Yellow Crucifer workshop. Oct. 2018 Bob Leaney.

Brassicaceae – Family characters. c 3500 spp worldwide in c 350 genera : c 300 spp. in UK.

- Herbaceous annuals to perennials, sometimes woody at base (eg Br. oleracea, Er. cheiri).
- Leaves simple, lobed, or 1-2 (3) pinnately lobed – most commonly lobed to pinnatisect ("radish like").
- No stipules • Flowers in racemes or occy panicles (eg Armoracia).
- Very long flowering period in any one plant usually, so flowers & fruits can usually both be found – immature, v. small fruits can usually be used for identification.
- 4 petals, free → cross like flowers • 4 sepals, free, usually shed before fruiting
- Stamens usually 6, occy. 4 (two shorter outer stamens lost) – 2 in some Lepidium spp.
- Fruit a dry capsule, usually opening from below by 2 valves – occy indehiscent (eg Raphanus). May have indehiscent section near tip (beak). Beak may have 1 or more seed. The valves can be rounded (giving a circular X section) or angled (giving a square X section)
- Hairs may be simple, medifixed or stellate – mostly simple in yellow composites (though Aurinia/Alyssum & Camelina can have branched hairs) – Most spp sparsely hairy to glabrous.

Yellow crucifers Many spp are crop plants that can escape onto field banks or road verges, but this is happening much less recently in most cases (eg. Turnip) – Brassica napus (oil seed rape) is much the commonest crop escape on road verges nowadays. Sinapis arvensis, an ancient introduction, is basically an arable weed but much less common than it was, though quite frequent still on road verges. There are a number of new modes of introduction for aliens:

Forage crops: Brassica rapa (fodder turnip); Sinapis alba (white mustard); Raph. sativus (fodder radish)
Green manure: Sinapis alba; Game crop: Raph. sativus; Camelina sativa; Sinapis alba.
Bird seed or grain alien: Hirschfeldia incana (Hoary Mustard); Rapistrum rugosum (Bastard Cabbage).

Plants escaping from these sources onto field banks, wasteground or road verges may be recorded as wild plants, & also plants persisting as arable weeds. Brassica oleracea (Cabbage) in one of its numerous forms (see later), is only likely to be found on neglected or relic gardens (not "counting" as wild).

Distinctive yellow crucifers that are quite easily recognised because of unusual characters :-

- Stems woody at base : Brassica oleracea; Aurinia/Alyssum saxatile; Erysimum cheiri.
- Leaves succulent : Brassica oleracea. • Stem leaves 0 : Coincya monensis var. cheiranthos.
- Very hairy : Aurinia/Alyssum saxatile; Erucastrum gallicum (Hairy Rocket); E. cheiri (sometimes).
- Fruits mostly one seeded : Bunias orientalis (Warty Cabbage); Neslia paniculata (Ball Mustard); Rapistrum rugosum
- Fruits with 2 obvious segments : partition c $\frac{2}{3}$rds from base, terminal segment with (0) 1 (-2) seeds visible in it : Hirsch. incana
- Dependent, winged, indehiscent fruits (ash key like) : Isatis tinctoria : Obpyriform fruits :- Camelina sativa.
- Indehiscent beaded pods (no line of dehiscence) : Raphanus

Status The great majority of our yellow cruciferous weeds of arable land & ruderal habitats, though they behave like natives, are actually archaeophytes (introduced before 1500 as crops or crop contaminants), or neophytes (intr. after 1500); the only natives are Barbarea vulg.; Rorippa (all 3 spp); Turritis glabra; Raph. raph ssp maritimus (? Br. oleracea var. oleracea, Br. nigra, Dip. muralis).

Main identification characters & descriptive terminology :-

Habit :

Broadly branched from near base; large leaves only at base; numerous small "balls" of flowers

Broadly branched from near base but whole plant "leafy"; few balls of larger flowers

Narrowly branched from near base, few balls of flowers

Narrowly branched only near top V. few balls of flowers

Leaf dissection :- Entire leaves :- Camelina sativa, Erysimum cheiri, Isatis tinctoria, Turritis glabra (Erisgmum entire with wavy (sinuate) edge Cheiranthoides).

