BRITISH WILD FLOWERS IN THEIR NATURAL HAUNTS

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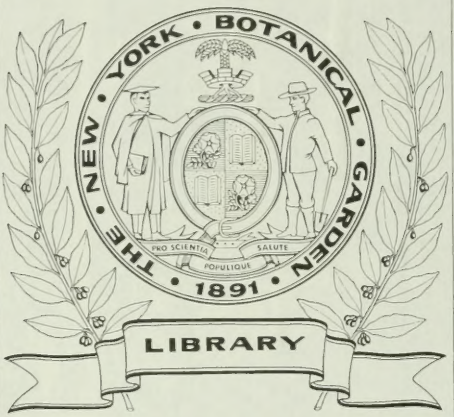
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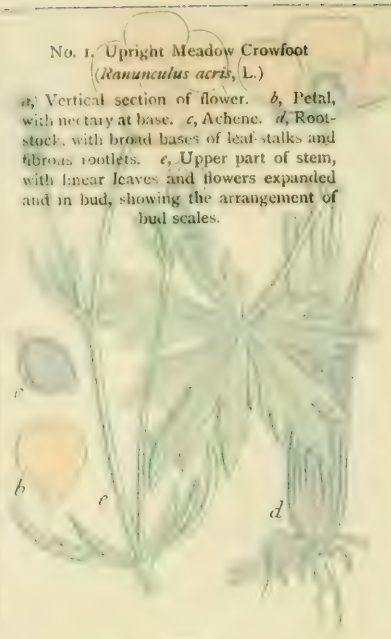
BRITISH WILD FLOWERS

1. Upright Meadow Crowfoot (*Ranunculus acris*, L.). 2. Lesser Celandine (*R. Ficaria*, L.). 3. Lady's Smock (*Cardamine pratensis*, L.). 4. Dame's Violet (*Hesperis matronalis*, L.).

No. 1. Upright Meadow Crowfoot
(*Ranunculus acris*, L.)

a, Vertical section of flower. *b*, Petal, with nectary at base. *c*, Achene. *d*, Root-stock, with broad bases of leaf-stalks and fibrous rootlets. *e*, Upper part of stem, with linear leaves and flowers expanded and in bud, showing the arrangement of bud scales.

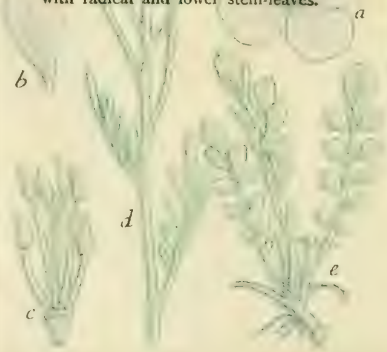


No. 2. Lesser Celandine
(*Ranunculus Ficaria*, L.)

a, Petal, with nectary at base. *b*, Achene. *c*, Plant, natural size, showing rosette habit, with underground tuberous rootstock and roots.

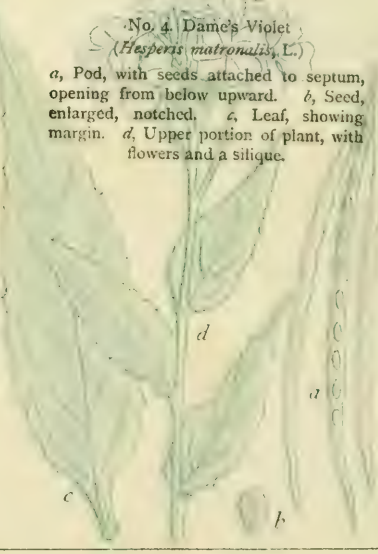
No. 3. Lady's Smock
(*Cardamine pratensis*, L.)

a, Corolla from above, showing tips of 4 long and 2 short stamens, with pistil in centre. *b*, A single petal. *c*, Stamens enlarged, and pistil, with honey-gland at base of former. *d*, Upper portion of plant, with flowers and siliques. *e*, Rootstock, with radical and lower stem-leaves.



No. 4. Dame's Violet
(*Hesperis matronalis*, L.)

a, Pod, with seeds attached to septum, opening from below upward. *b*, Seed, enlarged, notched. *c*, Leaf, showing margin. *d*, Upper portion of plant, with flowers and a silique.



A New BRITISH FLORA

BRITISH WILD FLOWERS

IN THEIR NATURAL HAUNTS

Described by A. R. HORWOOD
With Sixty-four Plates in Colour
Representing 350 *Different Plants*
From Drawings by J. N. FITCH
and Many Illustrations from
Photographs

VOLUME II

THE GRESHAM PUBLISHING COMPANY, LTD.
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Section II

FLOWERS OF THE FIELDS AND MEADOWS

FLOWERS OF THE FIELDS AND MEADOWS

The flowers which grow in our fields and meadows are intermediate in character in many ways between (1) those which grow near (or in) water, and require moist conditions, that is, *hydrophytes*, and (2) those that need dry-soil conditions and grow on the highlands, that is, *xerophytes*. Hence they are called *mesophytes*.

This group, as will be seen, also includes Woodland Plants (*hylophytes*), plants growing on cultivated soil, and waste-ground plants or ruderal plants.

Their soil requirements are also of a different type, striking a mean between those of very moist and of very dry conditions. Accordingly the plants included under Sections II–V are not artificially but more or less naturally grouped as here. The soil is not acid, cold, or saline, but fairly moist and well drained, not barren or containing acid humus. These plants range over the Temperate Zones. Generally speaking, a large number are perennials.

The meadow community consists largely of grasses, rushes, sedges, and "herbs" generally. Such communities are in a sense artificial, having been derived from primeval forest lands, since enclosed and cultivated, with lines of hedges, ditches, and artificially-disposed trees. A few meadows only on hills and near water may be still aboriginal.

This type consists of wide expanses of grass land, variegated with other herbaceous perennials, in which, of course, though not here shown, grasses predominate. It is much more exposed to frost than woodlands, as are all other wide lowland types of communities.

In the fields and meadows insect life is most abundant, and it is here that the processes of pollination and seed dispersal are best seen.

Nearly all the plants are perennials, and only a few are annual. A few have creeping underground stems, which contribute to the expansive character of the vegetation, but most are cæspitose or tufted.

Certain types of meadow flora may be characterized by their

relative lowland or upland character, depending on relative porosity or humidity, such as (*a*) that in which Smooth Meadow Grass (*Poa pratensis*) prevails, (*b*) Rough Meadow Grass (*P. trivialis*), (*c*) Heath Hair Grass (*Deschampsia flexuosa*), also an upland type. Where Carnation Sedge (*Carex panicea*) and Purple Moor Grass (*Molinia cærulea*) grow the habitat is a wet upland meadow, and a marshy meadow is characterized by the dominance of Meadow Fescue (*Festuca elatior*).

Amongst these Pascual or Pratal (i.e. meadow) species, of which there are about 120, are some twenty which are addicted to a limy soil. We include here about twenty-nine. Out in the meadows stands the tall meadow Crowfoot, waving its bitter graceful stems in the wind, and usually discarded by the cattle. In the shade of the ditch banks, or on wet clay banks, the golden-hued Lesser Celandine carpets the ground with regal splendour. Lady's Smock, with its delicate lilac-tinted blooms, studs the moist meadows by the streamside. So too the lilac-flowered Dame's Violet, scenting the night breeze, lurks in the cool shade of paddocks and covert sides. Ragged Robin makes gay marshy meadows in hill and dale with its fine, pink, tassel-like blooms, amongst sedges, rushes, and arrow grass. Down by the trout stream, like some fine garden flower, sheltered by protective foliage finely and delicately cut, the deep-blue orbs of the Meadow Crane's Bill reflect in floral emblem the Italian skies. The Humble and the Hive Bee seek the "honeysuckles" of red and white clovers in the meadows, humming, yet busy all the while. Over these one hears the lark carolling sweet melody in the clear fresh skies of early summer and spring. Where the meadows roll into uplands and make rambling ramparts carved by Nature's hands rise the lemon-tinted clusters of Hop Trefoil, giving a touch of gold to the eternal green of the meadows.

"Bacon and Eggs", or the yellow and golden flowers of Bird's-foot Trefoil, clustered up and down on the little undulating knolls, give too a richer hue to the verdant emerald sea. "Queen of the meadows", the filmy gauze-like heads of Meadowsweet, rise gracefully from the waterside or the ditch. Trailing over the ridges in the shires or on banks on the uplands the Cinquefoil scrambles over the scrubby grass, lending a new shapeliness to the outlines of the meadow lands with their stereotyped fascicles of short-stemmed grasses.

Hidden amongst the hillsides in choice spots the sparkling orbs on the Dewcup give the brilliance of diamonds to the common upland flowers. The Great Burnet towers with its graceful dark-brown

GENERAL VIEW OF A MEADOW

flower-heads amongst the shorter herbage, ever and anon swaying with the rhythm of the breeze. On the higher slopes the nest-like clusters of white bloom varied with pink of the Wild Carrot, are scattered commonly where the Devil's-bit Scabious rears its heliotrope head in the meadows laid to hay, while on the lawn and in the fields the lowly Daisy preaches eternally a sermon in mute obeisance, with all nature spread out as a book, "which he who runs may read".

Yarrow and Ox-eye Daisy, common but beautiful, make up many a posy in the boy or girl schooldays. Knapweed, busby-like in flower, the golden Dandelion, with its old-world "clocks", the early-blooming Goat's-beard, Cowslips that reek of anise, the quaking, shivering Yellow Rattle, purple Self-heal, the dainty purple and spotted orchids, and the Purple Crocus are all found here.

Upright Meadow Crowfoot (Ranunculus acris, L.)

The deposits in which seeds of this species have been found are post-Roman. It occurs in the Arctic and Cool Temperate Zones in Arctic Europe and N. Asia, and has been introduced into America. It is found in every part of Great Britain, as far north as the Shetland Isles, and up to a height of 4000 ft. in the Highlands of Scotland. It is common in Ireland and the Channel Islands.

Every meadow, whether it be upland or lowland, dry or wet, nourishes a goodly number of individuals of the tall-flowered, upright-growing Crowfoot, which stands out in such contrast to the lowlier grass stems and leaves around. Owing to its acrid properties it is usually avoided by cattle, hence this marked contrast. As a rule it likes flat expanses best, and as far as experience goes it is more uniformly dispersed over dry soils, being thus a xerophile.

The Upright Meadow Crowfoot is similar in habit to Goldielocks, but is taller. There are few flowering stems, and the leaves are chiefly at the base, lying close to the ground, and are usually little variable but much divided. The tall, erect stems distinguish it from the other species of Buttercup.

