
b) with or without translucent submerged leaves and stipules < 5cm long (Acid/Uplands in Region)	**polygonifolius**
Large translucent submerged and opaque floating leaves - yellowish colour (River Stour in the Region only)	**nodosus**

ELODEA

Much confusion recently over spread of 'Elodea nuttallii' since the species that is spreading is not strictly E. nuttallii and has probably been named in error. The main separating character between E. canadensis and 'E. nuttallii' is the usually narrower, more pointed leaves of the latter WHICH ARE BROADEST AT THE BASE AND TAPER IMPERCEPTABLY TO AN ACUTE TIP. In E. canadensis the leaves are parallel sided for much of their length and taper to an obtuse or acute tip. The degree of serrulations on the leaf is not diagnostic.

E. callitriche and E. ernstiae are synonymous and recognised by the light green leaves which are narrowly lanceolate and acute and up to 2.5cm long (.5cm longer than in other spp.). The whorls of leaves are in threes and distant. Rare, very southerly distribution.

Note: Lagarosiphon superficially similar but leaves not in whorls.

ELODEA Michx. (from Wigginton and Graham)

The status of Elodea in Britain is gradually being resolved. It now seems probable that there are three species growing in this country ; E.canadensis Michx., E. nuttallii (Planch.)St John, and E. ernstae St John. E.canadensis and E. nuttallii are found in our region, and E. ernstae is confined to s. England. E. nuttallii has replaced E. canadensis at many sites and is showing no signs of slowing its rapid increase. It is more tolerant of higher nutrient levels, and this may be a factor influencing its rate of spread. All species show considerable morphological variation, and this has caused much confusion. Elongate forms of both E. canadensis and E. nuttallii are frequent in the north-west, especially in the Cumbrian Lakes. The 'Elodea nuttallii' of Esthwaite Water is now known to be Hydrilla verticillata, but it may well be extinct from this, its only known British locality.

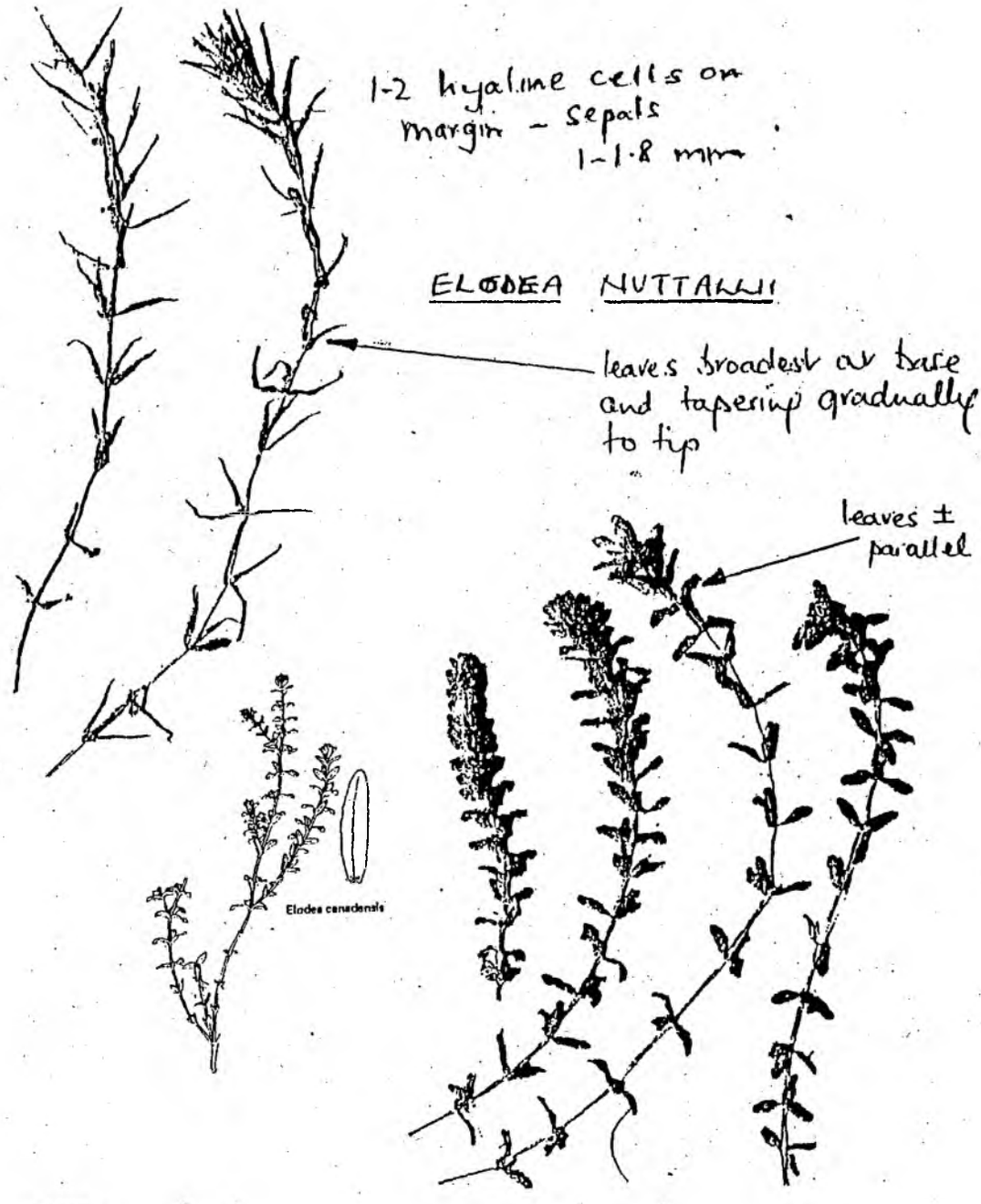
Leaf length and width are poor characters for identification, since they show great variability. Microscopic characters, however, do prove useful, and the species can be separated vegetatively on a combination of micro- and macroscopic features.

1. Median and upper leaves in whorls of (3)4-5 ; nodal scales fimbriate.
Hydrilla verticillata (L.f.)Royle

1. Median and upper leaves in whorls of 3 ; nodal scales entire.

2. Median and upper leaves usually firm, rarely reflexed, elliptic to linear-oblong, the apex obtuse ; leaf-margins with 3-10 rows of hyaline cells ; mean leaf-tooth length 60-70(72) µm ; sepals of female flowers 2.0-2.8mm long.
Elodea canadensis Michx.

2. Median and upper leaves flaccid or firm and strongly reflexed, linear-lanceolate, the apex acuminate ; leaf-margins with 1-2 rows of hyaline cells ; mean leaf-tooth length 73-80 µm ; sepals of female flowers 1.0-1.8 mm long.
Elodea nuttallii (Planch.)St John



ELODEA

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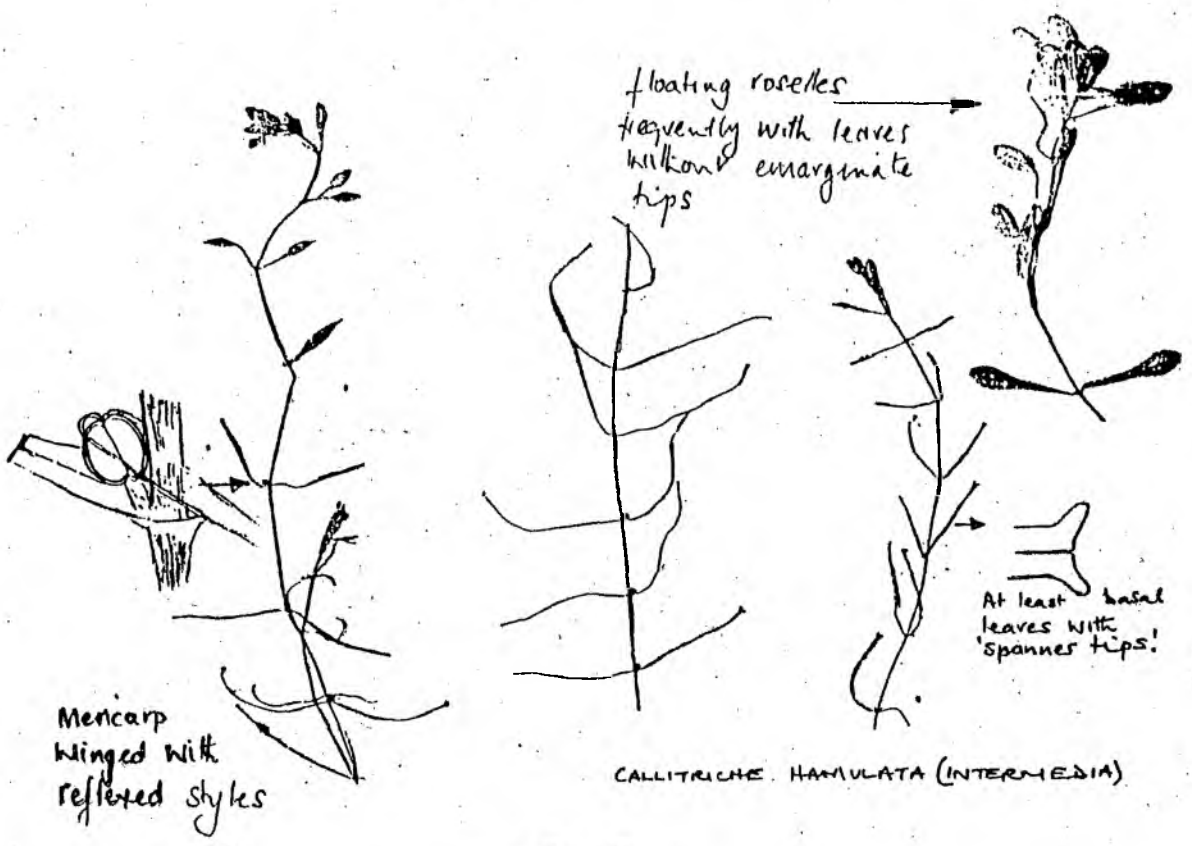
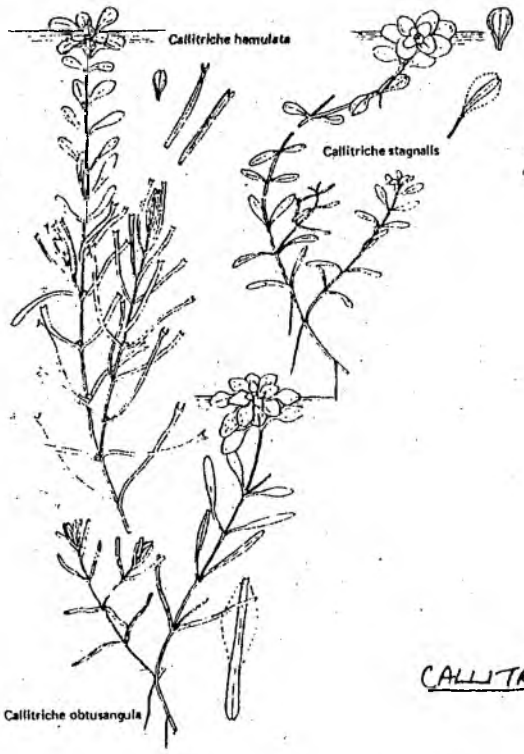
GROENLANDIA DENSA

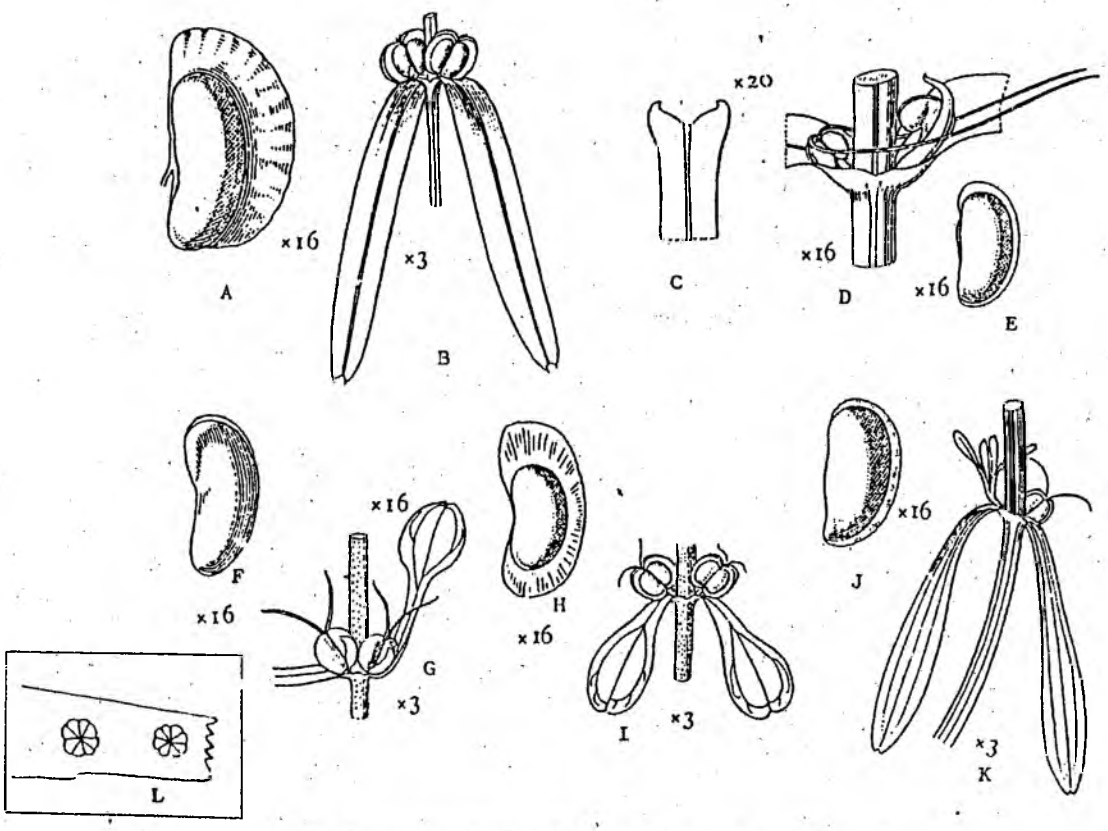
Common name is Opposite-leaved pondweed which indicates its characteristics. Leaves are in opposite pairs and like Potamogeton perfoliatus is sessile and amplexicaul. Groenlandia, as a genus too, differs from British Potamogeton in the absence of stipules.





Spanner-leaved or Intermediate Water-starwort typically has narrow lower leaves which end in 'spanners' but the leaves of the upper part of the plant may not have any such diagnostic leaves - it likes acid water. In contrast C obtusangula (Blunt-fruited W-S) likes calcareous water; it has diagnostically dense apical rosettes with >18 leaves present - however when immature it is impossible to tell apart from the common C Stagnalis which is also impossible to tell from C platycarpa.

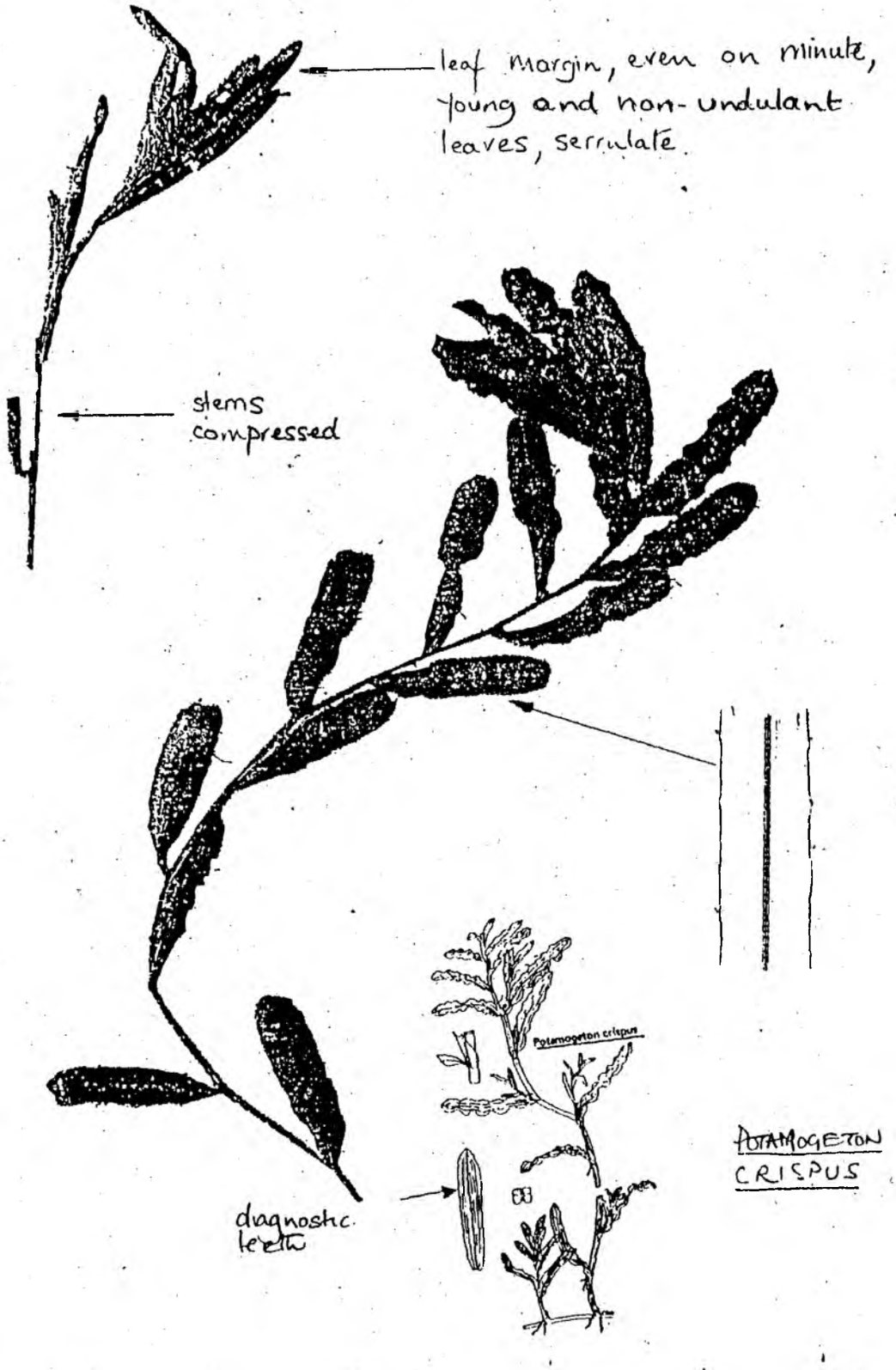
CALLITRICHE

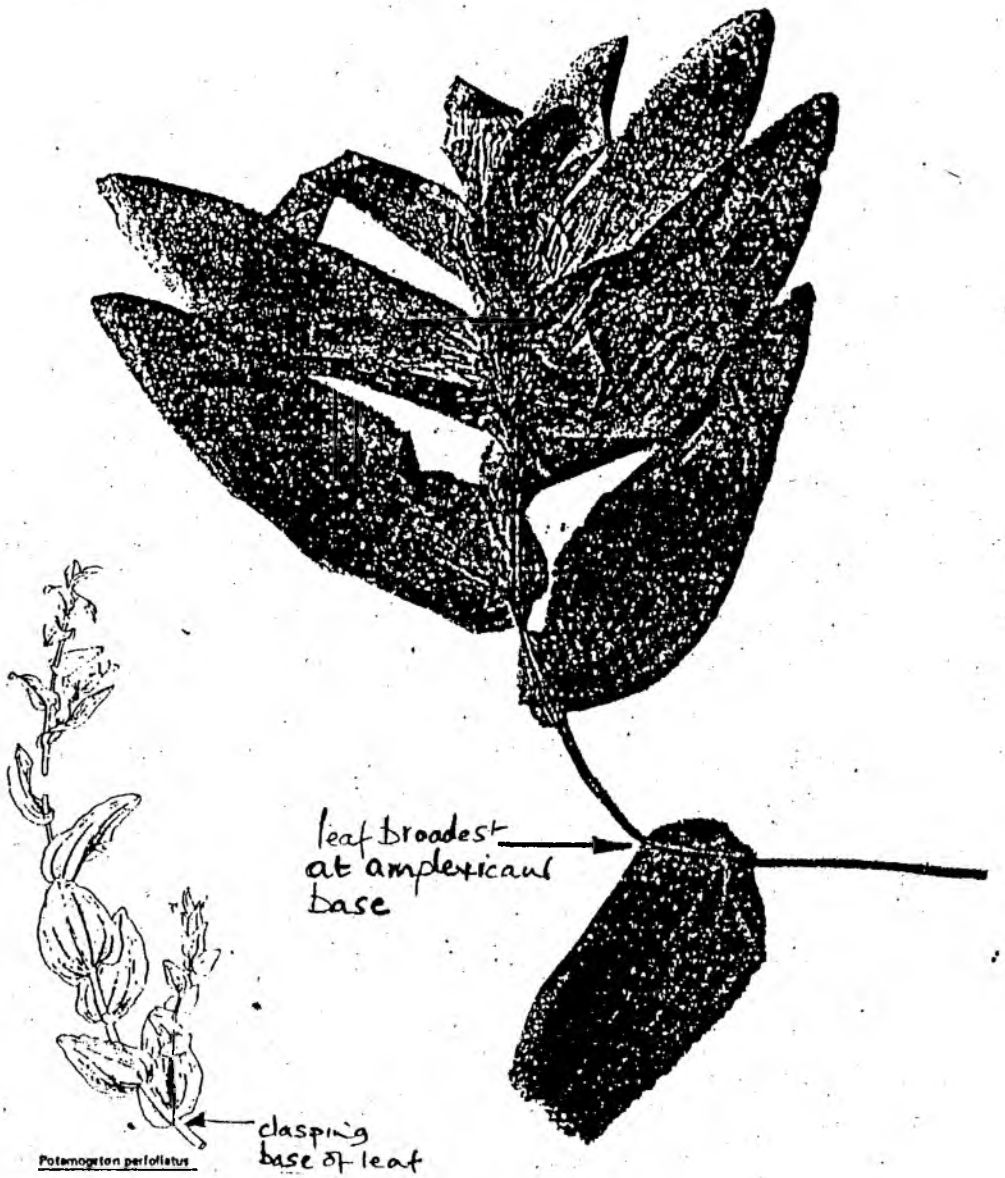


C. hermaphroditica (A,B) C. hamulata (C,D,E)
C. obtusangula (F,G) C. stagnalis (H,I)
C. platycarpa (J,K) Peltate hairs x200 (L) on part of leaf

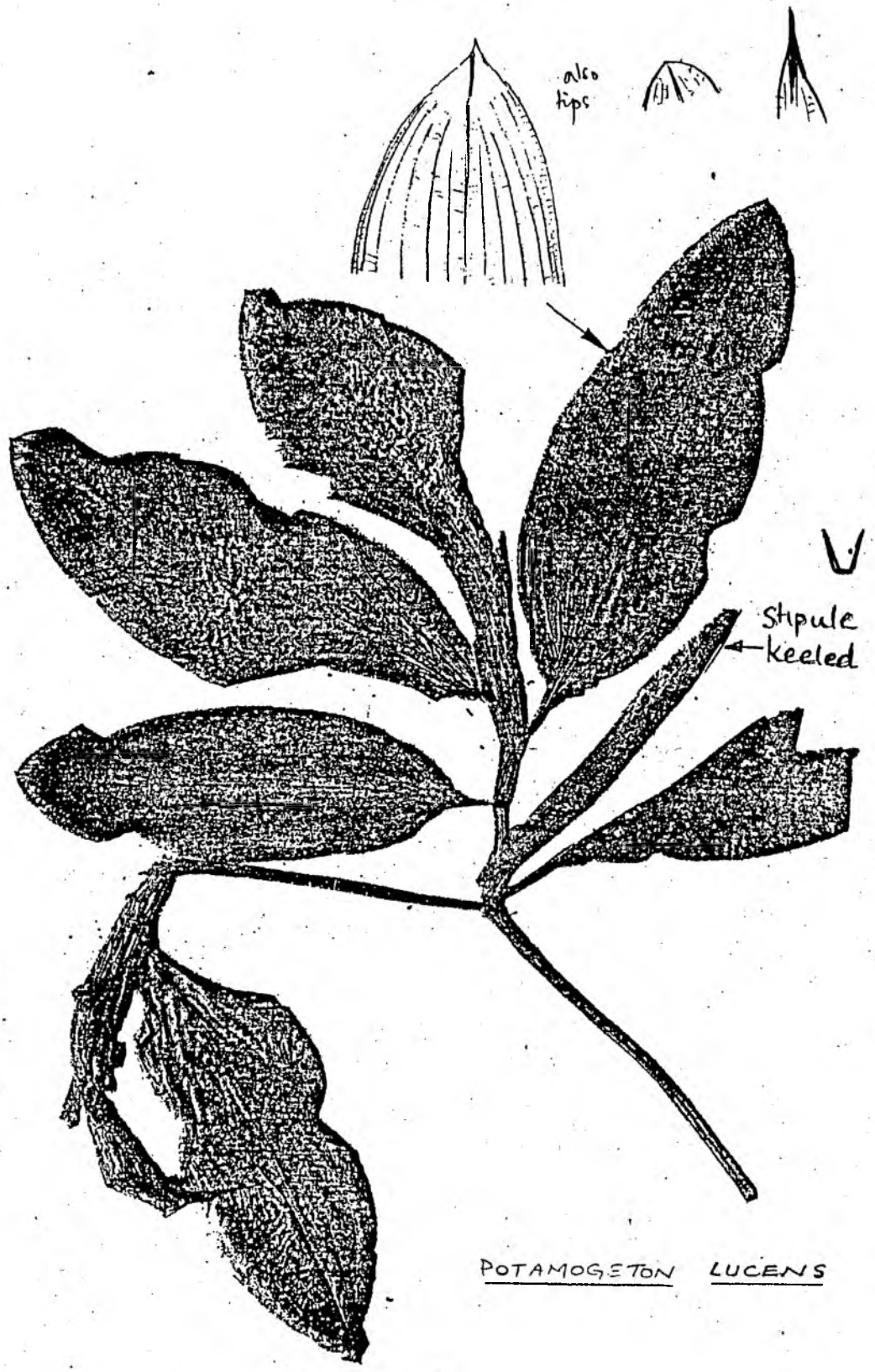
BROAD LEAVED PONDWEEDS

	Stems compressed +, not - (1)	Floating leaves present +, not - (2)	Floating leaves coriaceous +, translucent, not-veined - (3)	Coriaceous wings at base of floating leaves +, not - (4)	Submerged leaves ± all expanded, ± translucent +, ± linear - (5)	Linear submerged leaves opaque +, translucent - (6)	Submerged leaves delicately net-veined +, not - (7)	Floating leaves: leaf base characteristics and petiole length (cm) (8)	Submerged leaves: leaf base characteristics and petiole lengt (9)	Leaf margins entire +, serate e, microscopically denticulate (10)	Leaf tips: hooded +, not -, often cuspidate e (11)	Leaf sizes (cm): floating leaves above, submerged leaves below (12)	Stipule length (cm) (13)	Peduncle thicked upwards +, not - (14)	Fruit spike length (cm) (15)	Peduncle length (cm) (16)	Fruit shape (redrawn from CTV) (17)	Other useful characteristics (18)
NATANS	-	+	+	+	-	+	-	15-60	straight (phyllodes)	+	-	2.5-12.5 x 1-7 15-50 x 1-3	5-20	-	3-8	5-12		Deep running water form may rarely form floating leaves giving rise to confusion with P. pectinatus.
POLYGONIFOLIUS	-	+	+	-	+	-	±	½-2x blade length	variable blade narrows into stalk	+	-	2-6 x 1-4 8-20 x 1-3	2-4	-	1-4	5-20		
COLORATUS	-	+	-	-	+	-	+	always < blade length	Often subsessile	+	-	2-10 x 1.5-5- 6-15 x0.5 -2	2-4	-	2.5-4	5-20		
NODOSUS	-	+	+	-	+	-	+	x2 blade length	± long stalked leaf narrowed at base	+	±	6-15 x 2.5-6 10-20 x 1.5-4	7-10	-	2-6	>10		
LUCENS	-	-	-	-	+	-	+	-	Usually 0.5-1.5 with blade decurrent on stalk	-	±	- 10-20 x 2.5-6	3-8 (keeled)	+	5-6	7-25		
GRAMINEUS	-	±	+	-	+	-	-	x2 blade length	sessile	-	±	2.5-7 x 1-2.5 2.5-15 x0.3 -3	2-5	+	2.5-5	5-10(25)		
ALPINUS	-	±	+	-	+	-	-	blade narrows to short stalk	subsessile or very short stalk	+	±	3-8 x0.8-2 6-15 x 1-2	2-6	-	2-4	5-18		Midrib with fine network of veins along its length; 7-13 longitudinal veins
FRAILONGUS	-	-	-	-	+	-	-	-	rounded base ± sessile semi-amplexicaul	+	+	- 6-18 x 2-4.5	0.5-6	-	3-7	15-40		13-17 longitudinal veins
PERFOLIATUS	-	-	-	-	+	-	-	-	broadest at amplexicaul sessile base	-	-	- 2-10 x 1.5-6	≤1	-	1-3	3.5-10		
EPIHYDRUS	+	+	+	-	-	-	-	blade narrows to stalk	linear blade into sessile base	+	-	3.5-7 x 1-2.5 8-20 x .3-.8	3-5	-	1-2.5	3-4		Midrib bordered by clear band of lacunar tissue
CRISPUS	+	-	-	-	+	-	-	-	broad sessile base	e	-	- 3-10 x0.5-1.5	1-2	-	1-2	2.5-10		Mature leaves usually undulate

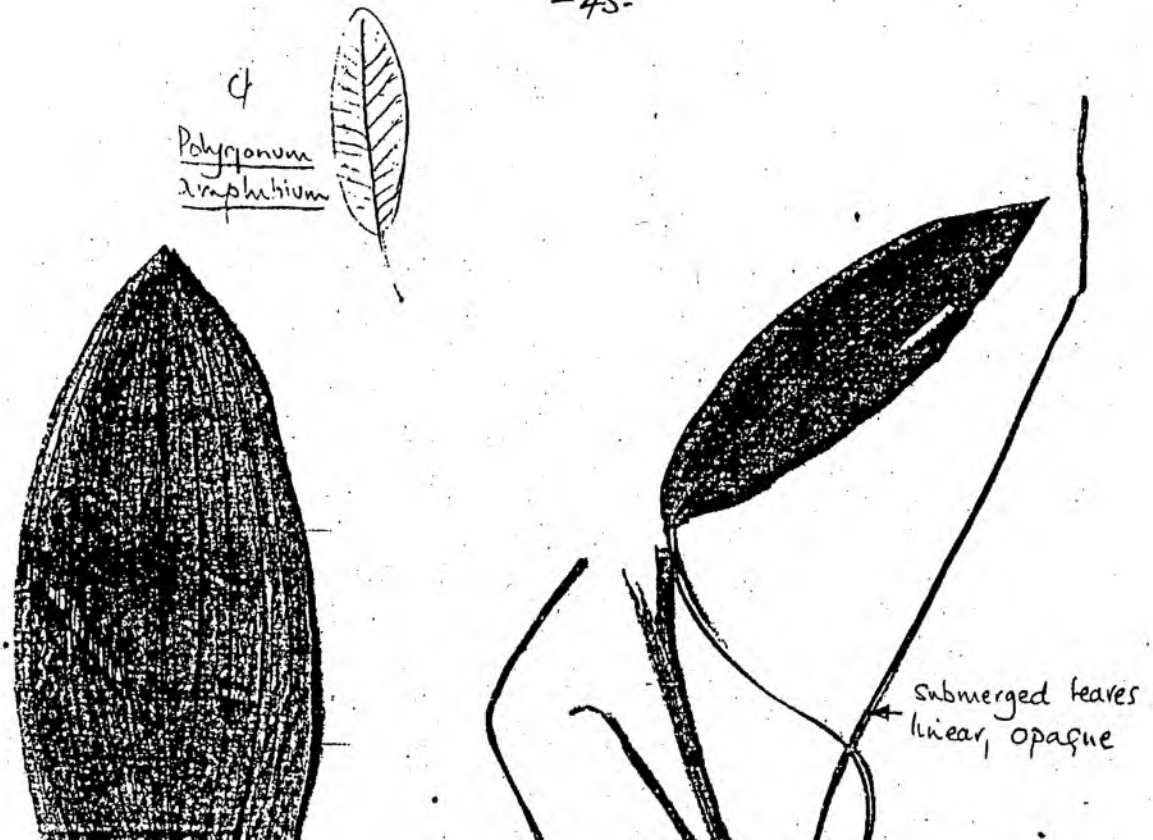

leaf margin, even on minute, young and non-undulant leaves, serrulate.
stems compressed
Potamogeton crispus
diagnostic teeth
POTAMOGETON CRISPUS