1 - 2 pinnate - virtually all the rest except for Descurainia sophia (2-3 pinnate)

Auricles clasping stem. Brassica oleracea / napus / rapa →

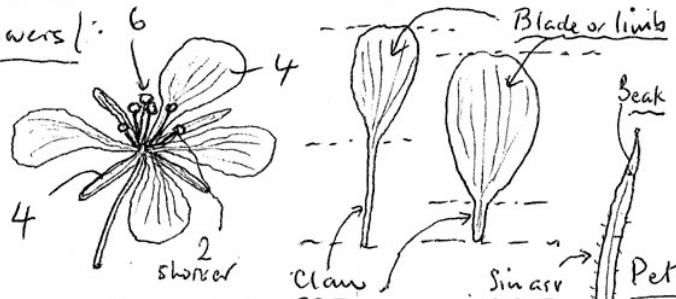
Isatis / Camelina →

Turritis →

Indumentum :- Most of the usual yellow crucifers do not have branched / stellate hairs but are either glabrous or fairly sparsely hispid (stiff bristles). Particularly hispid spp are Sinapis arvensis & Hirschfeldia incana. Stellate hairs are found in Alyssum / Aurinia, Camelina, Neslia and forked hairs in Bunias & Descurainia. Erisgmum cheiri has dense silky (modified) appressed hairs (on pods + stem).

Colour : Glaucous or blue/grey green Br. napus; Mid grey green: Hirschfeldia incana. Dark green Sinapis arvensis; Fresh bright green: Sinapis alba, Br juncea, Br. rapa.

Flowers :



Comparative length of limbs & claw important.

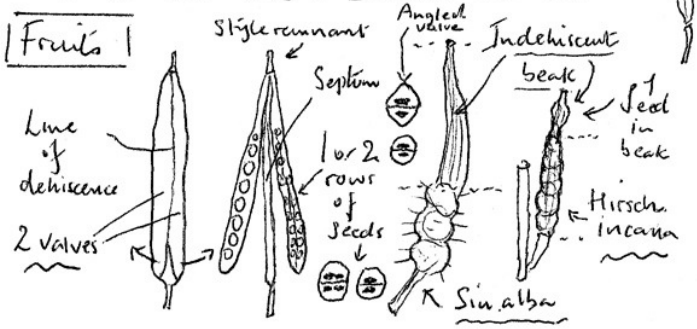
Petal length is the most useful floral character & in difficult ids can be a crucial check (in Sisce or Rich).

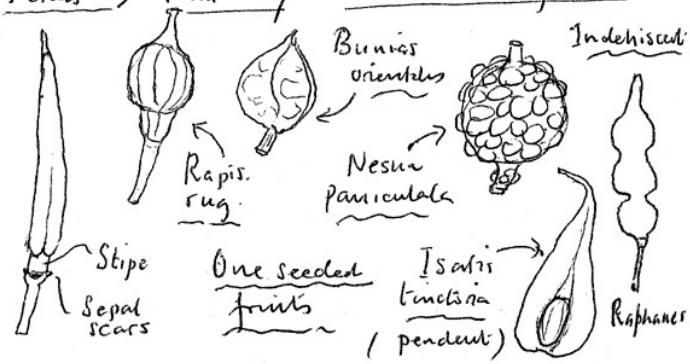
Flower size is a very useful starting point for id ~ two divisions used in key:

Petals < 7 mm long → "Tiny flowers"

Petals > 7 mm long → "Medium-large flowers"

Fruits :





Key to Yellow crucifers likely to be found in Norfolk. Bob Leamey Oct 2018

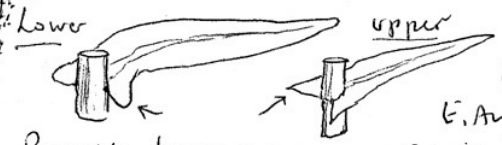
The species chosen are ones recorded in Norfolk in the last 30 years or so. (from Beckett & Bull).

1 Flowers tiny (most petals < 8 mm long) 2
1 Flowers medium or large (most petals > 8 mm long) . . . 5
2 Flowers tiny, leaves simple/entire 3
2 " " leaves 1-2-3 pinnate 4

(3) **Flowers tiny Leaves, simple with entire - sinnati edge**

Isatis tinctoria Very small flowers in dense much branched panicles. Stem

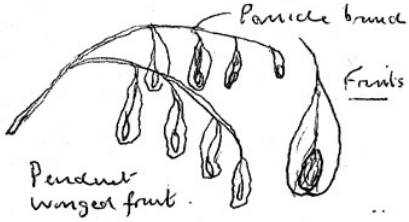
Leaves slim glaucous, lower with blunt clasping auricles, upper with acute clasping auricles



Recently being grown again & has escaped eg B1145 W of Reepham 2014.