The root is fibrous, but more robust than that of Goldielocks. The flowering stems are unfurrowed, whereas in the Bulbous Crowfoot they are furrowed. The long flowering stems, which are downy, and the finely-divided root-leaves help to distinguish it.

The sepals are spreading, the honey-gland is provided with a scale, and the carpels are smooth.

This buttercup grows to a height of 3 ft., flowers from April to

September, and is a deciduous, herbaceous, perennial plant, having no stolons.

As soon as the flower is open pollen is discharged by the anthers, commencing from the outside. The stigmas are at this stage not yet mature; the anthers open along their edges, and on ripening turn outwards. Bees dust themselves with pollen, carry it off, and deposit it elsewhere on other plants. The stigmas are mature before the inner stamens have shed all their pollen, and self-pollination often takes place by means of small insects crawling over the flowers.

Photo: B. Hanley

Upright Meadow Crowfoot (*Ranunculus acris*, L.)

The inner stamens often touch the stigmas. Larger insects bring about cross-pollination if they go from a young to an older flower. The petals secrete the honey. The female flower may occasionally be on a different plant, though as a rule the flowers are complete. Diptera (Empidæ, Syrphidæ, Muscidæ), Coleoptera (Nitidulidæ, Dermestidæ, Buprestidæ, Mordellidæ, Œdemeridæ, Cistelidæ, Cerambycidæ, Chrysomelidæ), Hymenoptera (Tenthredinidæ, Sphegidæ, Vespidæ, Apidæ), Lepidoptera—Small Heath (*Satyrus* (*Cœnonympha*) *Pamphilus*), Small Copper (*Chrysophanus* (*Polyommatus*) *Phlæas*), Burnet Companion (*Euclidia glyphica*)—visit it.

The fruit is dispersed by its own mechanism. The achenes or fruits are close together and are hooked, and dispersed by the normal splitting and scattering of the fruit. It is also wind-dispersed, and dispersed by animals from the effect of the wind upon the long flower-stalks, and by the agency of passing animals. The plants being bitter to the taste are therefore left standing.

It is largely a sand plant, subsisting usually on a sand soil derived from sandy formations in which there is a sandy loam.

The fungus *Entoloma microsporum* forms round or spindle-shaped swellings on the stem and leaves, and *Puccinia perplexans* infests it, as does *Pseudopeziza ranunculi*. The beetles *Prasocuris marginella*, a hymenopterous insect, *Monophobius albipes*, and a fly, *Phytomyza flava*, live on it.

The Latin *acris* refers to its bitter properties. It is also called Bachelor's Buttons, or Bouton d'or in French. The English names are Baffiners, Bassinet, Blister-plant, Bolt, Butter Creeses, Carlock-cups, Clovewort, Crawfoot, Crazy, Crowflower, Crowfoot, Eggs-and-Butter, Gilcup, Gold Crap, Gold Cup, Gold Knobs, Yellow Gowan, Guilty-cup, Horse Gold, King-cup, King's Knob, Paigle, Yellow Caul, Yellow Cups.

It is called *blister-plant*, because used in Lincolnshire by the "herb-women" for blisters. The common names *buttercup* and *butterflower* are said to be due to the supposed yellow colour of butter from cows eating them, but more probably because of the richness of the meadows where buttercups also grow. In reference to the name *Crazy*, it is called an insane herb by country folk from an absurd idea that its smell produced madness.

Pliny, in his day, noticed that this plant and other buttercups caused blisters like those caused by burning. It was thus used for removing leprous sores. Caustic preparations are made from them, but the bitterness is lost in drying; hence hay is eaten without blistering being caused. In the fresh state cattle refuse it. It is even said to cause blisters from merely pulling it up.

Essential Specific Characters:—

8.[1] *Ranunculus acris*, L.—Stem tall, erect, no bulb, radical leaves much dissected, upper entire, calyx erecto-patent, carpels smooth, glands of nectary with scale, receptacle glabrous.

Lesser Celandine (Ranunculus Ficaria, L.)

Owing to its soft carpels, perhaps, this plant has not been found fossil. It is confined to the Arctic and Warm Temperate Zone, occurring in Arctic Europe, Western Asia, and North Africa. It is found in every part of England and Wales as well as Scotland, from the Shetland Isles southwards. In Wales it grows at a height of 2400 ft. It is found in Ireland and the Channel Islands.

The lowly Pilewort, to give it its other name, so unlike the usual

[1] The number in front of the specific description of a plant indicates its place in the *Analytic Summary* at the beginning of Vol. I.

type of Crowfoot or Buttercup in flower, and especially in foliage and habit, differs in having only one cotyledon, which may be regarded as due to its *geophilous* habit, that is to say, the green parts live above ground for only part of the year. Thus it is propagated by small tubers, which give it its name, and it would appear according to one view to be a Dicotyledon which has suppressed its other cotyledon or seed-leaf owing to the fact that its habitat was once more aquatic. It will be found down in the damp hollows of clayey ash woods, or in moist open meadows and fields, and under hedges carpeting the bank to the exclusion of all else. In fact, on a lawn it is a great exterminator of grass.

The Lesser Celandine has a loose rosette habit. The plant is without hairs. The root-fibres are stout, cylindric, or tufted tubers, which are thick, club-shaped, fleshy. The stem is prostrate, short, branched below, weak, sometimes with bulbs or corms in the axils, in which case the plant does not flower but reproduces by the corms. The stem is one-flowered, with 1–3 leaves. The leaves are chiefly radical, heart-shaped, thick, smooth, shining, dark green, angular, the angles blunt, or the margin may be wavy or scalloped. The leaves are stalked, the leaf-stalk stout and thickened below.

In the typical form the lobes of the lower leaves are separate at the base, not overlapping. The lowest sheaths are narrow. The stomata are on the upper surface of the leaves as in aquatic plants with floating leaves, and this species may once have been aquatic.

The flowers are large, shining yellow golden, about an inch in diameter. The petals may be absent. The flower-stalks are in the axils, stout, with one or two leaves. The petals are usually eight in number, but vary considerably in number up to sixteen, and in form, being often much reduced. There are three sepals as a rule. The achenes form a round head and are smooth, blunt, large. Seed is not always set, the plant reproducing vegetatively. The style is very small. The cotyledon is single as in Monocotyledons, which may result from suppression of the second, or be a primitive character. Since the plant is a geophyte and adapted to aquatic conditions, as a large proportion of the Monocotyledons also are, the order Ranunculaceæ may be regarded as closely allied to the Monocotyledons.

The Lesser Celandine grows 6 in. high, flowers from March to May, and is perennial.

The mode of pollination in the Lesser Celandine is not dissimilar on the whole to that in the common Meadow Crowfoots. The anthers ripen before the stigma. The number of the stamens is variable, as in

the other parts of the flower. The plant flowers early, at a time when few insects are flying, but none the less it is much visited by insects, which seek honey as well as pollen. The anthers are turned towards the centre at first, but the outer anther-stalks bend so that they lie just above the honey glands at the base of the petals. An insect seeking honey will naturally brush itself with pollen, which it bears to the next flower and deposits on the stigma. The anthers then turn out

LESSER CELANDINE (*Ranunculus Ficaria*, L.)

wards, an adaptation to prevent self-pollination. The next row of stamens then follows suit and the performance is as before.

In spite of this, as mentioned already, seed is rarely set, and the plant is vegetatively reproduced to a great extent. In some cases only female flowers occur. Early in the season the flowers of most plants possess few, 2–3, petals, those that come on later having as many as eleven.

The seeds are scattered by the plant itself, being contained in rounded achenes or fruits, which are adapted for dispersal when the achenes are mature and drop off.

Pilewort is a typical clay-loving plant, requiring a clay soil, generally derived from older rocks, and furnished by granite and schistose formations as well as later Carboniferous and Triassic formations.

The orange cluster-cups of the small fungus *Uromyces boæ* grow on the leaves of this plant, being the second phase of the fungus, which grows on various grasses. Other fungi which infest it are *Peronospora Ficariæ* and *Entoloma Ranunculi*.

The moth Flame Brocade (*Phlogophora empyrea* or *Trigonophora flammea*) infests it in the caterpillar stage.

Ficaria was proposed as a genus by Brunfels in allusion to its supposed cure of piles (Latin *ficus*, a fig). Celandine is the name given (from Greek *chelidon*) from its blossoming when the swallow arrives.

In English it is called Bright Eye, Celidony, Crain, Crazy, Crow Pightle, Figwort, Foalfoot, Gilding-cup, Gilty Cup, Golden Cup, Golden Guineas, Goldy Knob, King-cup, Marsh Pilewort, Paigle, Pilewort.

> There's a flower that shall be mine
> 'Tis the little Celandine. WORDSWORTH.

The Lesser Celandine is not so acrid as the other species. The leaves have indeed been employed as a potherb. The roots are, however, acrid and bitter. By the law of signatures it was recommended as a remedy for piles. Pigeons are said to eat the tubers.

The tubers lie near the surface, and when exposed by rains their appearance gave rise to the notion that the atmosphere had rained wheat. In Sweden the plant is used in place of cabbage.

ESSENTIAL SPECIFIC CHARACTERS:—

10. *Ranunculus Ficaria*, L.—1 cotyledon, root knob-like, leaves reniform, cordate, radical, shining, entire, flowers yellow, 3 sepals, 9 petals, achenes smooth, obtuse, globose.

Lady's Smock (Cardamine pratensis, L.)

Nothing is known of the early distribution or occurrence of this plant. To-day it is found in the Arctic and Northern Temperate Zone, in Arctic and Subarctic regions. A closely-allied species has been met with in Australasia and in Tasmania. This well-known and well-beloved plant is known under one name or another in every county in Great Britain, and also in Ireland, and in Scotland, and it rises to a height of 3200 ft.

No water-meadow would be complete in spring without its Lady's Smocks, which are dotted up and down the low-lying districts bordering our streams and rivers from Land's End to John o' Groat's. It may be found also in hilly districts where springs issue from the hillside, and make the meadows moist and damp on their flanks. It is found in true marsh and bog-land, and once formerly in the Fens.

The Cuckoo Flower has the rosette habit. The rootstock is short

LADY'S SMOCK (*Cardamine pratensis*, L.)

and stout, and the plant is sometimes stoloniferous. The stem is, as a rule, round in section, rarely angular, tall and erect. The leaves are pinnate, the lobes arranged each side of a common stalk. The radical leaves have small leaflets rather round and somewhat angular, and are stalked, whilst those of the upper leaves are more or less stalkless, narrow linear or lance-shaped, entire and longer.

The flowers are large, of a delicate lilac tint, or white. The petals are large, three times as long as the calyx, spreading, inversely egg-shaped. The stamens are half the length of the petals, and the anthers are yellow. The style is stout and short. The stigma is small. The pod is erect, on a slender, ultimate flower-stalk, long, flattened at the

border, linear, with flat, nerved, elastic valves. The seeds are flattened at the border.