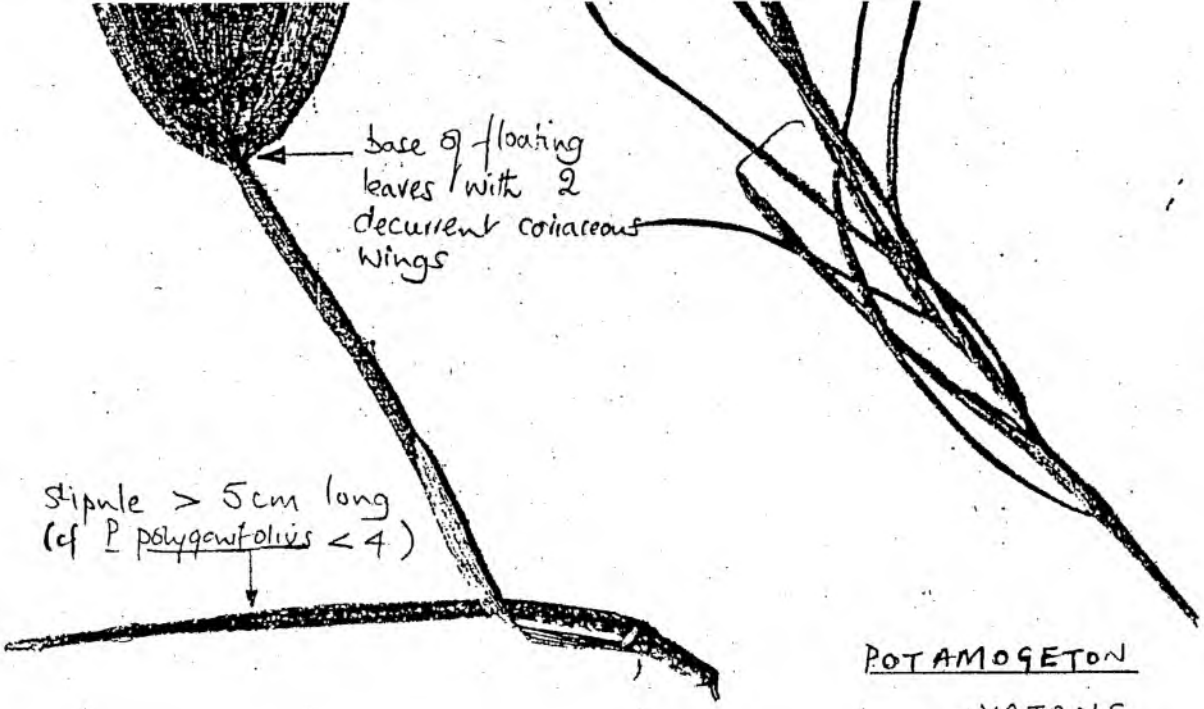


POTAMOGETON PERFOLIATUS

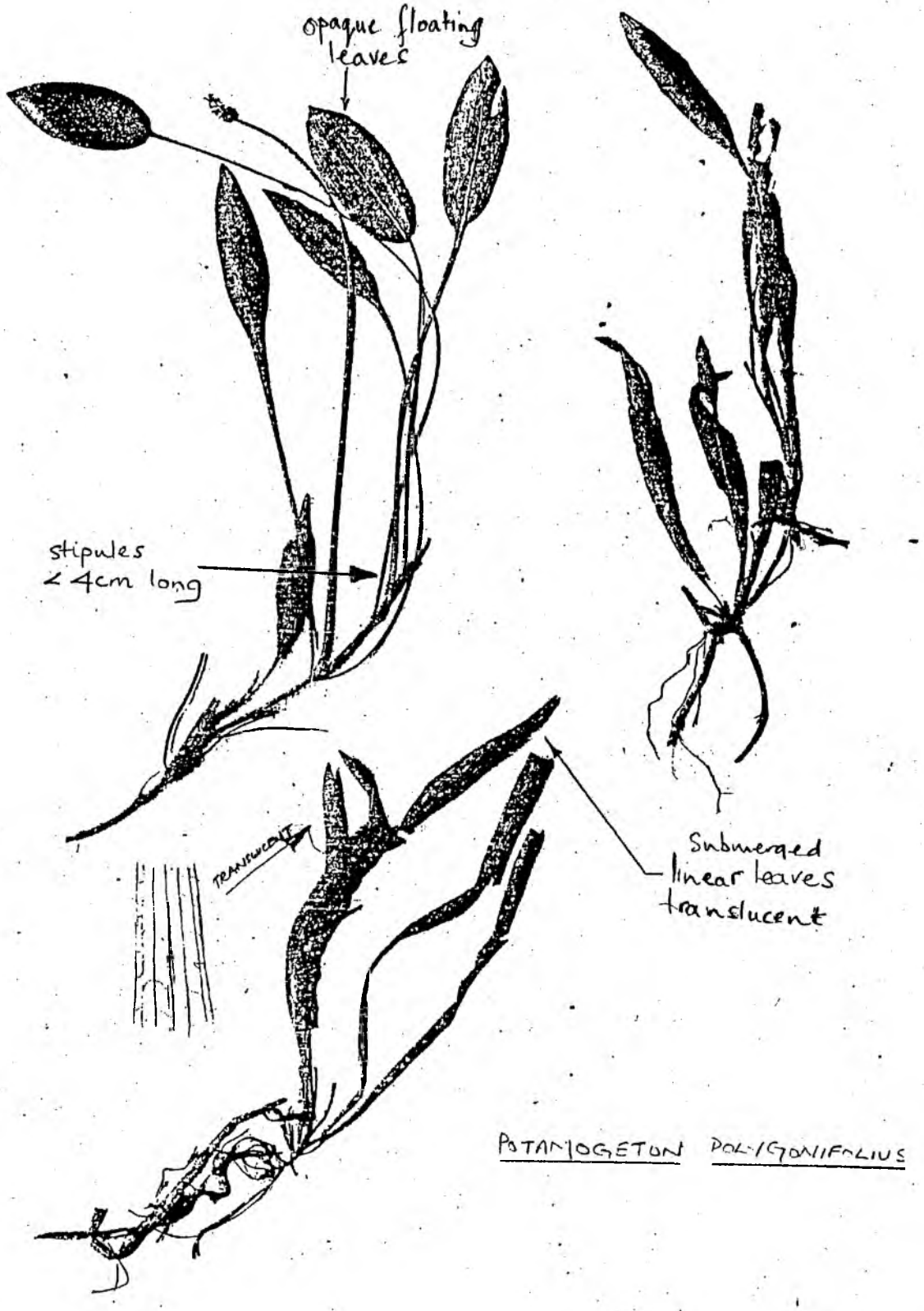


POTAMOGETON LUCENS


Polygonum
amphibium
submerged leaves
linear, opaque



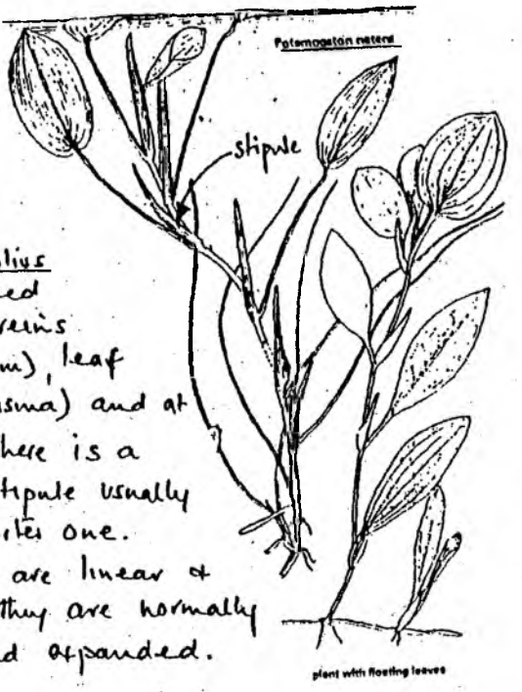
POTAMOGETON NATANS



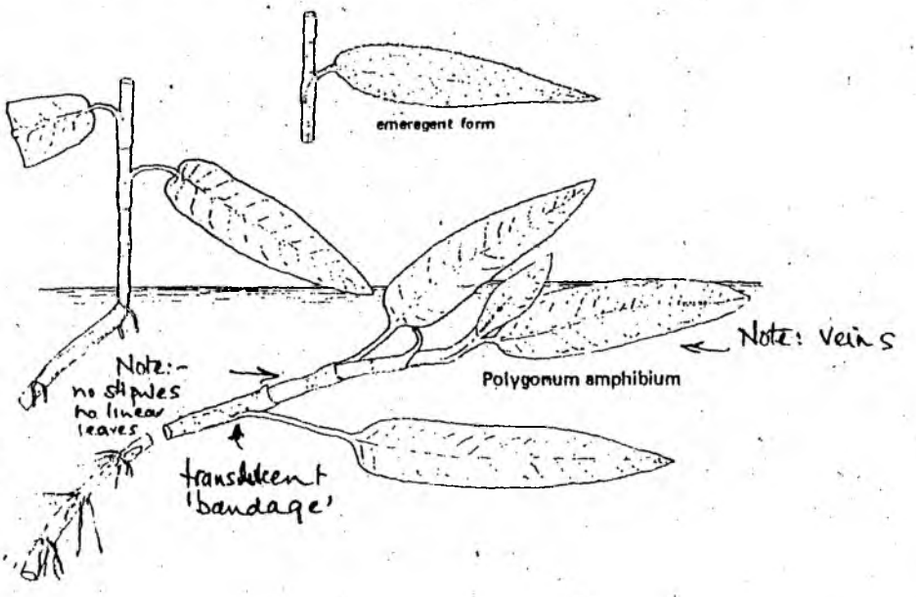
POTAMOGETON POLYGONIFOLIUS

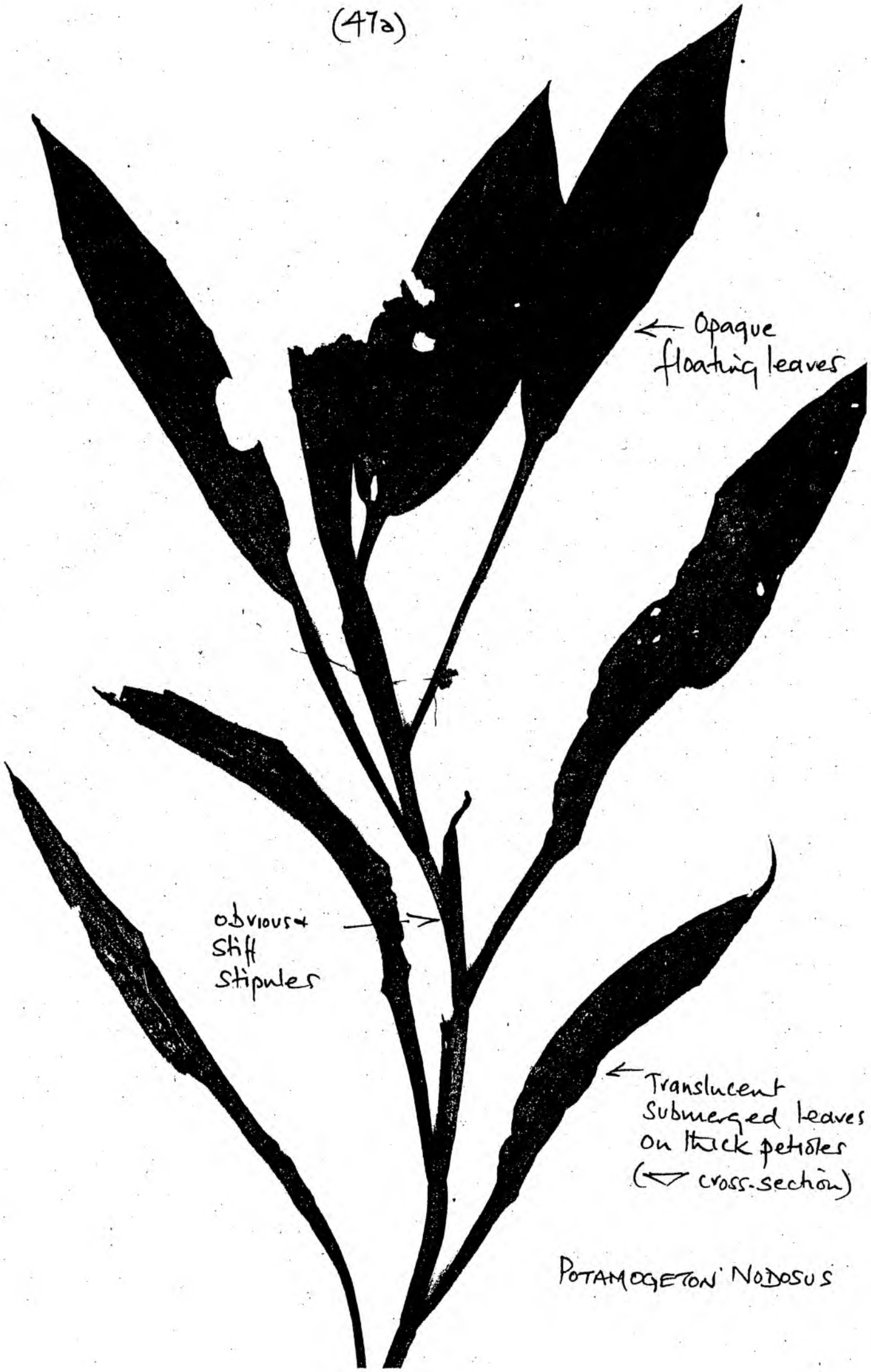
POTAMOGETON

natans & polygonifolius v Polygonum



P. natans & P. polygonifolius similar. Cannot be confused with anything as leaf veins are parallel (cf Polygonum), leaf stalks are oval (cf Alisma) and at the base of each leaf there is a stipule. P. n. has a stipule usually > 4cm long & P.p. a shorter one. Submerged leaves of p.n. are linear & opaque; in P.p. they are normally translucent and expanded.



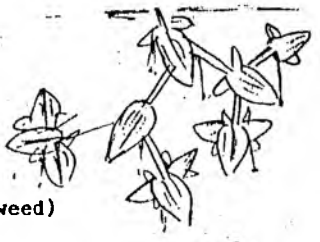

← Opaque floating leaves
obvious stiff stipules
← Translucent submerged leaves on thick petioles (⇔ cross-section)
POTAMOGETON NODOSUS

3. FREE-FLOATING OR ROUND FLOATING-LEAVED MACROPHYTES

Plants free-floating with unbranched roots hanging up to 5cm below thalli (or lacking roots)

Compound thalli

Ivy-leaved thalli, attached to one another via stalks; usually submerged and held in vegetation
LEMNA TRISULCA (Ivy-leaved Duckweed)

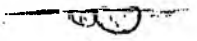


Small plants with reddish-green 'leaves' appressed to short stems floating on the surface

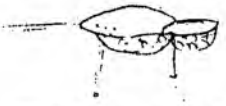
AZOLLA FILICULOIDES (Water-fern)

Simple thalli - single or with small 'buds'

Ovoid thall <1mm wide, rootless
WOLFFIA ARRHIZA (Rootless Duckweed)



Thalli <5mm; inflated; single rootlet
LEMNA GIBBA (Gibbous Duckweed)

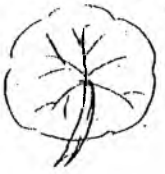


Thalli <5mm; not inflatted; single rootlet
LEMNA MINOR (Duckweed)

Thalli >5mm; flat; many rootlets
LEMNA POLYRHIZA (Great Duckweed)

'Typical' plants but usually floating; leaves are rounded heart shapes with two concentric veins; stoloniferous
HYDROCHARIS MORSUS-RANAE (Frogbit)

Creeping plants at margins with lobed, completely rounded leaves with stalks attached in centre
HYDROCOTYLE VULGARIS (Marsh Pennywort)



Water-lilies!! - floating round/oval leaves

Cabbage-like submerged leaves; shaped leaf stalks; leaves with radiating lateral veins which do not join; large yellow flowers - NUPHAR

No cabbage leaves; stalks rounded; leaf veins net-like and attached to each other

Yellow (fringed) flowers; wavy margin to leaf, stoloniferous
White flowers; not stoloniferous — NYMPHAEA

SEE ATTACHED DRAWINGS NYMPHOIDES

Azolla filiculoides

AZOLLA FILICULOIDES - water fern

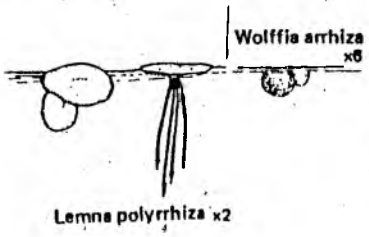
Nothing similar. Plants floating, up to 1cm growing in bluish-green or red-brown masses. Stems are branched and covered by overlapping scales which have a covering of unicellular hairs which makes the plant surface unwettable. Water beads thus collect and characteristically glisten on their surface. Local in South and abundance varies greatly from season to season.

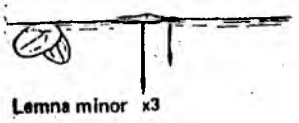
LEMNA

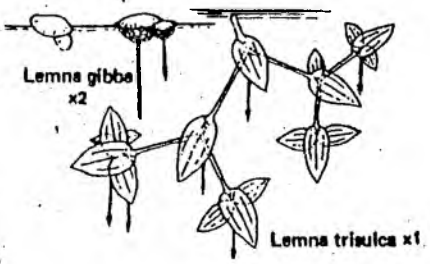
Three species (+ Spirodela polyrrhiza, synonomous with L. polyrrhiza).

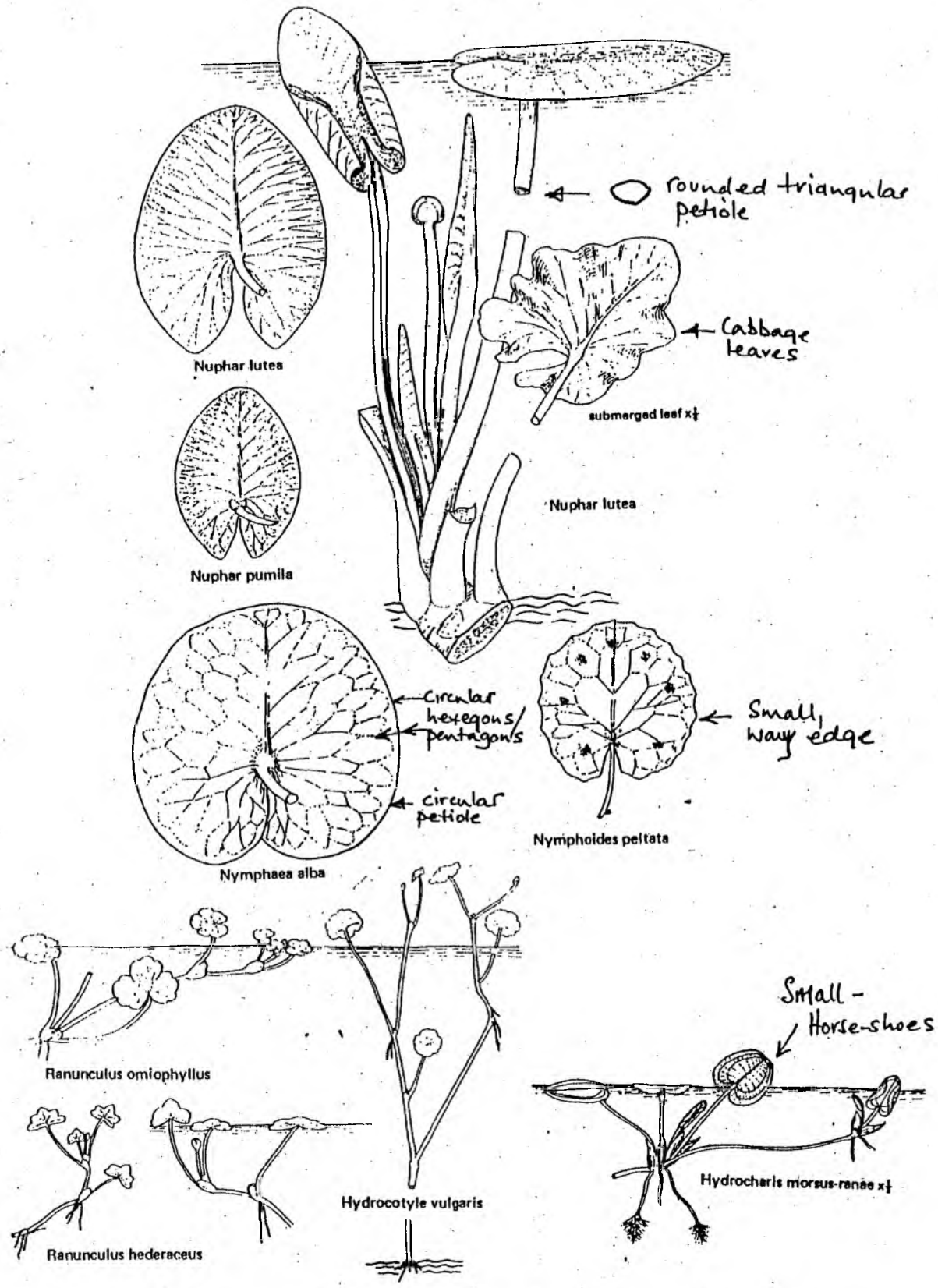
L. minor and S. polyrrhiza have floating disc-like thalli, the former less than 5mm in diameter and with a single root whereas the latter have thalli usually greater than 5mm and with many roots in a tight cluster hanging from the centre of the thallus. L. gibba has a convex upper surface and a spongy, hemispherical lower surface with a single root (young thalli not distinguishable from L. minor). L. trisulca rarely floats on the surface and forms mats of translucent, ivy leaf like growths composed of several thalli attached to each other by their stalks.

Wolffia arrhiza has a similar ovoid thallus to L. gibba but thalli are less than 1mm wide and there are no roots at all. This is the smallest British flowering plant and is often detected by its gritty touch when visably overlooked.









NUPHAR, NYMPHAEA, NYMPHOIDES, HYDROCOTYLE, HYDROCHARIS
RANUNCULUS OMIOPHYLLUS / HEDERACEUS

NUPHAR, NYMPHAEA, and NYMPHOIDES

The Water-lilies can all be separated on vegetative characters, usually by close inspection of the vernation

Nuphar have lateral veins that radiate from the midrib and repeatedly divide before reaching the leaf margin. The petiole is almost triangular in x section. There are two spp., the larger, ubiquitous N. lutea and the rare N. pumila. The latter has leaves not exceeding 5cm long and is hairy on the under surface. Floral characteristics are diagnostic, both having yellow flowers.

Both Nymphaea and Nymphoides have floating leaves with lateral veins which branch at wide angles and rejoin at the leaf margin The leaves of the latter rarely exceed 10cm, have wavy margins and usually purple spots on the undersides. Plants are small and stoloniferous at the water surface. Yellow flowers are borne in clusters. Nymphaea, when mature, has leaves of similar size to Nuphar but the circular petiole and vernation is sufficient to separate the genera. The former has large white flowers.

HYDROCHARIS MORSUS-RANAE

- floating leaved sp., leaves almost as wide as long
- free floating plants, individual plants joined by runners
- characteristic 'hairy' roots dangle up to 1ft below rosettes
- leaves less than 3cm wide

Cannot be confused with other floating leaved spp. since the small leaves have a distinct pattern of sub-parallel veins which can be seen on the underside to converge at the leaf tip and base. See Nuphar.

HYDROCOTYLE VULGARIS

- stoloniferous creeping or floating plant
- characteristic peltate leaves which are orbicular in shape and with crenate margins

Not confused with any other genus by virtue of the petiole insertion in the centre of an almost circular leaf. See Nuphar.

LONG SUBMERGED RIBBON LEAVES

Leaves trailing in water; long and translucent (at least in upper third) appearing flat but thickening towards base; with or without a prominent keel or thickening at the central midrib

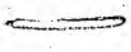
Leaves widely ribbon-like and very characteristically undulant; usually 10-30mm wide and up to one metre long; ± parallel sided with blunt rounded tips; no keel or thickening at midrib; leaves with expanding round blades and emergent 'arrow-shaped' leaves. Showy white flowers.

SAGITTARIA (Arrowhead)

Leaves <10mm wide; flat or slightly arc-shaped with no central keel or major thickening of leaves towards the base; tapering towards a fine point from a long distance below the tip (basal part ensheathing central stem); often with large cylindrical flower shoots

SCIRPUS (Club-rush)

Leaves flat in upper third but with obvious midrib thickening into shallowly triangular shape lower down

top  middle  lower 

not translucent except in upper parts with reddish tinge to bases often present.

SPARGANIUM EMERSUM (Unbranched Bur-reed)

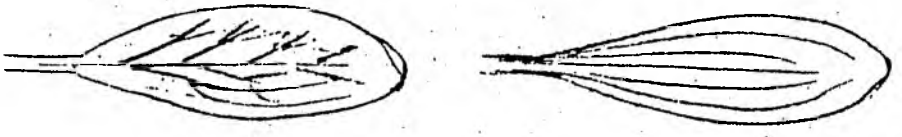
Leaves opaque, △ or shallowly △ in shape, often twisted & very stiff when pulled out of water

BUTOMUS (Flowering Rush)

SAGITTARIA SAGITTIFOLIA

- submerged leaves linear, translucent
- floating leaves either linear, lanceolate or ovate
- aerial leaves sagittate (arrow-shaped)

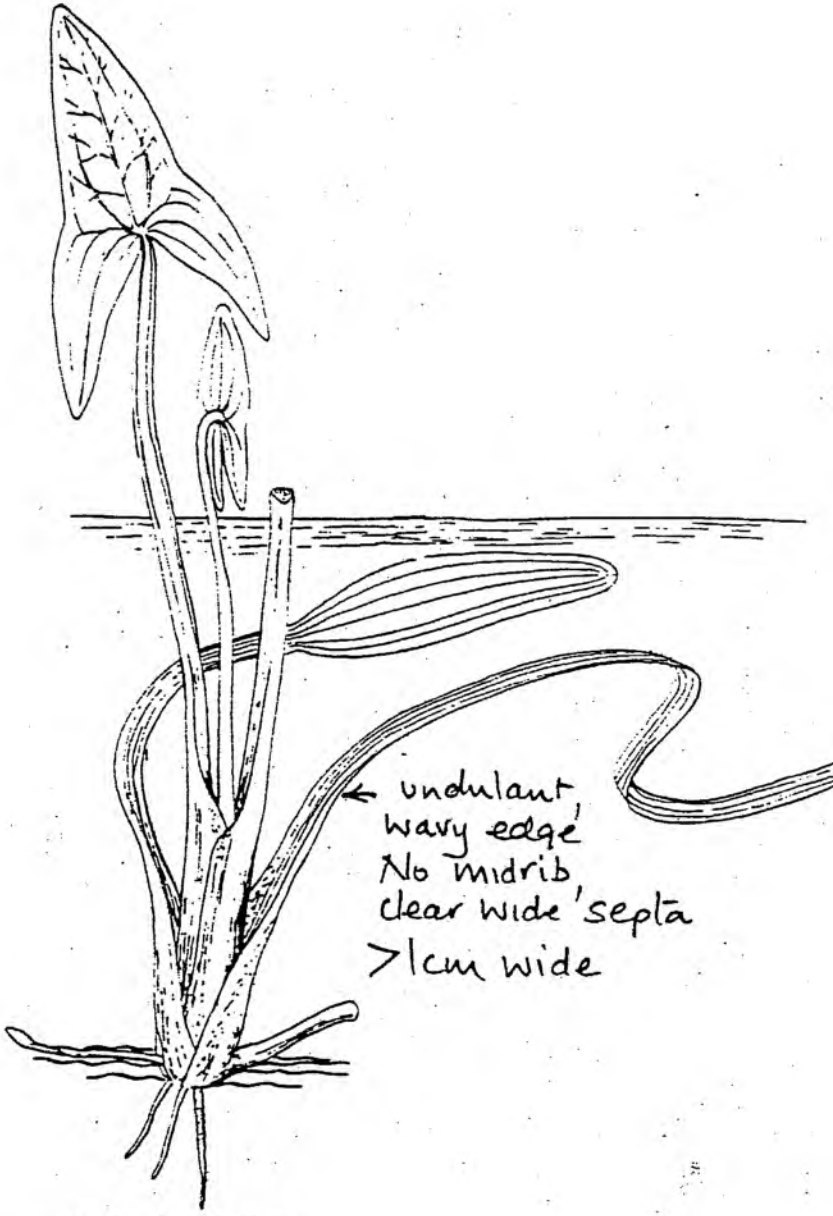
The aerial leaves are diagnostic but when ovate leaves only are present it may be confused with Alisma plantago-aquatica. These two can be separated by holding the leaf up to the light. Sagittaria lacks the conspicuous cross veins between the longitudinal veins obvious in Alisma.



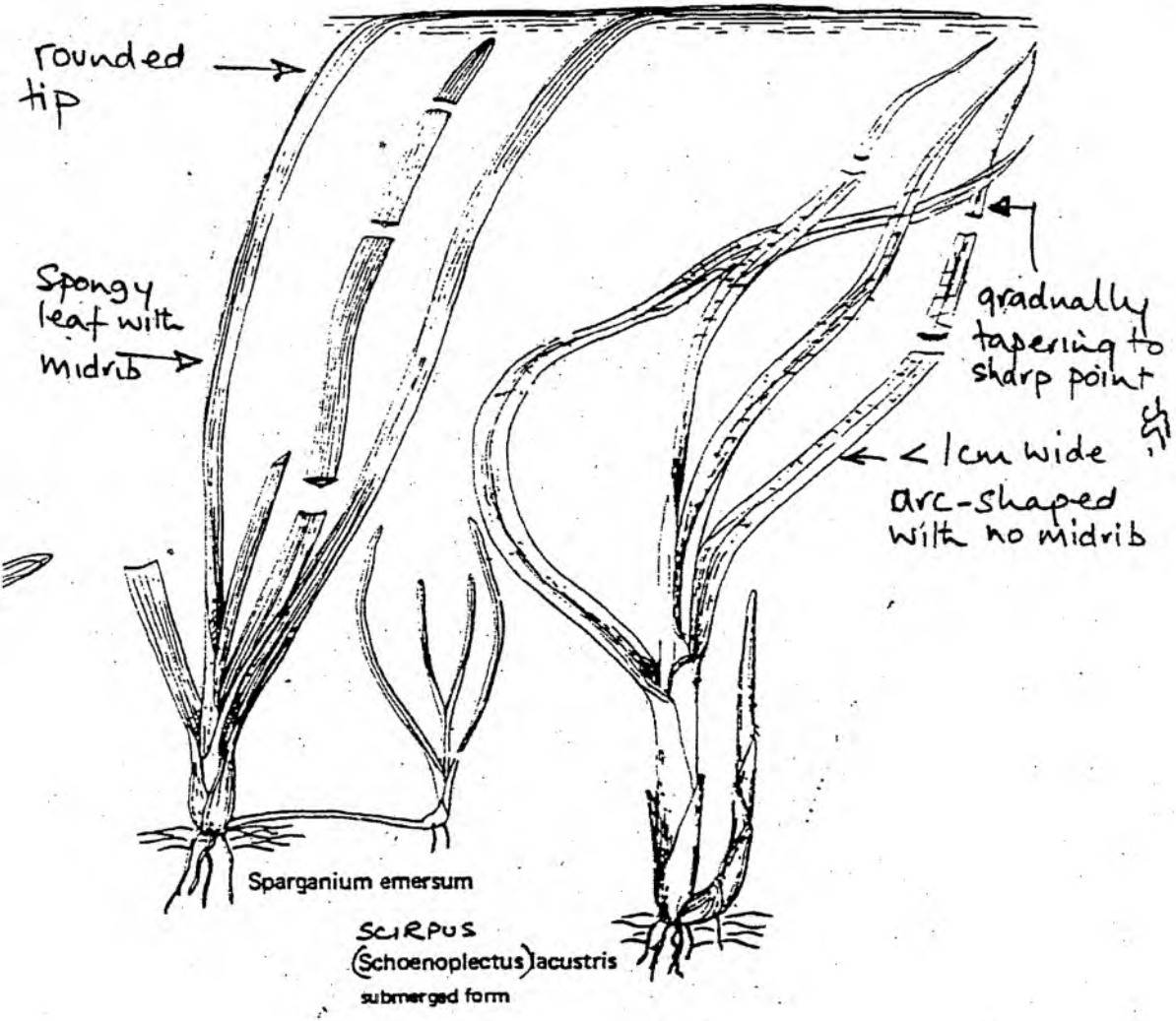
Alisma Sagittaria

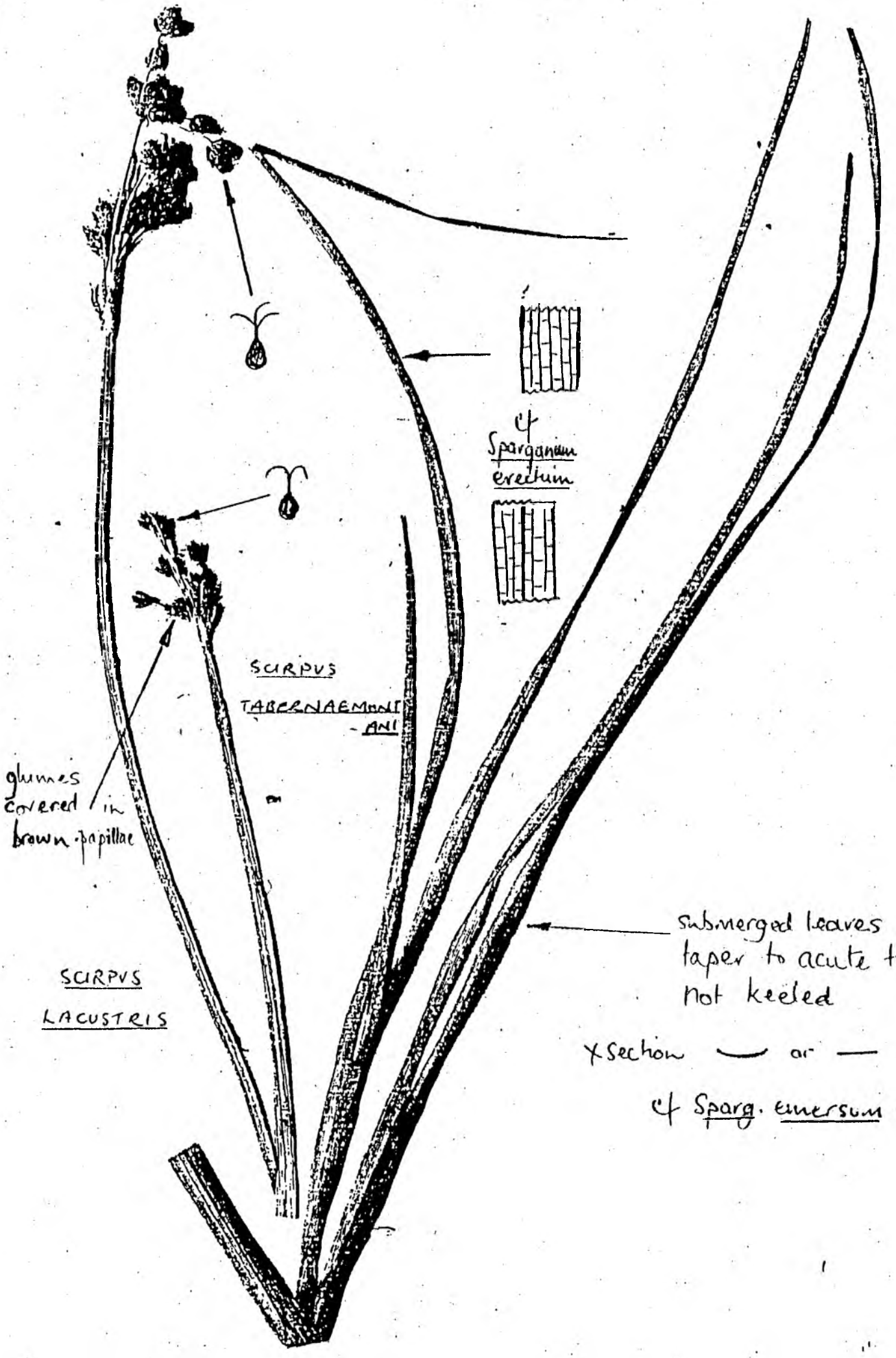
The strap-shaped submerged leaves are also diagnostic, although sometimes confused with Sparganium emersum and Scirpus lacustris. All but the youngest plants have leaves at least 5mm wide, characteristically undulant and commonly 2cm wide. The leaves are flat (cf S. emersum which has a slight keel) and most resemble submerged leaves of Scirpus lacustris. However, the leaves of Scirpus taper to an acute tip and are sheathing at the base which gives the lower half of the leaves an arc-like x section. Common in South and East, very rare South-west, West and North.

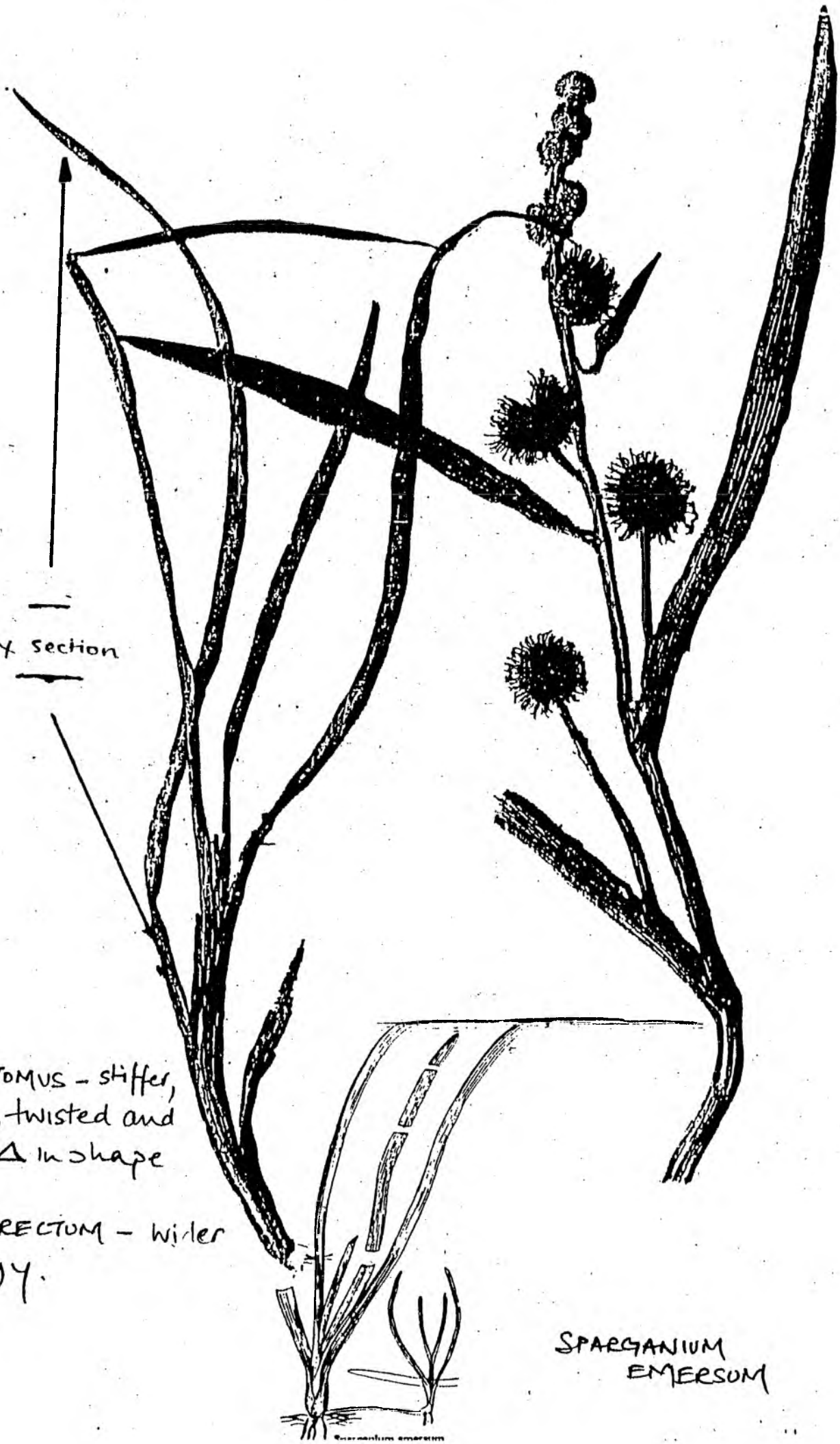
BUTOMUS SAGITTARIA SCIRPUS SPARGANIUM



Sagittaria sagittifolia


rounded tip
Spongy leaf with midrib
gradually tapering to sharp point
< 1cm wide
arc-shaped with no midrib
Sparganium emersum
SCIRPUS (Schoenoplectus) lacustris
submerged form


cf Sparganium erectum
SCIRPVS TABERNAEMONTANI
glumes covered in brown papillae
SCIRPVS LACUSTRIS
submerged leaves taper to acute tip not keeled
X section ⌣ or —
cf Sparg. emersum —



cf -BUTOMUS - stiffer, opaque, twisted and more Δ in shape

cf S. ERECTUM - wider & spongy.

SPARGANIUM EMERSUM

5. BROAD-LEAVED PLANTS OF THE WATER'S EDGE

Plants with leaves that have veins that radiate from a central midrib and are not linear and parallel.

● – SEE SECTION 8 FOR DETAILS

5.1 Stems circular (sometimes ribbed) with COMPOUND leaves.

a) Simple leaves (only single pairs of leaflets)

*Lobes of leaflets usually rounded, pairs of leaflets often not strictly opposite **Rorippa/Nasturtium (Water-cress).**

*Lobes of leaflets roundly toothed; pairs of leaflets always opposite **APIUM NODIFLORUM (Fool's Water-cress)**

*Leaf structure as above but with obvious teeth on margins; discoloured ring on the petiole **BERULA ERECTA (Lesser Water-parsnip).**

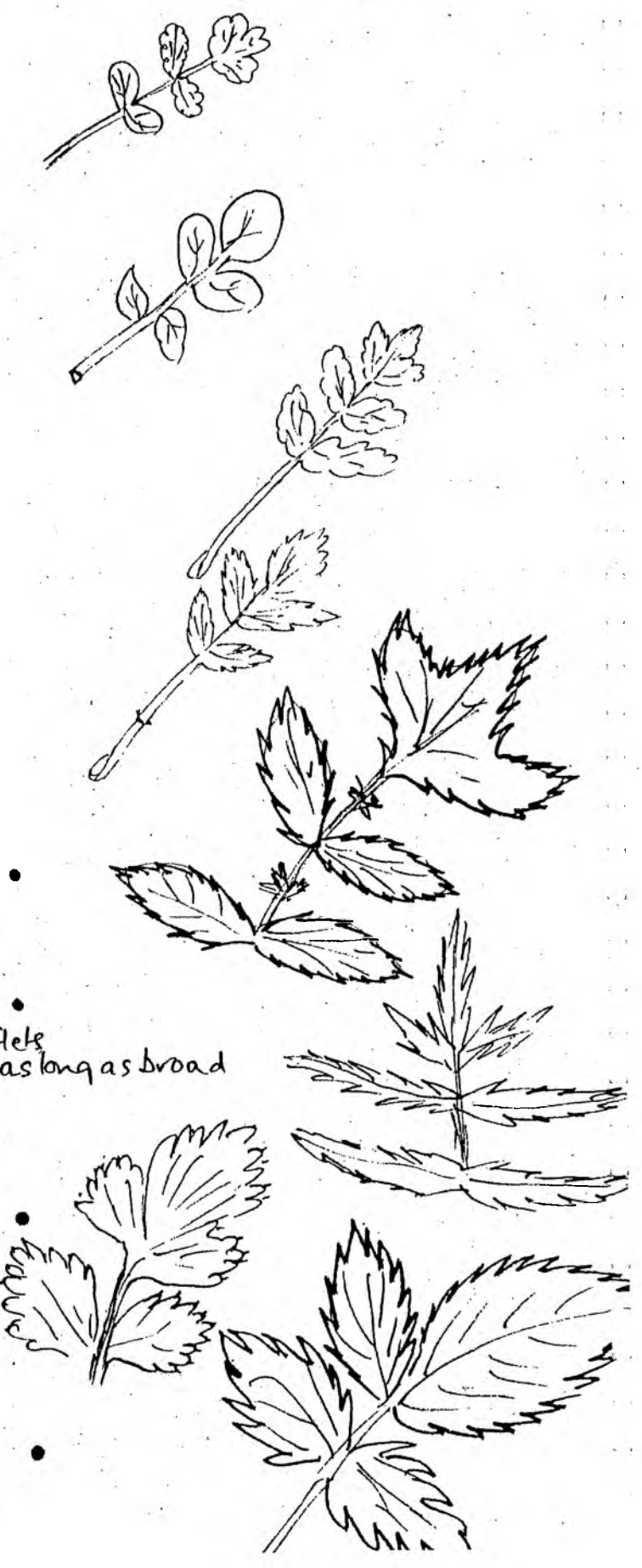
Reddish leaves with very sharply toothed leaflets with true leaflet pairs interspersed with tiny 'vestigial' leaflets **(FILIPENDULA ULMARIA (Meadowsweet)** ●

Smoothly rounded elongated leaflets with tiny hairs. **VALERIANA OFFICINALIS (Valerian).** ● – leaflets ±4½ as long as broad

b) Numerous divisions of leaflets - large plants with tough ribbed stems

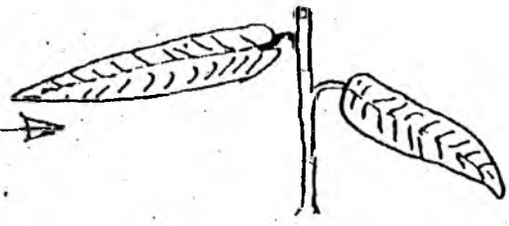
*Leaflet edges rounded but with a hair point tip **OENANTHE CROCATA** ●

*Margins very serrated **ANGELICA** ●



5.2 Stems circular, leaves attached to the stem alternately.

Alternate leaves on short stalks; often floating over surface; veins radiating from mid-rib obvious despite thick opaque leaves POLYGONUM AMPHIBIUM (Amphibious Bistort)



Soft leaves which are narrowly heart-shaped with short (or no) stalks. Base of leaves accompanied by transparent 'bandage' around stem at node - Strong pepper flavour. **POLYGONUM HYDROPIPER (Water Pepper).** P. mite similar but without pepper flavour.