Biennial or perennial

Grown as dye plant; last E. Anglian factory closed in 1913 (Wisbech). Last record in BrB at Whoxham in 1932

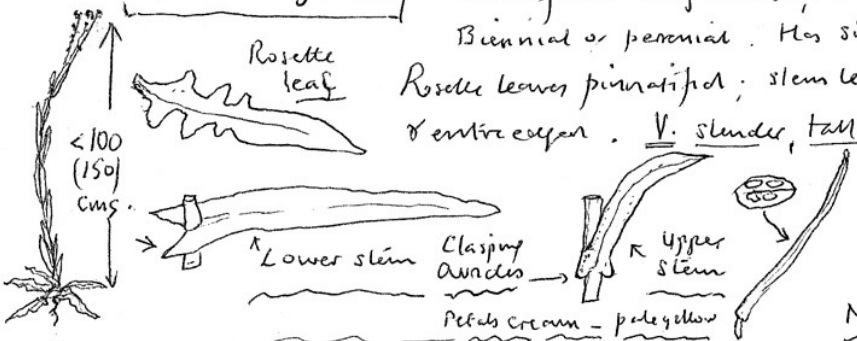


Archeophyte. "Ash key like

Turritis glabra Some flowers may be larger with petals just over 8 mm long

Biennial or perennial. Has simple and forked or stellate hairs.

Rosette leaves pinnatifid; stem leaves oblong-lanceolate, simple & entire edged. V. slender, tall plant with attenuated inflorescence



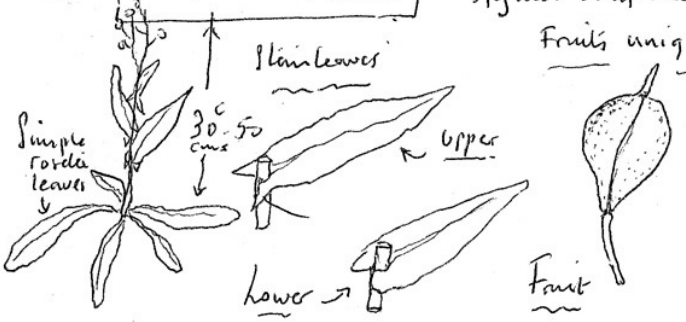
upper leaves glaucous (up to c 4 foot high)

Now very much confined to Southern Brecks (17 sites in BrB)

Native. Very much decreasing elsewhere (2 sites in Fretteneham 70's & 80s)

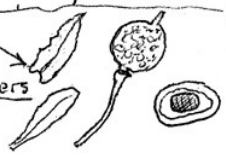
Camelina sativa Again simple leaves with clasping auricles; petals pale yellow.

Fruits uniquely obpyriform. Usually not so tall as Isatis or Turritis (only c 30-50 cms) Fresh green.



Annual archeophyte, formerly cultivated for oil & fibre & once characteristic weed of flax fields (False flax or Gold of Pleasure). Also grain or bird seed alien, & recently used in game crop mixtures (with Chenopodium quinoa Chen. album, Cichorium, Sinapis alba etc)

Neslia paniculata Kingsthorpe 1993 One seeded, ball like fruit. Looks like Lepidium strabo, but with yellow flowers



Neophyte; formerly woolaton, then very occasional grain or bird seed contaminant

(4) Flowers tiny, leaves lobed or 1-2(3) pinnate

Erysimum cheiranthoides

(3) Flowers tiny, leaves simple with entire-sinuate edge

No auricles

2·9-5 mm

V. constant habit. Bright-green.

Appressed medifixed (⊥) & stellate hairs

Hundreds of leaflets in B & B, but always in small numbers. (✳)

Annual

Archaeophyte.

Almost always on arable

Sisymbrium officinale

Upper

Blunt

Lower

V. small flowers.

3·1-4·2 mm

In dried state forms "tumbleweed" like balls - much like Bass. nigra.

✳ Fruit v. characteristically strictly appressed, and very gradually attenuated to fine point. Can be hairy.

Archaeophyte

V common on arable gardens roadsides & waste.

Stems often purple

Descurainia Sophia

(4) Cont.

Unmistakeable with its very finely divided ✳ 2-3 pinnate leaves & V. tiny flowers.