Lady's Smock is in flower between April and June. It is a herbaceous perennial, 1–2 ft. in height.

The flowers are large and conspicuous, the yellow anthers serving as honey-guides, by the strong contrast of colour they exhibit to the lilac petals, which are large, the flower being about $\frac{3}{4}$ in. across. There are four honey-glands, which lie at the base of the two short stamens, forming green fleshy cushions most conspicuous externally where honey collects. Two other glands lie at the base of the two long stamens. The honey collects in the pouches formed by the base of the persistent rather large sepals. The pouches of the two sepals subtending the larger honey-glands are larger than the others, broad, and more inflated below.

At first the anthers face the centre, the pistil being slightly lower than the long stamens on a level with the short stamens. The four inner lengthen before the flower opens and turn sideways, and an insect visitor is dusted with their pollen in seeking for honey from the larger honey-glands. When the flowers do not open, or in wet weather, the stamens do not always revolve, pollen may fall on the stigma and the flower is then self-pollinated.

The shorter stamens remain turned inwards towards the stigma, and they may be shorter (when self-pollination is impossible) or longer than the latter. There are thus equal chances of self- or cross-pollination.

The visitors are Hymenoptera (Apidæ), Diptera (Bombyliidæ, Empidæ, Syrphidæ, Muscidæ), Lepidoptera, Coleoptera (Nitidulidæ, Staphylinidæ), Thysanoptera (*Thrips*).

The Cuckoo Flower disperses its seeds itself. The fruit is a dry capsule or siliqua, in which when ripe the valves become ready to burst, and after rolling up they are often detached, and so disperse the seeds which are jerked out by an explosive motion.

The plant is galled by *Cecidomyia Cardaminis*. Two beetles, *Phyllotreta tetrastigma*, *Phædon betulæ*, and a Hemipterous insect, *Cimex festiva*, infest it.

Dioscorides gave the name *Cardamine*, which is the Greek for *subduing the heart—karda*, heart; *damao*, to strengthen, overpower. The English name alludes to the white appearance of linen, and Cuckoo Flower to the time when the cuckoo is first heard.

The English names are Apple-pie, Canterbury Bells, Bird's-eye, Bogspinks, Bonny-Bird-Een, Cuckoo's Bread, Bread-and-Milk, Cuckoo-pint, Cuckoo's Shoes and Stockings, Gookoo-buttons, Headache,

Lady Flock, Lady's Glove, Lady's Smock, Lamb Lakins, Lucy Locket, May Blob, May Flower, Milkgirl, Paigle, Pigeon's Eye, Pink, Shoes and Stockings, Smell Smock, Whitsuntide, Gilliflower, Spink.

> Or can our flowers at ten hours bell
> The gowan or the spink excell?

The name Apple-pie refers to the odour of the flowers and young shoots. It is called Bread-and-Milk from the custom of taking bread and milk for breakfast at the season when the Cuckoo Pint is in bloom. It is called Cuckoo Spit in allusion to those flowers which are attacked by an *Aphis*, and thus exhibit the "spit". Children regard it as unlucky to pluck such specimens, thinking the cuckoo has spit on them. Because "sile" means "strain" it is called Milk Sile, and the flower is thought to be in shape like a milk-strainer.

It was one of the flowers used in bridal bouquets when in season. But it was carefully avoided for May festivals.

Shakespeare uses the name "Lady's Smock" in *Love's Labour's Lost*:—

> When daisies pied and violets blue,
> And Lady's Smocks all silver white,
> And cuckoo-buds of yellow hue
> Do paint the meadows with delight,
> The cuckoo then on every tree
> Mocks married men, for thus sings he,
> Cuckoo!

The cuckoo flower was used as a salad, but is rather bitter.

Formerly it was held to be antiscorbutic, and used in stomach disorders, in spasmodic complaints, convulsive asthma, St. Vitus's dance, and epilepsy.

If inserted in a May garland, it was held unlucky and destroyed.

Essential Specific Characters:—

27. *Cardamine pratensis*, L.—Flowering stem erect, radical leaves rounded, dentate, upper linear-lanceolate, entire, pinnate, petals white or lilac, three times as long as the sepals, pods erect, style short.

Dame's Violet (Hesperis matronalis, L.)

There is no instance of the seeds being found in Glacial or earlier deposits. The plant is met with to-day in Europe and temperate Asia. This plant is always an escape from gardens, and is not even regarded as naturalized, though in some districts it seems to have

established itself. Its present dispersal is no doubt due in a measure to the former practice of using the plant for growing in pots indoors (hence the Latin specific name).

The Dame's Violet is found in meadows often in or near thickets, but seldom very far away from houses or gardens. It may, when the seeds have been carried downstream or dispersed by birds, be found in moist valleys in the west, as Shropshire, in some abundance, but as a rule its occurrence coincides with habitation.

Photo. J. H. Crabtree

DAME'S VIOLET (*Hesperis matronalis*, L.)

Of neat habit, Dame's Violet has a stout stem, erect, branched at the top only, with linear-lanceolate leaves, which are alternate, entire, and slightly toothed, giving it a compact habit, which with its height gives it an air of grace, added to which the fragrance of the flowers at night (hence the first Latin name) surrounds the plant with pleasant memories.

The flowers are of a deep lilac or white tint, and large, the sepals being erect. The petals are blunt at the tip with a claw or stalk. The pods are long siliquæ, which are erect and round, and the flowering branches are spreading. The valves are flat on the sides, ribbed or keeled, with three nerves, and there are numerous margined seeds. The pods have divisions or are knotted.

The plant is often 2 to 3 ft. high. It is usually in flower from May to August. Dame's Violet is perennial (according to many biennial), and is a deciduous, herbaceous plant increased by division.

As the Latin name implies it is especially odoriferous in the evening, and therefore is probably usually fertilized by moths, although it is visited by day by insects such as the hive bee, Large White Butterfly (*Pieris brassicæ*), Small White Butterfly (*P. rapæ*), Green-

veined White Butterfly (*P. napi*), *Halictus leucopus*, *H. albicans*, *Volucella pellucens*, *Rhingia*.

There are two large, green, fleshy honey-glands at the base of the short stamens, well developed internally, and the honey collects between the pistil and base of three stamens each side. The longer anthers fill the entrance of the flower, and when withered project, while the shorter stand inside below them, opening close to the stigma, afterwards protruding. The pistil is elongated, and the anthers thus opening internally, cover the stigma with pollen. When insects visit the flowers at the right time they cross-pollinate them, honey-seekers touching the stamens and stigma on opposite sides of the proboscis, and this happens in the case of pollen-seekers occasionally.

Dame's Violet disperses its seed itself. The dry pod opens and the seeds fall out around the plant by *tension* of the valves, or are blown away by the wind.

Requiring a sand soil, or partly a humus soil, it is a sand lover. There are no fungi which are parasitic upon it. The butterflies and moths, Large White (*Pieris brassicæ*), Orange-tip (*Euchloë Cardamines*), Silver-washed Fritillary (*Argynnis paphia*), Buff Ermine (*Spilosoma lubricipeda*), *Plutella porrectella*, feed upon it.

Pliny applied the name Hesperis, Greek *hespera*, evening; and the Latin *matronalis* means Dame's.

The English names are: Close Sciences, Damask Violet, Dame's Violet, Double Sciney, Eveweed, Gilliflower, (Dame's, Queen's, Rogue's, Whitsun, Winter) Rocket, (Red, White) Rocket, Sciney, Summer Lilac. Because ladies in Germany were said to put pots of it in their boudoirs it is called Dame's Violet. Sciney is a contraction for Damascena, once its specific name. The name Eveweed refers to its sweet scent at night.

It is cultivated as a garden plant, but it does not remain double-flowered any length of time. In the garden it needs a good loamy soil.

Essential Specific Characters:—

30. *Hesperis matronalis*, L.—Stem erect, tall, branched above, pubescent, leaves oblong-lanceolate, acuminate, dentate, flowers lilac, scented, calyx erect, pedicels twice as long, pods tetragonal, stigma lobed.

Ragged Robin (Lychnis Flos-cuculi, L.)

This plant is found in older Glacial, Neolithic, and Roman deposits. It is confined to the Cold North Temperate and Arctic Zones in Arctic Europe and Siberia. The Ragged Robin is found in every county in Great Britain, and in the Highlands at a height of 2000 ft.

Almost every meadow, field, and pasture, especially those which border marshy tracts or wet spongy ground on the sides of hills, is made gay with the feathery pink petals of the Ragged Robin in spring. It is especially fond of growing in the spongy, wet ground, surrounding a pond where Marsh Orchis, Toad Rush, Horsetails, Valerian, and other paludal species or marsh plants congregate.

The tall, slender, erect, nearly angular, furrowed stems are ascending, and have swollen joints, and are covered with hairs bent downwards, being purple in colour. Ragged Robin has the radical leaves blunt at the tip, with stalks, and narrow stem-leaves. The lower part is clothed with bristles, the upper is clammy.

The flowers are pink, and the petals divided into four parts, with an appendage on the upper side at the base of the limb. The narrow segments are erect and have a tooth on the outer margin. The flowers are in a loose cluster. The calyx is purple and has ten ribs. It is tubular and expanded. On the petals the hair is as long as that on the calyx. The capsule has five teeth bent inwards. There are no divisions in the fruit, and the seeds when the capsule opens are exposed to the wind.

Ragged Robin is often 3 ft. high. This pretty plant may be found in flower in May and June. It is perennial and increases by division.

The honey is placed in a position in the flower which is intermediate compared with the place of the honey-glands in *Stellaria*, *Cerastium*, and *Gypsophila*, where the honey is easily accessible, and in *Dianthus* and *Saponaria*, where it can only be reached by long-tongued Lepidoptera.

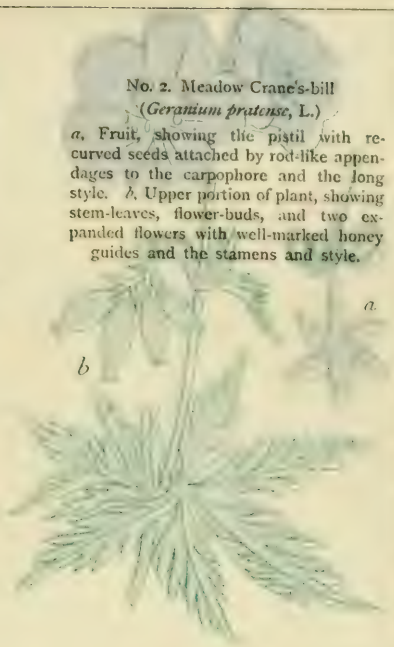
The nectaries unite in a fleshy ring round the ovary at the base of the stamens. The calyx is only 6–7 mm. long, with teeth 3 mm., which are erect, and support the claws or stalks of the petals. Insects with a proboscis 9–10 mm. long can thus reach the honey, and those with a proboscis can push the calyx-teeth to one side, whilst some insects are small enough to creep down the tube. The anthers ripen first. The five outer anthers open first and occupy the entrance to the flower, their pollen-covered sides are turned towards each other, and

No. 1. Ragged Robin
(*Lychnis Flos-cuculi*, L.)

a, Vertical section of flower. *b*, Capsule, with recurved teeth, open above, and a seed. *c*, Rootstock, with roots and radical leaves. *d*, Upper portion of plant, inflorescence, with flowers, buds, and bracts.