Broad leaves of robust plants with roundly serrated edges. Small yellow crucifer flowers. **RORIPPA AMPHIBIA (Great Yellow-cress)**

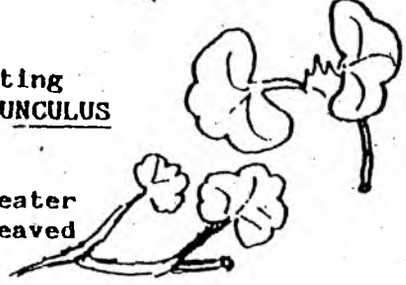
Alternate leaves with no, or very short, stalks; leaf tip often curving back on itself MYOSOTIS SCORPIOIDES (Water For-get-me-not)

Staggling plant with very variable leaves; basal ones often almost round, mid-stem ones long with blunt teeth and upper ones linear RANUNCULUS FLAMMULA (Lesser Spearwort)

Young plants with basal rosettes of stalked rounded leaves; flowering stems with variable shaped leaves with short stalks RANUNCULUS SCELERATUS (Celery-leaved Crowfoot)

Straggling plants with Ivy-shaped leaves floating on shallow water or lifted above soft mud RANUNCULUS HEDERACEUS (Ivy-leaved Crowfoot)

As above but with more rounded leaved with greater indentations RANUNCULUS OMIOPHYLLOUS (Round-leaved Crowfoot).



Tough rounded stems covered by soft downy white hairs; leaves broadly linear, lacking petioles and also covered in downy hairs; leaf attachment to stem has wings running down the stem **PULICARIA (Fleabane)**

Very large plants with broad, long and pointed leaves;

Leaves and stems tough and covered by hairs. Edge or dry bank species. **SYMPHYTUM (Comfry)**

Leaves fleshy and with no hairs. Rarely not rooted in shallow water. **RUMEX HYDROLOPATHUM (Great Water Dock)**

5.3 Stems still circular but leaves are attached in opposite pairs

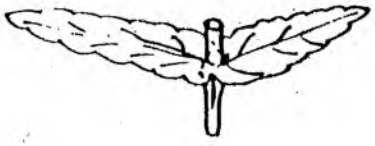
Large leaves always disected into three, sharply and finely divided, segments. **EUPATORIUM CANNIBINUM (Hemp Agrimony)**

Broadly linear leaves lacking obvious hairs; broadest at the base where they are attached by very short (if at all) stalks; Stems tough and with fine hairs. Occasionally leaves in threes. **LYSIMACHIA VULGARIS (Yellow Loosestrife)**

Leaves rounded and narrowest at the basal attachment to the stem VERONICA BECCABUNGA (Brooklime)

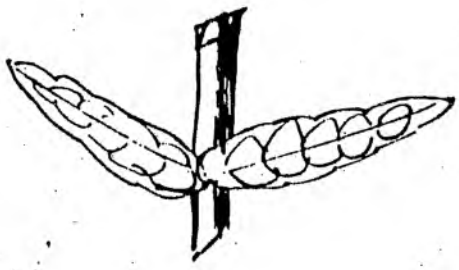
Leaves broadest at the basal attachment to the stem VERONIC CATENATA & V ANAGALLIS -AQUATICA (Pink and Blue Water-speedwell) [can be submerged]

Large hairy plants with paired leaves almost clasping the stem and with leaf flanges extending down the stem EPILOBIUM HIRSUTUM (Great Willow-herb)



5.4 Stems SQUARE OR Very Markedly Ridged to appear square. Leaves in Pairs Opposite each other or rarely in threes

Leaves attached in pairs with bases almost clasping the stem which is often ribbed LYTHRUM SALICARIA (Purple Loosestrife).



Leaves occasionally in threes or not perfectly paired – stem ridged.

Leaves rounded and with irregular blunt indentations; strong smell of mint MENTHA AQUATICA (Water mint) Leaves always on stalks

Leaves in very obvious pairs; leaves with short or non-existent stalks and very deeply toothed margins; flowers small, white and clustered around the stem above each pair of leaves LYCOPUS EUROPAEUS (Gypsy wort)

Leaves on short stalks, small and narrowly heart-shaped; smooth SCUTELLARIA (Skullcap)

Leaves with short or non-existent stalks, leaves and stem hairy, leaves toothed, with decurrent wings along petiole. Whole plant has pungent smell STACHYS PALUSTRIS (Marsh Woundwort)

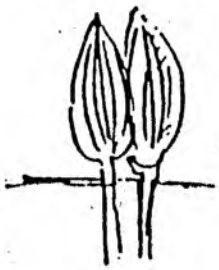
Deeply winged stems of large plants in pairs ⌑ Stems

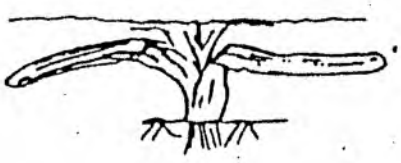
Rounded leaves on distinct petioles; often with small 'ears' at base of main leaf : petioles

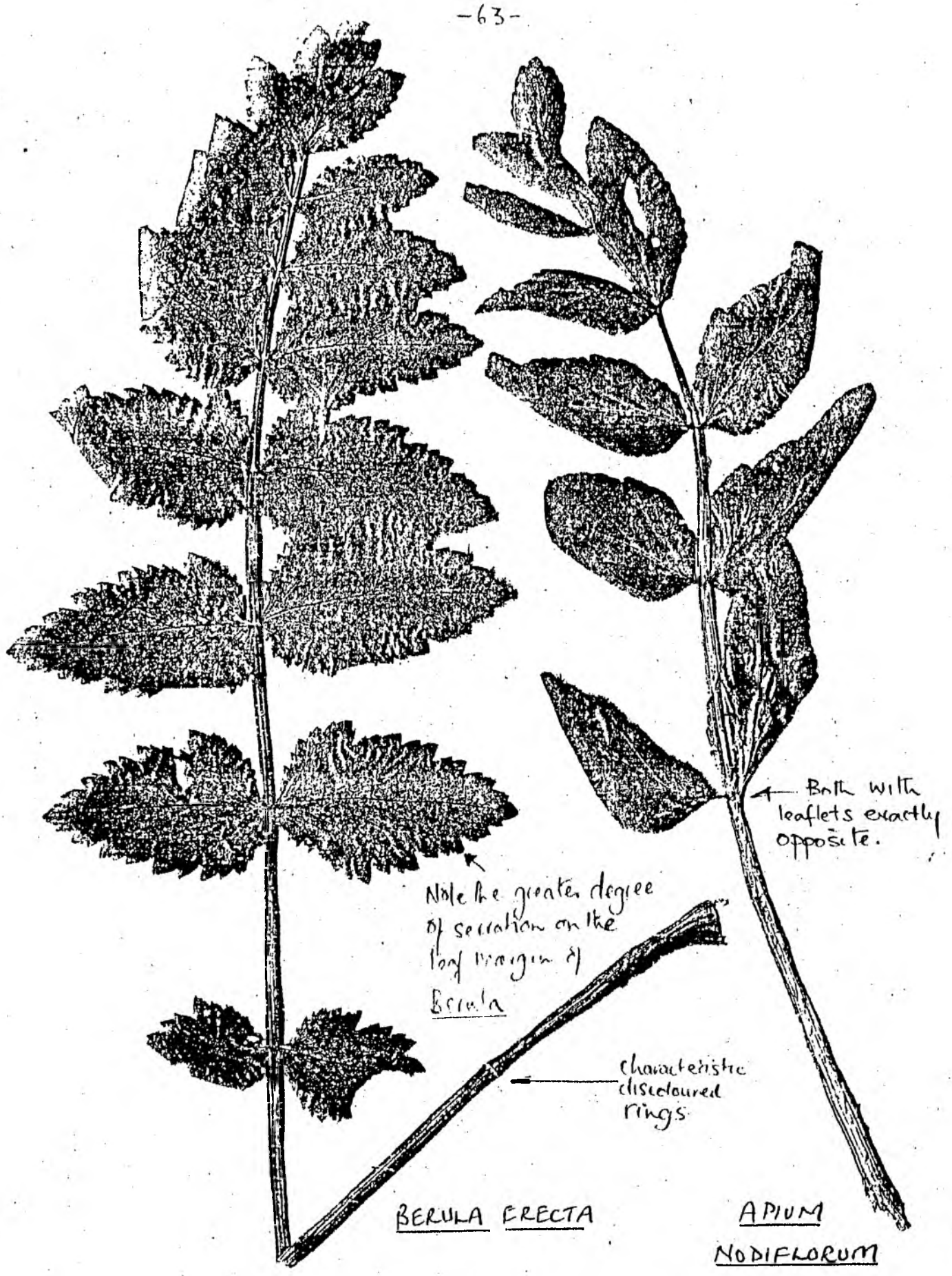
Scrophularia auriculata (Water Figwort)

5.5 Vegetative plants 'stemless', long-stalked ⌓ shaped

leaves with parallel veins in rosettes holding blades above water. Young plants often with linear translucent leaves in rosettes under water. Alisma (Water Plantain)



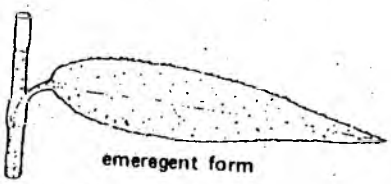




APIUM NODIFLORUM & BERULA ERECTA

Very similar umbelliferae with simple pinnata leaves. Apium rarely has more than 13 leaflets but Berula frequently has more. The latter's leaflets are more sharply dissected and near the base of the petiole there is always a discoloured ring-like constriction which may or may not have a pair of rudimentary leaflets attached. This is a 100% diagnostic separating character. In flower - Berula has umbels with numerous, often trifid, leaf-like bracts and Apium

Polygonum hydropiper



emeregent form

Note:- no stipules no linear leaves

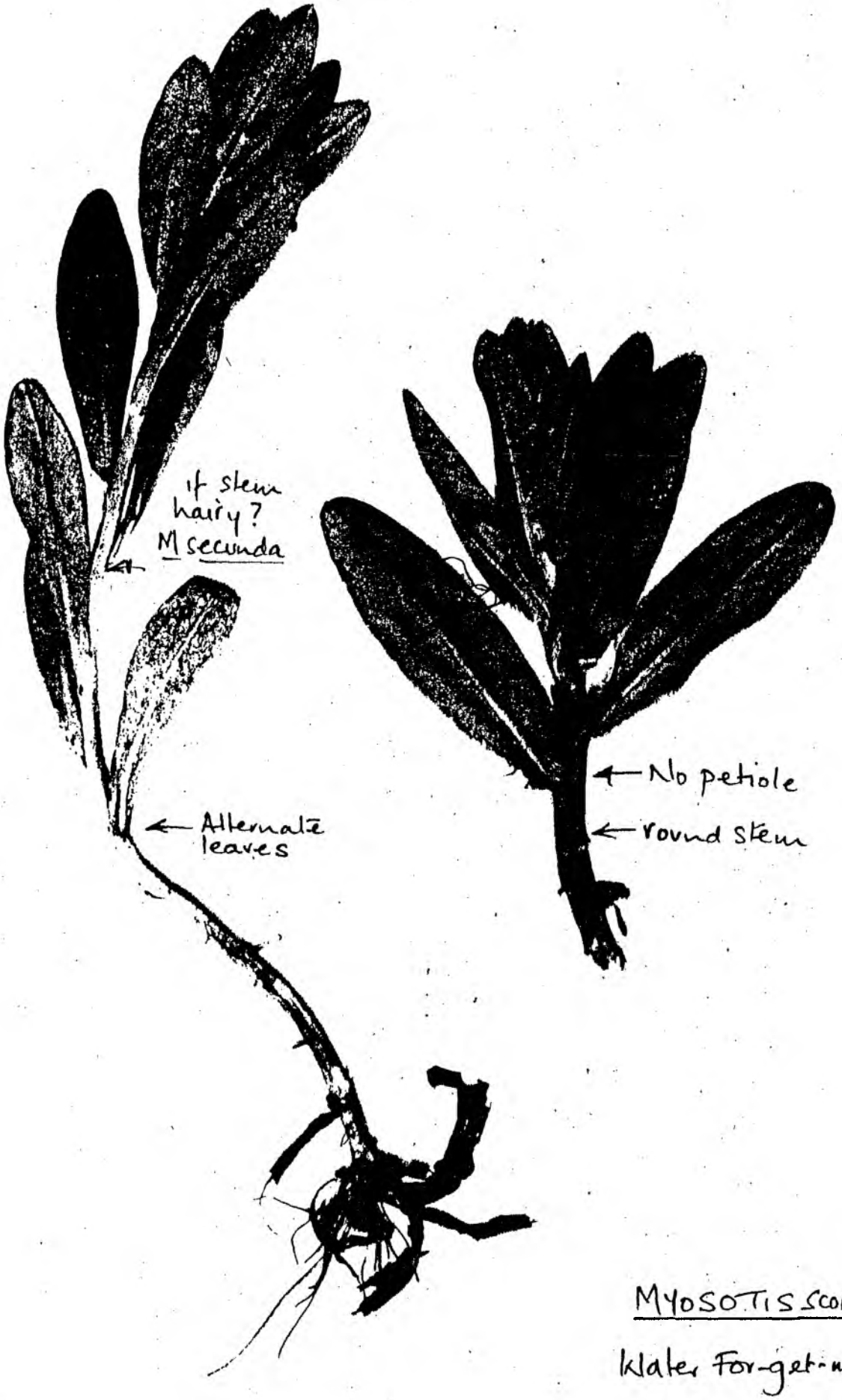
Note: veins

Polygonum amphibium

characteristic Polygonum 'bandage'

RORIPPA AMPHIBIA

Great Yellow-cress



MYOSOTIS SCORPIOIDES

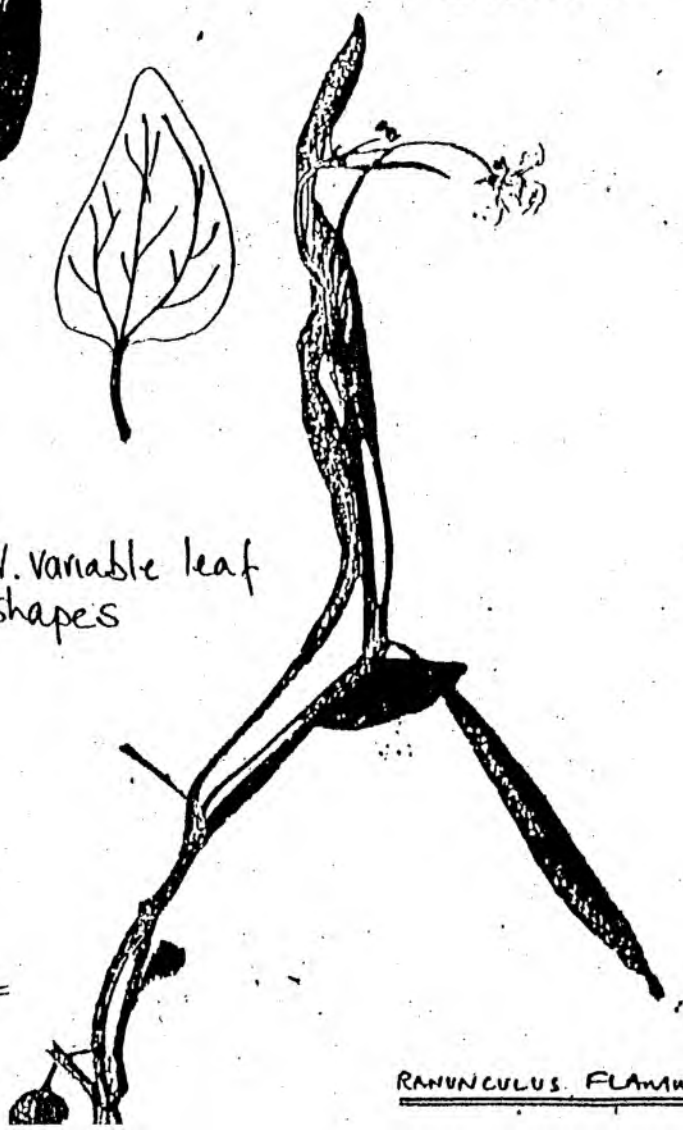
Water For-get-me-not

RANUNCULUS SCELERATUS

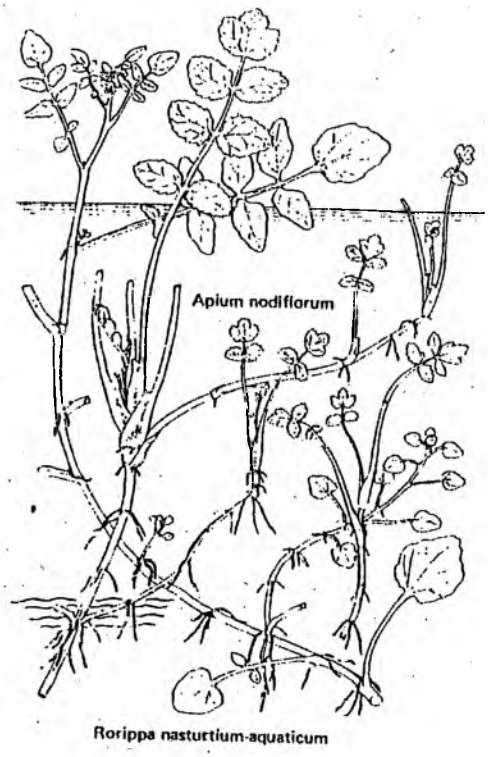
lowlands

V. variable leaf shapes

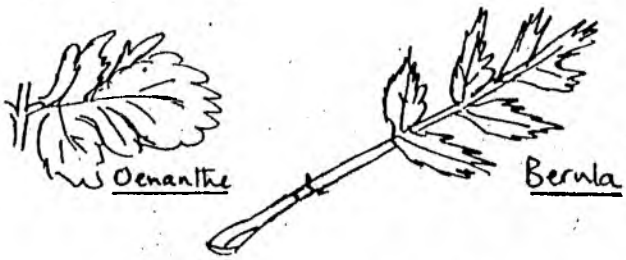
Ranunculus flammula Acid/Uplands



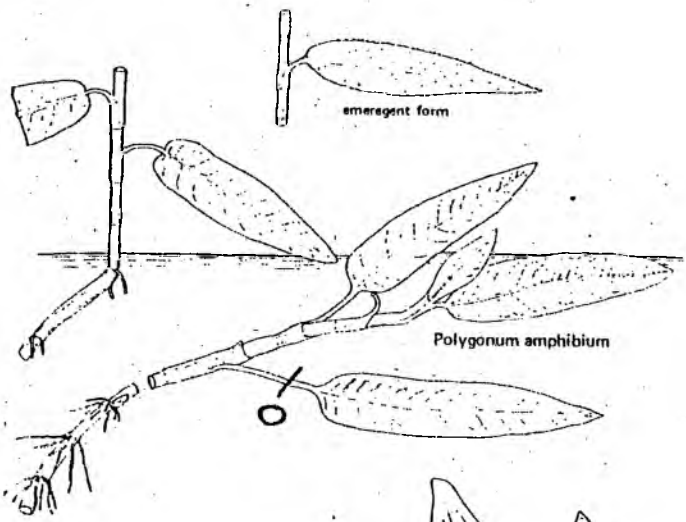
RANUNCULUS FLAMMULA



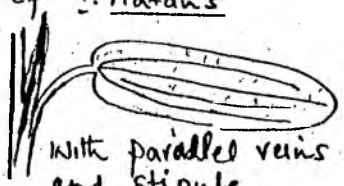
Rorippa nasturtium-aquaticum



and Oenanthe crocata which is often very large and smells strongly of parsley (poisonous)



cf P. natans

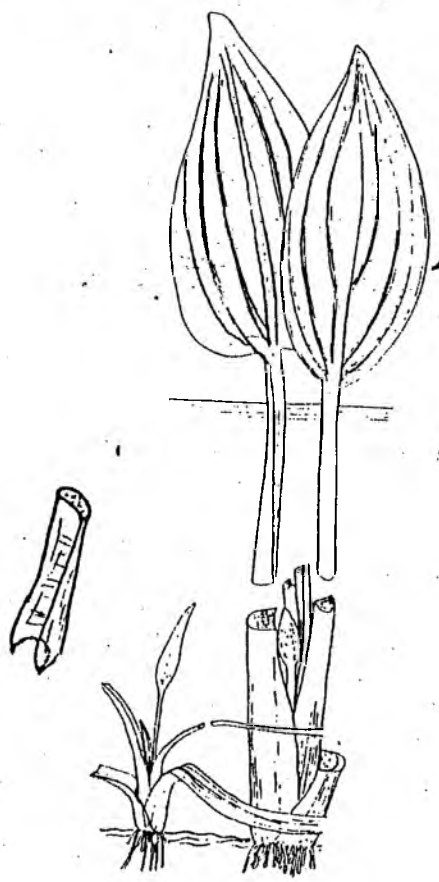


With parallel veins and stipule

or

Alisma

which has parralel veins and asymmetric leaf stalk (petiole).

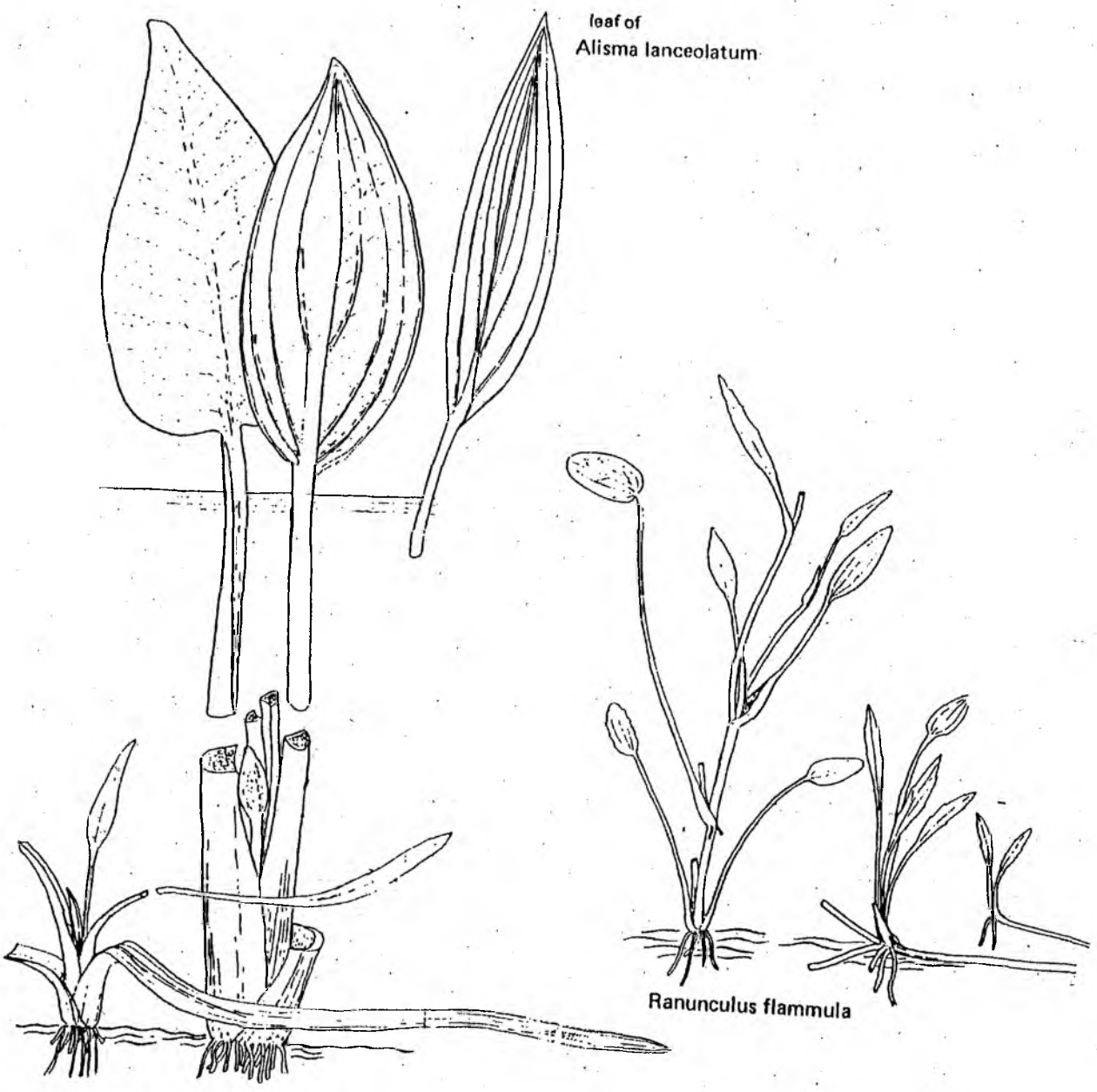


Parallel veins with faint cross veins

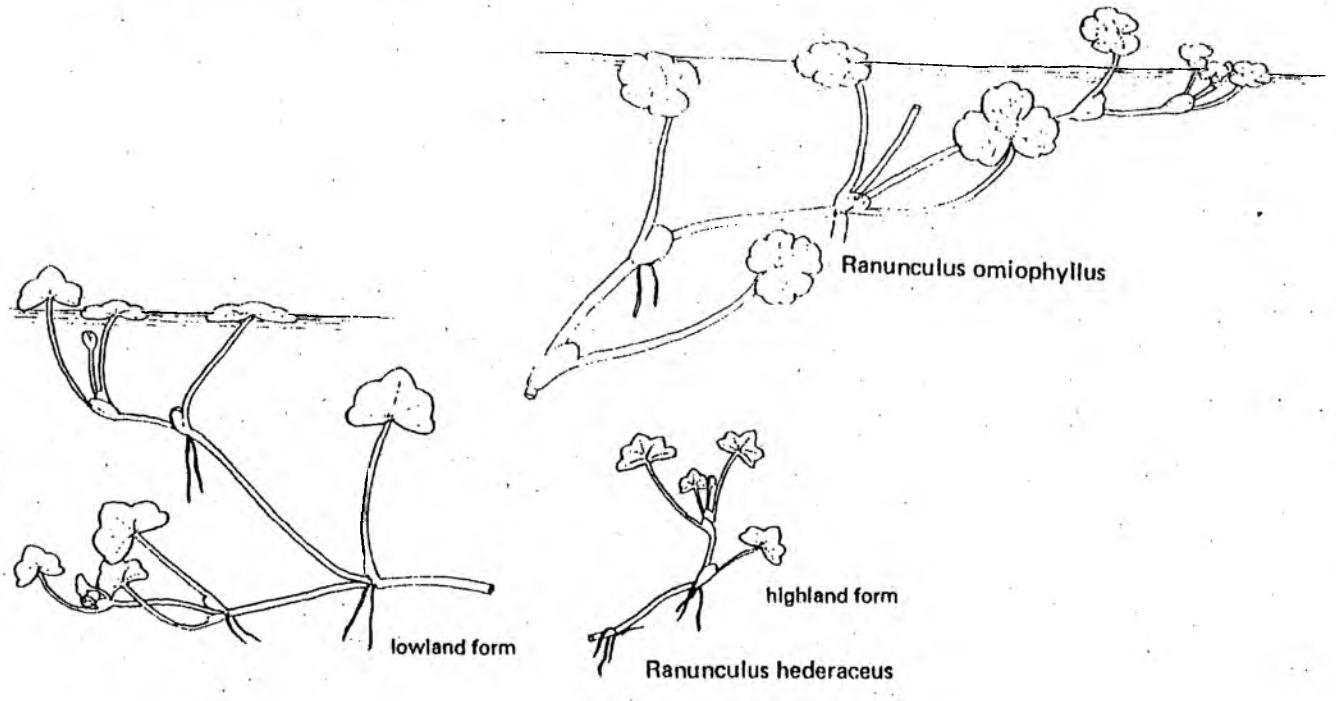
cf R. flammula

no cross veins

With main veins dividing



Alisma plantago-aquatica
+ detail A. lanceolatum



Ranunculus hederaceus

VERONICA

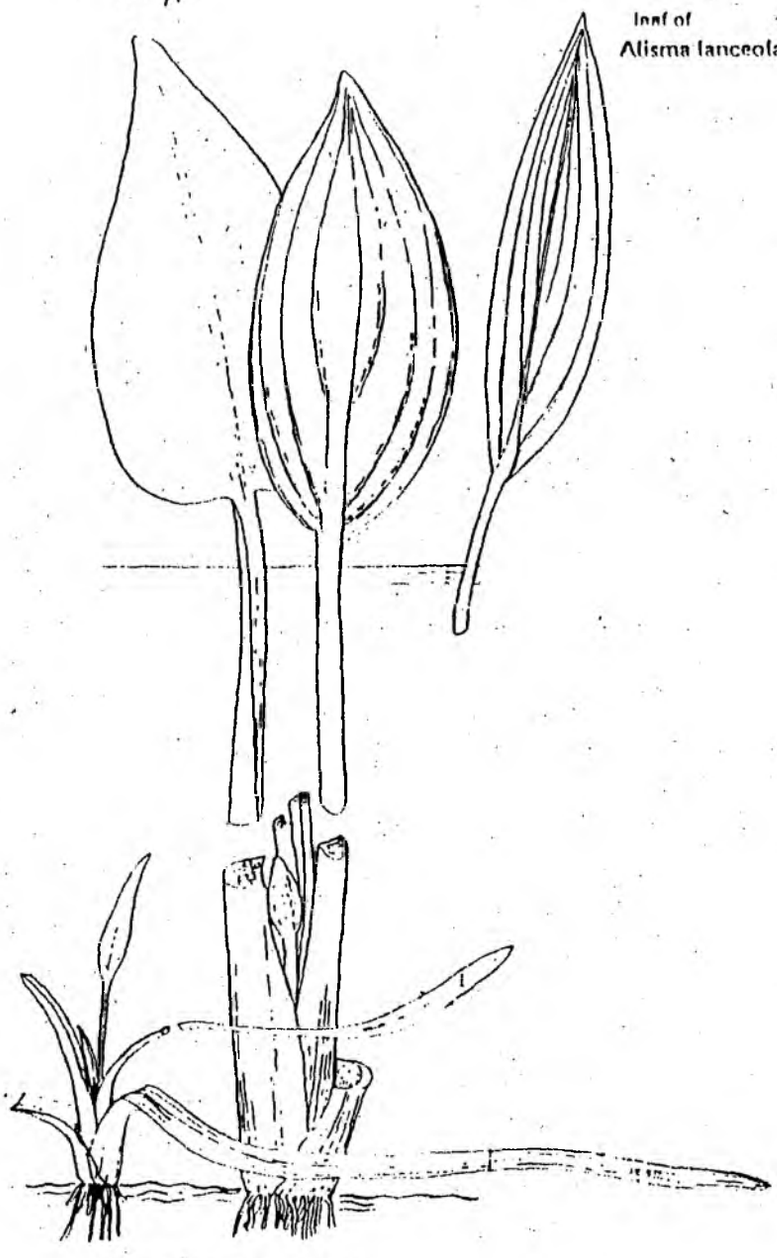
V. beccabunga is characteristic in having shortly petioled, obtusely rounded leaves and bright blue flowers.

V. scutellata has alternate racemes of white or very pale flowers with purple lines. The leaves are linear-lanceolate and acute.

V. catenata and V. anagallis-aquatica have ovate lanceolate sessile leaves and may be fleshy and permanently submerged. The former usually has purplish-tinged stems and leaves - this is not, however, 100% reliable. Floral characteristic are diagnostic.

V. CATENATA
- corolla pink
- bracts broad (1.5mm) lanceolate and larger than pedicels
- pedicels spreading at right angles after flowering

V. ANAGALLIS-AQUATICA
- corolla blue
- bracts linear, equal or shorter than pedicels
- pedicels ascending after flowering



Alisma plantago aquatica
+ detail A. lanceolatum

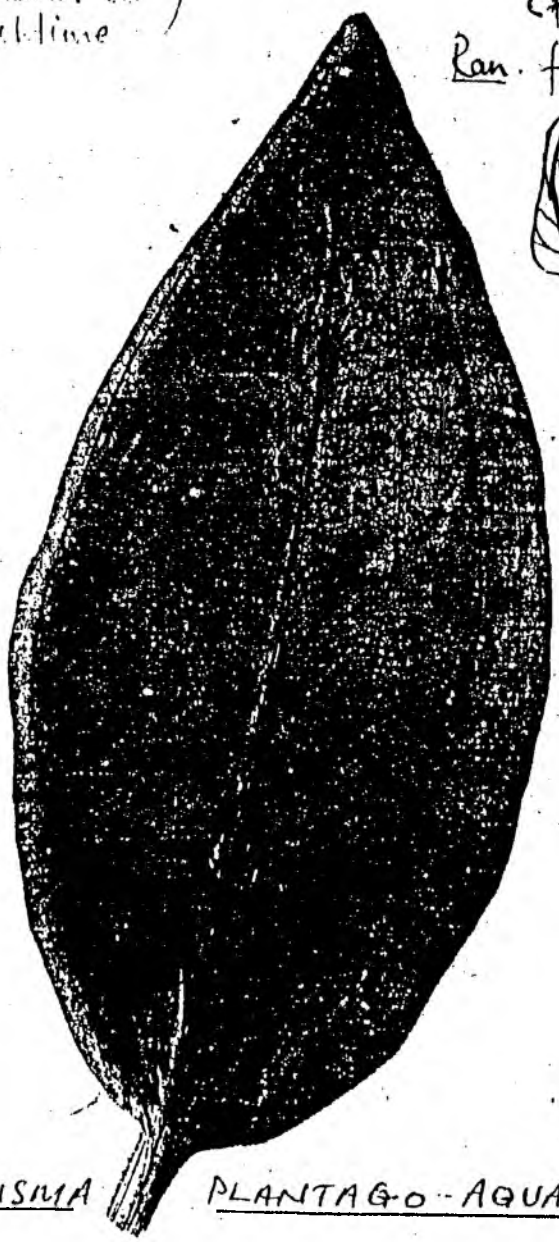
ALISMA

3 spp.-critical det. relies on fruit but usually possible to identify on vegetative characters. A. gramineum has linear, ribbon-like leaves with blades almost indistinguishable from petioles. (V. rare). A. lanceolatum has lanceolate leaf blades that taper gradually into the petiole. A. plantago-aquatica has ovate leaves that are rounded or subcordate at the insertion on the petiole. Young plants are very variable and may resemble Potamogeton natans, Baldellia ranunculoides or Luronium natans. The three spp. above have oral or spherical petioles of various diameters but Alisma have ⌓ half-spherical petioles.

Critical key and fruit characters as in C.T.W. p933.