1·4-1·8 mm

Archaeophyte. Mainly on sandy soils of Breckland or "Greensands" of NW Norfolk & also in Fellmongers Hunstanton area. Nearly always an arable weed; occasionally on walls or waste or docks (grain contaminant)

Petals shorter than sepals (At vegetative stage beware Phacelia)

Bunias orientalis

Hairy perennial ✳

Tall well branched & with many flowers on top inflorescence branches (Some petals may be over 8 mm long)

4·6-8·5

Upper leaf

Basal leaf

Leaves lobed to sinuate

"Woolly cabbage" & warty

Fruits one seeded

Erucastrum gallicum

✳ Hairy with simple hairs, deflexed on stems. Casual, annual. Neophyte from (formerly) wool, grain & bird seed. (1966 1988 & 1991 in Norfolk)

Simple hairs

Leaves bipinnatifid

e-deflexed

Backs on at least lower ⅓ of raceme

Hairy Rockets

Aurinia (Alyssum)

Both spp have dense appressed stellate hairs

✳ V. hairy

Perennial

Aurinia saxatile

Seeds freely

Garden escape

No calyx (occasional)

Aurinia alyssoides

(Grain contaminant) — Much smaller narrowly oblanceolate leaves. Annual

Persistent calyx.

Last record 1951 (Norfolk)

Barbarea

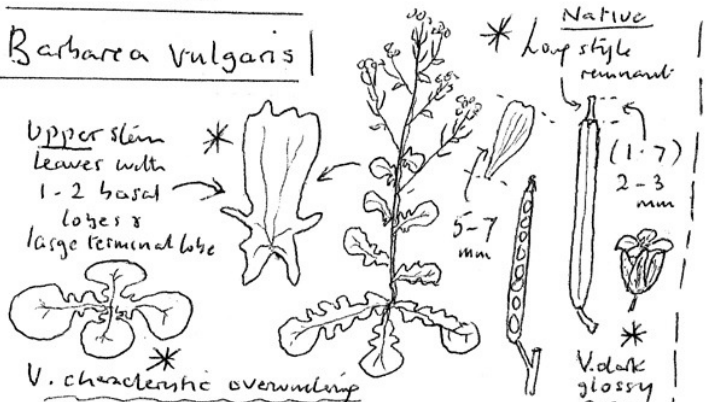
Quite tall upright plants with characteristic shiny "watercress-like" leaves (Watercress) at base, and with a definite main stem. Fruits on short stalks in ascending posture. Fruits always long & narrow, 1 row of seeds

cf Rorippa

4 spp separated by: (i) Leaf dissection (esp. upper stem leaves) (ii) Length of petals (iii) length of style. Only Barbarea vulgaris has persistent overwintering rosettes.

(4) Flowers tiny, leaves lobed or 1-2 (3) pinnate (cont)

Barbarea vulgaris



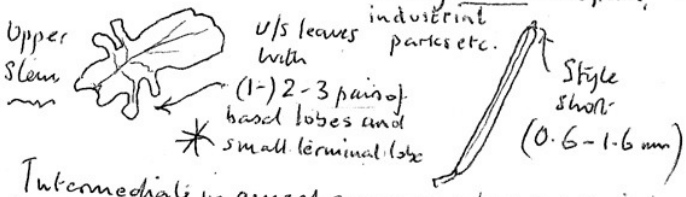
V. characteristic overwintering & spring basal rosettes: Dark glossy green, v large rounded terminal lobes.
Common on moist roadverges, ditch banks, woodland sides, waste ground & arable. Only persistent spp.

Barbarea stricta

Neophyte or native — Similar sites as B. vulgaris
Mostly a Norfolk plant ~ last record 1983.
Mainly wateredge semi-natural midland sites
Similar to B. vulgaris but upper stem leaves ± entire, smaller flowers, & shorter style.

Barbarea intermedia

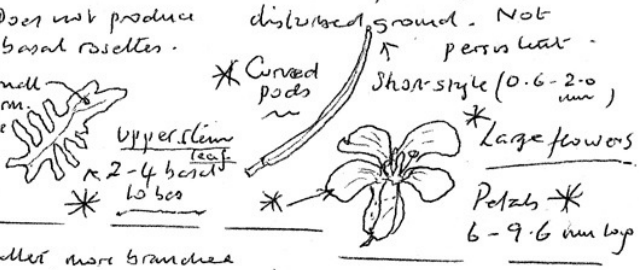
Neophyte, casual; usually urban wasteground, industrial parks etc.