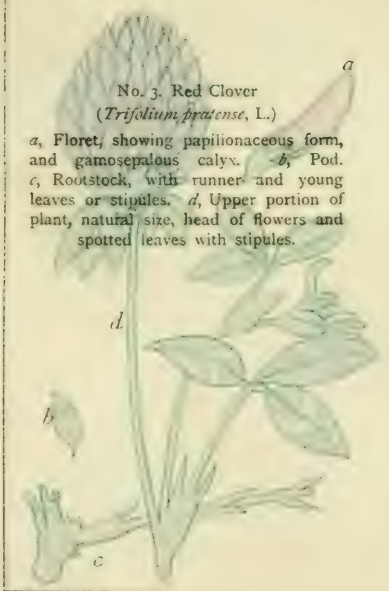
No. 2. Meadow Crane's-bill
(*Geranium pratense*, L.)

a, Fruit, showing the pistil with recurved seeds attached by rod-like appendages to the carpophore and the long style. *b*, Upper portion of plant, showing stem-leaves, flower-buds, and two expanded flowers with well-marked honey guides and the stamens and style.



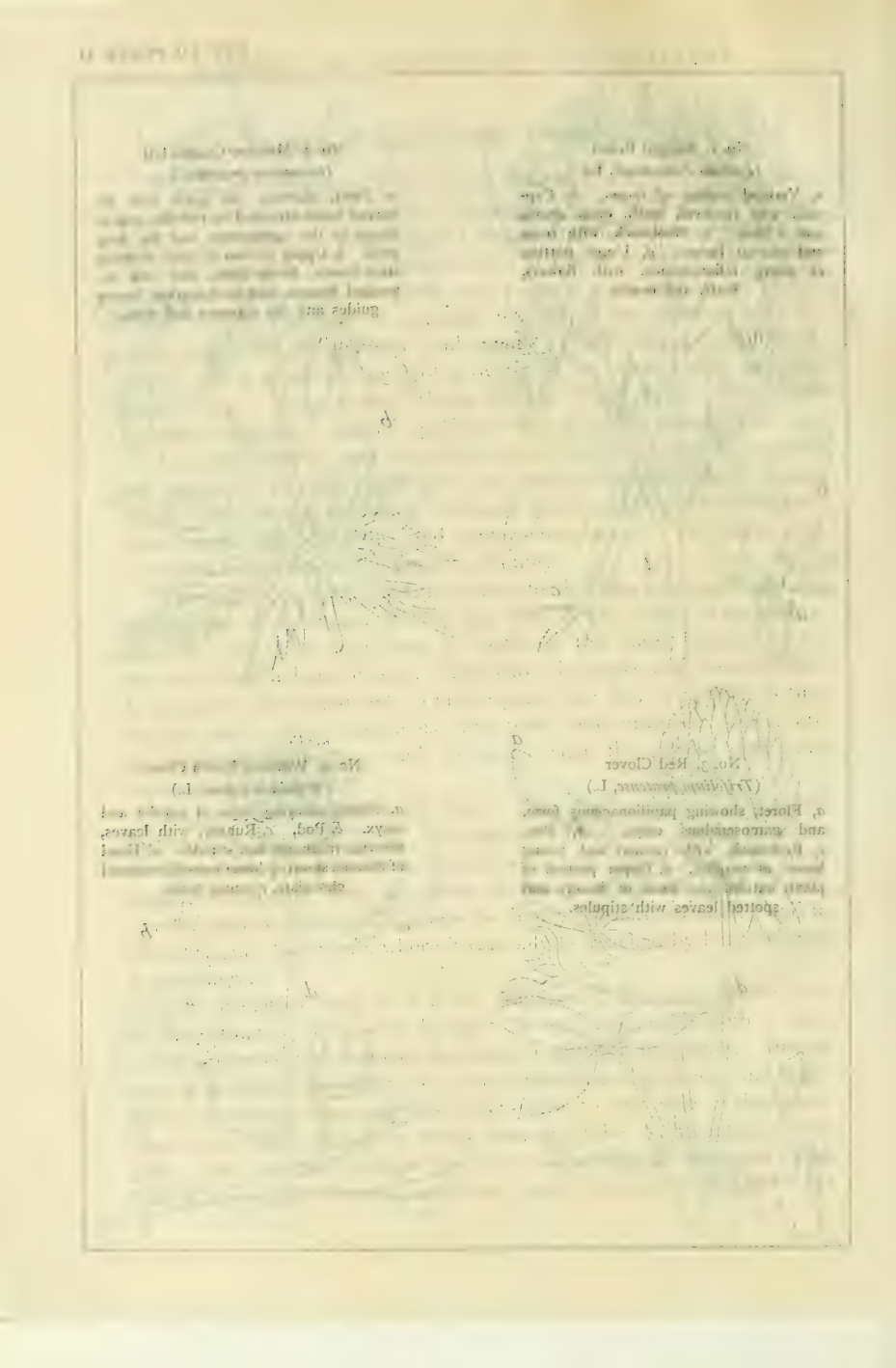
No. 3. Red Clover
(*Trifolium pratense*, L.)

a, Floret, showing papilionaceous form, and gamosepalous calyx. *b*, Pod. *c*, Rootstock, with runner and young leaves or stipules. *d*, Upper portion of plant, natural size, head of flowers and spotted leaves with stipules.



No. 4. White or Dutch Clover
(*Trifolium repens*, L.)

a, Floret, showing form of corolla and calyx. *b*, Pod. *c*, Runner, with leaves, showing markings and stipules. *d*, Head of flowers, showing lower ones discoloured chocolate, ripening fruits.



1. Ragged Robin (*Lychnis Flos-cuculi*, L.). 2. Meadow Crane's Bill (*Geranium pratense*, L.). 3. [illegible]
pratense, L.). 4. White or Dutch Clover (*T. repens*, L.

pollen is conveyed to the proboscis owing to the crowded corolla-mouth. The stamens next elongate and bend, so that they lie in the space between the petals, and the inner whorls occupy the middle. When they wither the five styles arise under the stigmatic papillæ. The styles move as far as the entrance, making $1\frac{1}{2}$ or 2 spiral twists.

The visitors are Hymenoptera (Apidæ), Lepidoptera, Diptera (Syrphidæ).

Like other species Ragged Robin is dispersed by the wind. The capsule opens above, and allows animals or the wind to cause the seeds to be flung to a distance when the stem is shaken.

The plant is fond of peat, living only in a wet, peaty soil, which is found in low-lying districts or meadows.

It is infested by a fungus, *Ustilago violacea*, one of the rusts and smuts. The other species of Lychnis are infested by Pink Rust, *Puccinia arenariæ*, *Ascochyta Dianthi*, *Puccinia lychnidearum*. Two moths, the White Spot (*Dianthœcia albimacula*) and the Marbled Coronet (*D. conspersa*), visit it.

RAGGED ROBIN (*Lychnis Flos-cuculi*, L.)

Flos-cuculi, Tragus, was once a generic name, and is Latin for Cuckoo-flower. Ragged Robin is known by the names of Bachelor's Buttons, Meadow Campion, Cock's-cairn, Cock's-comb, Crow-flower, Fair Maid of France, Cuckoo Gilliflower, Indian Pink, Marsh-gilliflower, Meadow Pink, Pleasant-in-sight, Ragged Jack, Ragged Robin, Robin Hood, Rough Robin, Meadow Spink, Wild Williams. The name Cuckoo Gilliflower was given in allusion to its flowering in spring, and its resemblance to a Gilliflower. Meadow Spink is given because its flowers resemble those of *Dianthus plumarius*.

When cultivated in the garden the flowers are double. Occasionally the plant is white-flowered.

Essential Specific Characters:—

50. *Lychnis Flos-cuculi*, L.—Stem angular, purplish-green, leaves lanceolate, flowers pink, notched, in a loose panicle, calyx tubular, capsule 5-toothed.

Meadow Crane's Bill (Geranium pratense, L.)

The seed-bearing beds have yielded no testimony as yet as to the antiquity (or otherwise) of this fine plant. It is found in the North Temperate and Arctic Zones, in Arctic Europe, and Siberia. It is found in several counties of England and Wales, as well as Scotland, but is absent apparently from N. Cornwall, N. Devon, Isle of Wight, W. Sussex, Carmarthen, Pembroke, Merioneth, Lincoln, Mid Lancashire, Isle of Man, Peebles, Selkirk, Stirling, Elgin, Inverness, Mid and N. Ebudes. It is found in the Orkneys. In the N. Highlands it is found only in East Ross. In the Highlands it is found at 1800 ft. In N.E. Ireland it is very rare.

The Meadow Crane's Bill is a plant of the meadows and fields, growing by the sides of streams, and generally in moist situations, usually in lowland districts, but sometimes at high elevations, under moist conditions. With it grow Meadow Sweet, Cowslip, Yellow Rattle, Self-heal, Spotted Orchid, amongst many others.

The habit of the Meadow Crane's Bill is more or less erect and pyramidal, inversely so, the leaves on long stalks, forming a flat platform above, radiating from the rootstock. Thus they present a wide surface to the light and air. The rootstock is blunt. The stems are erect to spreading, branched above, and are glandular hairy above, with the hairs turned downwards. The leaves are all stalked, the radical ones very long-stalked, and are rounded or palmate with seven lobes radiating from a common centre, the lobes cut and coarsely toothed, irregularly lobed, acute. The stipules are awl-shaped to lance-shaped.

The flowers are large, 1–1¼ in. across, bluish-purple, veined. The petals are long, inversely egg-shaped, entire or notched, the claw or stalk fringed with hairs, or bearded. The sepals are long-awned, spreading. The filaments are slender, wedge-shaped below, hairless, or hairy at the base. The flower-stalks are 2-flowered, bent back in fruit. The carpels are smooth, glandular to hairy, the hairs spreading. The seeds are minutely netted.

The Meadow Crane's Bill is often 3 or 4 ft. high. The flowers may be found from June to September. The plant is perennial, increasing by division of the root.