ALISMA
LANCEOLATUM

cf
Ran. flammula



ALISMA PLANTAGO-AQUATICA

6. EMERGENTS

Single unbranched round stems with apical/terminal spikelets

Stems/leaves scarcely indistinguishable;

<2mm wide; all single spikes not in clumps 'edge species' - basal sheaths closed & flat-topped — ELEOCHARIS (Spike-rush)

As above but spikes always >2mm wide, reaching >2m high; usually aquatic and often with translucent submerged trailing leaves — SCIRPUS (Club-rush)

Round stems/leaves as above; in clumps; flowers not terminal but near top - basal sheaths open and roundedly split. — JUNCUS EFFUSUS J INFLEXUS (Soft & Hard Rush)

Stems △, leaves V/W shaped and usually tough and with sharp edges — CAREX (Sedges)

Leaves  at top,  in mid-leaf,  at base

Blue-green tinge, scentless; large yellow 'iris' flowers — IRIS (Yellow Iris)

Greeny-yellow; smells of tangerines — ACORUS (Sweet-flag)

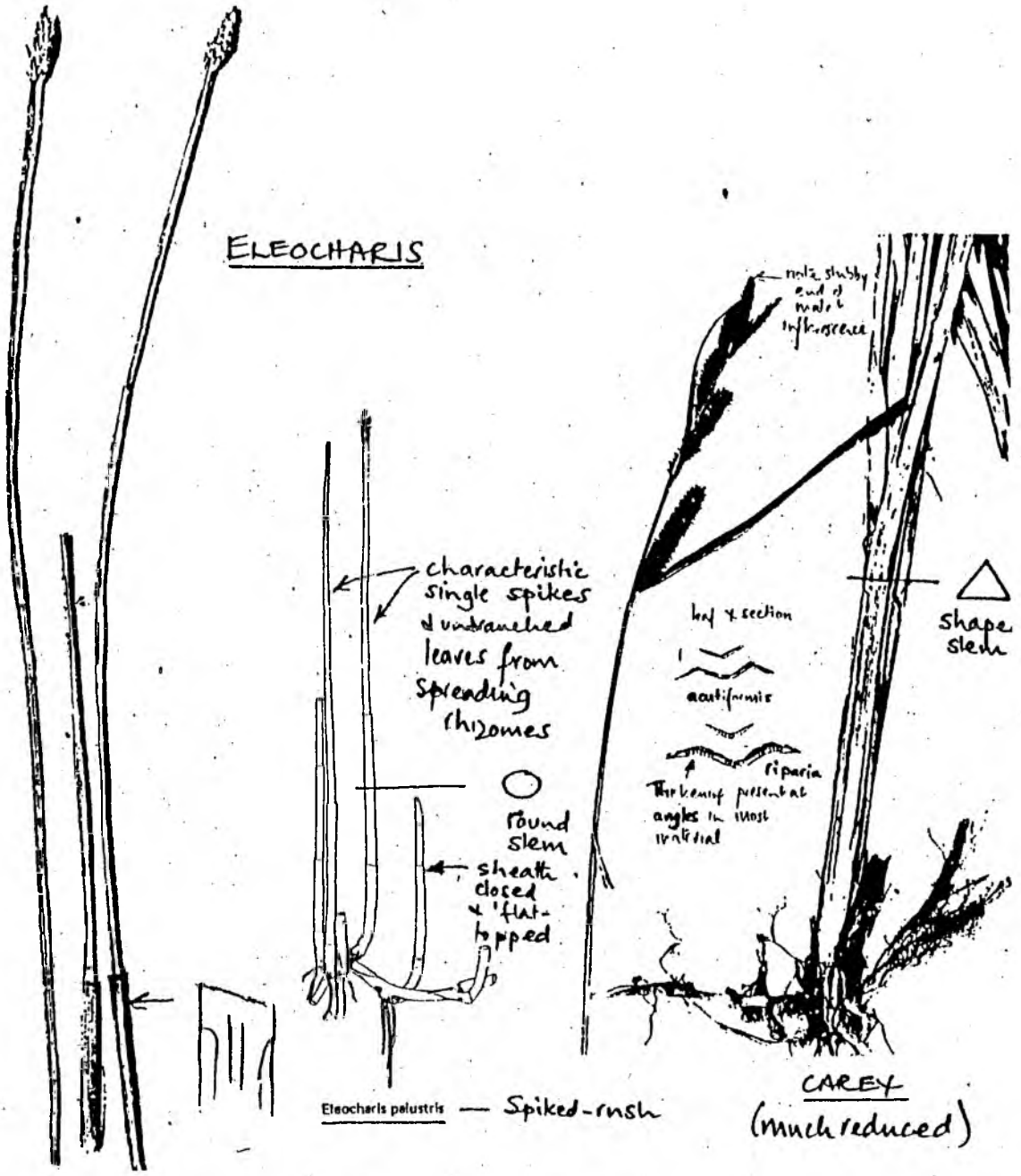
Leaves triangular, at least in mid leaf; soft squashy texture

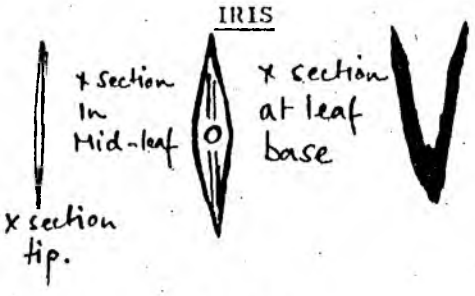
Leaves straight and flat at top ; softly triangular  in lower two-thirds — SPARGANIUM (Branched Bur-reed)

Leaves TWISTED and + △ triangular over entire length (Pink Umbel flowers) — BUTOMUS (Flowering Rush)

Huge leaves; flat at top, flattened moon-shaped in mid-leaf with 'bullrush' flowers in summer — TYPHA Reedmace/Bulrush

TALL EMERGENTS

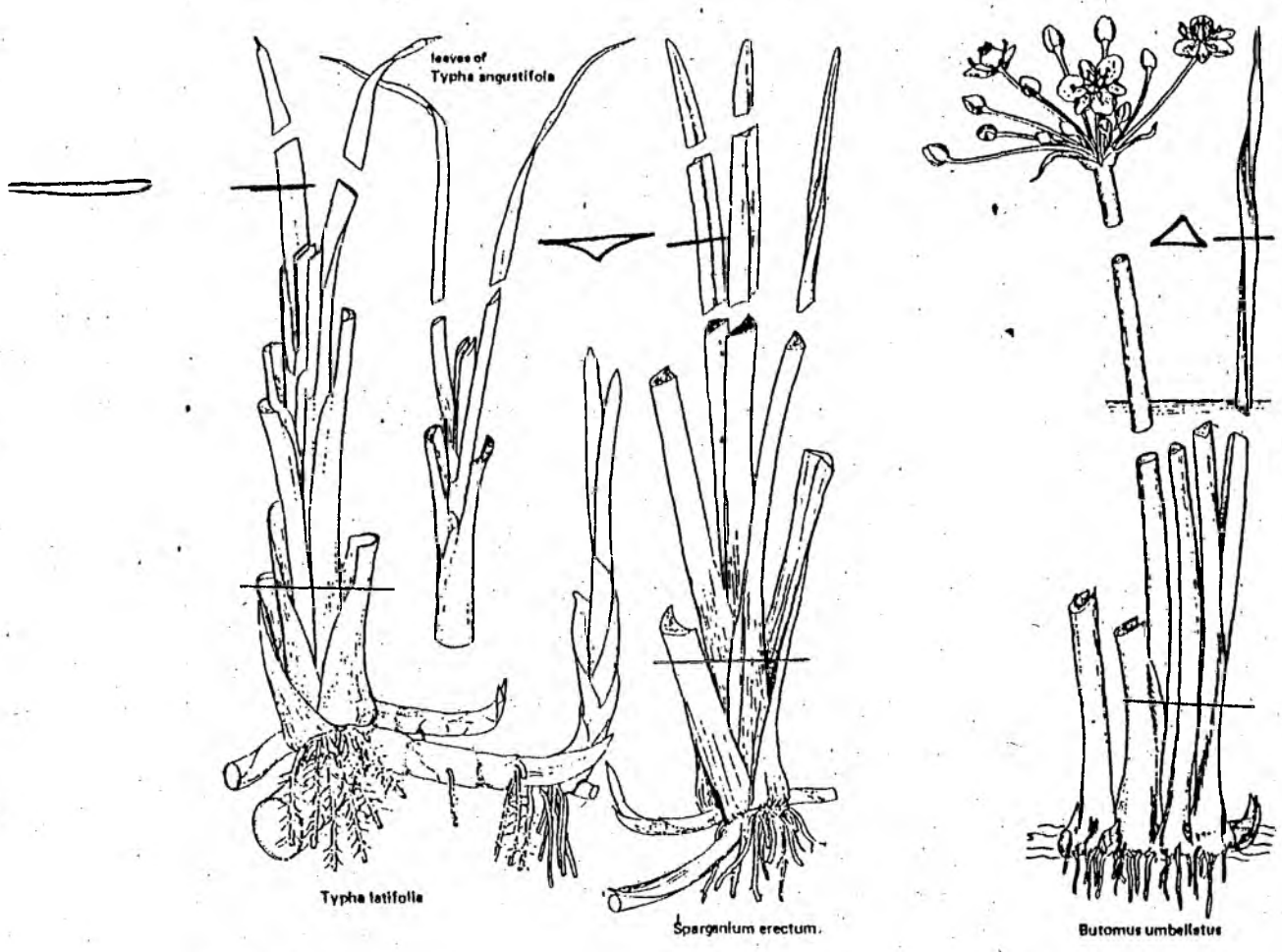




Characteristic leaf shape shared only by ACORUS, which is flattened laterally in the plane of the leaf ranks. Leaves are thus sword-shaped with no distinction between dorsal and lateral surfaces. Iris differs from Acorus in being blue-green colourd and lacking scent when crushed. Separation of species is impossible without flowers. Iris pseudacorus is distinct from all the other species by its yellow flowers.

CAREX

Stems triangular, often very sharp (as are leaves of many species). Leaves V or W shaped.



TYPHA

- leaves thick and spongy, flat, without keel and sheathing at base

The above characters separate Typha from other emergents of similar large size. Acorus and Iris have leaves in two ranks which are thickest in mid-leaf (|); Sparganium erectum has triquetrous leaves.

SPARGANIUM

Large emergent (usually) leaves which have rounded tips and smooth edges; flat at the very top but gradually becoming triangula and spongy (different from Butomus in not being twisted and the leaf blade being wider than the depth of the midrib thickening).

BUTOMUS UMBELLATUS

- triquetrous, twisted stems — △
- leaves less than 1cm wide and tapering to acute tip
- leaves produced evenly around base

The twisted leaves with their acute tips are generally sufficient to separate this species from young Sparganium erectum. The latter also has triquetrous leaves but these are normally more than 1cm wide, are not equally triquetrous on all sides (△) and leaves are produced in two distinct ranks from the base where leaves are more flattened in both spp.

IRIS

Characteristic leaf shape shared only by ACORUS, which is flattened laterally in the plane of the leaf ranks. Leaves are thus sword-shaped with no distinction between dorsal and lateral surfaces. Iris differs from Acorus in being blue-green colourd and lacking scent when crushed. Separation of species is impossible without flowers. Iris pseudacorus is distinct from all the other species by its yellow flowers. I. vesicolor is separated from other blue-flowered species by the claw of the outer perianth segments only equalling the limb whereas in I. spuria they are double the length.

SPARGANIUM

Four species which are easily identified when in fruit (follow C.T.W. p.1054).

Sparganium augustifolium has long, slender leaves which are not even keeled at the base where the sheaths are inflated. However occasionally in small plants the leaves at the base are not inflated and thus are vegetatively inseparable from S. minimum.

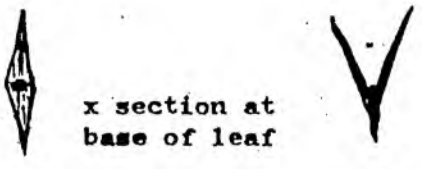
Sparganium minimum also has slender (2-6mm) parallel-sided leaves with blunt tips but these are not inflated at the base. The above spp. thus resemble Scirpus lacustris in having strap-like submerged leaves which are never keeled, but the leaves of Scirpus are arc shaped in x section at the base since they tightly ensheath the stem; they also taper gradually to an acute tip. Care should also be taken to eliminate the possibility of recording either Luronium natans or Glyceria fluitans as S. minimum. The former may be very similar but has a stoloniferous growth; the latter may occasionally occur rooted in the middle of peaty pools where its leaves superficially suggest S. minimum.

Sparganium emersum is difficult to separate from S. erectum when both are emergent and the latter is young; size cannot therefore be used as a reliable character. Both have triangular leaf sections which are longer on the inner side than the two outer sides (cf Butomus ± equally triquetrous leaves). A useful field character is that S. emersum is normally tinged with red or pink and S. emersum are flat with a small yet distinctive keel. Both are widespread.

ACORUS CALAMUS

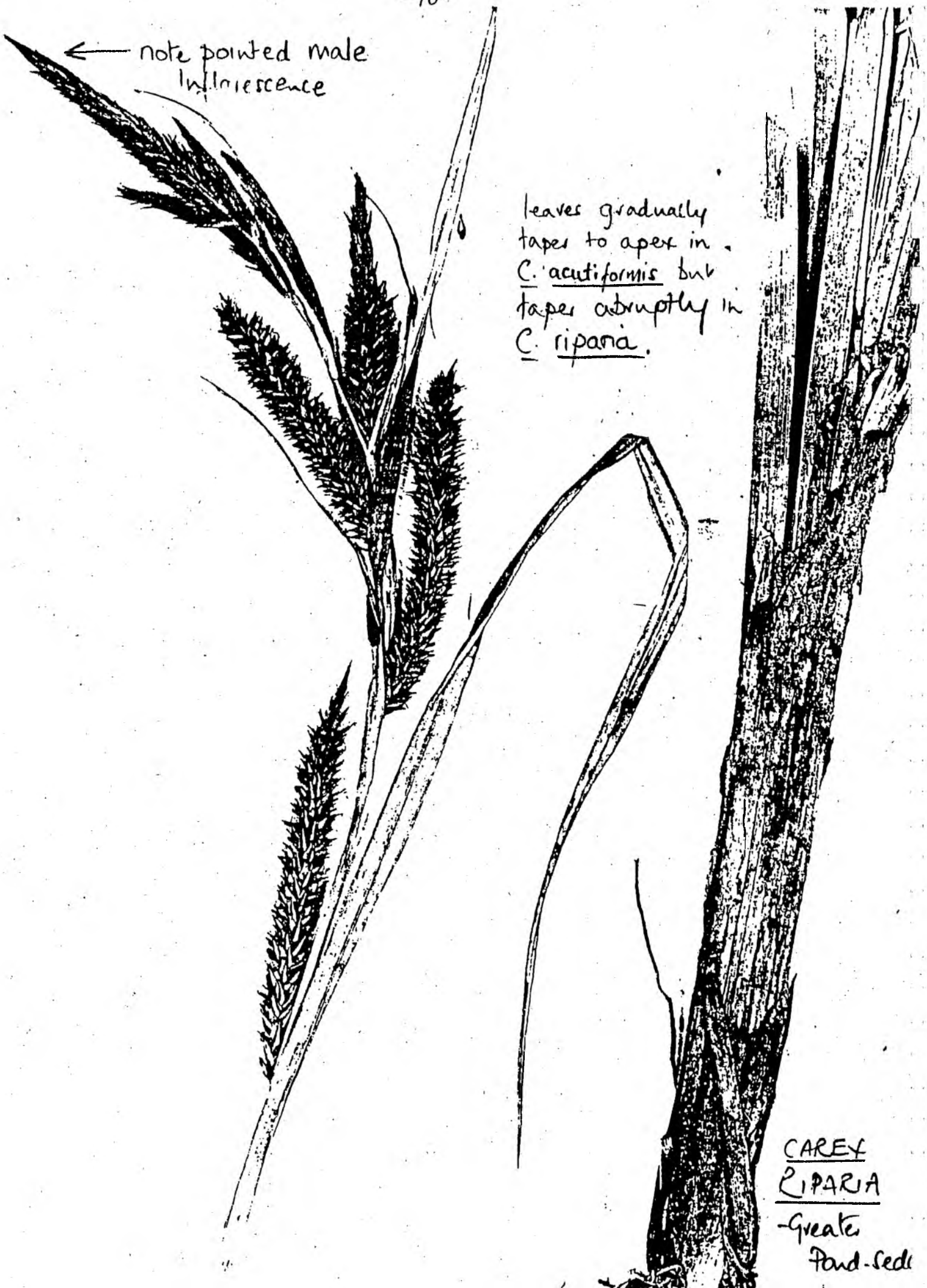
- smells of tangerines when rubbed
- leaves Iris like ie lateral flattening and 1-2cm wide
- leaves undulant and crinkled

Separated from Iris pseudacorus - latter blue-green v. v. green; no scent when crushed and rarely crinkled.

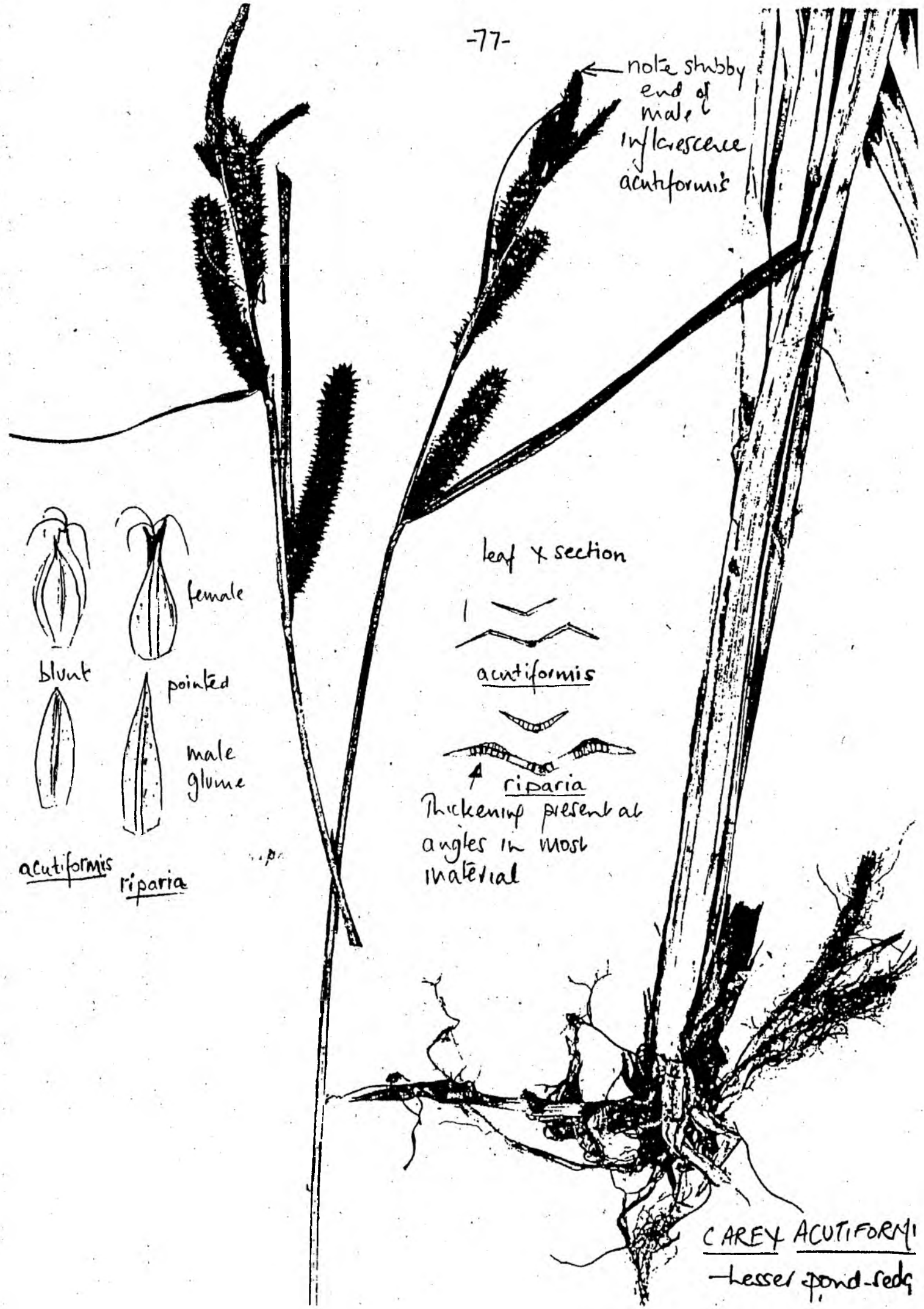


x section in mid-leaf

x section at base of leaf



CAREX RIPARIA
-Greate
Pond-Sedg


note stubby end of male inflorescence acutiformis
female
blunt
pointed
male glume
acutiformis
riparia
leaf x section
acutiformis
riparia
Thickening present at angles in most material
CAREX ACUTIFORMIS
-lesser pond-sedge

SCIRPUS MARITIMUS

- stems triquetrous, rough at top
- leaves keeled, margins rough
- bracts leaf-like and exceeding inflorescence
- glumes 7mm, apex bifid, awned from sinus

May be confused with Scirpus triquetrus which also has triquetrous stems and occurs in similar brackish habitats. However S. maritimus is locally abundant and S. triquetrus is V. V. rare and confined to the Taw estuary. The former has 10-20mm spikelets (v.5-8mm), glumes approximately 7mm (v.4mm) and awned (v. S. triquetrus glumes which have rounded lateral lobes). The bristles are shorter than the nut in S. maritimus and equalling the nut in S. triquetrus. S. tabernaemontani has characteristic glumes which are covered in brown papillae.

SCIRPUS LACUTRIS and S. TABERAEMONTANI

Characteristic terete (not angled grooved etc) stems and leaves making mature plants unmistakable. The latter is commonly smaller (to 1.5m), is glaucous and is unmistakable in flower since there are always only 2 stigmas (v. usually 3). Submerged, linear leaves may be present without the characteristic emergent terete ones. These may resemble either Sparganium emersum or Sagittaria - for difference see notes for the latter.

7. TALL REEDS/GRASSES

There are three tall reeds/grasses which can be told apart very easily. They are: Common Reed (Phragmites australis), Reed Sweet-grass (Glyceria maxima) and Reed Canary-grass (Phalaris arundinacea). There are only single species within the Phragmites and Phalaris but there are three smaller Glycerias; they share the same characters of the Reed Sweet-grass and so can be told apart from other marginal grasses.

GLYCERIA MAXIMA

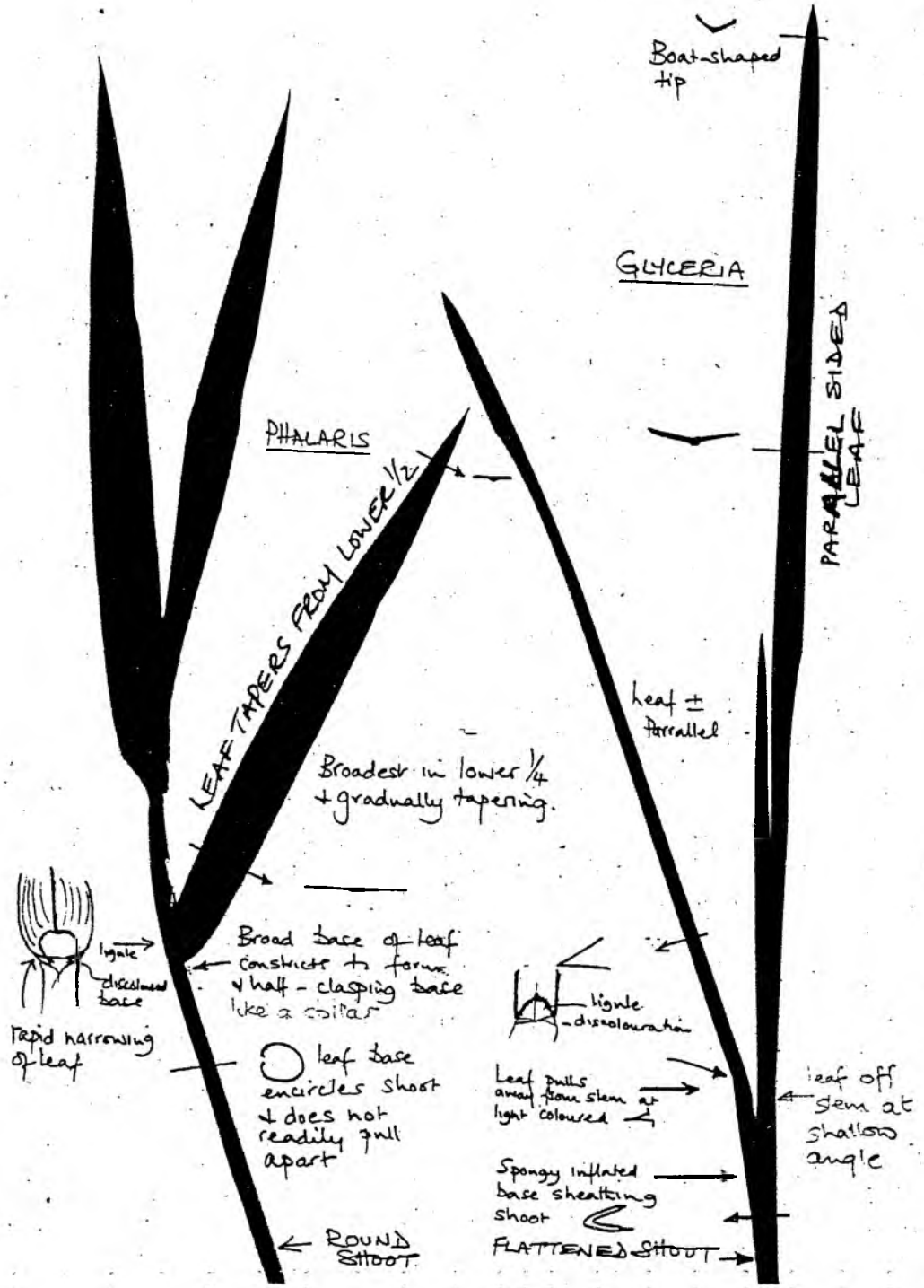
- an erect reed which may reach 2m
- leaves most commonly project upwards from the shoot and rarely occur at right angles
- leaves boat-shaped at the tip, flat in mid-leaf and V shaped at the base
- leaves more or less parallel and not inflated in lower quarter
- shoots flattened
- plants die back in autumn and resume growth in early winter (others die back and are green again only in spr ng)

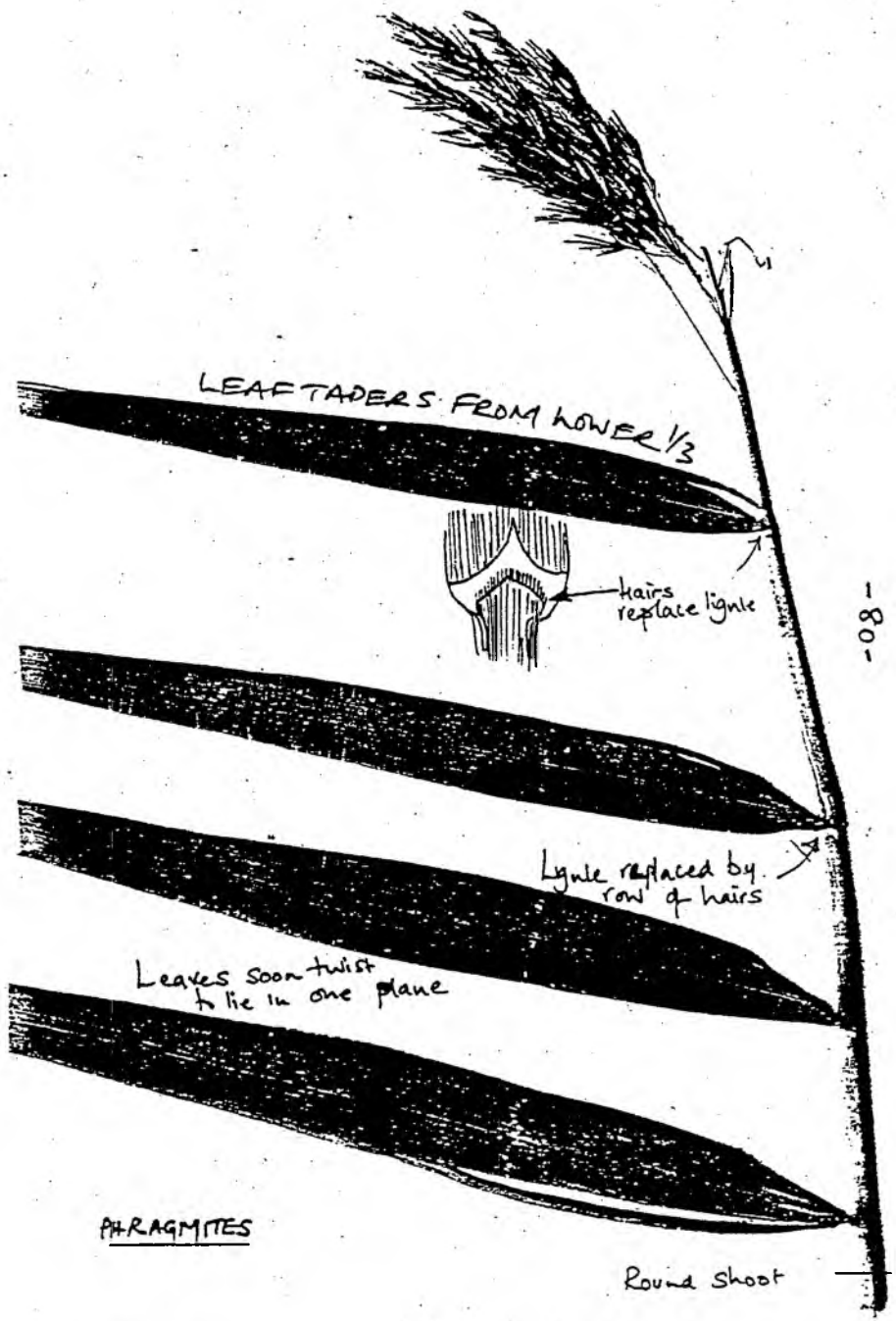
PHALARIS ARUNDINACEA

- an erect reed reaching up to 2m
- leaves often project 45-90 degrees from the shoot
- leaves FLAT and broadest in lowest ¼; tapering to fine point and not V shaped at base
- in common with Glyceria, the leaf base has a papery ligule (transparent growth at base of leaf encircling the stem); in contrast to Glyceria the ligule does not have a keel or mid-rib

PHRAGMITES AUSTRALIS

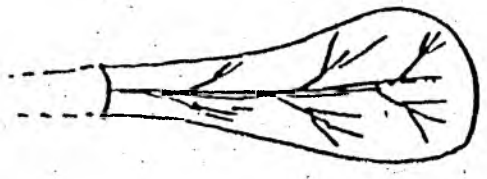
- an erect reed up to 3m
- leaves flat, smooth and tapering from a broad base to a fine tip
- in common with Phragmites the shoot is round
- instead of a ligule the leaf base has a ring of hairs
- leaves often 90 degrees and in one plane


Boat-shaped tip
GLYCERIA
PARALLEL SIDED LEAF
PHALARIS
LEAF TAPERS FROM LOWER 1/2
Leaf ± parallel
Broadest in lower 1/4 + gradually tapering.
ligule
discoloured base
Broad base of leaf constricts to form a half-clasping base like a collar
Rapid narrowing of leaf
leaf base encircles shoot + does not readily pull apart
ligule - discolouration
Leaf pulls away from stem at light coloured
Leaf off stem at shallow angle
Spongy inflated base sheathing shoot
ROUND SHOOT
FLATTENED SHOOT


LEAF TAPERS FROM LOWER 1/3
Hairs replace ligule
Ligule replaced by row of hairs
Leaves soon twist to lie in one plane
PHRAGMITES
Round shoot

8. Marshland/Wetland/Pool Plants

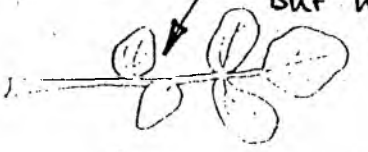
Plants with leaves whose veins radiate from a central mid-rib and are not linear and parallel.



8.1 STEMS CIRCULAR

(a) compound leaves with single pairs of leaflets.

Compound leaves with rounded lobes : Nasturtium officinalis or Rorippa nasturtium-aquaticum (Watercress)

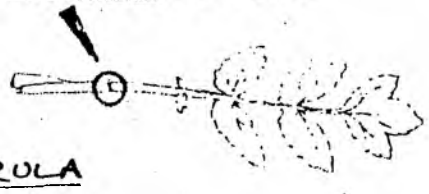


see 5.

Compound leaves with irregular teeth on margins Apium nodiflorum. (Fool's Watercress)

Fine compound leaves (Rorippa) (Small Yellow Cresses)

- See 10.



Pale green toothed leaflets circa 4/5 times longer than broad; broadest in lower quarter, narrowing acutely to narrow sessile attachment to stalk  ; stem shallowly ribbed and hollow. Valeriana (Valerian)

Dark green highly serrated leaflets with pointed tips but rounded outline; attached to round petiole  ;

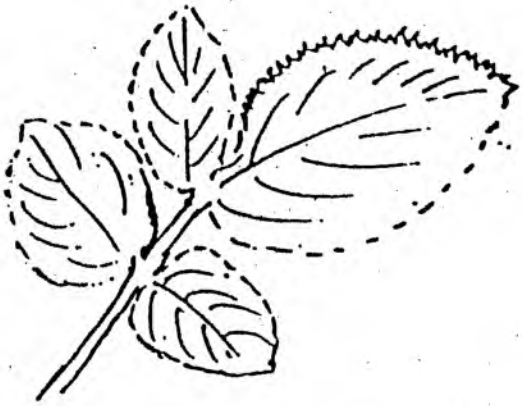
Many secondary small pairs of leaflets. Usually with red stem. **Filipendula** (Meadowsweet)

(b) Leaves with double branching (at least) of leaflets.

Leaf stalk ± ribbed, but circular; leaflets deeply lobed but gently curving to a point (circa <20 per leaflet). 3-4 times pinnate. **Oenanthe**

Leaf stalk ½circle with huge groove  ;

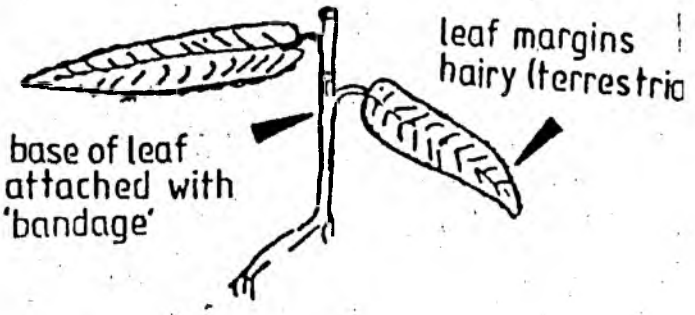
narrow sharp teeth on margins (circa >40). 2-3 times pinnate; stout, hollow, purplish stem. **Angelica**



Simple (NOT COMPOUND)

(c) Leaves attached to round stem alternately

Alternate leaves on short stalks; often floating over surface; veins radiating from mid-rib obvious, despite thick opaque leaves. Polygonum amphibium (Amphibious Bistort)



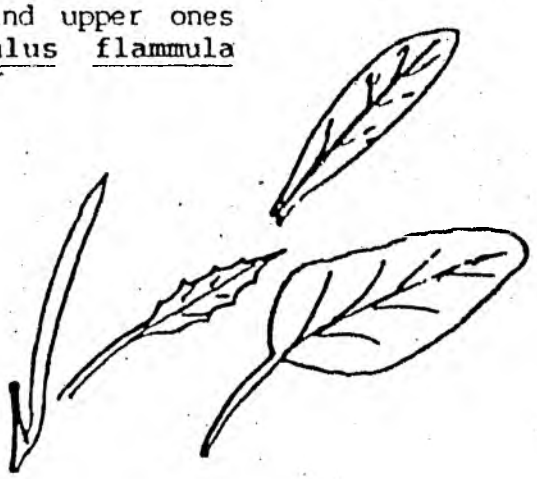
Broad leaves of robust plants with roundly serrated edges. Small yellow crucifer flowers. Plant 40-120 cm tall. (Rorippa amphibia)

See 5.

Alternate leaves with no or very short stalks; leaf tip often curving back on its self. Myosotis scorpioides (Water Forget-Me-Not)

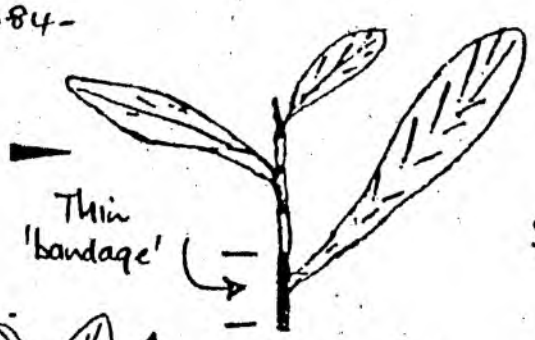
See 5.

Straggling plant with very variable leaves; basal ones often almost round, mid-stem ones long with blunt teeth and upper ones linear. Ranunculus flammula (Lesser Spearwort)



See 5 also

Leaves tapering gradually to form long stalk; widest in mid-leaf; leaf attached to stem with 'bandage'. Tastes of pepper. Polygonum hydropiper (Water Pepper)

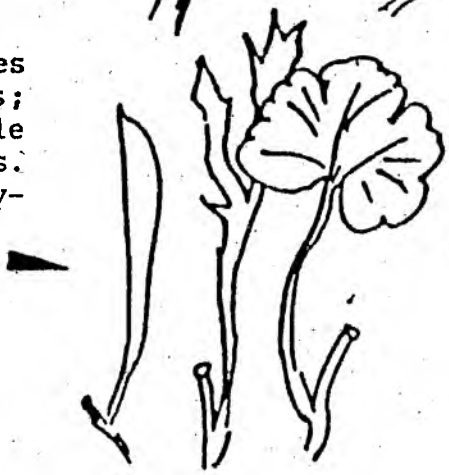


See 5.

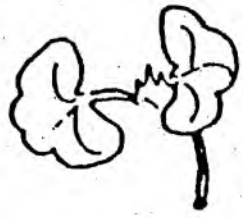
Leaves forming basal rosettes of spatulate leaves tapering gradually to ▽ shaped leaf bases. Broadest in upper 1/5. Lychnis (Ragged Robin)

Straggling plants with heart shaped leaves on stalks (or heart shaped leaves with lobes). Solanum (Bittersweet)

Young plants with basal rosettes of stalked rounded leaves; flowering stems with variable shaped leaves with short stalks. Ranunculus scleratus (Celery-Leaved Crowfoot)



Straggling plants with Ivy shaped leaves floating on water or lifted above soft mud. R.hederaceus (Ivy-Leaved Crowfoot)



See 5 also

As above but with more rounded leaves with greater indentations. R.omiophyllus (Round Leaved Crowfoot)

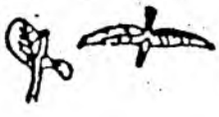
Plants marginal or aquatic; leaves in pairs without stalks.

Leaf pairs with fine tapered tips (cf Callitriche) and not in whorls (cf Elodea); leaf with mid-rib and without stalks; leaves slightly fleshy.
Crassula helmsii

Soft, almost parallel leaves with rounded tips ; simple small white flower. Montia fontana (Blinks)

no obvious mid-rib

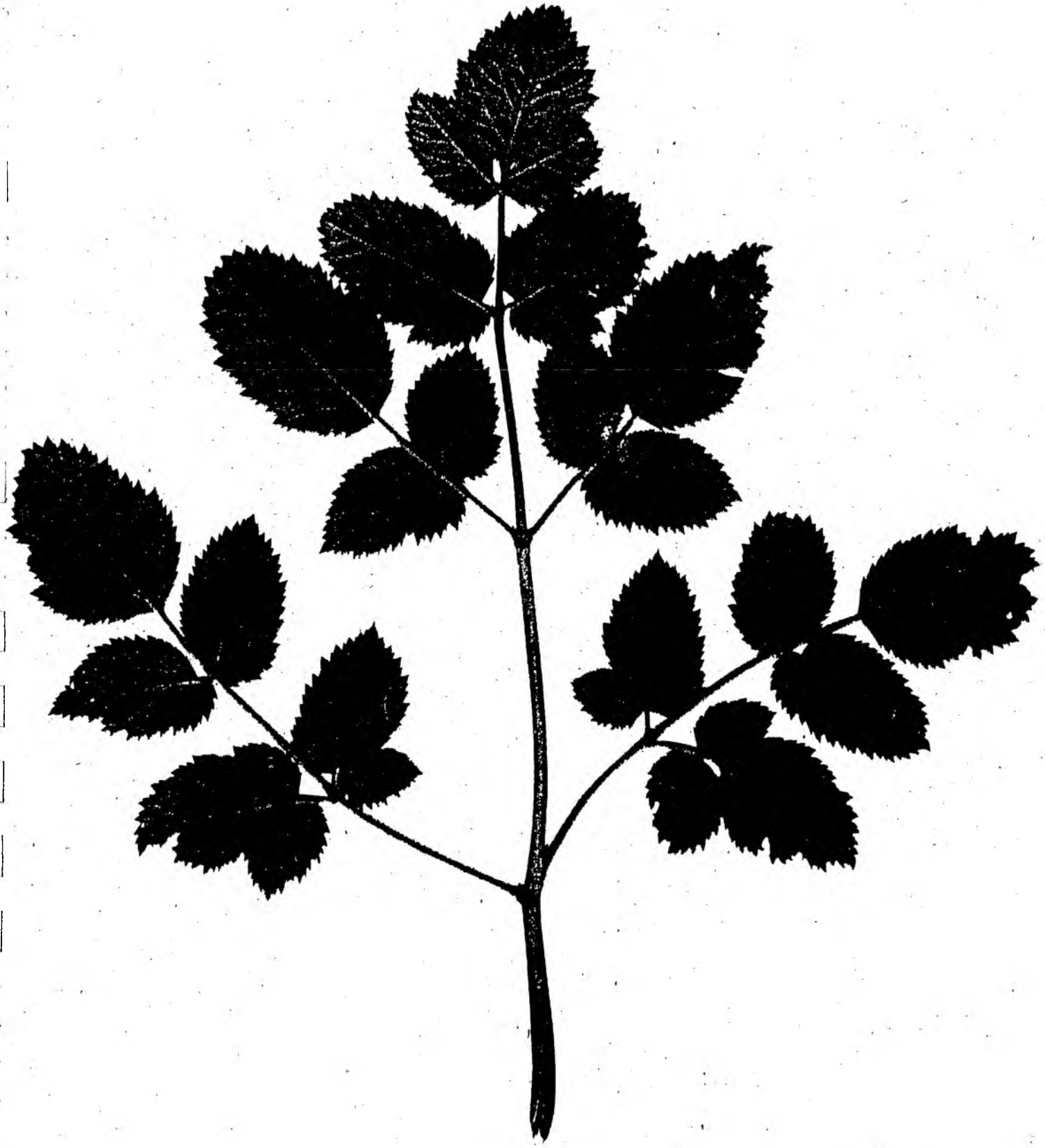
Stems still circular but leaves are attached in pairs opposite each other.