Intermediate in general appearance & leaf dissection between vulgaris & verna.

Barbarea verna

Neophyte casual.
Roadsides, waste, urban sites. disturbed ground. Not persistent.
Does not produce basal rosettes.

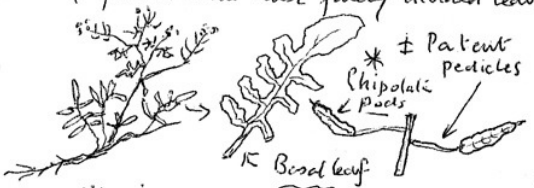


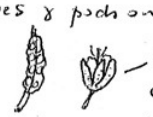
Rorippa

Compared with Barbarea usually much smaller, more branched & sprawling plants with more finely divided leaves & pods on ± patent stalks (R amphibia larger & less dissected leaves)

Rorippa palustris

Annual, native.
V. small flowers
Frequent on edges of ponds ditches, wet patches in grazing marsh, rivers.





Pedicels in fruit 3-10 mm ⟷ Pedicels 2-4(5) mm

R. islandica

Northern & Welsh sp.
Petals 1·0-1·7 mm

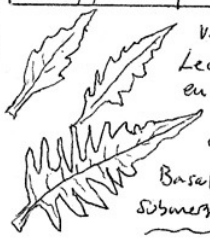
Rorippa sylvestris

Perennial, native.
Creeping rhizomes

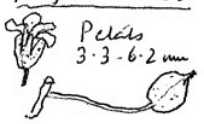
Similar sites as Ror. pal, but much scarcer & decreasing; Recent sites have tended to be on moist urban wasteground etc.

Rorippa amphibia

Native, perennial



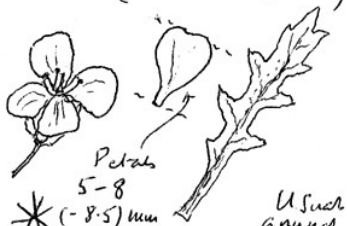
Same sites as R pal, but in Norfolk takes over pingos in VC 28

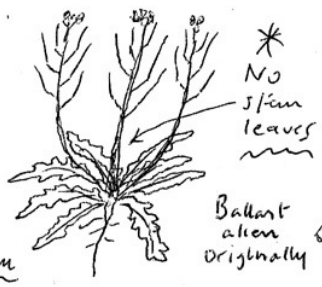


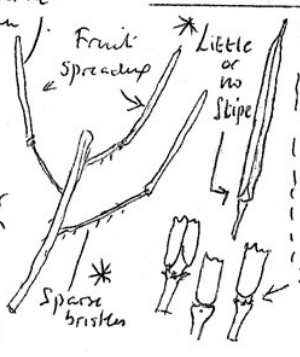
Diplotaxis muralis

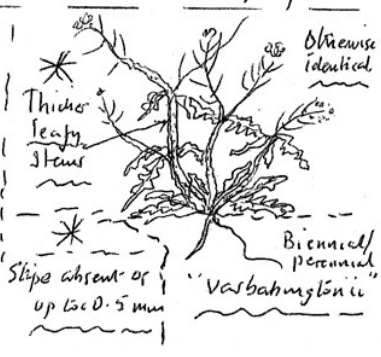
Archaeophyte (Preston, Pearman & Hall); Introduction (Stace); Doubtfully native (Rich)
Annual, occasionally to Status uncertain.
perennial ("var babingtonii").

Early in year extensive stations with basal leaves may be found







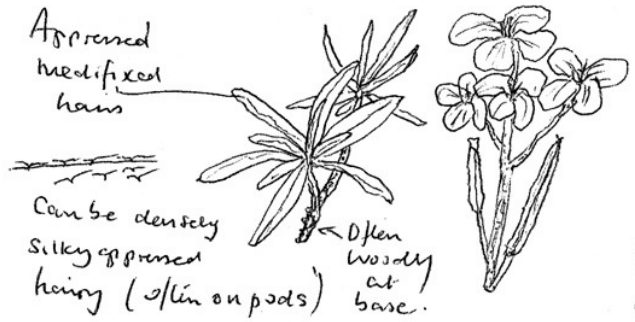


(5) Flowers medium or large, most petals > 8 mm long:

- Leaves simple, entire edged 6
- Leaves lobed or pinnate 7

(6) Leaves simple, entire edged, linear elliptic or narrow oblanceolate.
Flowers yellow, red, brown, orange, purple.
Stems woody at base

Erysimum cheiri — Annual, or short-lived perennial.