This well-known wild flower exhibits admirably numerous adaptations to cross-pollination. Dark lines on the petals converging towards the centre act as honey-guides, and indicate where the honey-glands lie at the base of the outer stamens. The hairs on the claws of the petals protect the honey from the rain. The flowers are large and conspicuous and wide open, and short-lipped insects can gain access to the honey.

MEADOW CRANE'S BILL (*Geranium pratense*, L.)

The anthers ripen in advance of the stigma, which is a means of preventing self-pollination. When the anthers open, and in this stage hang over the stigma, the latter is incapable of being pollinated, all the stamens ripening, opening, and shrivelling before the stigma is receptive. Hence pollen must be borne by insects from other flowers before the plant can be pollinated at all, and as good seed is usually set this must usually be the case.

As the anthers wither the whorls of stamens bend outwards. When the anthers open the stigmas cannot be pollinated, but only when the anthers are farthest away from them. The visitors are Hymenoptera (Apidæ, *Apis mellifica*, *Osmia rufa*, *Chelostoma stelis*, *Andrena*, *Halictus*, *Prosopis*); Diptera (Syrphidæ, *Melithreptus*).

The Meadow Crane's Bill disperses its seeds by its own mechanism. The fruit is many-seeded, splitting into single parts that break off separately. When the seeds are ripe the carpels split, and the seeds are scattered by an explosive movement.

In the case of this species the carpels, which are hairy, not netted,

are not thrown. It is the seed which is netted that is thrown by the same means as in *G. Robertianum*, by the tenseness of the rodlike attachment of the capsule.

This plant is fond of peat and requires a humus soil, such as that afforded by loamy soil mixed with humus or a little peat—peaty loam.

The fungus *Sphaerotheca humuli* infests *Geranium* generally, and *Uromyces Geranii* grows upon this one.

A beetle, *Celiodes geranii*, lives on it.

Geranium, Dioscorides, is from the Greek *geras*, crane, in allusion to the beaked fruits, and *pratense* alludes to its habitat, in meadows. The plant is called Crowfoot, Crane's-bill, Grace of God, Gratia Dei, the first from the resemblance between its foliage and that of some Buttercups.

The Meadow Crane's Bill has been cultivated in the garden, and is a beautiful, showy, and striking plant.

Essential Specific Characters:—

67. *Geranium pratense*, L.—Stem erect, leaves palmate, 7-lobed, serrate, flowers large, blue, with ciliate claw, smooth stamens, tapered from broad base, capsule hairy, hairs glandular, spreading, seeds netted, fruit-stalks deflexed.

Red Clover (Trifolium pratense, L.)

No traces of this have been discovered where seeds have been found in Glacial beds. It is spread over the Northern Temperate Zone, in Arctic Europe, North Africa, North and West Asia, India, and has been introduced into North America. In Great Britain it is found in every part of the country northwards to the Shetland Isles. It also ascends to 1900 ft. in the Highlands, and it occurs in Ireland and the Channel Islands.

The wild red or purple clover is essentially a meadow plant, associated with Self-heal, Bugle, Bird's Foot, Milkwort, and a hundred other meadow species. In some places, especially sandy districts, the banks are luxuriantly clothed with this widespread Trefoil. It flourishes on clay, gravel, or sand, and its honey-bearing heads attract attention from their beauty and the fragrance they emit along the roadside and on pastures.

The Red Clover is more or less erect in habit. The stems are either solid or hollow, and slender or stout, the whole plant more or less downy. The leaves are trifoliate, with leaflets in threes. The leaflets are oblong, blunt, with a white spot or crescentic band, finely

toothed, notched, the upper entire, with a blunt point. The stipules are membranous, with long bristle-like points, closely pressed to the leaf-stalk, the free part blunt, egg-shaped, the veins branched and crossing.

The flowerheads are dense, stalkless or with a short stalk, egg-

RED CLOVER (*Trifolium pratense*, L.)

shaped, terminal, at length round, with opposite leaves below. The florets are pink, purple, or dirty white. The calyx is strongly ten-veined, hairy above, not half as long as the corolla, with a two-lipped contraction in the throat, the five teeth not longer than the corolla, slender and unequal, four nearly equal to the tube, the lower twice as long, fringed with hairs. The pod opens by the falling off of the top.

Red Clover is rarely more than 1 ft. high, and flowers from May to September. It is perennial, and may be increased by division.

The tube is long, 9–10 mm., and is not accessible as a rule to short-lipped bees such as the Honey Bee, which gets its supply of honey from the White Clover. The tube is formed by the cohesion of the nine inferior stamens with each other, and with the claws of the petals (keel, and base of the wings and standard or vexillum). The honey, which is abundant, lies at the base of the stamens, and is accumulated round the base of the ovary in the tube. The bee thrusts its head under the vexillum and into the staminal tube, and if the superior stamen were united with the others to form a tube the insect's proboscis would come in contact with it; but only its two ends are in the middle line, the rest lying on the side throughout its whole length. At the anterior end of the tube lie the broad base of the standard, continuous with the superior and lateral portion of the tube and with the inferior part by an expansion at the base of the free limb, and also the base of the carina attached to the inferior part of the tube in the interval left by the standard, which returns at once to its position after it has been depressed. The two alæ with flexible claws, with a lamina expanded at the base, cover the top of the tube, and keep it and the petals in position. The two alæ and the staminal tube also (like the vexillum and carina) come off from the anterior end of the common tube, the tube, as has been seen, being split superiorly to include the free tenth stamen, dividing into stiff filaments curving upwards, thickened at the end.

The style lies in the centre of the tube, curving upwards, the stigma exceeding the anthers. The bee clings on to the alæ and rests the middle and hind legs lower down, the keel and alæ are depressed, and the stigma and anthers touch the bee's head below. Pollen brought from elsewhere is deposited on the stigma by the bee. The bee is then dusted afresh with pollen from the anthers, and cross-pollination follows. As the bee withdraws from the flower it may touch the stigma with some of the pollen just applied, and cause self-pollination. The pod opens at the top, allowing the 1–4 seeds to fall out.

The visitors are Apidæ, Diptera (Bombyliidæ, Syrphidæ, Conopidæ), Lepidoptera—Large White (*Pieris brassicæ*), Small White (*P. rapæ*), Small Tortoise-shell (*Vanessa urticæ*), Wall Butterfly (*Satyrus* (*Pararge*) *megæra*), Meadow Brown (*S.* (*Epinephele*) *janira*), Large Skipper (*Augiades* (*Hesperia*) *sylvanus*), the Small Skipper (*Adopæa* (*H.*) *thaumas*), Silver Y Moth (*Plusia gamma*).

Red Clover is above all others addicted to a sandy habitat, requiring a sandy soil. It is found on Keuper Marl, Lias, Boulder Clay, &c.

Several fungi infest it: *Urophlyctis trifolii*, *Peronospora trifolii*, *Sclerotinia trifoliorum* (Clover Sickness), *Pseudopeziza trifolii*, *Gleosporium caulivorum*, *Macrosporium sareniaeformis*; and it is galled by *Cecidomyia trifolii*. The beetles *Sitones lineatus*, *Apion virens*, *Phytonomus meles*; the moths *Leucophasia Sinapis*, *Zygaena trifolii*, *Lasiocampa trifolii*, *Eulalia bipunctaria*, *Eubolia palumbaria*, *Stigmonita compositella*, and the Hemipterous *Orthocephalus saltator* feed on Red Clover in one form or another.

Trifolium (Pliny) is from the Latin *tres*, three; *folium*, leaf, hence trefoil; and *pratense* alludes to its meadow habitat. Clover is from A.S. *claefer*, Belg. *klaver*, from A.S. *cleafan*, to cleave. It is called Beebread, Broad Clover, (Broad, Meadow, Red, or Soukie) Clover, Clatter Malloch, Clover-grass, Cob, Cock's-head, Cow-clover, Cow-grass, Honey-suck, Honeysuckle Trefoil, Knap, Marl-grass, Plyvens, Shamrock, Sleeping Maggie, Sookies, Suck-bottle, Suckies, Sucklers, Suckles, Sucking Sugar Plums.

> Under that tree, and on the suckler brae,
> Where oft we wont, when bairns, to run and play.

Though called Beebread the hive bee does not visit it. The name Soukie Clover is given because children suck the flowers for honey. In Virginia it was said to have sprung from the blood of men slain in battle. It is a talisman to detect fairies:

> I'll seek a four-leaved clover
> In all the fairy dells,
> And if I find the charmed leaf—
> Oh, how I'll weave my spells!

Two-leaved clover is lucky, and gathered with a formula:

> A clover, a clover of two,
> Put it in your right shoe,
> The first young man you meet,
> In field, street, or lane,
> You'll get him, or one of his name.

If a lover puts a sprig of clover in his shoe before he sets out on a journey in Bohemia he will remain faithful, and a lover also puts a four-leaved one under his pillow to dream of his sweetheart. To dream of it foretells a happy marriage. To live in luxury is "to lie in clover". Bad luck attends the finding of a five-leaved clover.

Red Clover is one of the most useful plants for meadow lands. It is sown in spring with corn, and when the corn is cut it furnishes a winter fodder, growing up with it. It is also ploughed in as a green crop, enriching the soil by the power it has of fixing nitrogen by bacterial agency. It was first grown in 1645 in this country.

Essential Specific Characters:—

78. *Trifolium pratense*, L.—Stem rigid, hairy, leaflets broad, entire, stipules blunt, ovate, flowers purple, sessile, in round heads, calyx downy.

White or Dutch Clover (Trifolium repens, L.)

This is one of the Leguminosæ which, so far as we know, is of quite recent date. The North Temperate and Arctic Zones are its home, i.e. in Arctic Europe, N. Africa, N. and W. Asia, India, and N. America. In Great Britain it is found in every county as far north as the Shetlands, and in the Highlands it is found growing at 2700 ft. It is a native of Ireland and the Channel Islands.

Truly wild upon most sandy stretches of pasture, the Dutch or White Clover is to be found in fields, on banks, upland as well as lowland, in all parts of the country; but it is rather more common in the eastern and southern counties than in the west and northern counties. With its occurrence is connected the honey output of most hives, as the Red Clover is inaccessible to the hive bee.

While Alsike and Red Clover are more or less erect, Dutch Clover is a creeping, trailing plant, with numerous, widespreading, simple stems, with leaflets in threes, egg-shaped at either end, slightly notched at the tip and toothed, with a green or purple or white spot in the centre. The leaf-like organs on the leaf-stalks are narrowly elliptic, and drawn out into a point, with purple veins.

The white, rarely purplish, flowers are in clusters, and when young are erect, but later bent down, on long stalks, the heads being in umbels. The ten calyx teeth are about equal, and ribbed, with bristle-like teeth. The corolla, like the pea flower, is twice the length of the calyx, the standard being brown, not falling.