- See 5

Leaves rounded and narrowest at the basal attachment to the stem.
Veronica beccabunga (Brooklime)

- See 5



ANGELICA SYLVESTRIS

Wild Angelica

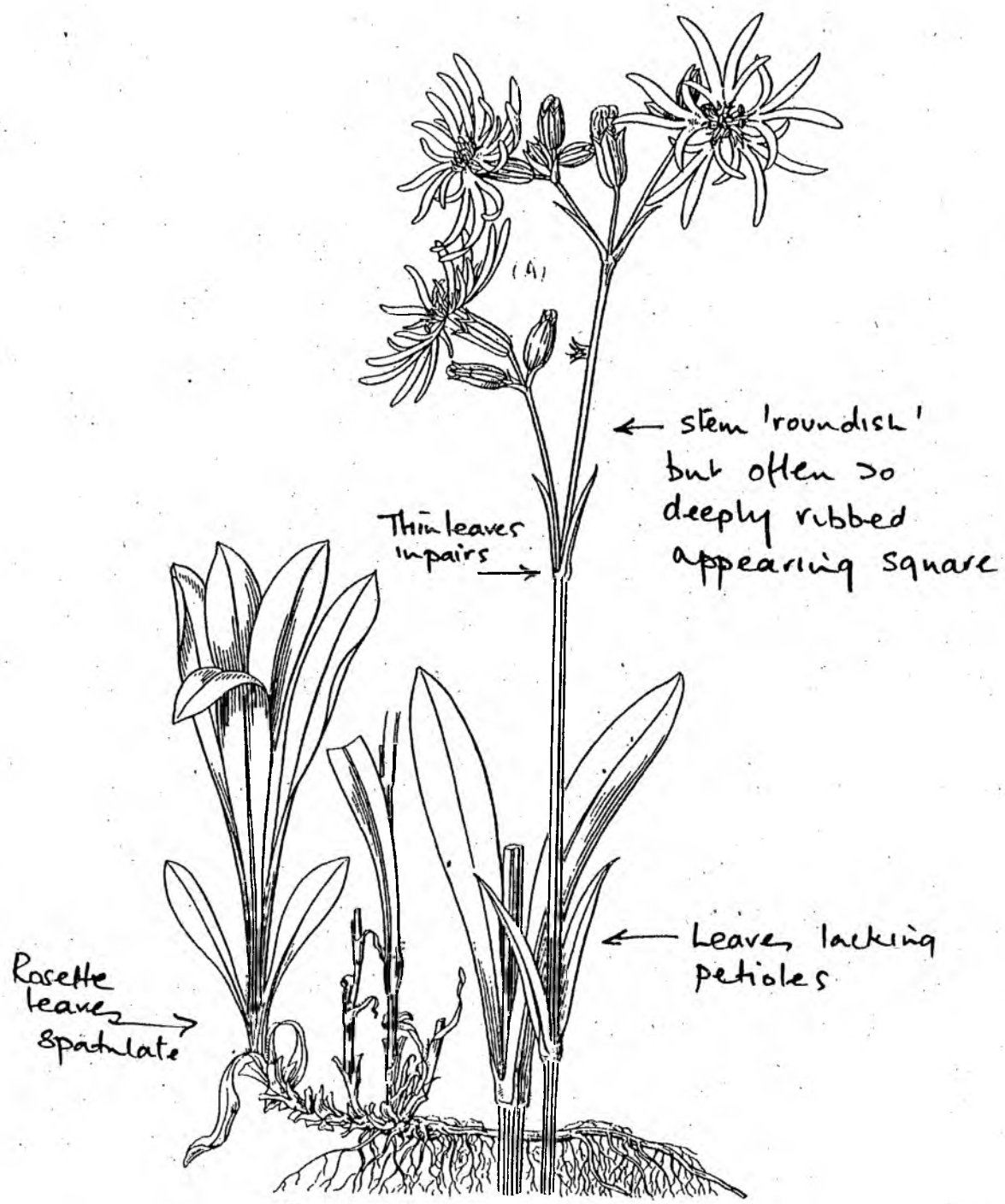
Can grow submerged & retains leaf character.

OENANTHE CROCATA

Hemlock Water Dropwort

RANUNCULUS SCELERATUS
(lowland)
(rich silts)

RANUNCULUS FLAMMULA
(Acid) (upland)



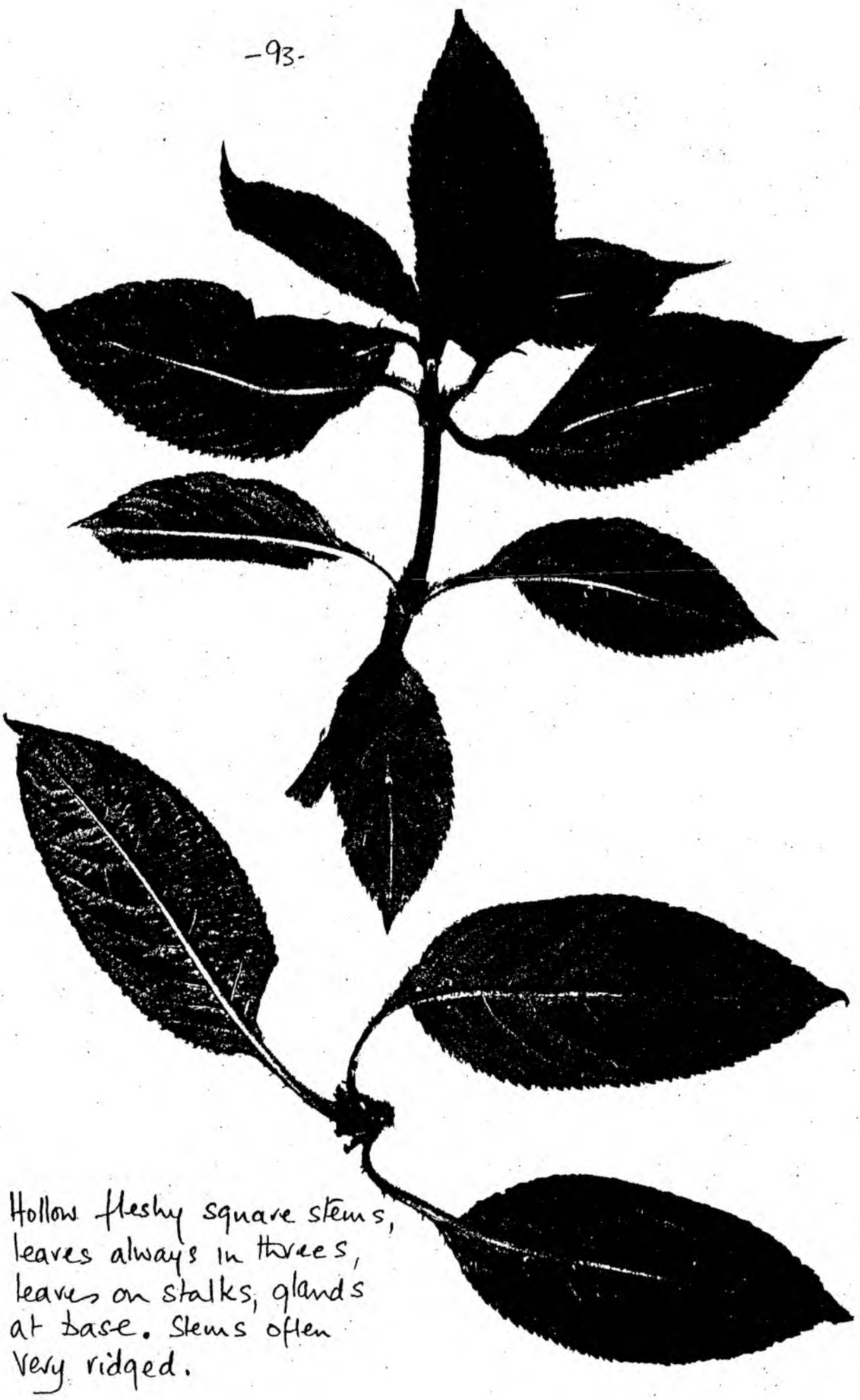
Lychnis flos-cuculi L.

Ragged Robin

SOLANUM DULCAMARA

Bittersweet

EPILOBIUM HIRSUTUM
Great Willow-herb



Hollow fleshy square stems, leaves always in threes, leaves on stalks, glands at base. Stems often very ridged.

IMPATIENS GLANDULIFERA Indian Balsam

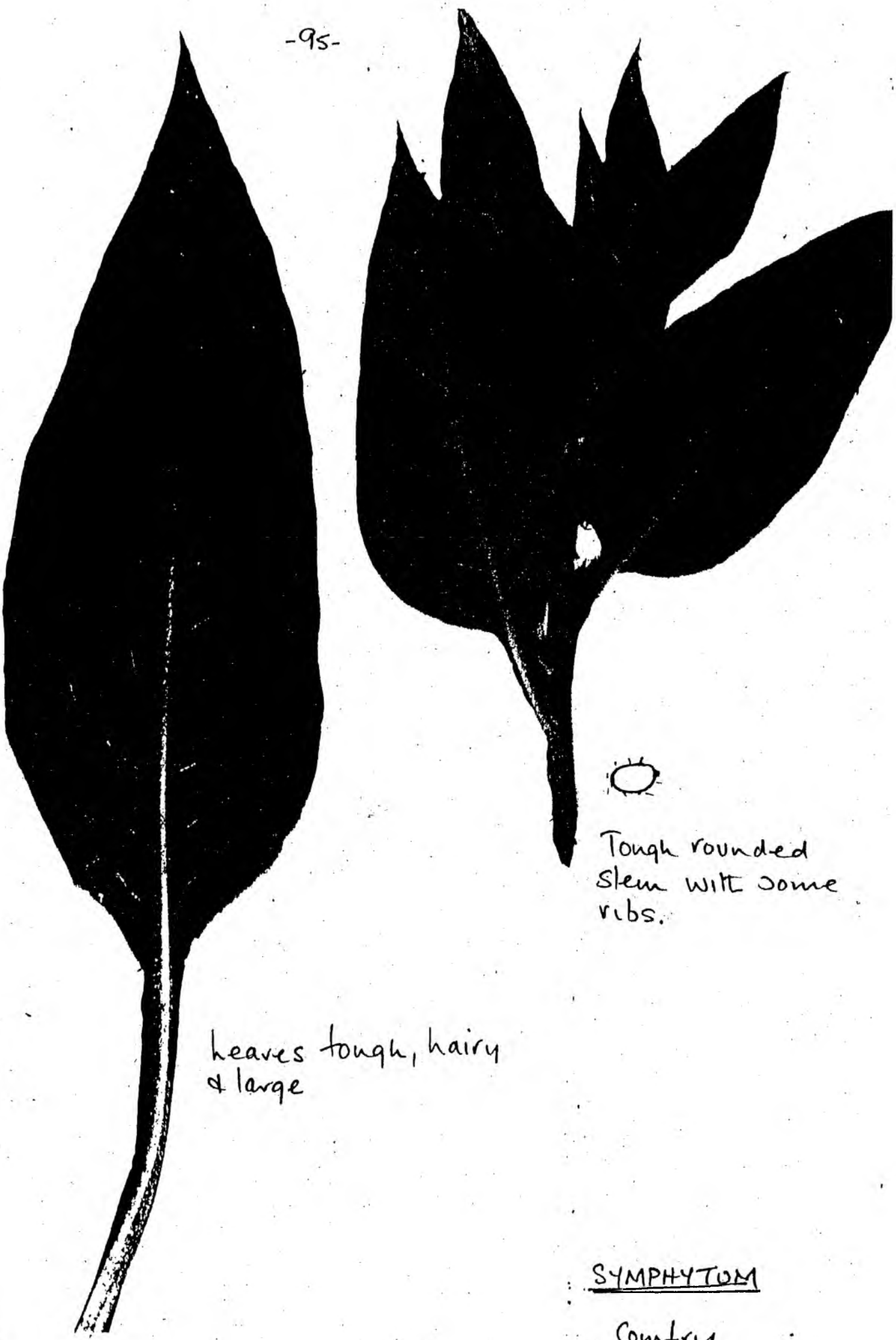
IMPATIENS GLANDULIFERA
– leaves in whorls of 3

Hollow, ridged stems

lower Leaves in pairs; Upper leaves alternate

Impatiens capensis Meerburgh

Orange Balsam



Tough rounded stem with some ribs.

leaves tough, hairy & large

SYMPHYTUM

Comfry

EUPATORIUM CANNIBINUM Hemp Agrimony

PULICARIA DYSENTERICA

Fleabane

Leaves alternate, covered in soft white hairs; lacking petiole & with bases forming extended flanges down stem.

Caltha palustris (Marsh-marigold)

Buttercup like herb; hollow stems; cordate or kidney shaped leaves; leaf green and glabrous, stalk arising from origin of heart shaped leaf margin.

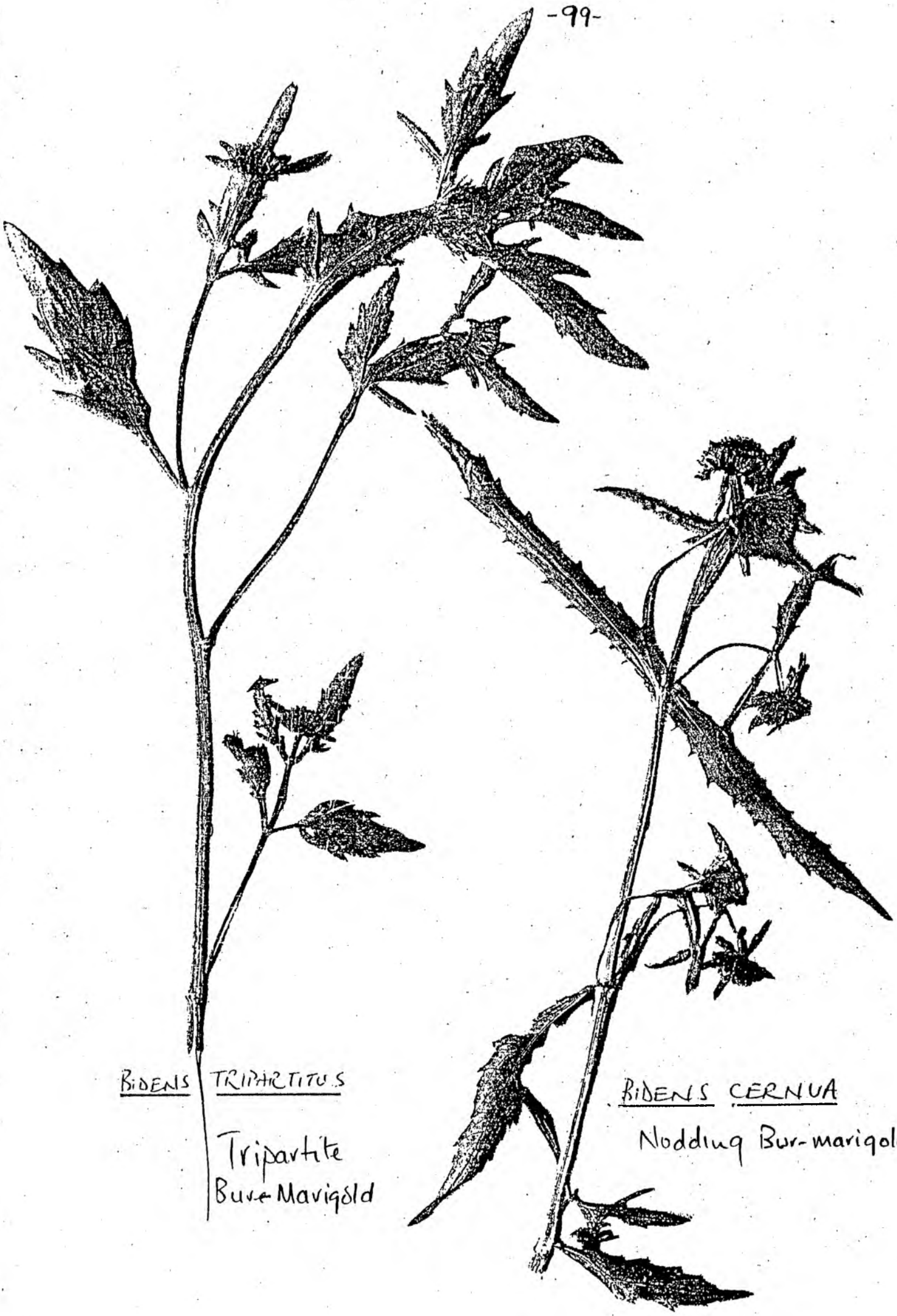
Caltha palustris L.

Bidens

Leaves opposite, undivided, lanceolate' pointed, coarsely toothed, stalked, ± hairy.
Bidens cernua (Nodding Bur-marigold).

Bidens cernua L.

Similar to above but hairless or downy; leaves trifoliate with toothed, lanceolate lobes and short winged stalks.
Bidens tripartita (Trifid Bur-marigold).



BIDENS TRIPARTITUS

Tripartite Bur-Marigold

BIDENS CERNUA

Nodding Bur-marigold

MONTIA FONTANA

Blinks

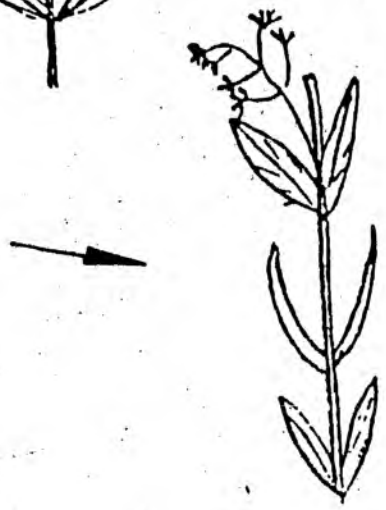
(Upland / Acid)

8.2 STEMS SQUARE

Small plant with leaf <2cm long

Leaves in whorls of 3,4,5 or 6; like Cleavers but smooth. Galium palustre

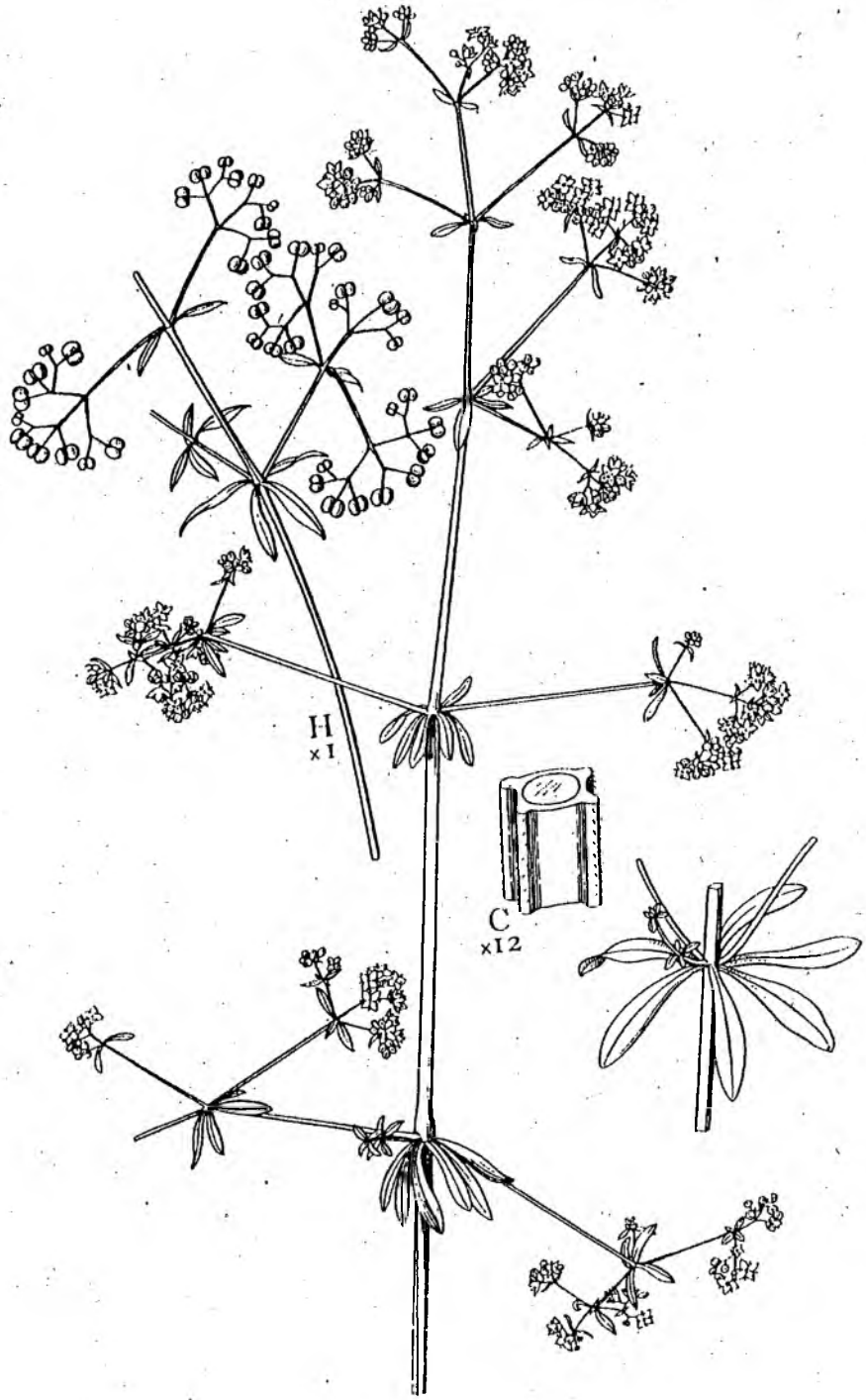
Leaves in pairs, leaves broadest at base 'tapering to clasping base. Small white flowers with sepals > petals. Stellaria alsine (Bog Stitchwort)



Leaves and stem bristly; strongly scented (smelly);leaves deeply indented;widest in lower third. Lower leaves short stalked (5mm), higher leaves with no stalks. Flowers in whorls at base of leaves. Stachys palustris (Marsh Woundwort)

Stachys palustris L.

Deeply indented leaves with distinct petioles and un-scented. Hairless stem. Scutellaria galericulata (Skullcap)


H
x 1
C
x 12

cf tiny
STELLARIA
ALSINE –
Marsh Stitchwort

← square, weak, fleshy stem

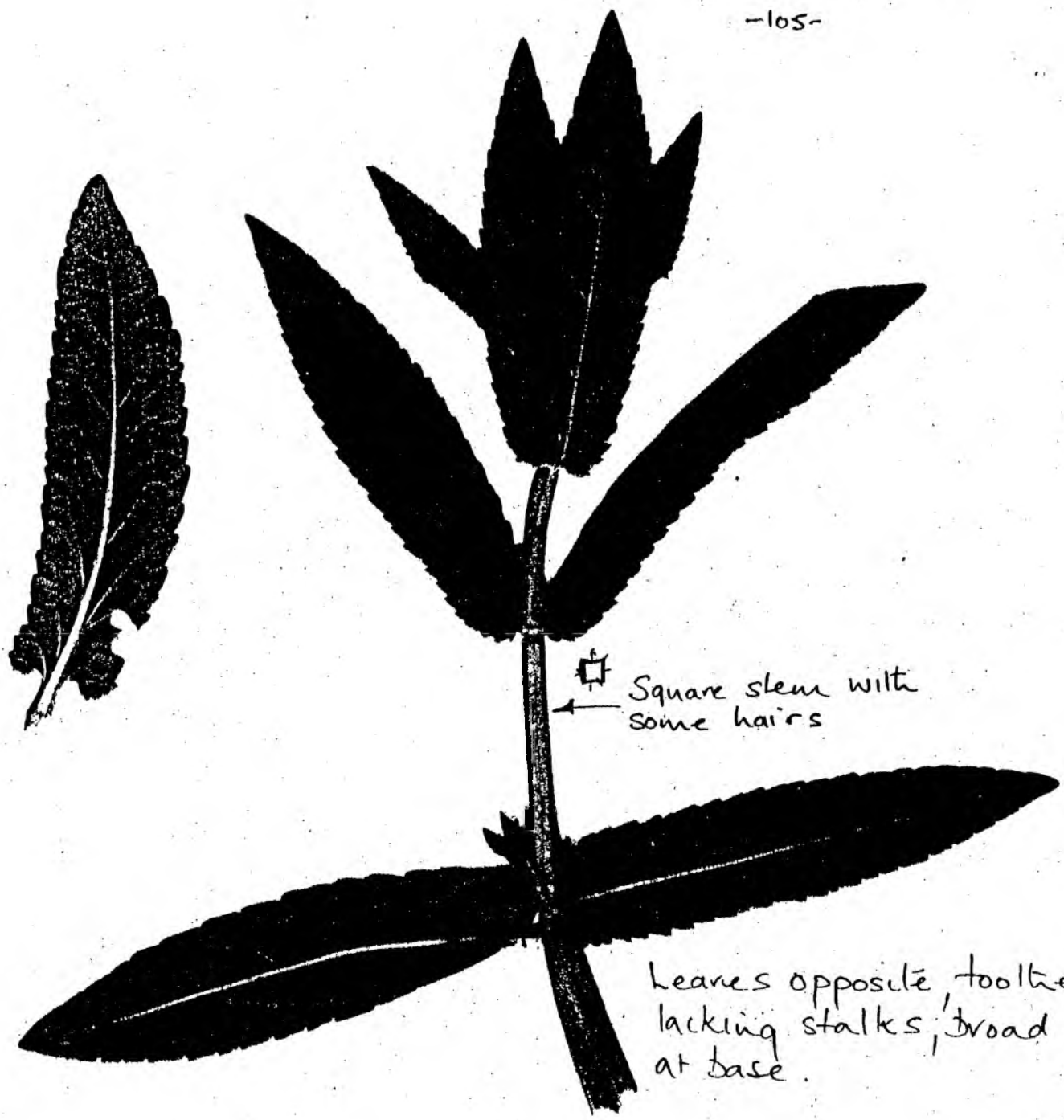
Leaves in pairs, broadest in lower ⅓ but tapering to sessile attachment to ~~ob~~ stem

MYOSOTON
AQUATICUM

Water-chickweed

LYCOPUS EUROPAEUS

Gypsywort



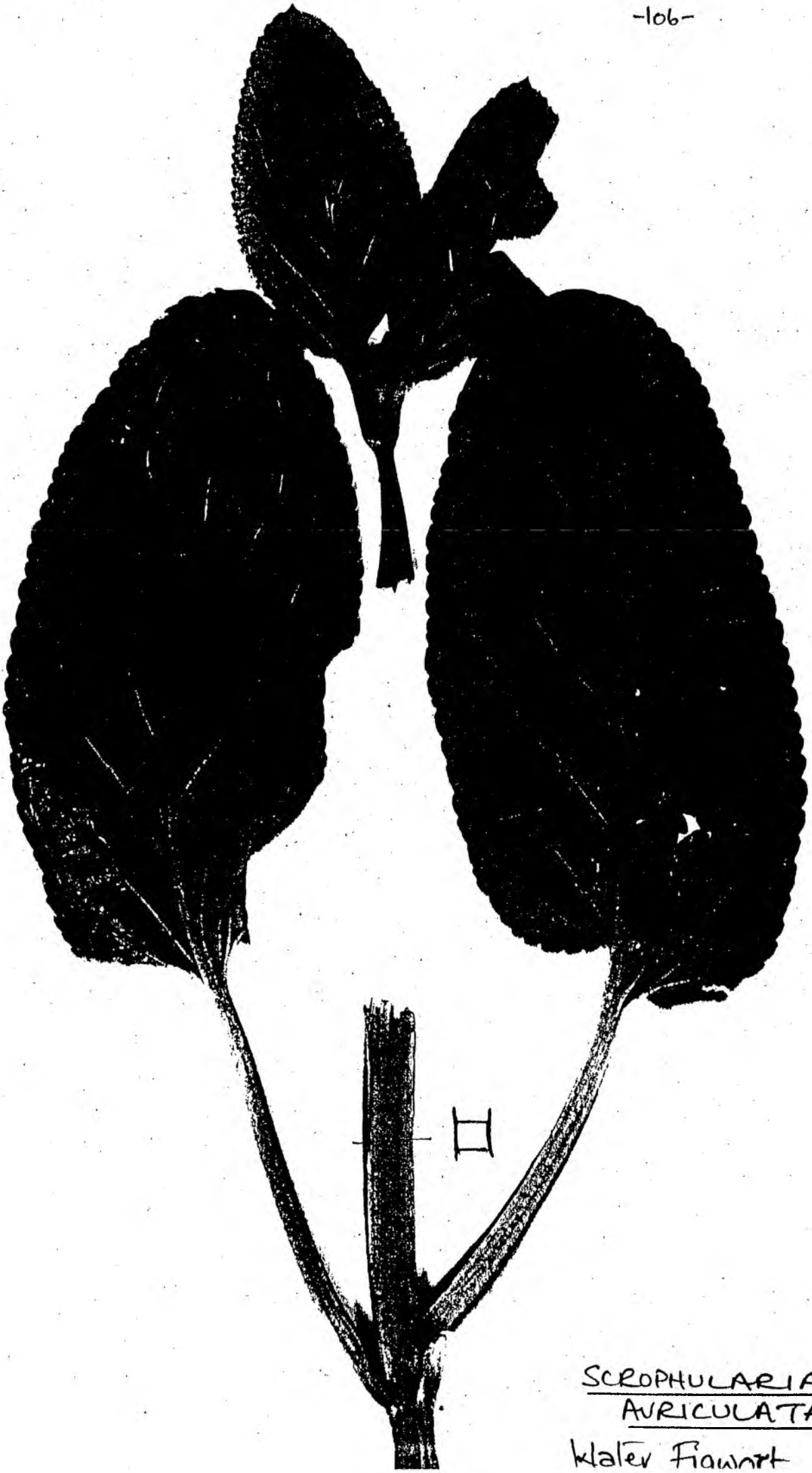
Smells very pungent

STACHYS PALUSTRIS

Marsh Woundwort.

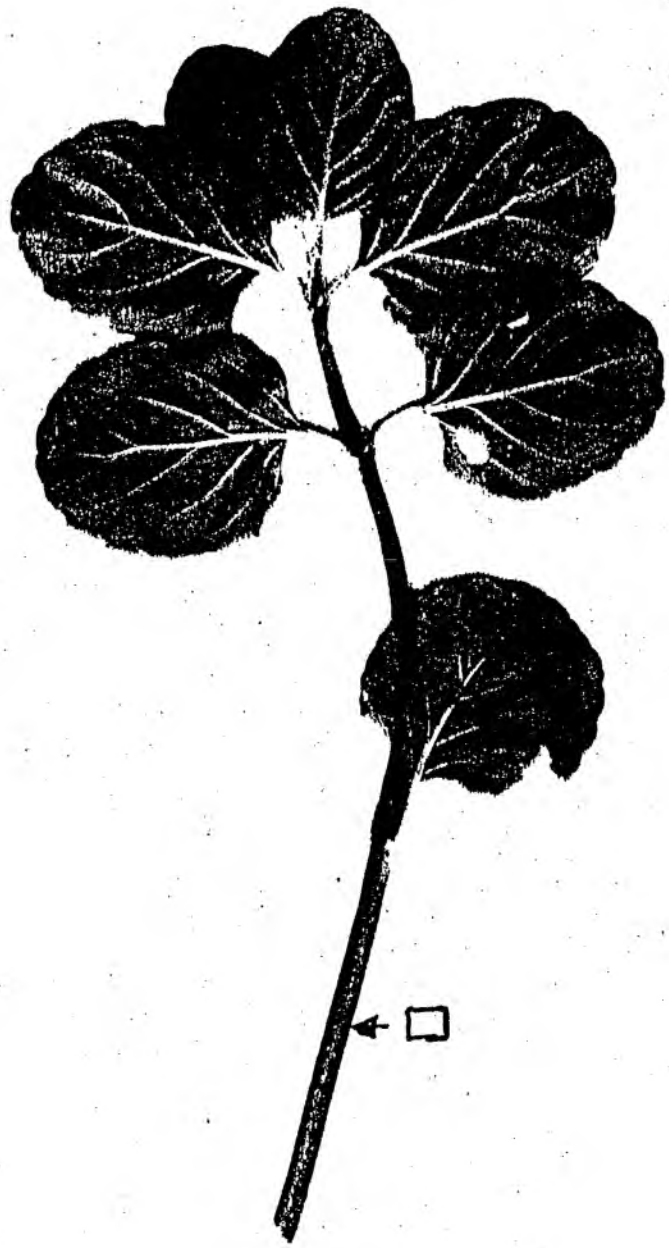
cf SCUTELLARIA

Skullcap

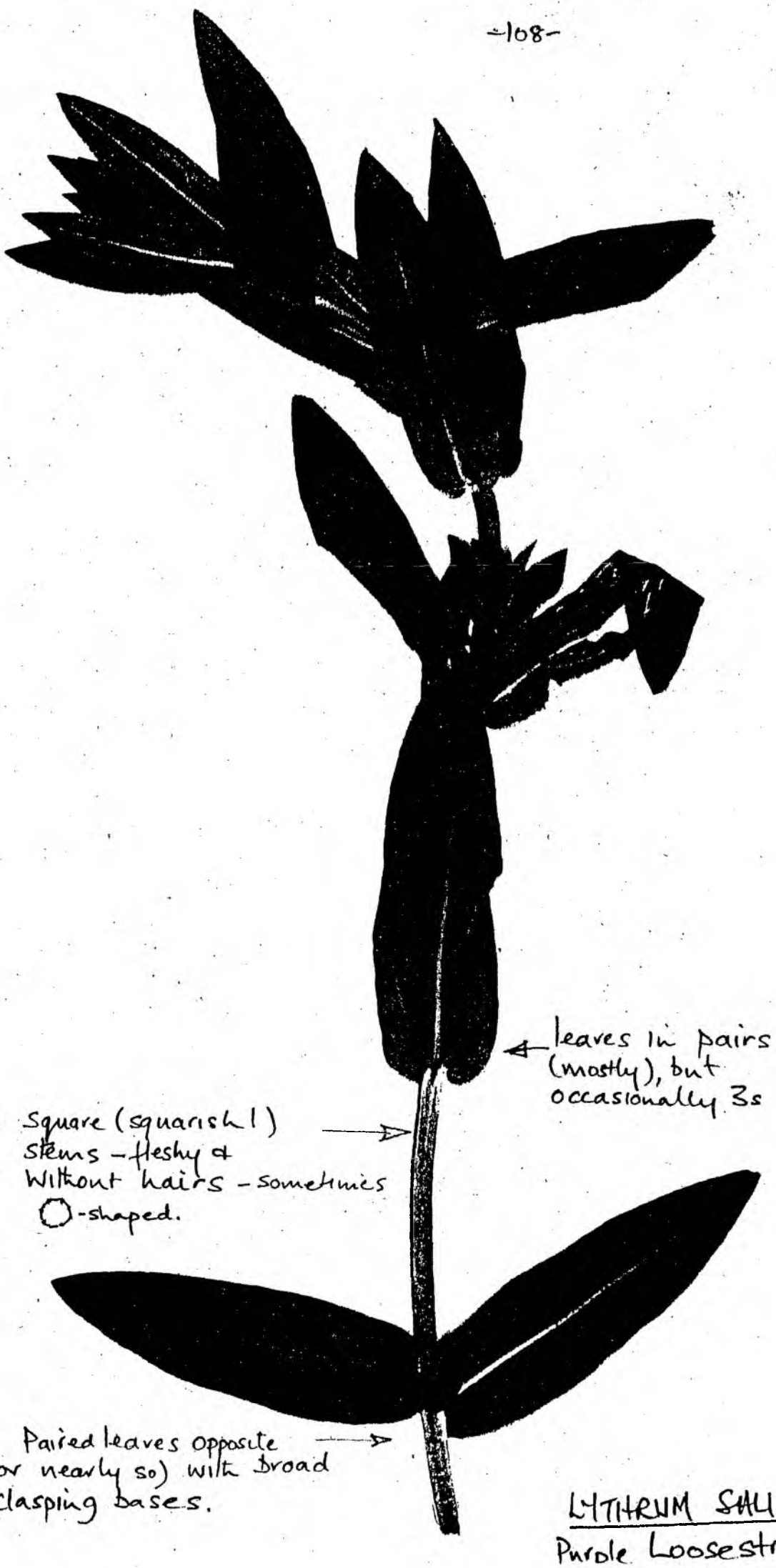


SCROPHULARIA AURICULATA

Water Figwort



MENTHA AQUATICA
Water Mint



LYTHRUM SALICARIA
Purple Loosestrife

LYTHRUM
SALICARIA

9. Bryophytes

CINCLIDOTUS FONTINALOIDES (Hedw.) P. Beauv.

This rather robust plant of streams and lakes takes its specific name from its resemblance to the still larger aquatic mosses of the genus *Fontinalis*. The long, branched stems, which grow on frequently submerged rocks or wood, are 5–18 cm in length, and bear rather long (about 4 mm), narrow, tongue-shaped leaves. When dry the plant resembles *Grimmia alpicola* var. *rivularis* and *Orthotrichum rivulare*, the leaves then appearing shrivelled and somewhat twisted; but in the wet state the size and shape of the leaves distinguish it, and under a lens the thickened leaf margin provides a further good character. In colour the plant varies from dull olive to deep blackish green.

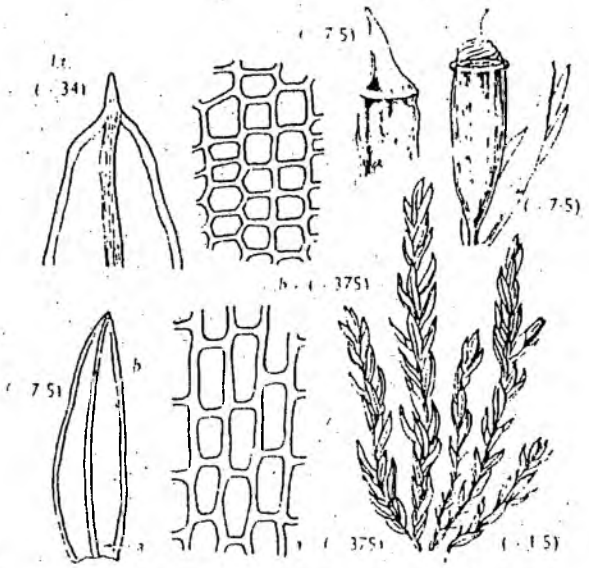


Fig. 59. *Cinclidotus fontinaloides*: *l.t.* tip of leaf; the capsule on the right has the lid removed, showing the peristome.

Under the microscope the strongly thickened leaf margin, composed of several layers of short cells, and the rather blunt apex beyond which the nerve usually extends as a short point, are easily seen and highly diagnostic. The leaf cells as a whole are distinctive, being almost uniformly short with rather thick walls and dense chloroplast content; nearly square in outline (8–10 μ), they become slightly elongated only in the extreme base of the leaf.

Although *Cinclidotus fontinaloides* is dioecious, the capsule is not uncommon. It arises on a lateral branch, on a very short seta, so that it is partly concealed among the leaves. It is yellow-brown, with a reddish rim. The lid is long-beaked; the peristome of 16 slender red teeth is spirally wound when dry.

AMBLYSTEGIUM
(LEPTODICTYUM) **RIPARIUM** (Hedw.) Warnst. (*Hypnum riparium* Hedw.)

This is a rather common moss in lowland habitats near water. It forms loose, untidy patches on soil, wooden palings, rotting stumps or fallen branches on the margins of lakes or pools. In its bright green colour and glossy texture it sometimes looks like *Brachythecium rutabulum*; at other times it may resemble some forms of *Drepanocladus aduncus*. *Leptodictyum riparium* is, in fact, a notably variable plant, and identification should be confirmed under the microscope. Perhaps the most useful field characters lie in the rather soft texture of the plant as a whole, and the widely spreading character of the fairly narrow, finely pointed leaves, both wet and dry.

The leaf is 2–4 mm long, straight and tapering from a not very broad base to a rather long fine point. Under the microscope the long single nerve (½ of total length of leaf) separates it at once from *Campylium stellatum*, or from those species of *Plagiothecium* which it sometimes resembles in its markedly flattened branches. The absence of longitudinal folds and the lack of teeth along the leaf margins readily separate it from *Brachythecium rutabulum*. The long narrow cells become shorter and wider in the basal angles of the leaf, but well-defined patches of alar cells are not formed.