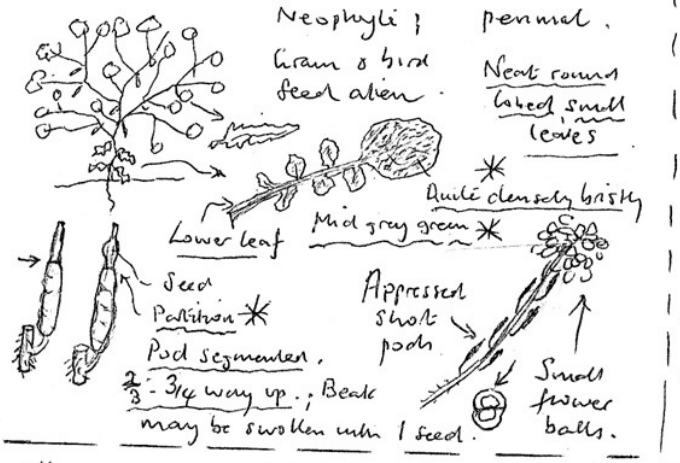


Archaeophyte; probably from Aegean hybrid horticultural selection.
Cliffs, rocks, mainly walls in Norfolk, (especially in churchyards).

(7) Leaves lobed or pinnate
fruits short & appressed;
plants forming small leaved "bushes" with numerous small balls of flowers
. . . . . (8)

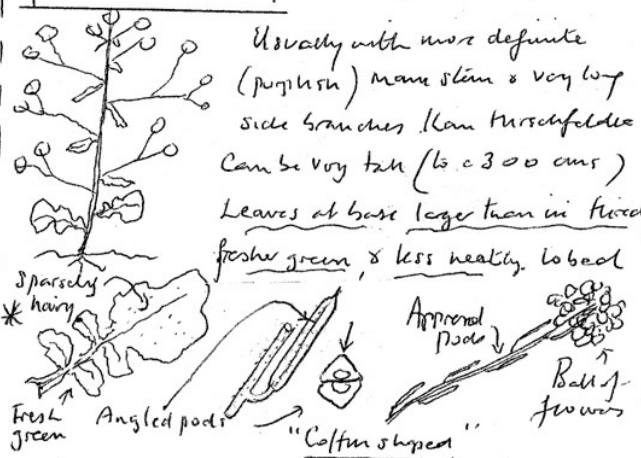
(7) Leaves lobed/pinnate, fruits mostly long ascending to patent;
plants a leafy 'bush' or narrow & little branched
. . . . . (9) → next page

(8(i)) **Hirschfeldia incana** — Neophyte; Alien grain & bird seed.



Annual, or short-lived perennial.
Often on roads & railways (M25); frequent around Norwich & in Breckland, increasing. Likes building sites, urban areas, industrial parks.

(8(ii)) **Brassica nigra** — Probably native; Annual.



Original sites probably river banks (→ dykes & ditches)
Also road verges, waste & urban sites. Formerly cultivated for mustard (replaced by Brass. juncea) - still in France etc

(8(iii)) **Rapistrum rugosum** — Neophyte; grain & bird seed alien. Annual (? sometimes biennial)
Broadly bushy usually without main stem (ie more like Hirschf)

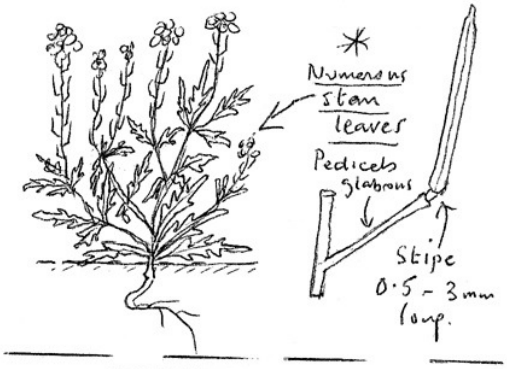
Norfolk population largely spreading from Yarmouth, along roads (esp A149) - recently reaching Rollesby, Ludham, Wroxham, Rackheath.
Indehiscent. Our ssp is usually ssp linnaeanum (overwintered)

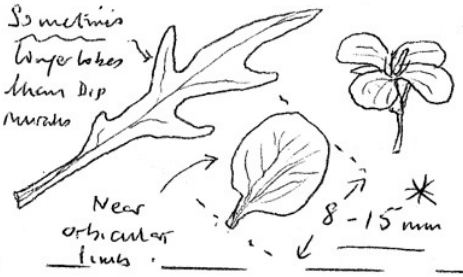
(9) Leaves lobed or pinnate; long fruits not appressed (ie ascending to patent), plants a leafy 'bush', or narrow and little branched only at top . . . .