The pods are long, and contain four seeds.

Rarely does the White Clover exceed 2 to 3 in. in height. The flowers are in bloom from May to September. It is perennial, and increases by root division.

The Dutch Clover has a very simple flower, in which the wings are united to the keel at one point, and the stamens and pistil are enclosed in the keel. They protrude when it is depressed and return

when the pressure is removed, and the pollen is thus well covered, or protected from rain or creeping insects. The honey lies at the base of the ovary near the base of the united stamens, being reached by apertures each side of the free stamen. The insect stands on the two wings, thrusting its head beneath the standard, which it forces up, depressing the wings and keel and forcing the stamens and pistil against the bee's abdomen, and possibly causing cross-pollination on the return of the parts to their place if the insect has previously visited another flower of the same species. The stigma projects above the anthers, first touching the abdomen of a visitor. The calyx-tube is short, allowing *Andrena* and *Halictus* to reach the honey. The wings and keel move together or rotate when pressed, and the former projecting beyond the latter this causes a lever motion. The elasticity of the standard causes the parts to return to their place after insects' visits, and the other parts also. The visitors are Hymenoptera (Apidæ, *Apis mellifica*, *Bombus pratorum*, *Megachile willoughbiella*, *Halictus tarsatus*, *H. immaculatus*, *Andrena fulvicrus*); Diptera (Syrphidæ, *Volucella bombylans*, Conopidæ, *Myopa buccata*, *M. testacea*); Lepidoptera (Large White Butterfly (*Pieris brassicæ*)).

White Clover (*Trifolium repens*, L.)

The pods are covered by the corolla not falling in fruit, and these when the head is ripe fall off just round the plant. The seed is thus dispersed by the plant itself.

Like the Red Clover, White Clover requires a sand soil, never (or rarely) growing in humus soil as the former does.

Urophlyctis trifolii and *Peronospora trifoliorum* are fungi parasitic upon it. A beetle (*Apion flavipes*) and a hymenopterous insect (*Colletes marginata*) live on it

The second Latin name refers to its creeping habit. It is called Bloodwort, Claver, Clover, Dutch or White Clover, Curl-doddie, Fourleaved Grass, Sheep's Gowan, Purple Grass, Honeystalks, Honeysuckle Clover, White Honeysuckle, Lamb's Sucklings, Purple-wort, Quillet, Sucklers. The name Purple Grass is given to a cultivated form with dark-brown purple foliage.

Parkinson says of this:

> The purple grasse spreadeth on the ground.

"The leaves are in some three, in others foure or five, on a stalke of a sad greene colour, with a shadow of darke purple cast over them, the flowers are white; I never saw this but in gardens where women keepe it with confidence to be good for the purples in children or others." This is a good instance of the absurd "doctrine of signatures" then in force.

"Honeystalks" are clover flowers "which contain a sweet juice". Cattle sometimes overcharge themselves with clover and die.

> Words more sweet, and yet more dangerous,
> Than baits to fish, or honeystalks to sheep.
>
> SHAKESPEARE, *Titus Andronicus.*

Lambs were fed on clover, hence the name Lamb's Sucklings. As a fodder plant it is valuable, and it spreads and roots widely, being permanent, unlike the Red Clover. A square yard is quickly covered by a plant in one year. The seeds have been used in times of famine for making bread. The hive bee seeks its honey from this clover.

ESSENTIAL SPECIFIC CHARACTERS:—

81. *Trifolium repens,* L.—Stems creeping, leaflets obovate, serrate, flowers white, in round heads, fruit-stalks deflexed after flowering, peduncles axillary, longer than the leaves, legumes 4-seeded.

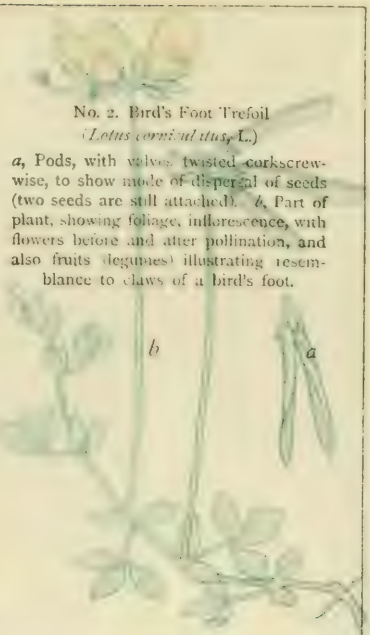
Hop Trefoil (Trifolium procumbens, L.)

The present range of Hop Trefoil—for this is only known in the present-day flora—is the North Temperate Zone of Europe, North Africa, North and West Asia, and it is also an introduction in North America. In Great Britain it is unknown in Monmouth, South-east York, Main Argyle, Hebrides, Orkneys, elsewhere it grows from Ross southwards, ascending to 1200 ft. in Derbyshire, Ireland, and the Channel Islands.

The Hop Trefoil, while commonly a meadow plant, is also a

No. 1. Hop Trefoil
(*Trifolium procumbens*, L.)

a, Floret before pollination. *b*, Floret after pollination, discoloured chocolate. *c*, Pod. *d*, Part of plant, with heads of flowers in different stages.



No. 2. Bird's Foot Trefoil
(*Lotus cornicul'atus*, L.)

a, Pods, with valves twisted corkscrew-wise, to show mode of dispersal of seeds (two seeds are still attached). *b*, Part of plant, showing foliage, inflorescence, with flowers before and after pollination, and also fruits (legumes) illustrating resemblance to claws of a bird's foot.

No. 3. Meadow-sweet
(*Spiræa Ulmaria*, L.)

a, Spirally-twisted achenes, forming a head. *b*, Separate achene. *c*, Inflorescence, showing flowers with stamens and pistils. *d*, Flower-stalk, with buds and upper stem-leaves and stipules.

No. 4. Cinquefoil
(*Potentilla reptans*, L.)

a, Calyx, seen from below with bracts. *b*, Head of achenes. *c*, Part of plant, showing runner, adventitious roots, stipules, leaves, and a flower with stamens and pistil, and the cinquefoil (or Tudor rose) form of corolla, with the linear alternating sepals.

1. Hop Trefoil (*Trifolium procumbens*, L.). 2. Bird's Foot Trefoil (*Lotus corniculatus*, L.). 3. (*Spiræa Ulmaria*, L.). 4. Cinquefoil (*Potentilla reptans*, L.).

frequent associate of species that delight in the more or less undisturbed security and protection of the railway banks, which are now so general a feature of most districts.

Likewise it frequents natural banks and slopes, being accustomed to dry conditions, and is largely a dry-soil lover.

Hop Trefoil (*Trifolium procumbens*, L.)

The specific name suggests the trailing habit of most of the stems, the principal one being erect, slender, the leaflets blunt at the tip, the leaves with lobes each side of a stalk, the leaflets in threes, and the stems are also slightly downy.

The flowerheads are round, large, in oval spikes, with overlapping florets, having a hop-like appearance (hence the name). When the flowers are withered the standard yellow, like the rest of the flowers, is arching but does not fold over the pods. It is bent down, does not

fall, and is furrowed. The flowers are stalked, the style is less than the pod, the leaf-like organs on the leaf-stalks are ½-ovate, acute, and the seeds are oval.

The stems are rarely 18 in. long, and usually 1 ft., and on the coast about 6 in. high, with larger flowers. The flowers are in bloom in June and July. The plant is annual.

The flowers are large and conspicuous, and are visited by bees, *Apis mellifica*, *Halictus flavipes*. The tube is not so long as in Red Clover, the flowers numerous and dense. The standard is broad, and arches over the centre, and the style is hooked. The short calyx allows the other parts of the flower to return to position after an insect visit.

The pod is a 1-seeded fruit, not splitting into many parts, egg-shaped, and when ripe it falls off or is broken off. It is therefore dispersed by its own agency.

Hop Trefoil is addicted to a sand soil. Like Hare's Foot Trefoil, it also grows on the more ancient rock formations on stony barren ground.

It is a food plant for a beetle, *Apion pisi*, and a moth, *Anthocera trifolii*.

The second Latin name refers to its procumbent or trailing habit. It is called Hop or Yellow Clover, and Hop Trefoil. From the hop-like shape of the flowers it is called Hop Trefoil. Not so valuable as Red or White Clover, it is an annual. It often covers barren ground where nothing else will grow.

Essential Specific Characters:—

82. *Trifolium procumbens*, L.—Stem erect, branches procumbent, leaflets obovate, central petiole longest, stipules ovate, flowers yellow, in dense, round, hop-like heads, forty flowers, standard dilated not folded.

Bird's Foot Trefoil (Lotus corniculatus, L.)

This plant, which is known only, as regards its distribution, as a member of the flora of the North Temperate Zone to-day, is a native of Europe, N. Africa, N. and W. Asia. In Great Britain it is found in every part, as far north as the Shetlands, growing at a height of 2800 ft. in the Highlands. It is found in Ireland and the Channel Islands.

The common Bird's Foot Trefoil forms clumps and patches of golden colour in the meadows from June till late in the summer. There it is associated with Yellow Rattle, the Daisy, the Ox-eye

Daisy, and other widespread pratal species, growing luxuriantly also on banks, such as railway embankments or cuttings.

The slender, numerous stems grow in close clusters, and are branched, the leaflets, which are in threes, are egg-shaped and smooth, but hairy here and there. The stems are half-erect and somewhat square-stalked. The leaflets are only shortly stalked. The stipules (in pairs) are narrowly elliptical, ending in a point.

The flowers vary in colour from red to lemon colour, and in number from 5 to 10, but are usually golden yellow, and borne on short

Bird's Foot Trefoil (*Lotus corniculatus*, L.)

flowering branches, in a sort of umbel, the heads being bent down. The calyx is not quite half as long as the corolla, and at first the teeth are pressed together and erect, and are triangular below, awl-shaped above, the points of the two upper teeth meeting together. The pods are cylindrical, separated by divisions between the seeds, and two-valved.

Sometimes the plant is a foot or more in height, but usually 4–6 in. The flowers may be seen from May to September. Bird's Foot Trefoil is perennial.

In this common flower we have a type of the relation of parts to insect visits typical of flowers like the Pea in general. There are five petals, of which the upper is erect and called the standard. Below

these are the two wings or alæ. The other two lower petals are united along the anterior margin to form a carina or keel.

The nine stamens are united at the base to form a tube encircling the pistil, and project beyond it into a triangular cavity at the bottom of the keel which is a repository for pollen. The tenth is free. The alæ are locked by projecting knobs fitting into a hollow opposite (as in the mantle of a Sepia or Cuttle-fish). An insect alighting on the flower bears down the alæ and the keel, which is pushed over the column or ring of stamens and forces the pollen up into the cavity and against the abdomen of the insect, and when the insect goes off to another flower the parts return again to their former position and cover up the pollen. The bee is able to reach the honey when the tenth stamen is free. In other species of Leguminosæ where the tenth stamen is united there is usually no honey.