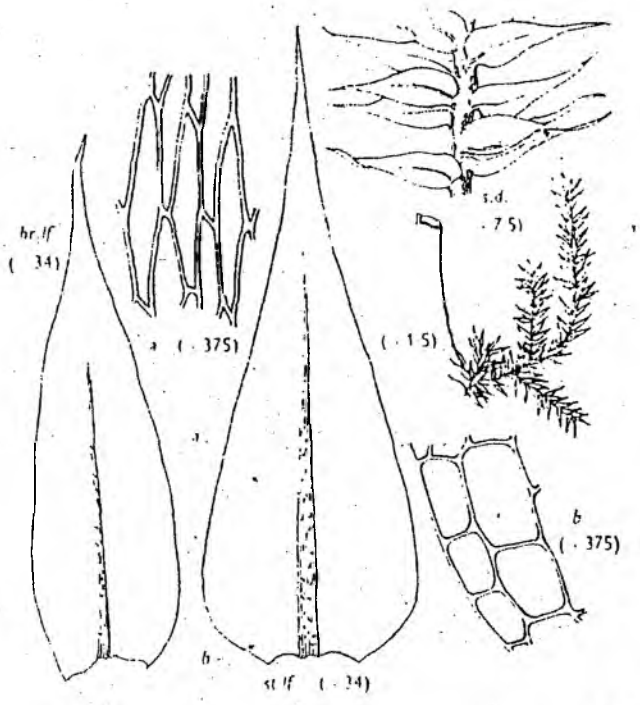


Fig. 141. *Leptodictyum riparium*: *st.lf.* stem leaf; *br.lf.* branch leaf; *s.d.* fragment of shoot in a dry state.

Leptodictyum riparium is autoecious and capsules are common. The orange-red seta is 1·5–2·5 cm long, the capsule narrowly ovoid to cylindrical, curved, with a conspicuously large peristome.

Ecology. The various substrata—rock, wood and soil—on which this species grows are mentioned above, its presence almost always being associated with river bank or pond margin. It is mainly a lowland species and is most common in calcareous districts. I have found it to be the sole species responsible for the extensive growths of moss on the metallurgical coke of the bacterial filter beds of the Reading Sewage Farm.

FONTINALIS ANTIPYRETICA Hedw.

This aquatic species is well known even to non-bryologists, and its long, sparingly branched leafy shoots are a common feature of rivers and lake margins in all parts of Britain. Anchored to stones or tree roots, the lower parts of the submerged stems are often bare of leaves; but above, the dark green leafy branches may reach a length of 50–70 cm. In mountain streams more slender forms are frequent, and the colour is often a duller, brownish green, sometimes tinged with rusty red. The var. *gracilis* Schp. is a slender, often reddish form.

The leaves in *F. antipyretica* are highly characteristic, both in arrangement and in form. They are borne typically in 3 well-marked ranks and give the leafy shoots as a whole a 3-winged (or triquetrous) form. Each leaf is 4–7 mm long and is folded so as to be boat-shaped with a sharp keel. Indeed, the leaves quite commonly split along the keel. The only other common British species, *F. squamosa*, lacks this keeled leaf.

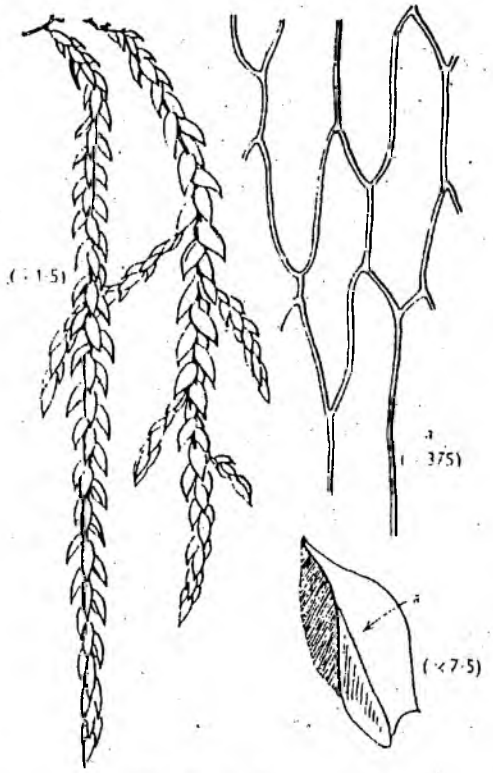


Fig. 124. *Fontinalis antipyretica.*

The leaves are nerveless and their cells are very long, commonly 12–15 × 100–150 μ. The cells are thin-walled and tend to become much distorted in dried material. Sharply defined patches of specialized alar cells are lacking, but the leaf base as a whole is marked by somewhat shorter and wider cells, with slightly thicker, sometimes orange-coloured walls.

Although this is a variable plant, its robust habit and broad, keeled, nerveless leaves will readily distinguish it from other aquatic mosses such as *Eurhynchium riparioides* and species of *Drepanocladus*.

RHYNCHOSTEGIUM

(EURHYNCHIUM) RIPARIOIDES (Hedw.) Rich. (*Eurhynchium rusciforme* (Neck.) Milde)

Robust in habit, bright or deep green in colour, often with a fine metallic sheen when dry, *E. riparioides* is one of our commonest and most conspicuous aquatic mosses. It forms extensive patches on boulders, wood or stonework, low on the banks of streams or sometimes actually submerged. The stems are often very long and only sparingly branched above, whilst below they become bare of leaves and discoloured. The way in which the leaves stand out from the stems reminds one of *Brachythecium rutabulum*, but the present species is normally a plant of stronger, more rigid growth, with more densely crowded leaves and more flattened shoots than *B. rutabulum*. Further, *Eurhynchium riparioides* when growing submerged in fast-running water is usually distinct in its long shoots which may extend for 8–15 cm with scarcely a branch, the lower parts wiry and rough with the persistent bases of eroded leaves. The whole plant, however, varies greatly in size and habit.

The leaf is 1·5–2·5 mm long, broad with a narrow insertion; it is approximately ovate, somewhat concave in form and shortly acute at the apex. The single nerve extends for about three-quarters of the leaf length; another important microscopic character is the closely and rather strongly toothed leaf margin. Except at the basal angles (where there are wide, but ill-defined patches of short oval cells) the cells are very long and narrow (*c.* 7–10 × 70–100 μ).

E. riparioides is autoecious, and the capsule not uncommon. Borne on a smooth seta 1–2 cm long, it is ovoid, and is held horizontally. The long beak to the lid is a notable feature.

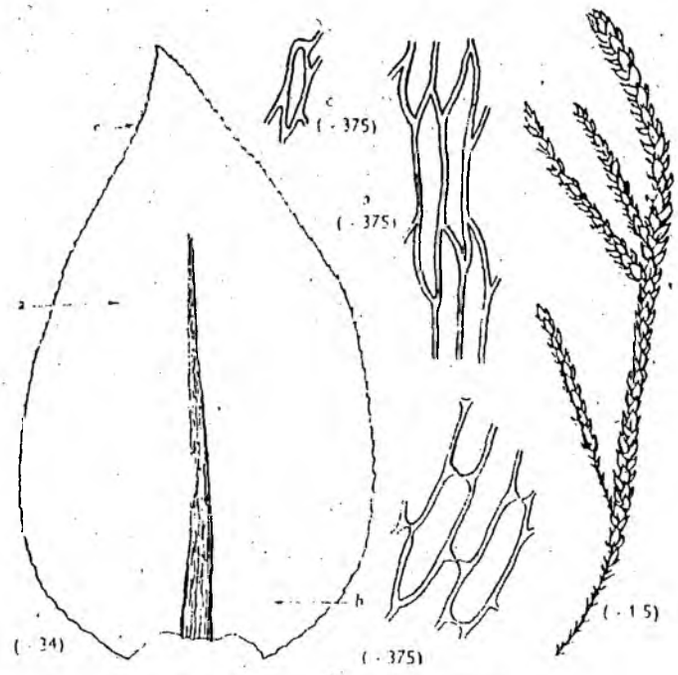


Fig. 165. *Eurhynchium riparioides.*

Ecology. It demands running water and is thus confined to streams and rivers. Preferring swiftly flowing water, in lowland districts it is found chiefly about mill-races and waterfalls. It will grow attached to wood or rocky substrata, and will tolerate both acid and calcareous conditions. It appears to demand at least periodic submersion in water, and its limitations in this respect might be worth investigating. I have noticed that, when the moss flora of boulders in shaded mountain streams shows zonation, this species (often almost pure) occupies the lowest zone, and is thus fully exposed only in time of drought. Sometimes, in western Britain (and in Ireland) it will cover the whole bed of a stream.

10 MISCELLANEOUS

10.1 Edge Grasses -

Agrostis
Alopecurus
Glyceria (3 small species and hybrid)
Poa
Catabrosa
Deschampsia

10.2 Small Edge Oenanthe spp.

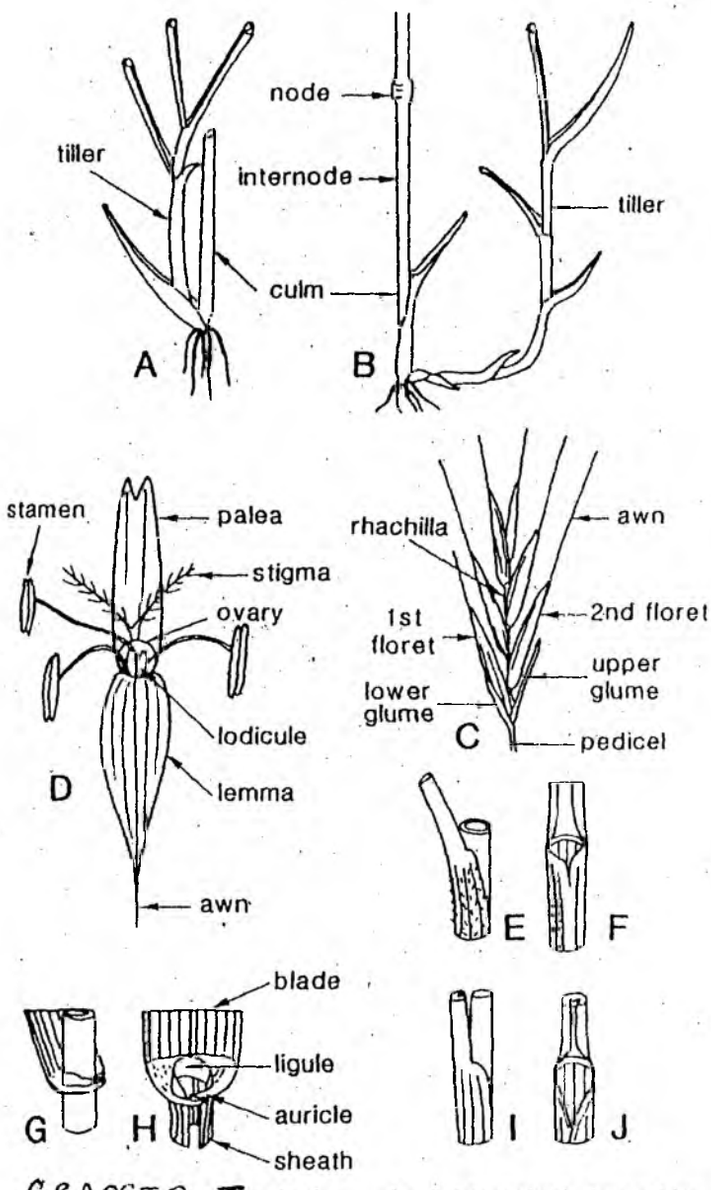
Fistulosa
Pimpinelloides
Silaifolia
Lachenalii

10.3 Rorippa spp.

10.4 Eleocharis spp.

10.5 Callitriche spp. (more details)

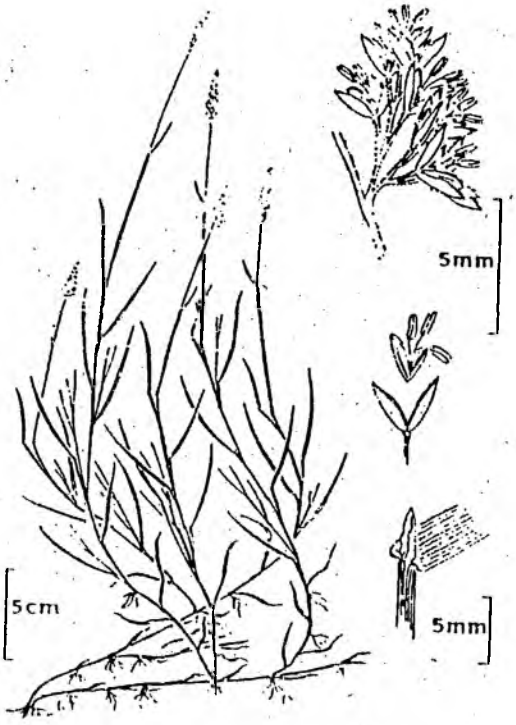
10.6 Equisetum spp.



GRASSES Terminology. A, intravaginal innovation shoot. B, extravaginal innovation shoot. C, spikelet. D, floret with lemma pulled back. E-F, innovation leaf-sheath of **Festuca rubra**. G-H, innovation leaf-sheath of **F. pratensis**. I-J, innovation leaf-sheath of **F. ovina**. Drawn by S. Ogden.

Agrostis stolonifera

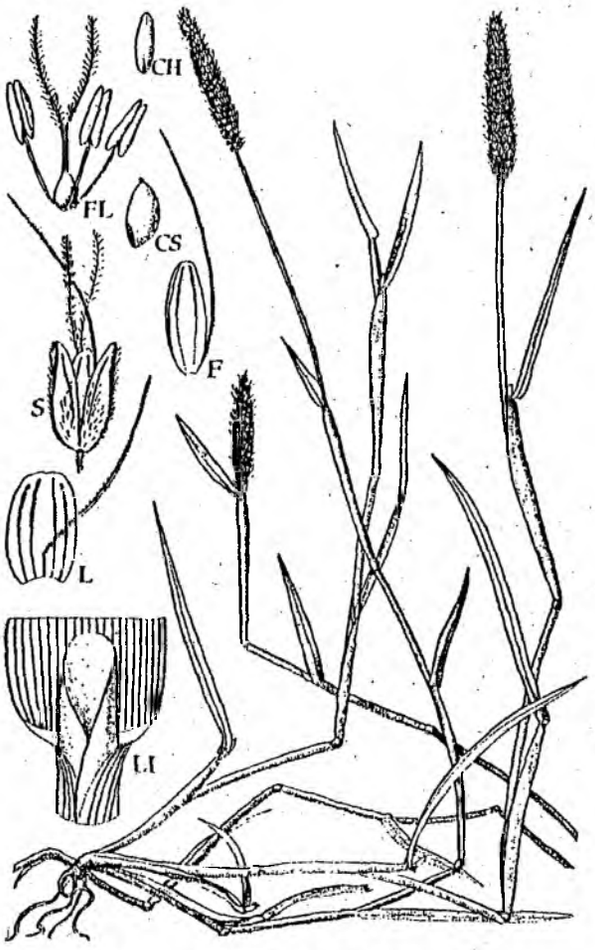
Characteristic rolled young leaves and stoloniferous growth.
Palea two thirds the length of the lemma.



Alopecurus geniculata
(Marsh Foxtail)

Creeping grass with erect flower stems
Leaves linear-lanceolate, rough above
with inflated sheaths; ligules 5mm long.

Alopecurus geniculatus L.
Marsh Foxtail.



Alopecurus geniculatus. Common; wet places.

MARSH OR FLOATING FOX-TAIL

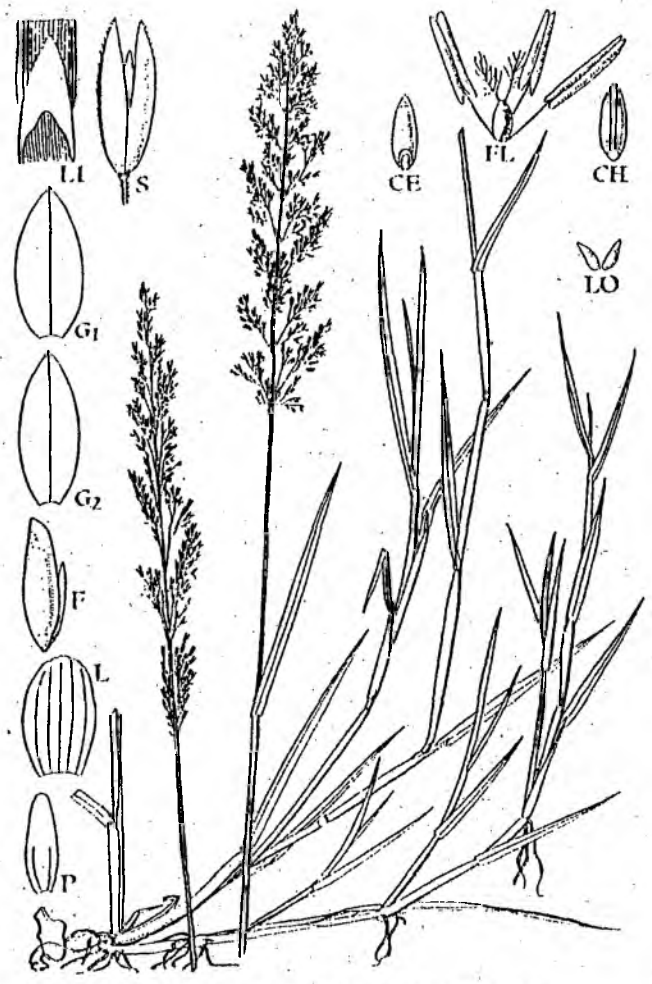
Alopecurus geniculatus L.

Perennial, 15–45 cm high. Culms spreading, usually ascending from a kneed or prostrate base and rooting at the nodes, sometimes extensively creeping, occasionally floating in water, slender, few- to many-noded, smooth, whitish-green in the upper part. Leaves hairless; sheaths smooth, whitish-green, the upper somewhat inflated; ligules (LI, ×6) blunt, 2–5 mm long, membranous; blades pointed, 2–12 cm long, 2–7 mm wide, flat, spreading, green or greyish-green, rough on the nerves, or smooth beneath. Panicles very dense, spike-like, narrowly cylindrical, blunt, 1·5–7 cm long, 3–7 mm wide, green, or tinged with blue, or purplish; pedicels very short.

Spikelets (S, ×6) oblong, 2·5–3·3 mm long, 1-flowered, flattened, falling entire at maturity. Glumes narrowly oblong, blunt, keeled, with the margins free nearly to the base, thinly membranous, 3-nerved, fringed with silky hairs on the keel and with appressed hairs on the sides. Lemma (F, L, ×6) slightly shorter than or as long as the glumes, broadly oblong or ovate, very blunt, keeled, with the margins united near the base, thinly membranous, smooth, 4-nerved, awned just above the base, with the awn exceeding the glumes by 2–3 mm. Palea absent. Anthers (FL, ×6) 1·5–2 mm long, yellow or purple. Grain (CS, CH, ×6) enclosed in the lemma between the thin glumes. *Ch. no.* 2n = 28.

A low grass of wet or moist places such as the muddy margins and shallow water of pools, rivers, streams, and ditches, and of damp depressions in meadows. It is widespread and of frequent occurrence in the British Isles, having been recorded from every county. Also throughout Europe, N. Asia, and N. America. Flowering: June to August.

As the stigmas mature before the stamens, cross-pollination can often take place when two or more species of *Alopecurus* grow together. The progeny of two hybrids produced in this way have been discovered in the British Isles. Both are male-sterile, their anthers being devoid of good pollen and remaining closed. One hybrid between *A. geniculatus* and *A. pratensis* (=*A. hybridus* Wimm.) is fairly widespread in S. England, occurring in marshy fields in at least ten counties. It is intermediate in structure between its parents, the culms spreading and geniculate, the uppermost ligule up to 5 mm long, the spikelets 3·5–4·5 mm long, with slightly pointed or somewhat blunt glumes, and anthers 2 mm long. The other hybrid, between *A. geniculatus* and *A. aequalis* (=*A. haussknechtianus* A. & G.), has been found in W. Norfolk.



Agrostis stolonifera. Very common; grassland, etc.

CREEPING BENT

Agrostis stolonifera L.

A tufted perennial, 8–40 cm high, spreading by leafy stolons and forming a close turf. Culms erect or ascending from a bent or prostrate base, rooting from the lower nodes, slender, 2–5-noded, smooth. Leaves green, greyish-, or bluish-green, hairless; sheaths rounded on the back, mostly smooth; ligules (LI, ×3) blunt, 1–6 mm long, membranous; blades finely pointed, 1–10 cm long, rolled when young, afterwards flat, 0·5–5 mm wide, closely nerved, minutely rough. Panicles linear to lanceolate, or oblong, 1–13 cm long, 0·4–2·5 cm wide, open in flower, afterwards contracted and often dense, or only loose below, frequently lobed, green, whitish, or purplish; branches clustered, closely divided, rough: pedicels 0·5–2 mm long.

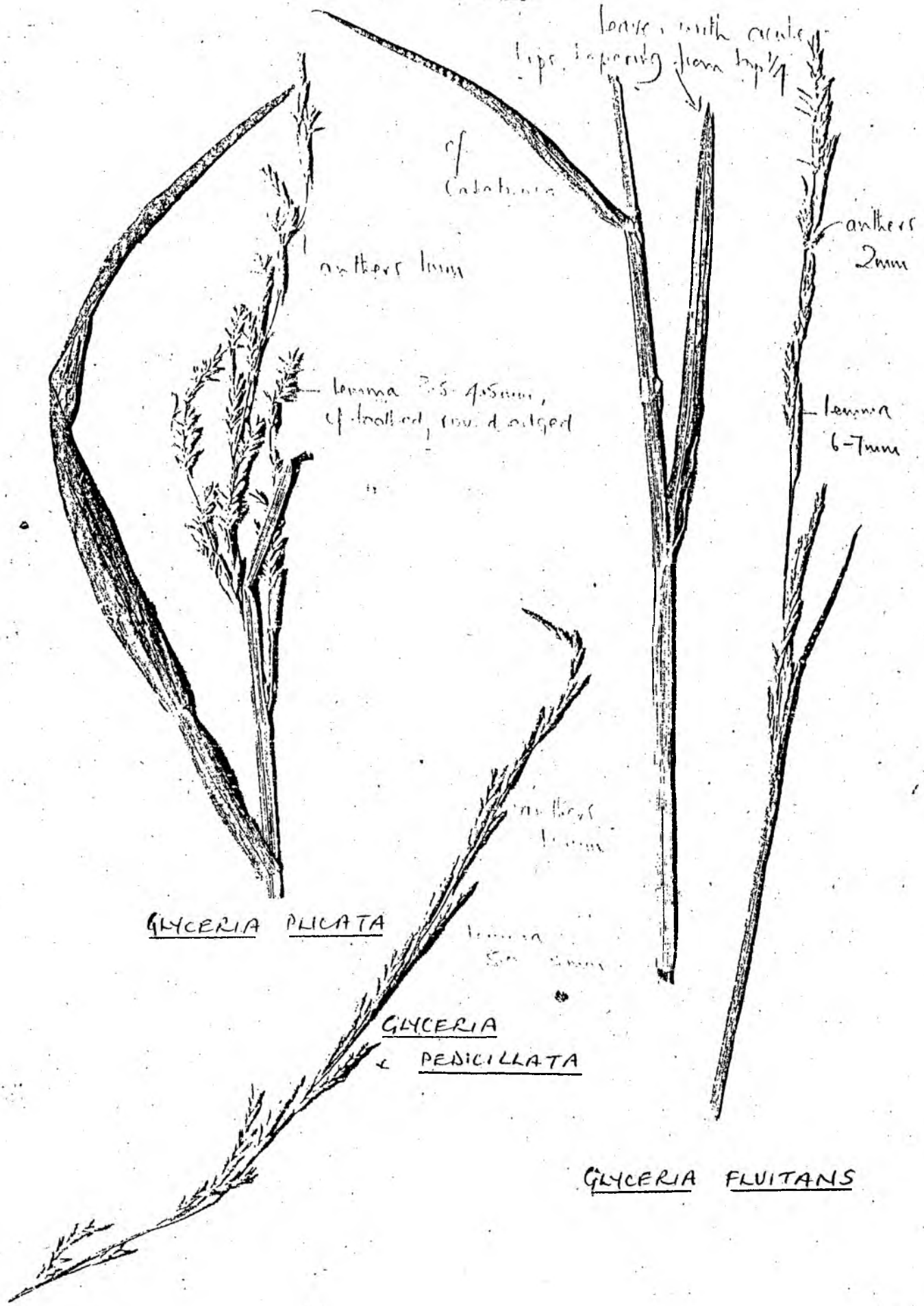
Spikelets (S, ×12) densely clustered, lanceolate to narrowly oblong, 2–3 mm long, 1-flowered, breaking up above the glumes at maturity. Glumes (G_1, G_2, ×12) persistent, as long as the spikelet, equal or slightly unequal, narrowly lanceolate to oblong-lanceolate in side view, pointed, membranous, 1-nerved, rough upwards on the keels. Lemma (F, L, ×12) up to three-fourths the length of the glumes, ovate or oblong, very blunt, finely 5-nerved, thin, usually awnless, rarely with a short awn from near the tip. Palea (P, ×12) up to two-thirds the length of the lemma. Anthers (FL, ×12) 1–1·5 mm long. Grain (CE, CH, ×12) enclosed by the delicate lemma and palea. *Ch. no.* 2n = 28.

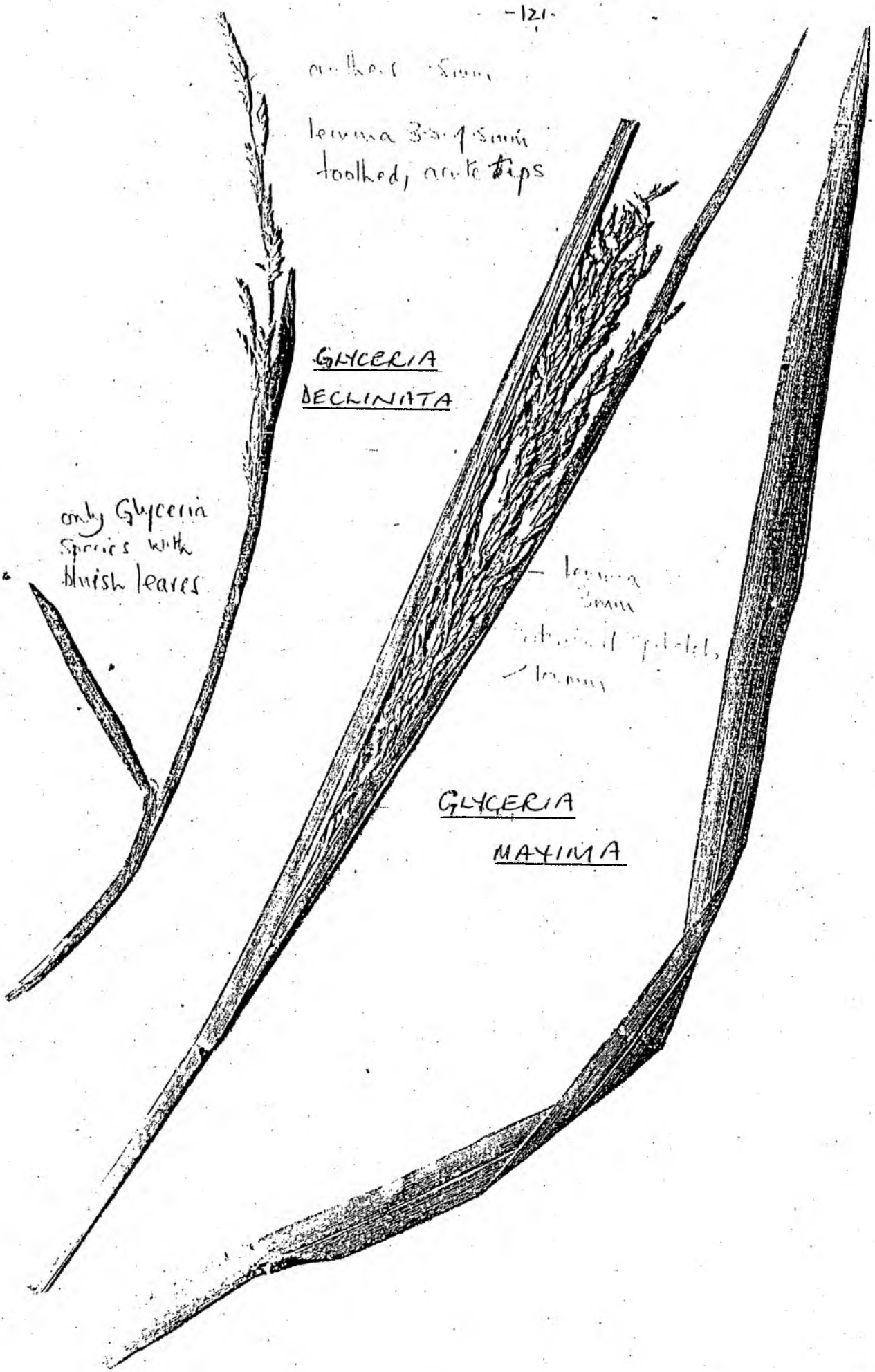
An extremely variable grass, frequent to very common in the British Isles in a wide range of situations; in lowland and hill grassland, salt-marshes, on chalk-downs, roadsides, inland and coastal sands, on cliffs, in open woodland, and as a weed on cultivated land; on light or heavy soils; from sea-level to 2,500 ft. Also called 'Fiorin' or 'White Bent'. Throughout Europe, temperate Asia, N. America; introduced into Australia, New Zealand, S. America, etc. Flowering: July and August.

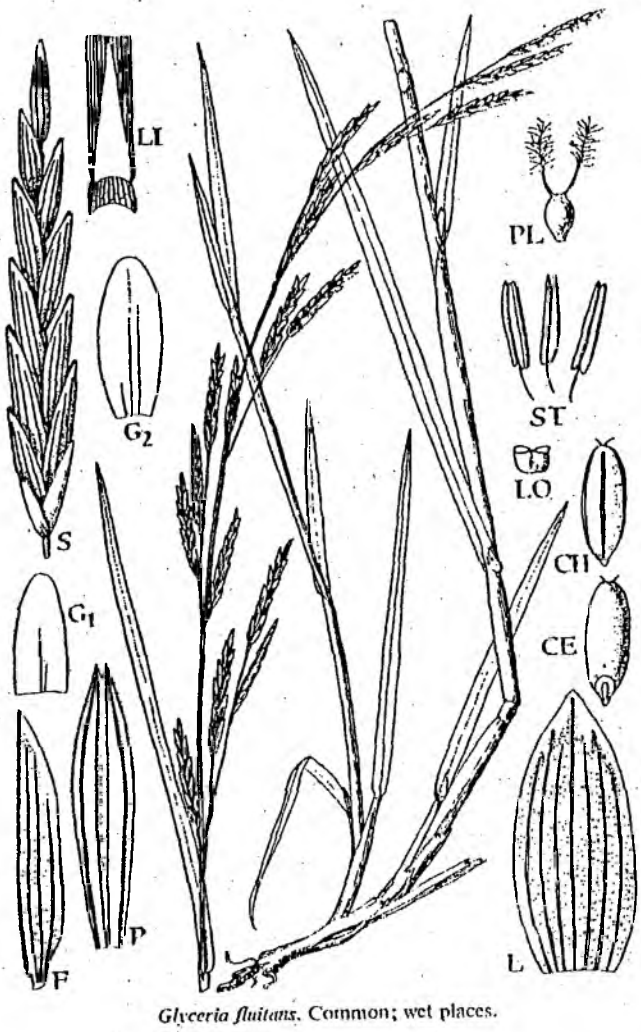
Dwarf varieties, such as those found in sea-marsh turf, are used in the formation of lawns. 'Marsh Bent', *A. stolonifera* var. *palustris* (Huds.) Farw., is widespread in wet places in the lowlands. It has extensively creeping stolons which mat loosely together and do not form a turf as in typical *A. stolonifera* (i.e. var. *stolonifera*). Its culms are 20–60 cm high; leaf-blades 6–20 cm long, 3–7 mm wide; ligules up to 8 mm long; panicles lanceolate to narrowly ovate, 8–30 cm long, up to 10 cm wide; spikelets 2·5–3·5 mm long.

GLYCERIA

Sp. \ characters	Apex of lemma distinctly toothed or lobed	Teeth acute on lemma	Length of lemma (mm)	Length of awn/ter (mm)	Length of spikelet	Sheaths rough	Palea equal/longer than lemma	leaf tapering abruptly	Palea keels winged	NOTES
FLUITANS			6-7	2	>10		✓	✓		
PLICATA	✓		3.5 4.5	1	>10	✓				
x PEDICILLATA	✓		5.0 5.5	1.2-1.5	>10	?				Intermediate between above
DECLINATA	✓	✓	3.5 4.5	.5	>10		✓	✓		
MAXIMA			3		<10	✓	±	✓		leaf sheath keeled at back; brown ring @ ligule


leaves with acute tips tapering from top 1/4
of
anthers 2mm
lemma 6-7mm
GLYCERIA PLICATA
GLYCERIA
x PENICILLATA
GLYCERIA FLUITANS


GLYCERIA
DECLINATA
only Glyceria species with bluish leaves
GLYCERIA
MAXIMA



Glyceria fluitans. Common; wet places.

FLOATING SWEET-GRASS

Glyceria fluitans (L.) R. Br.

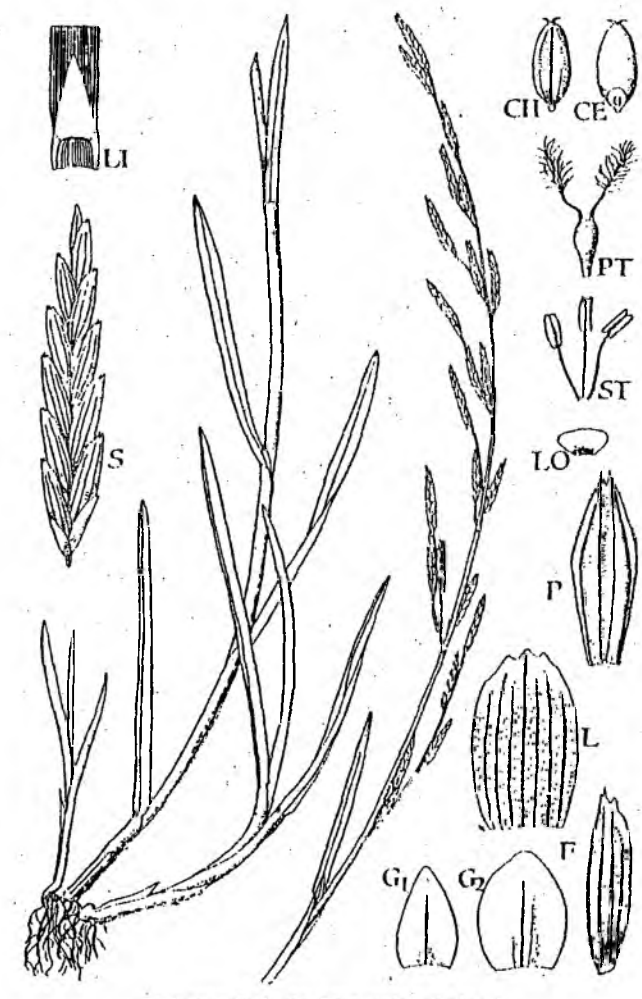
Perennial, up to 1 m high, loosely tufted or forming loose masses in shallow water. Culms erect or spreading, sometimes with a prostrate or floating base, few-noded, slender to rather stout, smooth. Leaves green, or with the sheaths purple, hairless; sheaths tubular, smooth; ligules (LI, ×1½) lanceolate-oblong, 5–15 mm long, membranous; blades pointed, 5–25 cm long, 3–10 mm wide, folded or flat, smooth except for the rough margins. Panicles open in flower, afterwards contracted and narrow, erect or curved and nodding, 10–50 cm long, sparingly branched in the lower part; main-axis smooth; branches usually in pairs or solitary, the longer of a pair bearing 1–4 spikelets, the shorter with 1 spikelet, appressed to the axis after flowering; pedicels 1–4 mm long.

Spikelets (S, ×3) narrowly oblong, 18–35 mm long, 2–3·5 mm wide, 8–16-flowered, green or purplish, breaking up at maturity beneath the lemmas. Glumes (G_1, G_2, ×6) persistent, elliptic-oblong or oblong, blunt, 1–3-nerved, thin; lower 2–3 mm, upper 3–5 mm long. Lemmas (F, L, ×6) rounded on the back, at first overlapping, later with incurved margins, elliptic-oblong or oblong, somewhat blunt or pointed, entire, 6–7·5 mm long, 7-nerved, firm except for the thin whitish apex, minutely rough. Paleas (P, ×6) sharply 2-toothed, with the teeth reaching the tip of the lemmas or usually shortly projecting. Anthers (ST, ×6) 2–3 mm long. Grain (CE, CH, ×6) 2·5–3 mm long, dark brown, enclosed by the hardened lemma and palea. *Ch. no.* 2n = 40.

A succulent aquatic grass, distributed throughout the British Isles, probably occurring in every county; in shallow water of ponds and lake-margins, in ditches, sluggish streams, and river-margins; often abundant and sometimes dominating such habitats. Widespread in Europe, especially in the west, also in N.E. America. Sometimes called 'Flote-grass' or 'Manna-grass'. Flowering: end of May to August.

Glyceria declinata and *G. plicata* may be separated from *G. fluitans* by their shorter lemmas (4–5 mm) and smaller anthers (0·8–1·5 mm). Both species hybridize with *G. fluitans*, the progeny being sterile. The hybrid between *G. fluitans* and *G. declinata* is rare, but that between *G. fluitans* and *G. plicata* is widespread in Britain and often abundant; an account of it is given under *G. pedicellata* (p. 99).

'Floating Sweet-grass' is eagerly grazed by cattle on account of its palatable succulent foliage.



Glyceria declinata. Frequent; wet places.

GLAUCOUS SWEET-GRASS

Glyceria declinata Bréb.

Perennial, usually loosely tufted, 10–45 cm high. Culms erect, or ascending from a curved or bent base, or prostrate, 1–3-noded, smooth. Leaves greyish-green or tinged with purple, hairless; sheaths keeled, entire, usually smooth; ligules (LI, ×2) 4–9 mm long, membranous; blades equally wide throughout, abruptly pointed or blunt, at first folded, becoming flat, 3–18 cm long, 1·5–8 mm wide, smooth except for the rough margins, often rather stiff. Panicles linear to lanceolate, straight or curved, often one-sided, sparingly branched, 4–30 cm long; axis smooth; branches solitary or in pairs or threes, appressed to or spreading on one side of the axis, smooth; pedicels 1·5–4 mm long.