9(i) Diplotaxis tenuifolia

Perennial; archeophyte (Stace; Bentham Pearman & Hall;) ? native SE England (Rich) Now grown as a salad plant

In docks, urban areas, wasteground, roadsides & walls. Common in Yarmouth & Norwich especially. Up to c 80 cms high (D muralis < 30 cms)

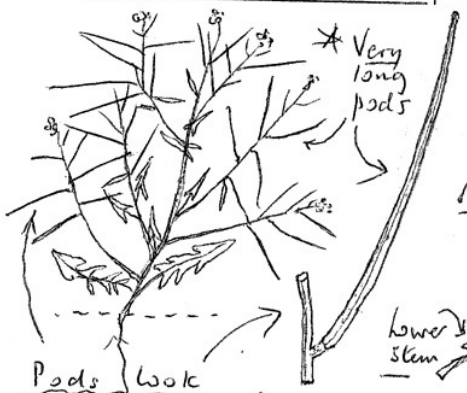


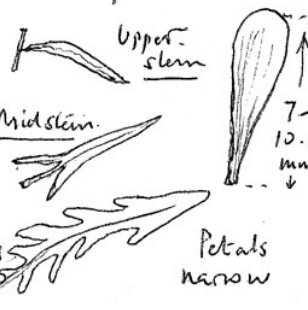


* Distinguished from Dip mur.
- mainly by flower size & esp petal length. (Some over 8.5 mm over 8.5 mm)
- No bristles on pedicels or stems.
- Stipe over 0.5 mm & some over 1 mm.

9(ii) Sisymbrium orientale

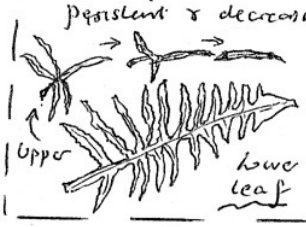
Annual; probably mainly grain alien, also in bird seed roadsides and waste ground, especially in urban areas. Mainly in Norwich but scattered in other towns & villages.

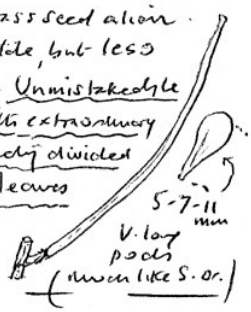




9(iii) Sisymbrium altissimum

Annual; bird and grass seed alien. Some habitats as S. orientale, but less persistent & decreasing. Unmistakeable with extraordinary finely divided leaves

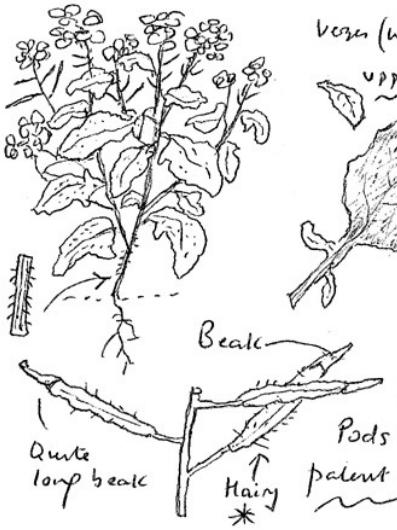


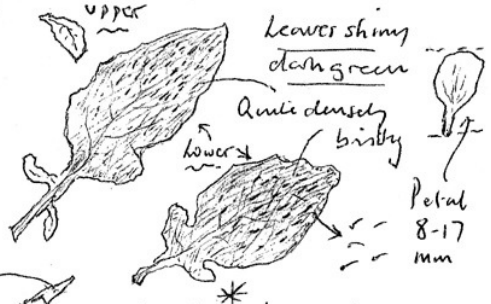


9(iv) Sinapis arvensis

Annual.