Pollen is discharged when the anthers burst before the flowers are opened. Of the two groups of five stamens one has thickened ends, and after the five inner anthers have shrivelled they fill the hollow in the keel in which the pollen is collected. The wings and keel are both depressed when a bee alights, and being locked together they spring back as by a "piston mechanism" after pressure is removed.

The visitors are Hymenoptera (Apidæ), Diptera, Sphinges, *Sesia*, *Zygæna*, *Bombyces*, *Porthesia*, *Noctuæ*, *Euclidia*, &c.

The pod is a many-seeded fruit, and is divided into divisions which alternate with the seeds, and as the chambers break off when the pod is ripe, the seeds travel to a short distance, and the Bird's Foot Trefoil is therefore extended in range by its own agency.

This plant is best suited by a sand soil in which there is a fair proportion of clay, or sandy loam, and is therefore both a sand-lover and a clay-lover. It is abundant on Triassic and Liassic clays as well as on later Oolitic rock soils.

The fungi *Peronospora trifoliorum* and *Uromyces striatus* attack *Lotus*. The beetles *Apion loti*, *Bruchus loti*, *Meligethes solidus*, a hymenopterous insect *Megachile argentata*, and the Lepidoptera, Dusky Skipper, Wood White, Common Blue, Clifden Blue, Common Heath, *Gelechia tumidella*, *G. tæniolella*, *Nepticula cryptella*, Silver Cloud (*Xylomyges conspicillaris*), &c., Transparent Burnet (*Zygæna minos*), Broad-bordered Five-spotted Burnet (*Z. trifolii*), Narrow-bordered Five-spotted Burnet (*Z. loniceræ*), *Lithosia palliatella*, *Coleophora discordella*, Bordered Gray (*Selidosema plumaria*), and *Myllophila semi-rubella*, and the fly *Diplosis loti* feed on it.

Lotus, a name given by Theophrastus, is the Latin for this common

plant, and the second Latin name means shaped like a little horn, referring to the fruit, from the Latin *corniculum*, a little horn. It is called Bird's-foot, Bloom-fell, Boots-and-Shoes, Feal Broom, Butter-and-Eggs, Butter-jags, Cat cluke, Claver, Cat-poddish, Cat's Claws, Cat's Clover, Cheese-cake, Craw-taes, Crow-foot, Crowtaes, Cuckoo's Stockings, Lady's Cushion, Dead Man's Fingers, Devil's Claws, Devil's Fingers, Eggs-and-Bacon, Fell-bloom, Fingers-and-Thumbs, Fingers-and-Toes, God Almighty's Thumbs-and-Fingers, Ground Honeysuckle, Hen-and-Chickens, Jack-jump-about, King Finger, Lady's Boots, Lady's-finger-Grass, Lady's Glove, Lady's Shoes and Stockings, Lady's Slipper, Lamb's Sucklings, Patten and Clogs, Milk-maid, Pig's Foot, Pig's Pettitoes, Sheep Foot, Tommy Tottles, &c. The name Cat cluke or Cat-luke is applied from a supposed resemblance it has to a cat's or bird's foot.

> The yellow Lambtoe I have often got
> Sweet creeping o'er the banks in sunny time.

It is a valuable meadow plant, and will grow freely and luxuriantly in damp spots. Mixed with other plants and grasses it affords good fodder for cattle and horses.

Essential Specific Characters:—

84. *Lotus corniculatus*, L.—Stem prostrate, leaves smooth, obovate, stipules ovate, flowers in an umbel, 5–10, yellow, calyx teeth appressed, points of two upper teeth converging, erect in bud.

Meadow-sweet (Spiræa Ulmaria, L.)

Beds of Preglacial, Interglacial, Neolithic, and Roman age (as at Silchester) have afforded seeds of this species. It is found in the North Temperate and Arctic regions of Arctic Europe, Asia Minor, and North Asia. The Meadow-sweet is found in all parts of Great Britain as far north as the Shetland Islands, up to 1200 ft. in Yorkshire. It is found in the West of Ireland.

Meadow-sweet is a very common riverside flower, fond of damp places, growing also in hollows in moist meadows, where it is accompanied by other moisture-loving plants, such as Lesser Spearwort, Water Avens, Bugle, Spear Thistle, various docks, Spotted Orchis, and other plants, amongst which one may name various kinds of rushes and sedges.

The Meadow-sweet is erect in habit, tufted. The rootstock is short. The stems are erect, furrowed, angular, simple or branched,

leafy. The leaves are pinnate, with lobes each side of a common stalk, white-felted below or hairless, toothed, with large toothed leaflets and smaller intermediate ones. In the radical leaves the terminal ones are large, the lateral ones egg-shaped, entire, small, alternate. The terminal leaflets are large with acute lobes, palmately lobed, with 3–5 segments. The stem leaves are downy below. The stipules are leafy, rounded, half-egg-shaped, toothed.

Photo. E. Hume

MEADOW-SWEET (*Spiræa Ulmaria*, L.)

The flowers are creamy white, sweet-scented, in corymb-like cymes, which are very compound, with long lateral branches. The lobes of the calyx are turned back. The petals are rounded. The carpels are hairless, twisted together, almost horizontal, 5–9, with two pendulous ovules. The stamens are numerous, 20–60.

Meadow-sweet is from 2 to 3 ft. high. The flowers may be gathered from May or June to October. The plant is perennial and increased by division.

The Meadow-sweet, as the name implies, is a sweet-scented flower. The compound cymes are conspicuous, and though the flowers do not contain honey they are much visited by insects, as the stamens are numerous and pollen is therefore abundant. In the first stage the stamens bend over towards the centre completely hiding the stigmas. But they gradually become erect, and bend outwards in succession. They then open and are covered with pollen. The centre of the flower then becomes accessible to insects, either small creeping ones or larger flying insects. When the stigma ripens it is thus open to

cross-pollination. But self-pollination may occur as pollen may fall from the anthers on the stigma, and insects may cause this, owing to the crowding of the flowers, the stamens of one flower bending over another may also lead to cross-pollination. The flowers may also be homogamous, in which case self-pollination will usually occur.

In the Meadow-sweet the fruit is a collection of follicles, with 1-celled carpels. The fruit splits open, allowing the seeds, which are few, to be jerked or blown out around the parent plant.

As it requires a clay soil, or a sandy loam in other cases, this plant is more or less a clay-lover.

The foliage is distorted by *Triphragmium ulmariæ*, and a fungus, *Sphærotheca humuli*, lives on it, while it is galled by *Cecidomyia ulmariæ*.

The beetles *Ischnomera melanura*, *Asclera cærulea*, a Hymenopterous insect *Blemocampa unguiculata*, the Homopterous *Eupteryx signatipennis*, the Heteroptera *Lygus lucorum*, *L. spinolia*, and the beetles *Cereus pedicularius*, *C. bipustulatus*, *Galeruca tenella* feed on it.

Photo Mat.

MEADOW-SWEET (*Spiræa Ulmaria*, L.) IN FLOWER

Spiræa, Theophrastus, from *speira*, cord, is the Greek name from its twisted seeds, and *Ulmaria*, Dodonæus, is from *Ulmus*, elm, from the elm-like foliage. It is called Bittersweet, Bridewort, Courtship-and-matrimony, Goat's Beard, Harif, Honey-sweet, Maid-of-the-Meadow, Maid-sweet, Meadow-soot, Meadow-sweet, My Lady's Belt, Queen-of-the-Meadow, Sweet Hay.

Queen-of-the-Meadow is a translation of the old name *Regina prati*. Bridewort is from its resemblance to the white feathers worn by brides; and it was used for strewing houses at wedding festivals:

> Amongst these strewing kinds some other wild that grow,
> As burnet, all abroad and meadowwort they throw.—DRAYTON.

In Ireland they believed if Meadow-sweet was put in water on St. John Baptist's Day it would reveal a thief, and if floating the thief would be a woman, if sinking a man. Its fragrant flowers were considered to have medicinal virtues, and it was an ingredient of the remedy "Save" referred to in the *Knight's Tale*:

> Eek save they drunken, for they wode here lymes have.

Essential Specific Characters:

93. *Spiræa Ulmaria*, L.—Stem tall, erect, herbaceous, leaflets entire, terminal palmately lobed, downy below, flowers white, in cyme, numerous, fragrant.

Cinquefoil (Potentilla reptans, L.)

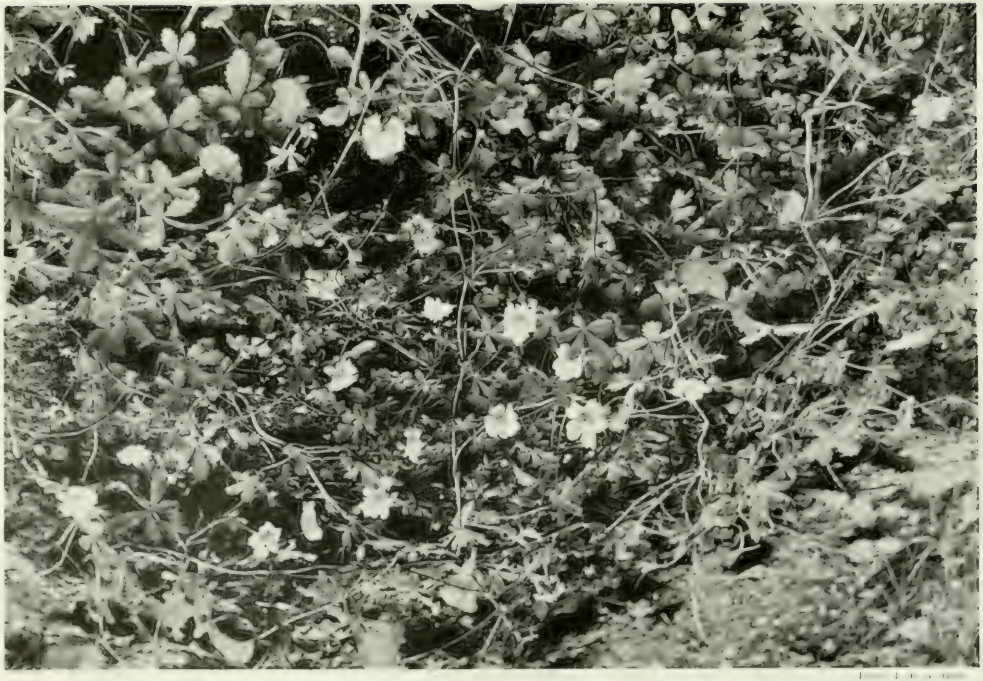
Unlike the Tormentil this plant has not been discovered in any early deposits. Its distribution in the Northern Temperate Zone is confined to Europe from Gothland southward, N. and W. Asia, Himalayas, Canaries, Azores. In Great Britain it is a common plant, but it is not found in Cardigan, S. Perth, Mid Perth, N. Aberdeen, Elgin, Easterness, Main Argyle, Dumbarton, Clyde Islands, Ebudes, and the whole of the N. Highlands, and Northern Isles, ranging thus from Banff southward. It is a native in Ireland and the Channel Islands.