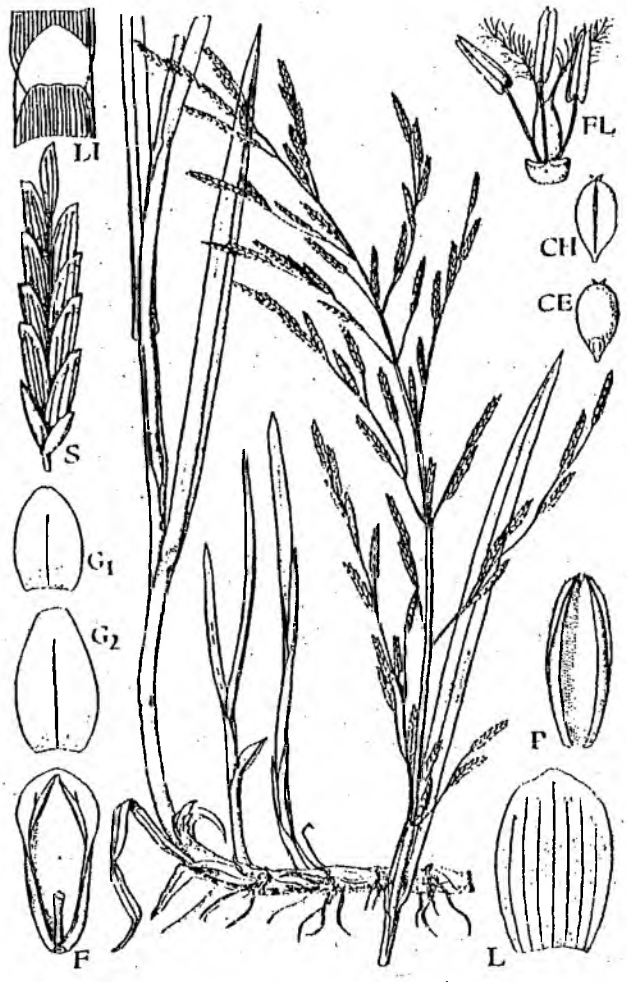
Spikelets (S, ×3) narrowly oblong, slightly compressed, 1·3–2·5 cm long, 1·5–2 mm wide, 8–15-flowered, breaking up at maturity beneath each lemma, green, or purplish. Glumes (G_1, G_2, ×6) persistent, ovate to oblong, blunt, membranous, usually 1-nerved, smooth; lower 1·5–2·5 mm long; upper 2·5–3 mm long. Lemmas (F, L, ×6) overlapping, much exceeding the glumes, broadly elliptic-oblong, usually with a broad 3-lobed or 3-toothed tip, 4–5 mm long, becoming firm except for the thin whitish apex, 7-nerved, minutely rough. Paleas (P, ×6) narrowly elliptic, narrowed into a sharply 2-toothed tip, this usually slightly projecting from the tip of the lemma, with the two keels narrowly winged. Anthers (ST, ×6) 0·8–1 mm long, purple or yellow. Grain (CE, CH, ×6) chestnut brown, 2–2·3 mm long, enclosed by the hardened lemma and palea. *Ch. no.* 2n = 20.

Widely distributed in the British Isles, probably occurring in almost every county, but its exact range is not yet known, owing to confusion in the past with *G. fluitans*; on muddy or dried-up margins and in the shallow water of ponds, ditches and streams, moderately common; less frequent than *G. fluitans*. Grazed by cattle with other aquatic grasses. Throughout W. Europe, from S. Norway and Sweden to S. Spain and Corsica; Madeira; also in the United States. Flowering: June to September.

Distinguished from other British species of *Glyceria* by the 3-toothed or 3-lobed tips of the lemmas and by the sharply 2-toothed tips of the paleas. A rather rare hybrid between *G. declinata* and *G. fluitans* may be recognized by its persistent spikelets, 5–5·5 mm long blunt lemmas, and the 0·5–1·8 mm long sterile anthers.

PLICATE SWEET-GRASS

Glyceria plicata Fries



Glyceria plicata. Frequent; wet places.

Perennial, 30–75 cm high, forming tufts or loose patches. Culms ascending from a prostrate base, rooting at the nodes, branched in the basal portion, unbranched above, slender to relatively stout, spongy, smooth. Leaves green; sheaths entire, keeled, rough or minutely hairy; ligules (LI, ×2) oblong, membranous, whitish, 2–8 mm long; blades pointed, 5–30 cm long, folded or flat, 3–14 mm wide, rough on both sides, or nearly smooth above. Panicles commonly rather broad, lanceolate to oblong, or broadly ovate, loose, 10–45 cm long; branches finally widely spreading, the lower in clusters of 2–5, with one branch longer than the rest and up to 12 cm long, the others shorter and with one to few spikelets, slender, rough; pedicels 1–6 mm long.

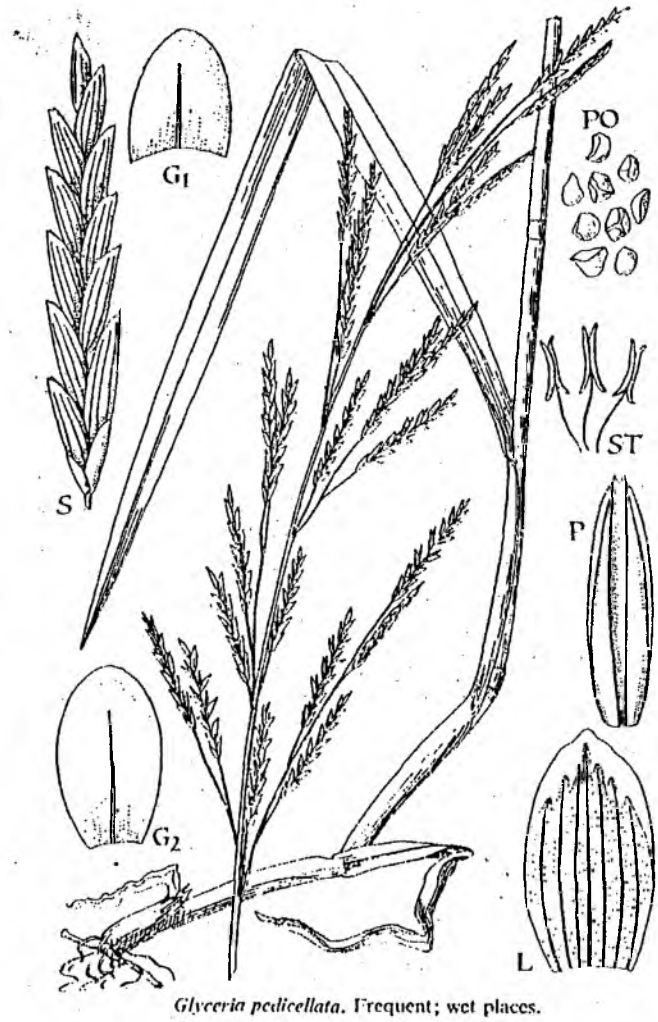
Spikelets (S, ×3) linear-oblong, at first cylindrical, later slightly compressed, 10–25 mm long, 1·5–2 mm wide, 7–16-flowered, green or purplish, breaking up at maturity beneath each lemma. Glumes (G_1, G_2, ×6) persistent, oblong to broadly elliptic, very blunt, membranous, 1-nerved; lower 1·5–2·5 mm long; upper 2·5–4 mm long. Lemmas (F, L, ×6) overlapping, later with incurved margins, rounded on the back, broadly elliptic to broadly obovate-oblong, very blunt, 3·5–5 mm long, prominently 7-nerved, firm except for the broad thin whitish tip, minutely rough. Paleas (P, ×6) oblong, very blunt, as long as or usually shorter than the lemmas, narrowly winged on the two keels. Anthers (FL, ×8) 1–1·5 mm long. Grain (CE, CH, ×6) about 2 mm long, enclosed by the hardened lemma and palea. *Ch. no.* 2n = 40.

This species of Sweet-grass is generally distributed throughout England, and extends to S. Scotland; it occurs also in Wales and in widely scattered localities in Ireland; in ponds, ditches, streams, and swampy places; usually less frequent than *G. fluitans*. Widespread in Europe; also in W. Asia and N. Africa. Flowering: June to August.

As in other species of *Glyceria*, its luscious foliage is eagerly grazed by cattle, whilst its seeds are eaten by water-fowl. It may be distinguished from *G. fluitans* by its rough or minutely hairy leaf-sheaths, usually much-branched wider panicles, very blunt shorter lemmas and the smaller anthers. *G. maxima* is much taller and stouter, with longer leaf-blades, wider spikelets, and smaller lemmas.

HYBRID SWEET-GRASS

Glyceria pedicellata Towns.



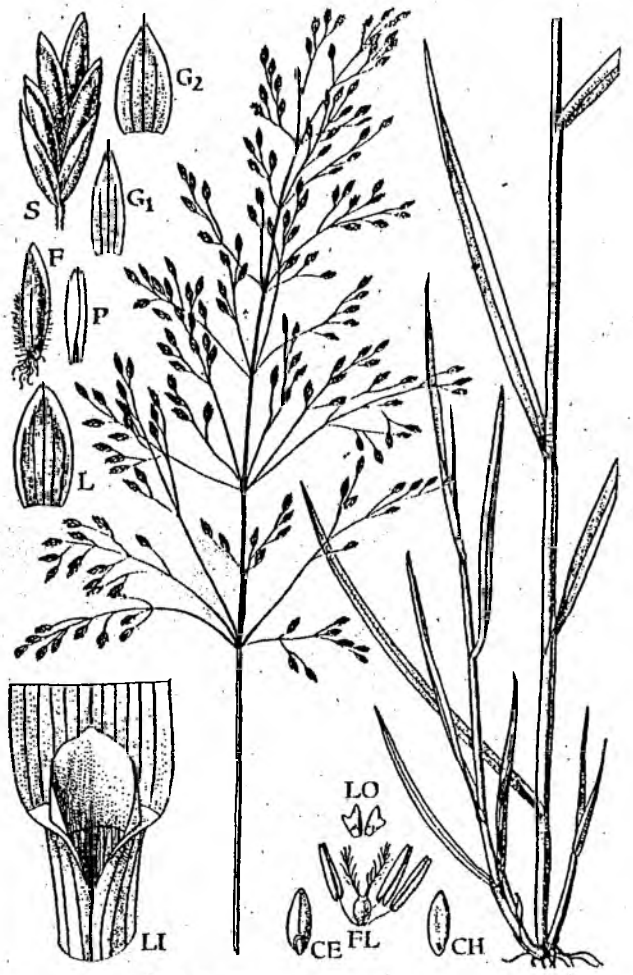
Glyceria pedicellata. Frequent; wet places.

Perennial, up to 1 m high, sometimes in large patches, and with long floating runners. Culms ascending from an extensively creeping branched base, slender to rather stout, fleshy, smooth. Leaves green, hairless; sheaths often minutely rough towards the blades, or quite smooth; ligules oblong, membranous, whitish, up to 10 mm long; blades abruptly pointed or rather blunt, up to 35 cm long, folded or flat, 5–12 mm wide, rough on the nerves beneath and sometimes above, or smooth except for the rough margins. Panicles lanceolate to oblong, loose, 10–50 cm long; branches erect or finally spreading, slender, mostly in pairs or threes in the lower part of the panicle, singly above or sometimes throughout, unequal, the longer up to 11 cm long, and bearing up to 9 spikelets, the shorter branches with 1 or 2 spikelets, smooth; pedicels 1–6 mm long.

Spikelets (S, ×3) linear-oblong, becoming slightly compressed, 1·5–3·5 cm long, 9–16-flowered, green, rarely purplish, more or less persistent. Glumes (G_1, G_2, ×6) broadly oblong to broadly elliptic, blunt, very thin, whitish, 1-nerved; lower 2–3 mm long; upper 3–4·5 mm long. Lemmas (L, ×6) overlapping, rounded on the back, elliptic-oblong, very blunt, 4–6 (mostly 5–5·5) mm long, firm except for the whitish membranous apex, prominently 7-nerved, minutely rough. Paleas (P, ×6) as long as the lemmas, oblong, shortly 2-toothed, with the keels narrowly winged in the upper part. Anthers (ST, ×6) pale yellow, 1–1·8 mm, remaining closed, with imperfect pollen (PO). *Ch. no.* 2n = 40.

This male-sterile hybrid is the offspring of the cross between *G. fluitans* and *G. plicata*. It is widely distributed in England, being recorded from many localities between Cornwall and Kent and northwards to Northumberland, but is most frequent in the south. It is known also from scattered localities in Scotland and Ireland and no doubt occurs in Wales. Also in W. Europe. The hybrid may grow with one or both parents, or more often alone, in shallow ponds, streams, ditches, and in boggy depressions in pastures. Flowering: June to August.

'Hybrid Sweet-grass' may be recognized by its persistent spikelets (those of the species readily breaking up at maturity for the dispersal of the seed) and by the sterile anthers. Its lemmas and anthers are smaller than those of *G. fluitans* and mostly slightly longer than those of *G. plicata*. It is a vigorous hybrid, its luxuriant succulent growth being much relished by cattle.



Poa palustris. Rare; wet places.

SWAMP MEADOW-GRASS

Poa palustris L.

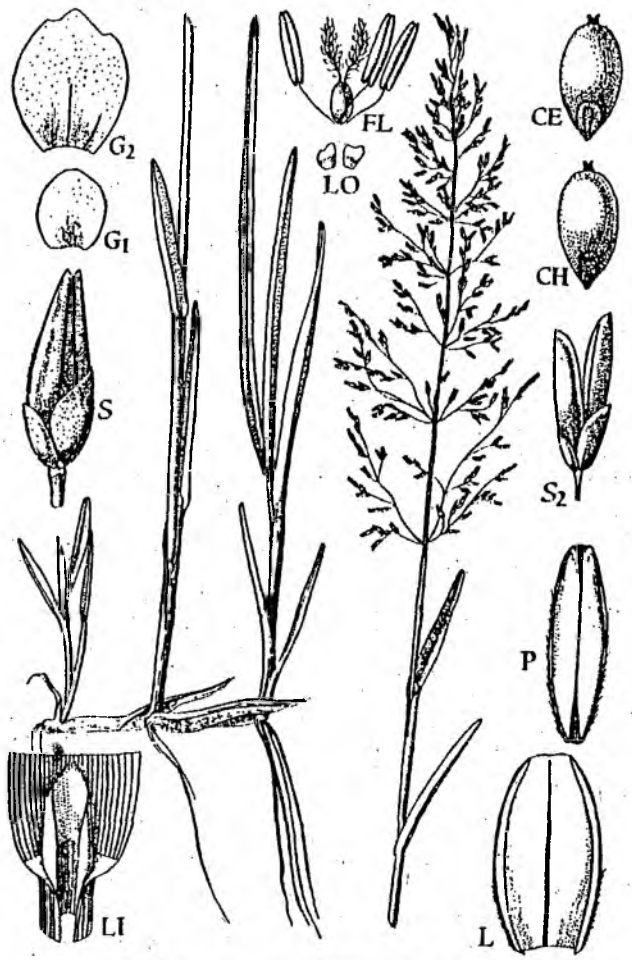
A short-lived loosely tufted perennial, 30–150 cm high, without rhizomes. Culms erect or spreading, sometimes bent and rooting at the base, slender to relatively stout, usually unbranched, 3–4-noded, smooth. Leaves green, hairless; sheaths smooth, the lower slightly keeled; ligules (LI, ×6) oblong, 2–5 mm long, membranous; blades pointed, up to 20 cm long, flat, 2–4 mm wide, usually flaccid, rough. Panicles ovate to oblong, open and loose, erect or mostly nodding, 10–30 cm long, up to 15 cm wide, yellowish-green or purplish; branches mostly in distant clusters of 3–6, spreading, fine, flexuous, rough, bare and undivided in the lower part, loosely divided above; pedicels 1–5 mm long.

Spikelets (S, ×6) ovate to oblong, compressed, 3–5 mm long, 2–5-flowered, breaking up at maturity beneath each lemma. Glumes (G_1, G_2, ×6) persistent, equal or slightly unequal, finely pointed, keeled, rough on the keels; lower lanceolate, 2–3 mm long, 1–3-nerved; upper narrowly ovate or elliptic, 2·5–3 mm long, 3-nerved. Lemmas (F, L, ×6) overlapping, narrowly oblong and rather blunt in side view, 2·5–3 mm long, keeled, usually with golden or brownish tips, finely 5-nerved, firm except for the membranous tip and margins, the keels and marginal nerves fringed below the middle with short white hairs, also with longer crinkled hairs at the base. Paleas (P, ×6) about as long as the lemmas, with two rough keels. Anthers (FL, ×6) 1·3–1·5 mm long. Grain (CE, CH, ×6) tightly enclosed by the hardened lemma and palea. *Ch. no.* 2n = 28, 42.

Although this grass is widespread in Europe, temperate Asia, and N. America, its occurrence in the British Isles may be due entirely to its past cultivation as a fodder grass. It was introduced for this purpose about 1814 and on several occasions since, but apparently it is not so useful here as a grazing or hay plant as in N. America, where it is known as 'Fowl Blue-grass'. In the lowland districts of the British Isles it is now established in a few widely scattered localities on river and pond margins, and in marshy places; occasionally it occurs also on waste ground and port rubbish dumps. Flowering: June and July.

Poa palustris may be distinguished from *P. nemoralis* by its much longer ligules, from *P. trivialis* by its smooth leaf-sheaths, blunt ligules and obscurely nerved bronze-tipped lemmas, and from *P. pratensis* by its longer ligules and the absence of rhizomes.

Vegatatively very very similar to small Glyceria species but it is much softer in appearance, often reddish and rooting at the nodes of the creeping shoot, and with very rounded (cf pointed) hooded tips. The leaves also taper from the upper sixth of the leaf (cf upper third) and the 'V' shape of the leaf is much less distinct. In flower it is clearly different with its much smaller, finer, inflorescences.



Catabrosa aquatica. Uncommon; wet places.

WATER WHORL-GRASS
Catabrosa aquatica (L.) Beauv.

A creeping perennial, 10–60 cm high, spreading by stolons and rooting at the nodes. Culms erect or ascending from a bent base, slender to somewhat stout, succulent, unbranched, smooth. Leaves hairless, smooth; sheaths compressed, with free margins, the lower overlapping, the basal often purplish; ligules (LI, ×3) 2–8 mm long, whitish, membranous; blades equally wide throughout, blunt, folded when young, afterwards flat, 4–14 cm long, 2–10 mm wide, rather thin, bright green. Panicles ovate to oblong, loose, 5–30 cm long, 2·5–10 cm wide, erect; branches clustered, spreading, very slender, minutely rough; pedicels short.

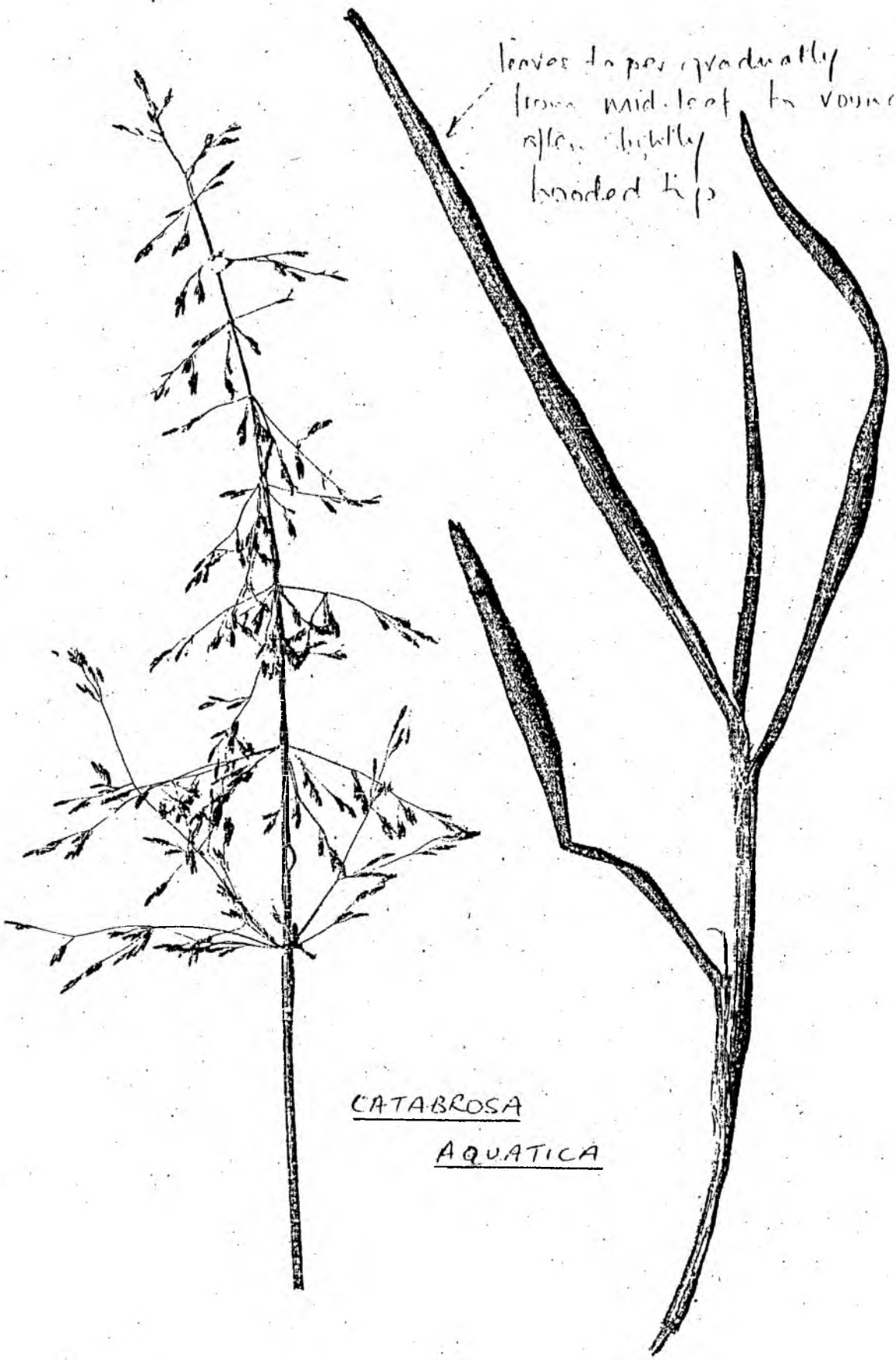
Spikelets (S, ×10, S_2, ×6) ovate to oblong, loosely 1–3-flowered, 3–5 mm long, breaking up at maturity beneath each lemma, green, yellow, or brown, often variegated with purple. Glumes (G_1, G_2, ×10) persistent, thinly membranous, smooth, blunt, unequal, purple or white; lower ovate to elliptic, 1–1·5 mm long; upper broader, 1·5–2·5 mm long. Lemmas (L, ×10) elliptic-oblong to oblong, rounded on the back, truncate, 2·5–3·5 mm long, firmly membranous except for the whitish tips, prominently 3-nerved, smooth, or with the nerves minutely hairy. Paleas (P, ×10) as long as the lemmas, 2-keeled, smooth, or minutely hairy on the keels. Anthers (FL, ×6) 1·5 mm long. Grain (CE, CH, ×12) loosely enclosed between the lemma and palea. *Ch. no.* 2n = 20.

An aquatic grass, irregularly distributed in the British Isles, generally rather uncommon and of local occurrence, and in some districts rare; on the muddy margins of ponds, slow-running streams, in ditches and swampy places, sometimes floating in shallow water, preferring rich soils. Also throughout Europe, N.W. Africa, temperate Asia, and N. America. Flowering: May to July.

On account of its sweet stems and succulent foliage it is eagerly grazed by cattle; this factor, together with improved land-drainage systems, the clearing of ditches and ponds, are no doubt responsible for its disappearance from some localities.

Plants from the north coast of Scotland, with larger lemmas than usual (up to 4 mm long), have been named var. *grandiflora* Hack. Other plants from poor wet sandy soils near the sea at various places on our west and northern coasts have been referred to var. *littoralis* Parn.; they have shorter culms, leaves, and panicles, and 1-flowered spikelets.

Vegetatively similar to small Glyceria species but the leaves are softer and only exhibit the 'V' shape when young and the tips are much more rounded. The flowers are smaller too.



CATABROSA
AQUATICA

(126A)

Deschampsia caespitosa. Very common; wet grassland, etc.

TUFTED HAIR-GRASS

Deschampsia caespitosa (L.) Beauv.

A densely tufted perennial, 20–200 cm high, forming large tussocks. Culms erect, or slightly bent at the base, moderately slender to stout, stiff, 1–3-noded, smooth. Leaves hairless, green; sheaths rounded on the back, or somewhat keeled, smooth, or rough upwards; ligules (LI, ×4) narrow, up to 15 mm long; blades sharply pointed or somewhat blunt, 10–60 cm long (rarely less), flat or rolled, 2–5 mm wide, coarse, ribbed above, with the ribs and margins very rough, smooth beneath. Panicles open, loose, rarely contracted, erect or nodding, ovate to oblong, 10–50 cm long, up to 20 cm wide, green, silvery, golden, purple, or variegated with these colours; branches very slender, spreading, rough, bare below; pedicels 1–6 mm long.

Spikelets (S, ×6) loosely scattered or clustered, lanceolate to narrowly oblong, 4–6 mm long, 2-flowered (FS), breaking up at maturity beneath each lemma; axis hairy (R). Glumes (G_1, G_2, ×6) persistent, as long as the spikelet or slightly shorter, keeled, membranous, shining, equal or nearly so, pointed; lower narrowly lanceolate, 1-nerved; upper wider, 3-nerved. Lemmas (FS, L, ×6) enclosed in the glumes or with their tips protruding, rounded on the back, 3–4 mm long, oblong, with a broad toothed tip, membranous, finely 5-nerved, bearded at the base, with a fine straight awn up to 4 mm long from near the base. Paleas (P, ×6) slightly shorter than the lemmas. Anthers (FL, ×6) 1·5–2 mm long. Grains (C, CE, CH, ×6) enclosed by the thin firm lemma and palea. *Ch. no.* 2n = 26 (28).

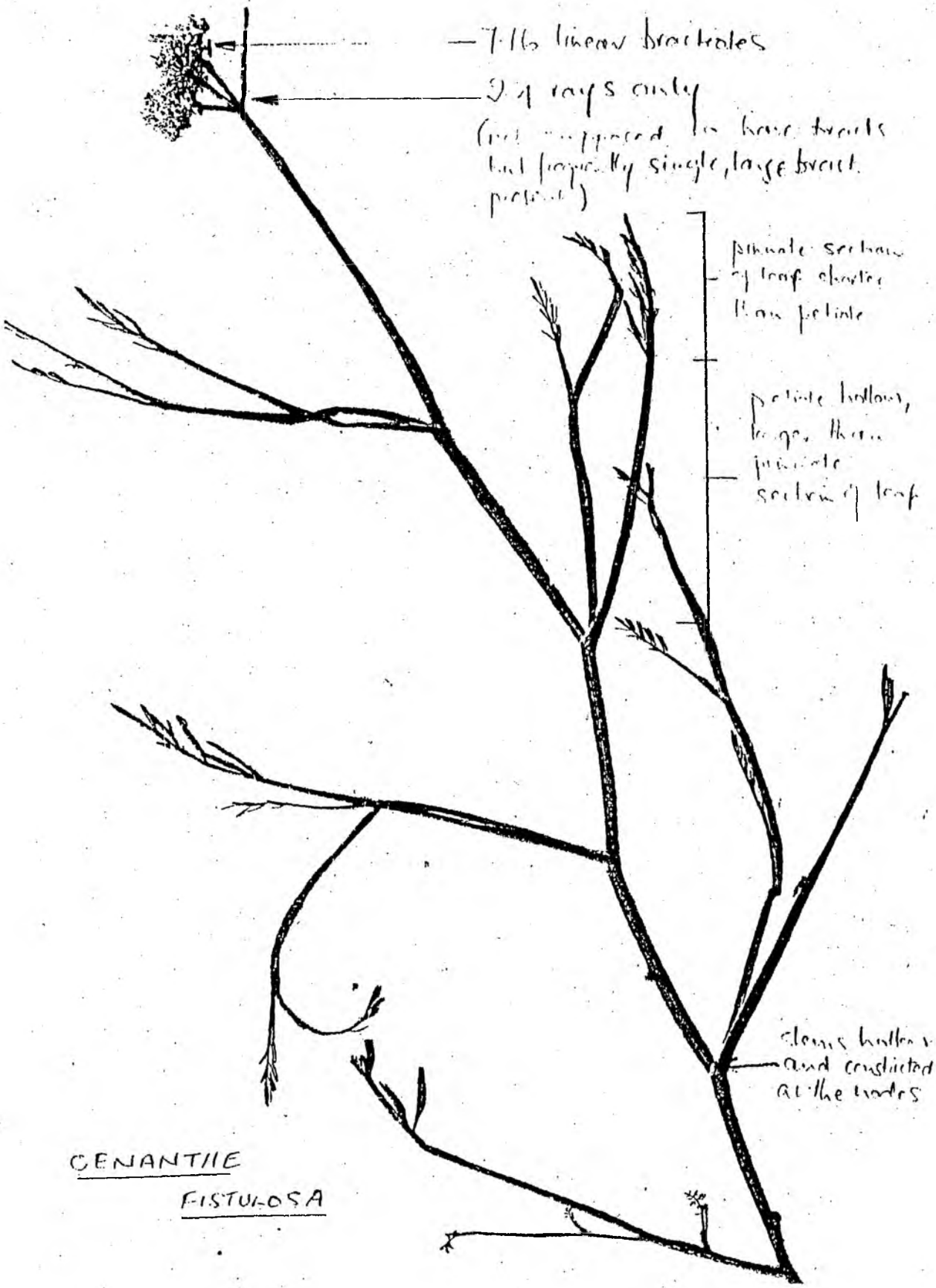
A coarse worthless grass of wet and badly drained soils, common throughout the British Isles, often very abundant in marshy fields, rough grassland, and moorland; from low altitudes up to about 4,000 ft on Scottish mountains. Widely distributed in temperate and arctic regions, occurring on mountains in tropical Africa and Asia. Sometimes called 'Tussock-grass' or 'Hassocks'. Flowering: June to August.

A rather variable grass, especially in size, length of leaves and in the colour of the spikelets. One variant, var. *parviflora* (Thuill.) Coss. & Germ., of damp shady places, is frequent on heavy soils in the oak woods of S. England, and extends to Central Scotland. It differs from typical *D. caespitosa* in having narrower leaf-blades (up to 2·5 mm wide) and smaller spikelets (2·5–3·5 mm long).

The beautiful panicles of 'Tufted Hair-grass' may be used in the fresh or dried state for decorative purposes.

A grass growing in a distinct tuft and never straggling. Leaves are stiff and without a midrib, the upper surface being very rough and characterised by 5-7 linear raised ribs; when stroked between the fingers from bottom to top the leaf is relatively smooth - from top to bottom it is impossible to move your fingers due to the upward facing teeth on the raised ribs on the upper surface.

There are four spp. with spatulate or linear upper leaves. Floral characters of these four spp. (O. fistulosa, O. pimpinelloides, O. silaifolia and O. lachenalii) are diagnostic and given in TUTIN (1980). However, it should be possible to separate them on vegetative characters alone. O.fistulosa has hollow petioles which are longer than the pinnate section of the leaf. The stems are fistula and contricted at the nodes. The other three species are similar in having solid or flattened petioles which are shorter than the pinnate section of the leaf. O. pimpinelloides has solid stems and tubers with very rounded tips whereas O. silaifolia has hollow stems and thickened, fusiform tubers. The stems of the former are more strongly grooved. O. lachenalii has cylindrical tubers similar to O. silaifolia, but narrower, and a stem which is solid except for a small cavity in old stems.



OENANTHE
FISTULOSA

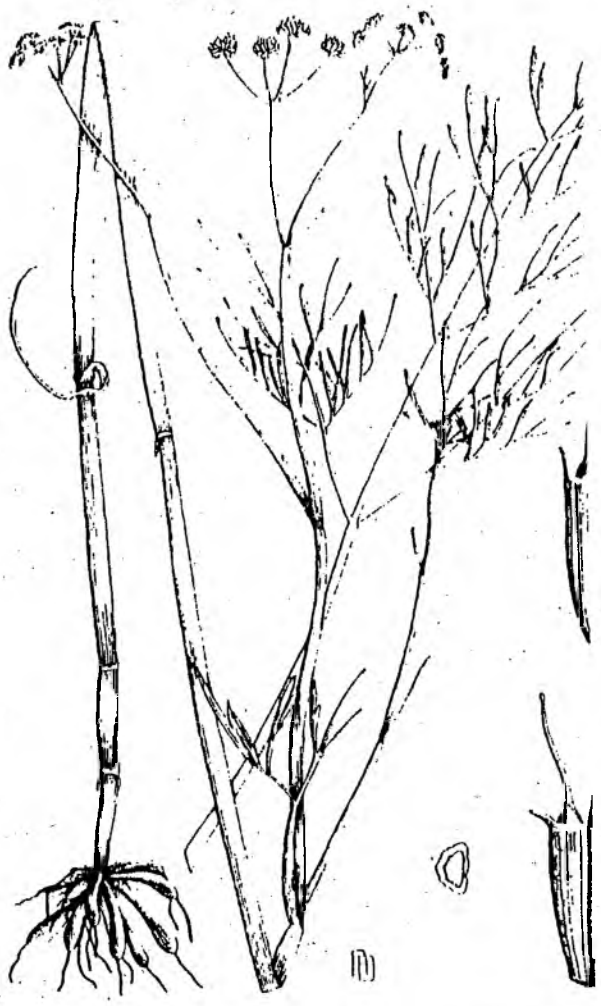
26. Oenanthe silaifolia Bieb.

Narrow-leaved Water-Dropwort

A glabrous perennial. *Roots* with obovoid or fusiform tubers which taper towards their junction with the stem. *Stems* up to 100 × 0.7 cm, solid at the base, hollow above, grooved and striate. *Lower leaves* 2- to 4-pinnate, long-petiolate, soon withering, the lobes usually 10–30 mm, linear to linear-lanceolate; *upper leaves* 1- to 2-pinnate, with linear-lanceolate lobes, the petiole shorter than the blade. *Umbels* compound, with 4–8(–10) smooth rays 1.5–3 cm long, thickening after flowering; peduncle longer than the rays; terminal umbels with long-pedicellate male flowers and shortly pedicellate hermaphrodite flowers, the lateral umbels with male flowers. *Bracts* usually absent; bracteoles 10–17, lanceolate, acute. *Partial umbels* not flat-topped in fruit, the pedicels thickening after flowering. *Flowers* white; sepals conspicuous, acute, persistent; outer petals somewhat radiating; styles with enlarged base, forming the stylopodium. *Fruit* 3–3.5 mm, cylindrical; commissure broad; mericarps with prominent ridges; carpophore present; vittae solitary; styles shorter than the fruit, erect to somewhat divergent; stigma tapering. *Cotyledons* abruptly contracted into a petiole. 2*n* = 22*. Flowering in June.

Wet meadows, usually near rivers, very local and apparently decreasing. South and east of a line from the Severn to the Wash with outlying stations in Worcestershire and Nottinghamshire. W., C. and S. Europe, S.W. Asia, N.W. Africa.

Similar to *O. pimpinelloides* when in flower, but easily distinguished by all the leaves having linear to linear-lanceolate, entire lobes, while the lower leaves of *O. pimpinelloides* have lanceolate to ovate, toothed or pinnatifid lobes.

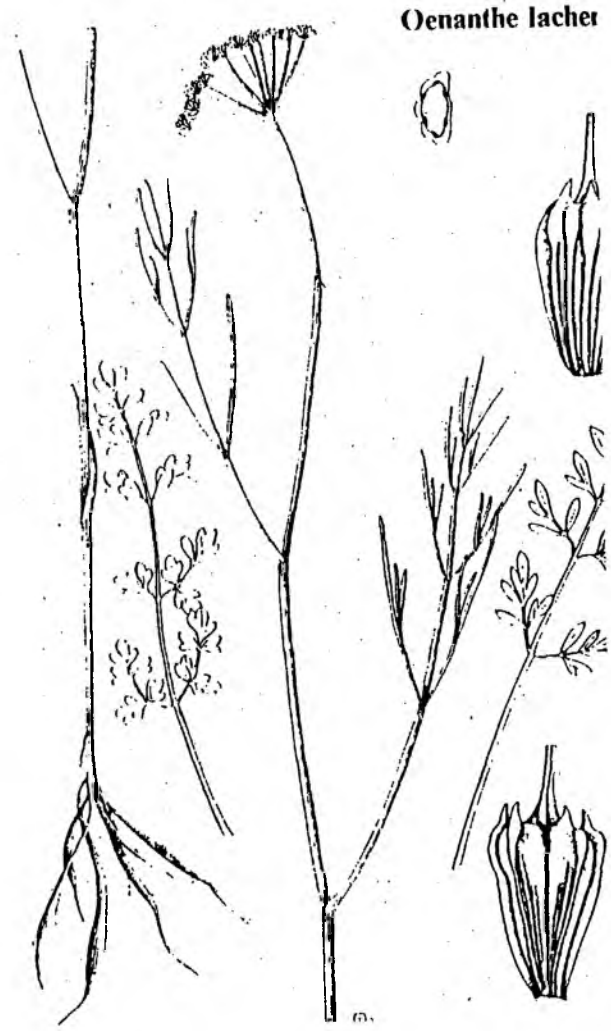


Oenanthe lachenalii C. C. Gmelin

Parsley Water-Dropwort

A glabrous perennial. *Roots* tuberous, cylindrical or fusiform. *Stems* up to 100 cm, c. 0.4 cm, solid, sometimes developing a small cavity when old, striate. *Lower leaves* (1–)2(–3)-pinnate, long-petiolate, soon withering, the lobes usually 10–20 mm, linear to spathulate or rarely narrowly obovate, entire or sometimes pinnatifid; *upper leaves* 1- to 2-pinnate, with linear to linear-lanceolate lobes usually 15–50 mm, the petiole shorter than the blade. *Umbels* compound, with 5–9(–20) smooth rays usually 1–3 cm long, not thickening after flowering; peduncle longer than the rays; umbels all with male and hermaphrodite flowers, the proportion of the latter decreasing in the later lateral umbels. *Bracts* up to c. 5, subulate or linear-lanceolate; bracteoles usually 5–7, oblong-lanceolate, acute. *Partial umbels* not flat-topped in fruit; pedicels not thickening after flowering. *Flowers* white; sepals conspicuous, acute, persistent; outer petals somewhat radiating; styles with enlarged base, forming the stylopodium. *Fruit* c. 2.5 mm, ovoid; commissure broad; mericarps with prominent slender ridges; carpophore present; vittae solitary; styles shorter than the fruit, divergent or recurved; stigma tapering. *Cotyledons* abruptly contracted into a petiole. 2*n* = 22*. Flowering from June to September.

In marshes and fens, often near the coast and in somewhat brackish places. Much of the British Isles, but absent from N. Scotland and many inland areas. W. Europe, extending eastwards to Poland and Jugoslavia; Algeria (very rare).