Archeophyte. Ancient weed & major pest in past, now reduced on arable fields by selective herbicides but still very frequent on arable edge, road verges (where disturbed), wasteground



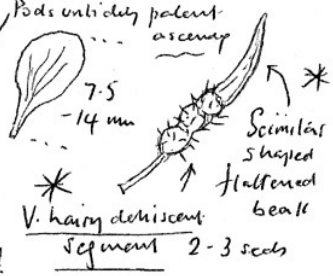


Pods untidily patent - ascending.

9(v) Sinapis alba

Archeophyte, annual.

Ancient introduction as food crop or as seed contaminant. Cultivated for mustard (gives hollis taste) together with Brassica juncea. Also used at cotyledon stage for winter lord cress (now replaced by Br. napus); forage crop, once planted in autumn as green manure or as game crop.



Sparsely bristly

(9) Large flowers petals > 8 mm, lobed or pinnate leaves (cont):

9(vi) Brassica oleracea

- Wild Cabbage (var oleracea), possibly native on sea cliffs in S. Britain; Headcabbage, Savoy Cabbage, Kale, Cauliflower, Broccoli, Brussel sprouts, Kohl-rabi.

Characters mainly for var oleracea

Leaves succulent, dark glaucous, undulant edged

Perennial

Inflorescence elongates in fruit

Fruits ± patent

Beak

Root never swollen

9(vii) Brassica napus

- Oil seed rape (Canola) Var oleifera
- Sweed (Rutabaga) Var. rapifera

OSR Mainly an oil crop, either for edible oils (margarines etc) or industrial oil (high in erucic acid: HEAR)

Now used instead of Sinalba for mustard & cress

Swede – culinary (Devon & Scotland) fodder

Annual or biennial

Leaves not succulent, pale glaucous, not undulant

35-95 mm

Fruits v. large entirely ascending

Beak

Beak ± patent

Buds overtopping

Petals 11-18 mm

Clasping lower leaf lobe

9(viii) Brassica rapa

- Wild turnip (ssp campestris) possibly native by streams & rivers - root slender
- Turnip-rape (ssp oleifera) root slender; oil plant.
- Turnip - culinary and fodder turnip (esp for sheep)

Fodder or globular turnip

Culinary

Obsolete as oil crop

Annual or biennial

Leaves not succulent, green to slightly glaucous. Lower per more bristly than B. napus. Flowers & fruits smaller, flowers deeper yellow

≤30-68 mm

Beak

Greener cf B nap.

Open flowers overlapping

Clasping lower leaf lobe

More bristly (cf B. nap)

9(ix) Brassica juncea

Brown Indian or Chinese Mustard.

Has replaced Br nigra in English Mustard (since 50s)

Used by Bangladeshis as pathera in curries.

Records for Norfolk 1990 & 1992 → numerous plants from August 2008 round Norwich inner ring road (starting Gurney Hill) (Prob. Bangladeshi source)

Taller plants (? mustard crop) on A47 2016-17.

Annual

Leaves not succulent, glabrous, pale green.

Fruits finer & held parallel in herringbone pattern.

No clasping leaf lobes.

Beak

Regular Herringbone pattern of fruits

No clasping lower lobe.

9-13 mm

9(x) Raphanus raphanistrum

Ssp raphanistrum | Annual, archeophyte

Can still be abundant arable weed; also waste ground, road verges, docks etc.

Petals can be white mauve (veined) or yellow

Long claw

11-24 mm

Pale grey green

Fruits of all 3 ssp are indehiscent

1-3(5)

Ssp maritimus | Perennial, native

Basal leaf V. large dark green

15-22 mm long claw

Lower leaf Basal lobes sometimes overlap

V large seeds

Deep Constriction

Petals always yellow

3-8 Small seeds shallowly constricted

Not overlapping

Hybrid rapa x mar displacing maritimus

c 3-7

Fairly large seeds

Intermediate in constriction

Rap sativus.

White - purple

Eruca vesicaria

Garden rocket

Occ. garden escape, but none yet in Norfolk.

Petals radish like cream or pale yellow with dark veins

No line of dehiscence

Fruit: flattened beak

13-26 mm

Long claw

Coincya monensis ssp cheiranthos

Flowers yellow Veined, radish like

12-23 mm

V. finely divided basal leaves, almost basal stem

V. long = claw

Terminal Segment (1-4 seeds)

Norfolk record VC28 2017