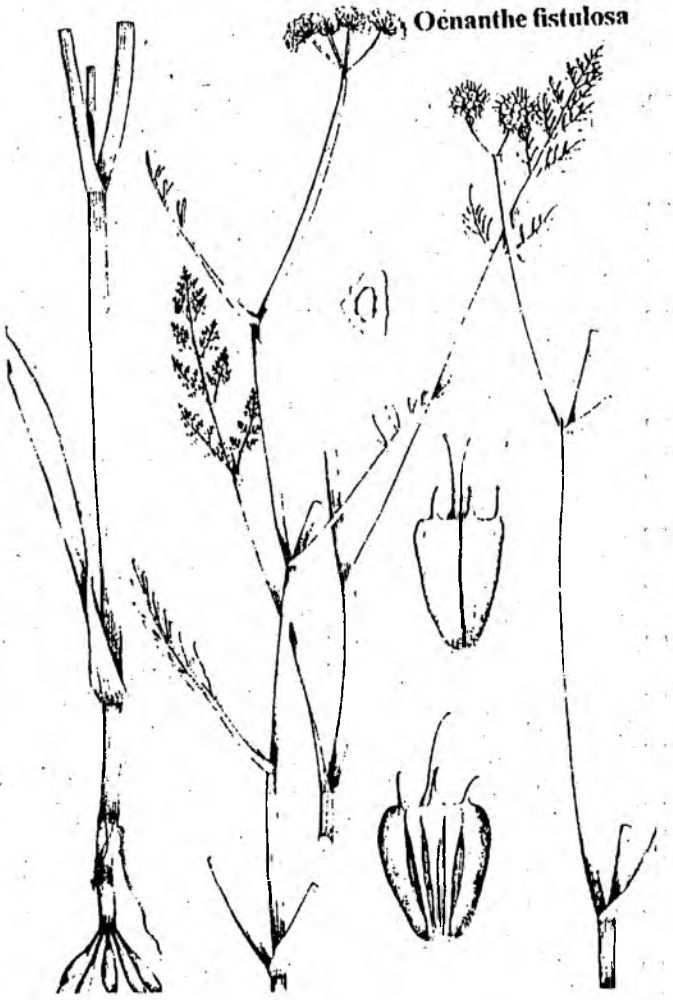
24. Oenanthe fistulosa L.

Tubular Water-Dropwort

A glabrous, stoloniferous perennial. *Roots* tuberous, fusiform. *Stems* up to 80 c. 0.5 cm, fistular, often constricted at the nodes, striate. *Leaves* 1 to 2(3)-pinnate, oblong to lanceolate in outline, the lobes linear to lanceolate; basal leaves 2-pinnate, sometimes submerged, soon withering, the cauline mostly 1-pinnate with entire lobes 0.5 2 cm; petioles of cauline leaves fistular, longer than the blade. *Umbels* compound, with 2 4 rays usually 1 3 cm long, thickening after flowering; peduncle longer than the rays; terminal umbels with hermaphrodite and some male flowers, the lateral umbels with male flowers. *Bracts* absent; bracteoles 7 16, linear. *Partial umbels* globose in fruit, the pedicels thickening after flowering. *Flowers* white or pinkish; sepals conspicuous, acute, persistent; outer petals somewhat radiating; styles with enlarged base, forming the stylopodium. *Fruit* 3 4 mm, obconical to cylindrical; commissure broad; mericarps with inflated corky ridges; carpophore present; vittae solitary; styles at least as long as the fruit, erect; stigma a small knob. *Cotyledons* abruptly contracted into a petiole. *2n* 22*. Flowering from July to September.

Marshy places and shallow water, mainly in the eastern half of England, very local in Scotland and Wales and mainly in the eastern half of Ireland. Most of Europe, W. Asia and N.W. Africa.

The genus contains about 35 species in Europe, temperate Asia and North Africa.

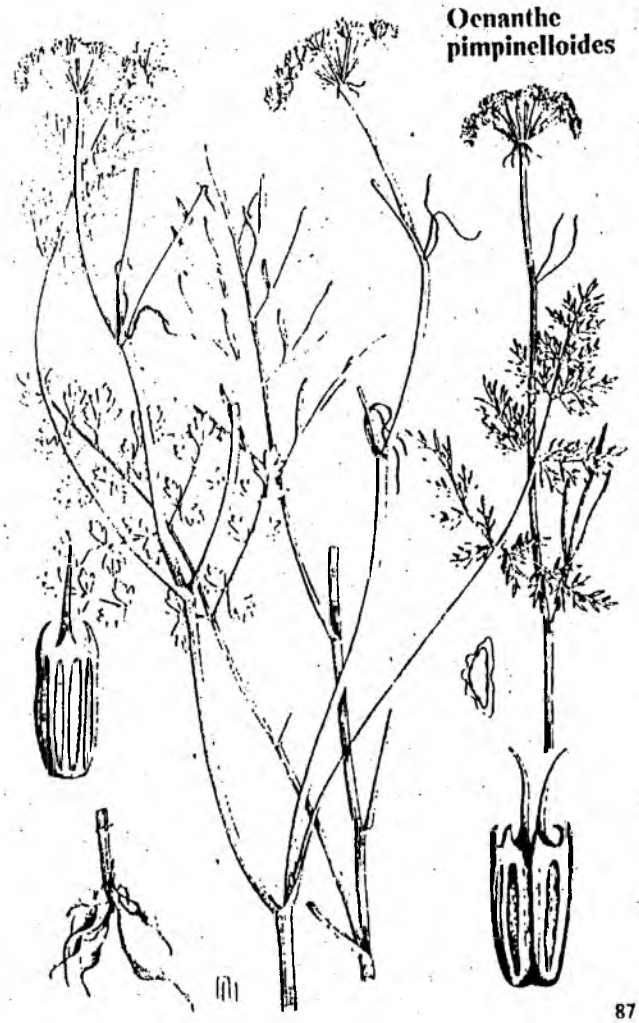


5. Oenanthe pimpinelloides L.

Corky-fruited Water-Dropwort

A glabrous perennial. *Roots* with ovoid tubers distant from the base of the stem. *Stems* up to 100 0.5 cm, solid, strongly grooved. *Lower leaves* 2-pinnate, long-petiolate, the lobes c. 5 mm, lanceolate to ovate, cuneate at the base, deeply toothed or pinnatifid; *upper leaves* 1- to 2-pinnate, the blade at least as long as the petiole, and the lobes 10 30 mm, linear, entire. *Umbels* compound, with 6 15 smooth rays 1 2 cm long, thickening after flowering; peduncle longer than the rays; terminal umbels with long-pedicellate male flowers and shortly pedicellate hermaphrodite flowers, the lateral umbels with male flowers. *Bracts* 1 5, linear to linear-lanceolate; bracteoles 12 20, linear to linear-lanceolate. *Partial umbels* flat-topped in fruit, the pedicels thickening after flowering, especially near their glabrous apex. *Flowers* white; sepals conspicuous, acute, persistent; outer petals somewhat radiating; styles with enlarged base, forming the stylopodium. *Fruit* c. 3.5 mm, cylindrical; commissure broad; mericarps with prominent ridges; carpophore present; vittae solitary; styles about as long as the fruit, erect; stigma a small knob. *Cotyledons* abruptly contracted into a petiole. *2n* 22. Flowering in June and July.

In damp meadows and other moist grassy places. Locally common from E. Devon and N. Somerset to Hampshire, very local elsewhere south of a line from Worcestershire to Essex; formerly in one locality in Co. Cork. W. and S. Europe, S.W. Asia.



RORIPPA SPP

Inc. NASTURTIUM SPP

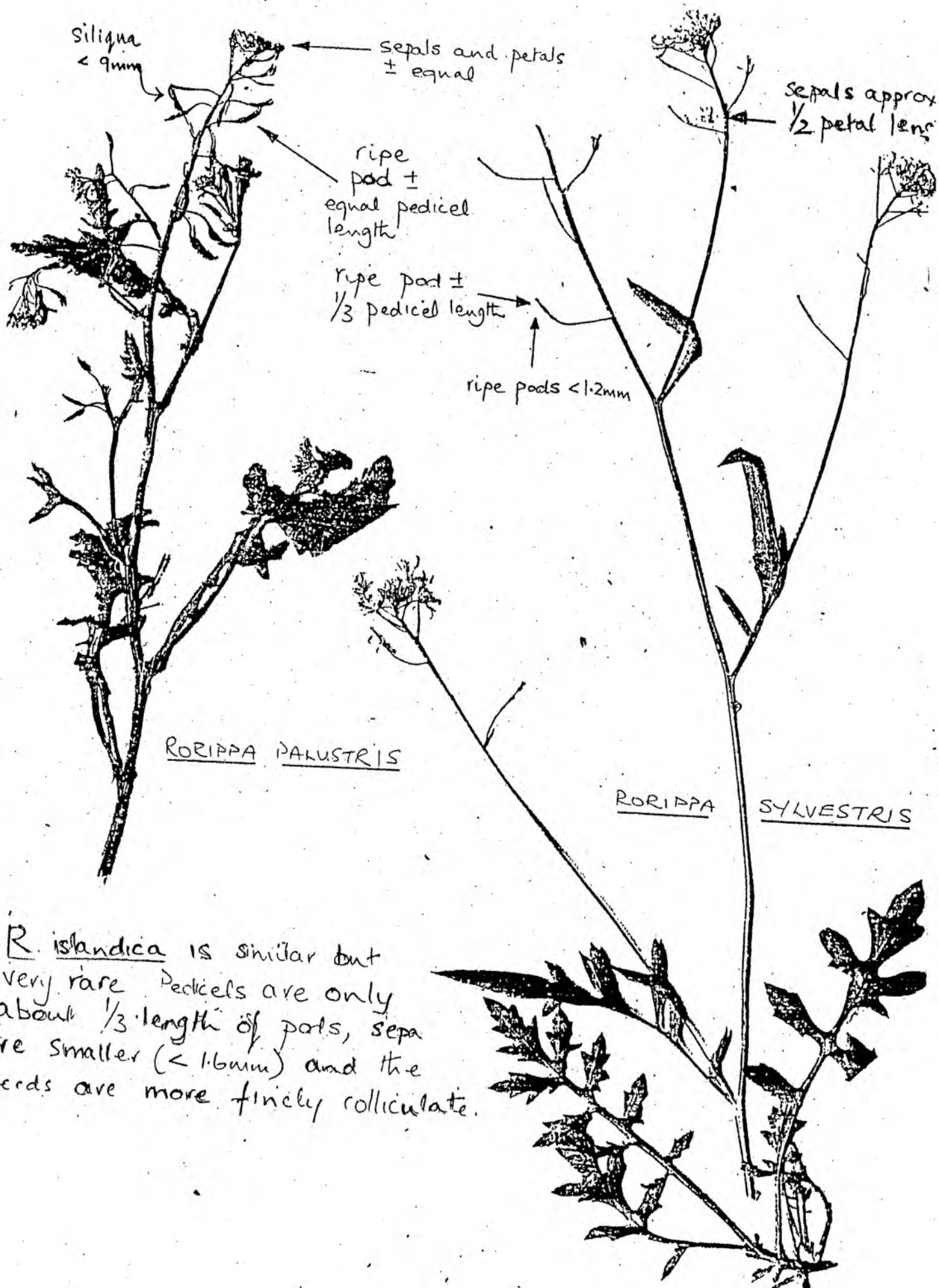
	NASTURTIUM-AQUATICUM	MICROPHYLLA	STERILIS (N-A x MICRO)	AMPHIBIA	AUSTRIACA	ISLANDICA	PALUSTRIS	SYLVESTRIS	AMPHIB x PAL.	AMPHIB x SYLV
PETALS WHITE + PETALS YELLOW —	+	+	+	−	−	−	−	−	−	−
SEEDS IN ROWS (+) / ROWS	−	+	deformed							
SILIQUA LENGTH (mm)	13-19	16-22								
DEPRESSIONS ON SEED COAT	c. 25	c. 100								
LEAVES PURPLE IN AUTUMN		+	+							
STOMATAL INDEX (%)	18	11	15							
SILIQUA LENGTH/ PEDICEL RATIO				1/5	1/2	2-3	1-2	± 1	INTERMEDIATE	INTERMEDIATE
SILIQUA LENGTH (mm) 1.5-3(+) 3-9(-) > 9 (○)				−	+	−	−	0		
SILIQUA/ PEDICEL CHARACTERS										
PETAL/SEPAL RATIO PETAL 7 1.5x SEPALS (+) ± equal length				+	±	−	−	+	+	+
STEM LEAVES WITH OBVIOUS AURICLES				−	+	−	+	−	+	−

Seed

WHITE FLOWERS

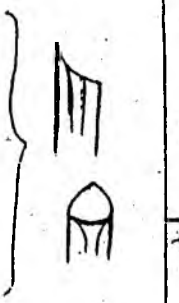
YELLOW FLOWERS

R. islandica hort
siliqua 9-18mm.



R. islandica is similar but very rare. Pedicels are only about 1/3 length of pods, sepa are smaller (< 1·6mm) and the seeds are more finely colliculate.

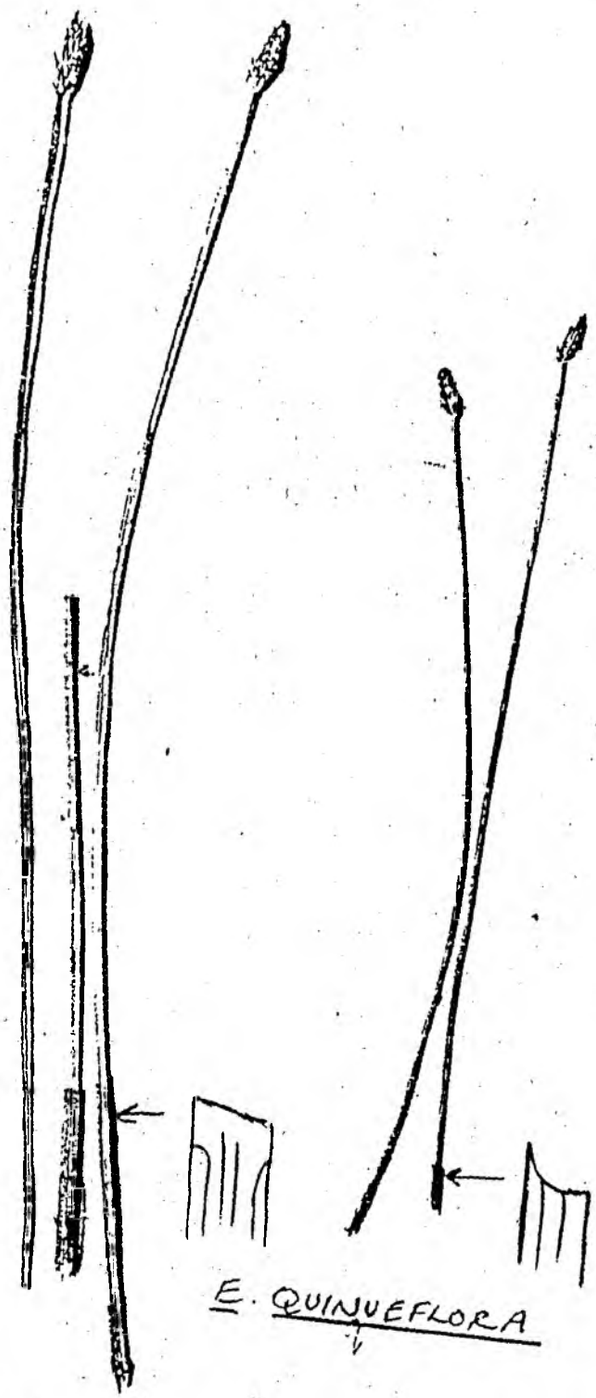
ELEOCHARIS

	lowest glume > ½ length of spikelet	no. of stigmas	glume length	style enlarged	perianth bristles	SHEATH CHARACTERS	DIAGNOSTIC FEATURES
PARVULA	+	3	2				spikelets green
ACICULARIS	+	3	2	+			stems usually 4 angled
QUINQUEFLORA	+	3	5	+			few stems/tuft, thin white runners, sheath reddish-brown
MULTICAULIS		3	5				no runners, sheath reddish brown,
PALUSTRIS		2			4 < NUT		 sterile bottom glume encircling base
UNIGLUMIS		2			ABS		
AUSTRIACA		2			5-6 > NUT		

To be certain of determination fruits are required for all but E. acicularis and E. multicaulis The above information should, however, aid determination to a group or even species without fruits present.

ELEOCHARIS

Characteristic genus with terminal, solitary, spikelets. Determination is frequently possible from inspection of the apex of the basal sheaths and/or the flower spikes. See separate sheet.



E. QUINUEFLORA

ELEOCHARIS PALUSTRIS

ELEOCHARIS MULTICAULIS

CALLITRICHE L. (from Wigginton and Graham)

The identification of Callitriche species often presents the recorder with considerable difficulties, for three main reasons:

i) the frequent absence or scarcity of fruiting plants
ii) the variability of leaf characters (whose morphology depends greatly upon the habitat
iii) the requirement for microscopical examination

Although leaves are very variable, plants can often be assigned to a particular species on leaf-shape alone. In many cases, however it is necessary to confirm the diagnosis by reference to fruiting and other characters. Terrestrial forms usually differ greatly in morphology from the aquatic forms, and even when fruit is present, such plants can be impossible to name with certainty.

The anatomical details of the mericarps (= seeds in CTW and Ross-Craig) can be observed by stripping off the outer layer of cells.

1. Terrestrial.

2. Mericarp with rounded margin, not winged or keeled; pollen grains oblong-ellipsoid or slightly reniform (more than 70% at least twice as long as broad). C. obtusangula LeGall

2. Mericarp winged or at least bluntly-keeled; pollen grains variously-shaped, but few or none twice as long as broad.

3. Styles persistent, reflexed and closely appressed to sides of fruit; stamens short, 1-2mm. C. hamulata Kutz. ex Koch (C. intermedia Hoffm.)

3. Styles persistent, erect or recurved, not appressed to sides of fruit; stamens 2-3mm or more. It is not always possible to proceed further - see note below.

4. Styles arcuate-recurved; fruit pale brownish; mericarps broadly-winged; pollen-grains sub-globose, 18-24µm, all viable. C. stagnalis Scop.

4. Styles erect or patent; fruit brown; mericarps narrowly-winged; pollen-grains variously-shaped, 24-30µm, usually 15-30% sterile. C. platycarpa Kutz. (C. verna, auct.)

1. Aquatic.

5. All leaves submerged.

6. Leaves emarginate at apex; peltate hairs and stomata absent; styles caducous, recurved, not closely-appressed to sides of fruit; mericarps broadly-winged. C. hermaphroditica L.

6. Leaves with expanded, deeply emarginate ('spanner-like') apex; peltate hairs with 10-15(18) radiate cells; stomata present; styles persistent, reflexed and closely appressed to sides of fruit; mericarps narrowly-winged. C. hamulata Kutz ex Koch (C. intermedia Hoffm.)

5. Upper leaves forming a floating rosette.

7. Submerged leaves linear, with expanded, deeply-emarginate ('spanner-like') apex; peltate hairs with 10-15(18) radiate cells; styles reflexed and closely appressed to sides of fruit; mericarps narrowly-winged; stamens short, 1-2mm; anthers up to 2mm; pollen-grains colourless. C. hamulata Kutz ex Koch (C. intermedia Hoffm.)

7. Submerged leaves linear, narrowly-elliptical, or narrowly-rhombic, not with 'spanner-like' apices; peltate hairs with (6)8-10(12) radiate cells; styles recurved or patent, not closely appressed to sides of fruit; mericarps broadly- or narrowly-winged; stamens 2-3mm or more; anthers usually more than 2mm; pollen grains yellow.

8. Rosette-leaves rhombic, distinctly 3-ridged, giving the rosette a distinctive, corrugated appearance; submerged leaves narrowly-rhomboidal, becoming linear below; fruit-lobes with rounded margins; mericarps with rounded, scarcely discernible margin; pollen grains oblong-ellipsoid, more than 70% at least twice as long as broad.
C. obtusangula LeGall

8. Rosette-leaves not rhombic; submerged leaves narrowly-elliptical or linear; fruit-lobes keeled; mericarps winged; pollen grains never twice as long as broad.

9. Leaves pale-green, rosette-leaves broadly-elliptical or suborbicular, about twice as long as wide, submerged leaves narrowly-elliptical, never linear; fruit pale brownish; mericarps broadly-winged; stamens 2-3mm; pollen grains subglobose, 18-24µm, all viable.
C. stagnalis Scop.

9. Leaves often a deeper green (often with a bluish tinge), rosette-leaves elliptical, 2-4 x as long as wide, some or all submerged leaves linear, with emarginate apex; fruit brown; mericarps keeled or narrowly-winged; stamens 3mm; pollen grains variously-shaped, 24-30µm, usually 15-30% sterile. C. platycarpa Kutz (C. verna, auct.)

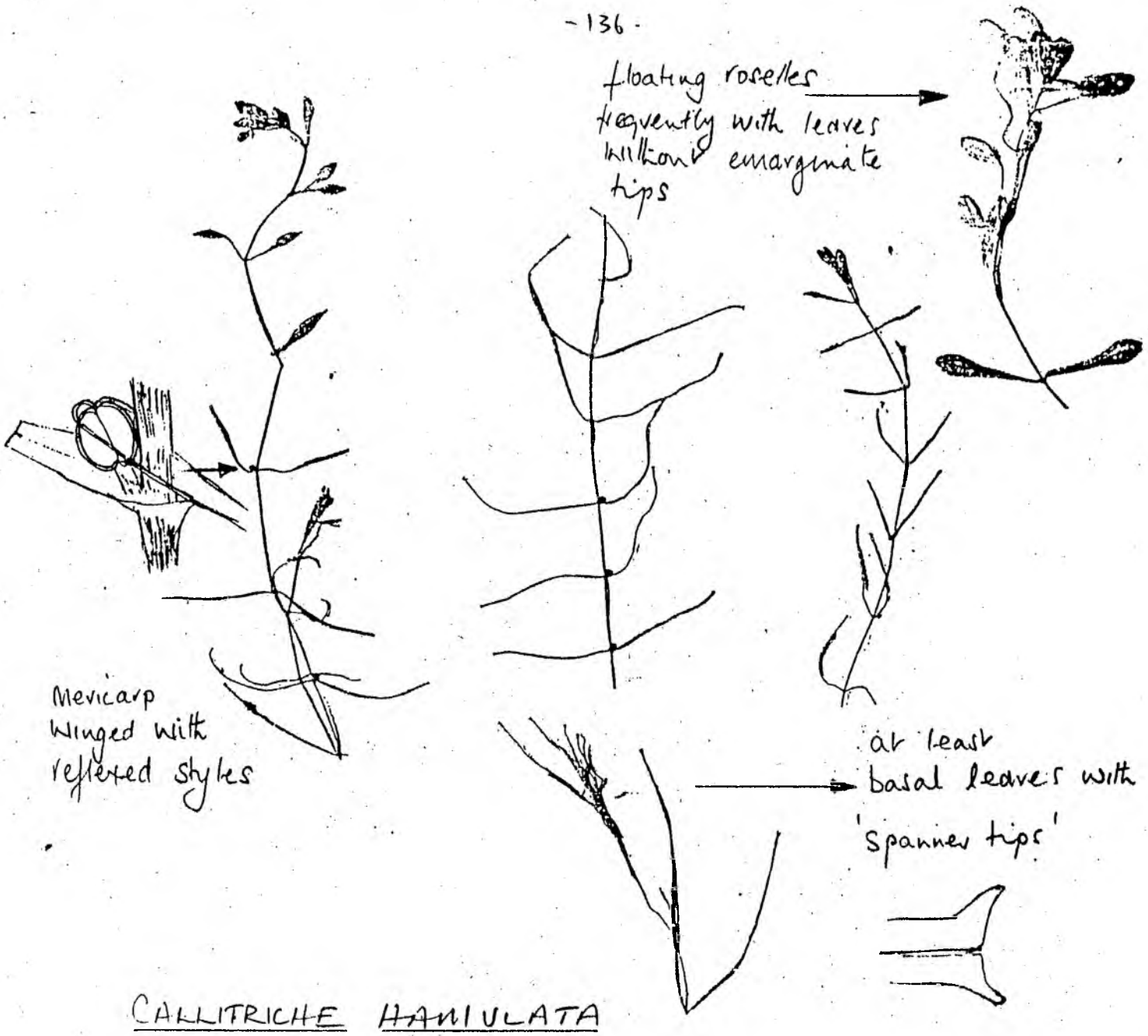
The most difficult separation is that of C. platycarpa and C. stagnalis. Lewis-Jones & Kay found in Glamorgan that they could not unequivocably separate them on the basis of fruit morphology alone, but found that a chromosome count was the most reliable distinction.

However, they can be separated on leaf characters when typical, Pollen grain-size, shape, and viability appear to be useful differentiating characters.

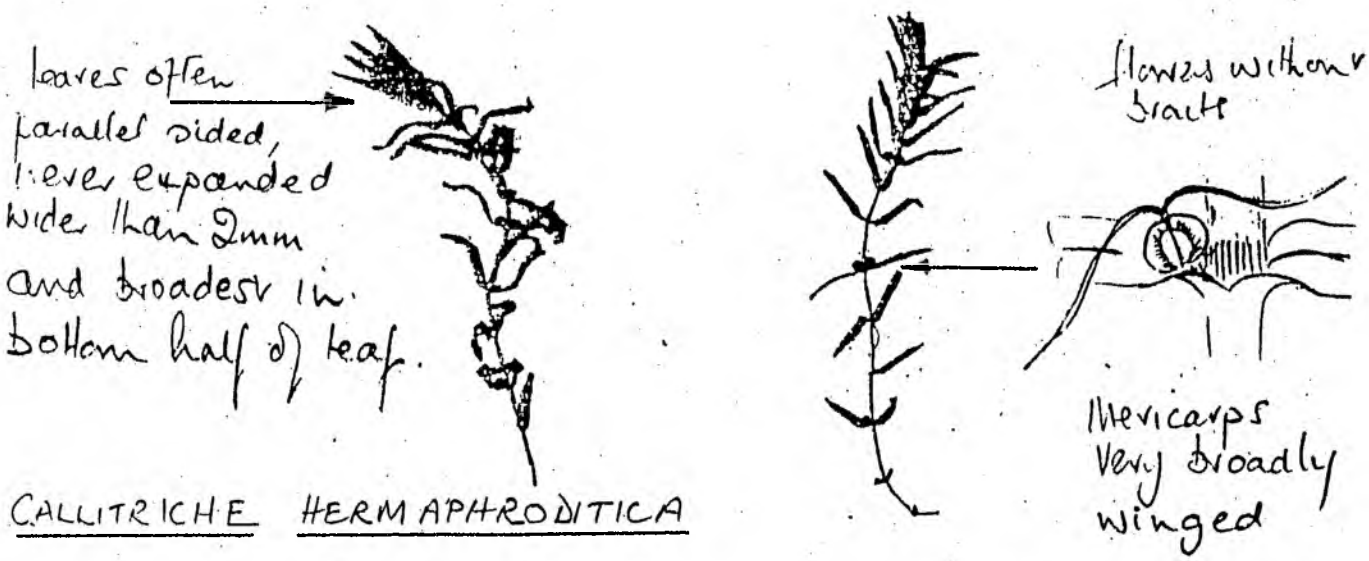
C. platycarpa is a widespread species and probably more so than the records suggest. It is mainly confined to lowland areas below 250m.

C. brutia Petagna (C. intermedia subsp. pedunculata (DC.) Clapham) is sometimes given specific status. It is very similar to C. hamulata, but is usually smaller, and is usually found in shallower water or on mud. The submerged leaves are less expanded and the apex is often unequally bifid; the fruit-stalks are up to 13mm long. The distribution of the taxa is imperfectly known, and it may occur in the region.

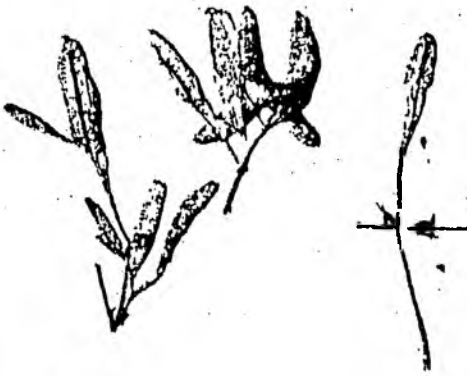
H.D. Schotsman, in Flora Europaea, Vol.3 (1972)
L.J. Lewis-Jones & Q.O.N. Kay, Nature in Wales 15, 180-183 (1977)
J.P. Savidge, pers. comm. (1974)



CALLITRICHE HAMULATA



CALLITRICHE HERMAPHRODITICA

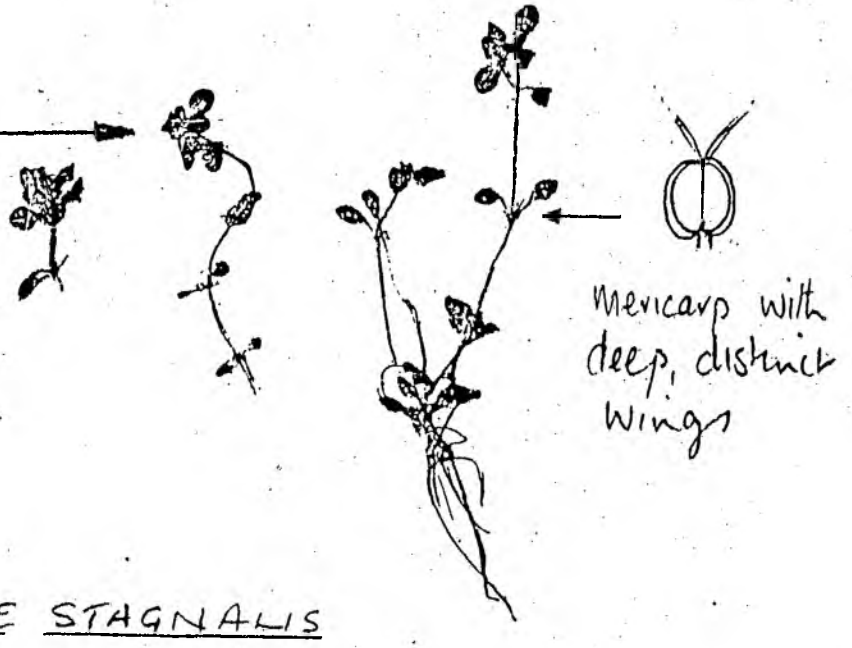


leaves at least 3 times longer than broad, submersed leaves often linear and emarginate. commonly only 1 veined.

mericarp very slightly keeled

CALLITRICHE PLATYCARPA

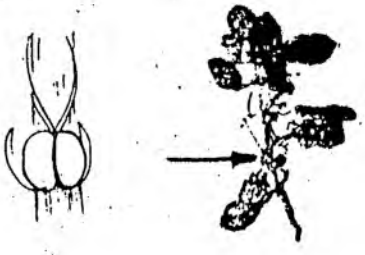
rosette with less than 10 leaves. Always three veined and never linear or emarginate



mericarp with deep, distinct wings

CALLITRICHE STAGNALIS

mericarps smooth



rosette of more than 12 leaves

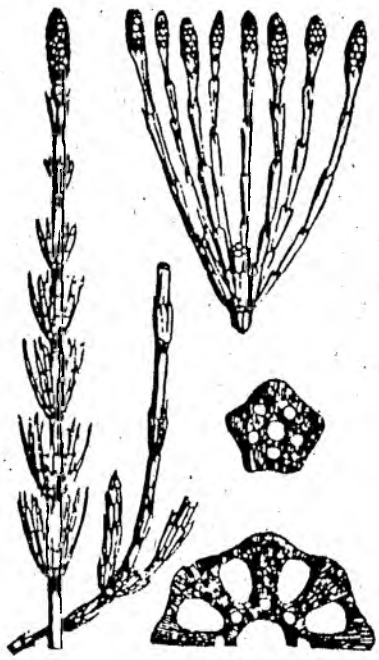
CALLITRICHE OBTUSANGULA

rosette leaves always distinctly 3 veined, leaves characteristically arched in mid-leaf. Submerse leaves often linear and dee

Equisetum

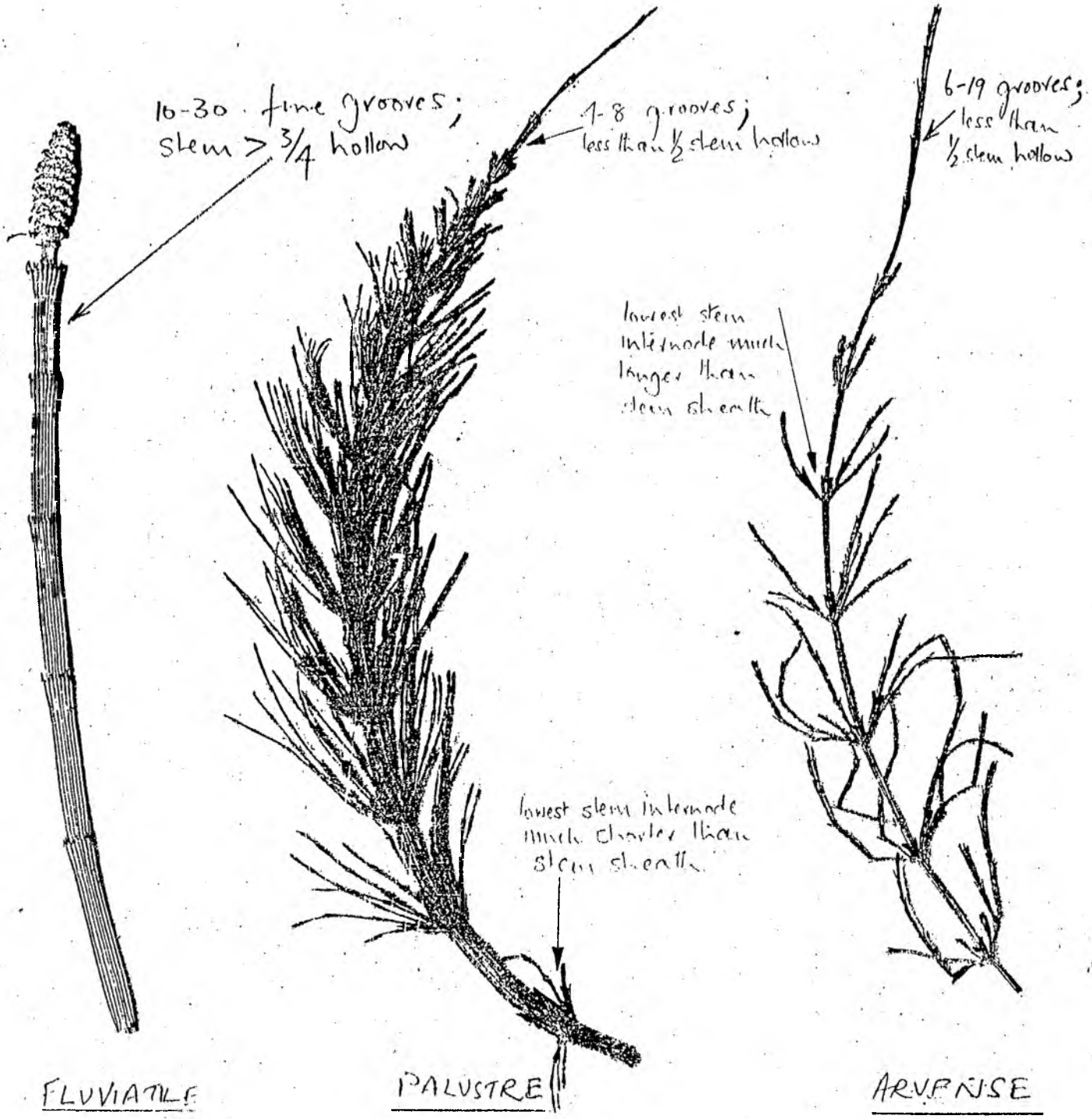
Parts of plant whorled. stems ± erect (2-12mm diam);10-30 very fine grooves in stem;sheaths close fitting to stem with small teeth. Stem hollow; hollow 4/5ths diameter of stem. Shallow water.
Equisetum fluviatile (Water Horsetail)

Similar to above but, stems erect (1-3mm diam.); irregularly branched; 4-8 deep grooves; sheaths loose; teeth 1-ribbed; hollow in stem small. Damp places.
Equisetum palustre (Marsh Horsetail)



Equisetum palustre L.

Three species are common in and/or beside water. E. fluviatile is characteristic with its hollow stem occupying 4/5 of the diameter and many (10-30) very fine, shallow grooves down the stem. E. palustre has very distinct, very deep grooves down the stem which are few in number (4-8). The central hollow is small and less than ½ diameter of stem. The ubiquitous E. arvense also has deep, distinct grooves (6-19) but has characteristically long basal internodes on leaves that exceed the stem sheaths.



FLUVIATILE

PALUSTRE

ARVENSE

Ex litorale

EQUISETUM

INDEX

Hypericum elodes (Marsh St John's-wort)	8
Impatiens glandulifera (Himalyan Balsam)	8
I. capensis (Orange "")	8
Iris pseudacorus (Flag-iris)	6
Lychnis flos-cuculi (Ragged Robin)	8
Lysimachia vulgaris (Yellow Loosestrife)	8
Lythrum salicaria (Purple Loose-strife)	8
Juncus bulbosus (Bulbous Rush)	1
J effusus and J inflexus (Hard and Soft Rush)	7
Lemna (4 spp) (Duckweed)	3
Lycopus europaeus (Gypsywort)	8
Montia fontana (Blinks)	8
Mentha aquatica (Water-mint)	8
Myriophyllum (spp) [Water-milfoil]	1
Myosoton aquaticum (Water Chickweed)	8
Myosotis scorpioides (Water For-get-me-not)	8
Nuphar lutea (Yellow Water-lily)	3
Nymphoides peltata (Fringed Water-lily)	3
Nymphaea alba (White Water-lily)	3
Oenanthe aquatica (Fine-leaved Water-dropwort)	1
O fluviatile (River "")	1
O crocata (Hemlock "")	5,8
O fistulosa and three fine spp.	10
Phalaris arundinacea (Reed Canary-grass)	7
Phragmites australis (Common Reed)	7
Poa palustris (Marsh Meadow-grass)	10
Polygonum amphibia (Amphibious Bistort)	5,8
P hydropiper (Water Pepper)	8
Potamogeton (c7 fine-leaved spp) Pondweeds	1
Potamogeton (c7 broad-leaved spp) Pondweeds	2
Ranunculus (c6 fine-leaved spp) Crowfoots	1
R hederaceus (Ivy-leaved Crowfoot)	5
R omiophyllus (Round-leaved ")	5,
R flammula (Lesser Spearwort)	8
R sceleratus (Celery-leaved Buttercup)	8
Rorippa nasturtium-aquaticum (Nasturtium) [Water-cress]	5,8,10
R amphibia (Great Yellow-cress)	5,8,10
palustris and sylvestris (Marsh/Creeping ")	10
Rumex hydrolopathum (Great Water-dock)	8
Sagittaria sagittifolia (Arrowhead)	4
Scirpus fluitans (Floating Club-rush)	1

S lacustris/tabermontani (Common Club-rush)	4,6
S maritimus (Sea Club-rush)	6
Scrophularia auriculata (Water Fig-wort)	8
Scutellaria galericulata (Skull-cap)	8
Solanum dulcamara (Bittersweet)	8
Sparganium emersum (Unbranched Bur-reed)	4
S erectum (Branched "")	6
Stellaria alsine (Marsh Stitchwort)	8
Stachys palustris (Marsh Woundwort)	8
Symphytum officinalis (Comfry)	8
Typha latifolia (Common Bulrush)	6
Utricularia spp (Bladderworts)	1
Valeriana officinalis (Common valerian)	8
Veronica catenata (Pink Water-speedwell)	2,5,8
V anagallis-aquatica (Blue "")	2,5,8
V beccabunga (Brooklime)	8
Zannichellia palustris (Horned Pondweed)	1
Wolffia arrhiza	

1 = Fine-leaved macrophytes, 2 = Broad-leaved macrophytes, 3 = Free-floating or round-leaved floating macrophytes, 4 = Long, submerged-leaved macrophytes, 5 = Broad-leaved water-edge spp, 6 = Emergents, 7 = Tall Reeds and Grasses etc, 8 = Marshland plants.

Also included as 9 are the mosses Amblystegium (Leptodictyum), Cinclidotus , Fontinalis and Rhynchostegium (Eurhynchium).

10 is Miscellaneous with detailed descriptions of some difficult groups.