The common Yellow Cinquefoil is a familiar plant in the meadows and fields when in bloom, covering some few feet with its golden flowers and creeping stem. It is addicted to little knolls and banks, and being fond of dry soil prefers high ground, spreading rapidly on the hillside or open meadow.

The common English name Cinquefoil describes the fivefold arrangement of leaflets in this plant, and the second Latin name describes its habit, creeping, the stem lying quite flat. It is usually a larger plant than Tormentil, and the stem is slender, thread-like, rooting at intervals. The leaves are larger, and are stalked, having finger-like, toothed leaflets, blunt at the tip, with some small leaves in the axils in pairs, and slightly hairy.

The flowering stalks bear solitary flowers and are long, in the axils, and half-erect, with large flowers, the sepals being alternately smaller, the petals heart-shaped. The achenes or fruits are rough, the seeds numerous.

Cinquefoil being a plant which lies on the ground is never more than 6 in. in height. It flowers freely in June and July. It is perennial and propagated by runners.



COMMON YELLOW CINQUEFOIL (*Potentilla reptans*, L.

The flower is like that of *P. verna*, in which there is a ring-like ridge on the inner wall of the tube borne on the top of the flower-stalk, which surrounds the base of the stamens, and is marked by its dark reddish-yellow colour. The honey is not secreted in drops, but in a very evident, smooth adherent layer. The anthers become covered on both sides with pollen, and ripen at the same time as the stigmas.

Insects alight in the centre, or on the petals, and in the latter case they dust themselves with pollen, but do not touch the stigmas, as the honey-ring lies farther out. If they alight in the middle of the next flower they cross-pollinate it. But the flower is often self-pollinated. The flowers close up in part in dull weather, and completely at night, and it is then that the anthers touch the stigmas.

The visitors are *Prosopis armillata*, *P. hyalinata*, *Halictus maculatus*, *H. leucozonus*, *H. sexstrigatus*, *Andrena albicrus*, *A. nana*, *Sphecodes gibbus*, *Nomada xanthosticta*, *N. succincta*, *Ammophila sabulosa*, *Syrphus arcuatus*.

The achenes or fruits are granulated or covered with little points, and are dispersed, when dry, around the parent plant.

A dry sand soil is the principal requirement of Cinquefoil, which is strictly a sand plant, growing luxuriantly on sand, derived from sedimentary rocks or even directly from older granitic debris.

Nestophanes potentillæ forms galls upon the stems and rhizomes, and a moth, the Knotgrass (*Acronycta rumicis*), feeds on the Cinquefoil.

The second Latin name refers to its creeping habit. It is called Cinquefoil, Fitlef, Five-finger-blossom, Five-finger-grass, Five-fingers, Five-leaf, Five-leaved-grass, Golden-blossom, Herb Five-leaf, Sink-field, Synkefoyle, Tormentil. Sinkfield is merely a corruption for Cinquefoil, which alludes to the five leaflets.

In the fourteenth century it was much used, and imagined to be a cure, for stomach complaints. Like Tormentil it is astringent and used in dysentery, being also used for tanning. Tea used for fevers was made with it.

Essential Specific Characters:—

100. *Potentilla reptans*, L.—Stem slender, rooting, creeping, leaflets obovate, leaves stalked, flowers large, yellow, petals five, obcordate, carpels rough.

Lady's Mantle (Alchemilla vulgaris, L.)

No trace of Lady's Mantle is found in the rocks. It is an Arctic plant found in the North Temperate and Arctic regions in Arctic Europe, N. and W. Asia, Kashmir, Greenland, Labrador. In Great

Britain it occurs in every part of the country except in Mid Lancashire, as far north as the Shetlands. In the Highlands it is found at a height of 3600 ft. It is native also in Ireland and the Channel Islands.

Lady's Mantle is a plant of the uplands, being rarely found at low levels. Whilst it grows in meadows and fields of intermediate altitude, it is more often found on the sides of hills, where such plants as *Viola calcarea*, *Hieracium Pilosella*, Salad Burnet, *Kœleria*, and other plants are found.

It is an erect plant, with kidney-shaped leaves, plaited, with 6–9

Lady's Mantle (*Alchemilla vulgaris*, L.)

lobes, and toothed, the stem and leaf-stalks being smooth, the leaves greenish below and downy. The stipules or leaf-like organs on the leaf-stalks are united at the base and toothed. The leaves are mainly radical leaves, and spring from the rootstock, being large and neat. Such leaves borne on the flowering stems are without stalks.

The yellowish-green flowers are borne in racemose cymes, which are spiked and panicled. The short flower-stalks are downy, and the texture of the whole plant is more or less silky. The achenes or fruits are few and glandular.

Occasionally the stem is a foot long, usually less, or about 6 in. June to August are the months when the flowers are in bloom. The plant is propagated by dividing the roots. It is a deciduous, herbaceous perennial.

The small flowers have no corolla. Because they are green beetles

No. 1 Lady's Mantle
(*Alchemilla vulgaris*, L.)

a, Vertical section of flower. *b*, Flower from above, magnified. *c*, Rootstock, with sheaths and palmate leaves. *d*, Inflorescence, with flowers and bracts, and upper stem-leaves and stipules.

No. 2. Great Burnet
(*Poterium officinale*, A. Gray)

a, Section of flower. *b*, Flower, showing 4 stamens and long style of pistil, with petals, gamosepalous calyx, and bracts. *c*, Rootstock, with pinnate leaf. *d*, Inflorescence, with fruit.

No. 3. Wild Carrot (*Daucus Carota*, L.)

a, Floret from above. *b*, Hooked fruit or schizocarp. *c*, Section of a fruit, showing rows of prickles. *d*, Inflorescence, showing pinnate bracts of involucre, and mass of flowers in compound umbel.

No. 4. Devil's Bit Scabious
(*Scabiosa succisa*, L.)

a, Tubular floret. *b*, Achene, with calyx of bristles above. *c*, Rootstock (præmorse) and radical leaves. *d*, Inflorescence, with flowerheads in different stages.

do not visit them. There is a yellow, fleshy ring on the inner wall of the receptacular tube which surrounds the style (and later the ovary) which secretes a thin layer of honey, giving a greenish-yellow colour to the flower.

The small amount of honey makes it unattractive to insects with a long proboscis. It is not usually self-pollinated, but the partial separation of the sexes makes for cross-pollination. It is not often that male and female organs are equally developed, but usually either the stamens are fully developed and the pistil is short, barely projecting above the honey-secreting ring, or the style is long and projects and the anthers are completely useless. Sometimes flowers occur in which one or two stamens are developed as well as the pistil. It is visited by *Xanthogramma*, Flies, and Butterflies. The plant is becoming dicœcious, stamens and carpels being often found on different plants.

The glandular achenes are enclosed in the membranous calyx and are chiefly dispersed by the wind.

Lady's Mantle is a sand-loving plant, addicted to a dry soil, in which there may be some little lime.

The leaves are checked in growth by a fungus, *Uromyces alchemillæ*. A beetle, *Phyllobius viridicollis*, two moths, the Small Rivulet (*Emmelesia alchemillata*), *Lampronia prælatella*, and a Homopterous insect, *Trioza scutipennis*, live upon it.

Alchemilla, Tragus, is from the same Arabic origin as alchemy, from its supposed virtues, and the second Latin name from its universality.

Lady's Mantle is called Bear's-foot, Dew cup, Duck's-foot, Great Sanicle, Lady's Mantle, Lamb's Foot, Lion's Foot, Padelion, Pedelyon, Syndaw. The name Dew cup is given to it because the moisture, owing to the hairs on the surface, collects in a drop in the middle of the leaf, which thus appears unwetted. It was also called Our Lady's Mantle. It is the Maria Stakker of Iceland, which produces sleep if placed under the pillow. It had a reputation for restoring feminine beauty. It is astringent.

Essential Specific Characters:—

101. *Alchemilla vulgaris*, L.—Herbaceous, erect, leaves reniform, plaited lobed, hairy, flowers yellowish-green, terminal, in racemes or cymes.

Great Burnet (Poterium officinale, A. Gray)

This common plant is an ancient one, having been found in Preglacial, Early Glacial, Interglacial, Late Glacial, and Neolithic deposits.

It is a Northern Temperate and Arctic Zone plant found in Arctic

Europe, N. and W. Asia. In Great Britain it is found throughout the Peninsula province, in Wilts and Dorset in the Channel province, in the Thames province not in Kent or Essex, throughout Anglia, Severn, S. Wales and Montgomery, Carnarvon, Anglesea, and Flint, in N. Wales, in the Trent, and in the Mersey province except in Mid Lancs, Humber province, Tyne and Lakes provinces except in the Isle of Man, in the whole of the West Lowlands except Renfrew and Lanark, and in Roxburgh, Berwick, and Forfar. It is found in Yorkshire at 1500 ft. It is native in W. and N. Ireland and the Channel Islands.

Great Burnet, with its tall purple flowerheads, is a conspicuous plant in most meadows laid to grass in the summer. In meadows, fields, and pastures it grows side by side with Yellow Rattle, Sorrel, Sawwort, Field Scabious, Ox-eye Daisy, &c.

Quite a familiar sight in the meadows in summer, the tall erect stems of the Great Burnet are branched, with egg-shaped, half-heart-shaped leaflets, the leaves smooth, the lobes one each side of the common stalk, and distant or few.

Deep purplish-brown, the heads of flower are conspicuous amid the green sea of wild flowers and grasses in a meadow. The spike is egg-shaped or oblong, with calyx and stamens of the same length, the latter not shorter than the sepaloid calyx, which is smooth. In fruit the calyx is four-winged in the upper part.

Two to three feet is the height of this species. It flowers from June to August. A deciduous, herbaceous perennial, it is propagated by means of seeds.

The flower has no corolla, and the calyx does duty for petals. This in the lowest part (and the middle belongs to the tube of the receptacle) surrounds the ovary, and the middle part, a fleshy ring round the base of the style, secretes honey, while the upper part spreads out into four dark-purple, sepal-like lobes. The anthers and stigmas develop together. The plant is monœcious, the sexes being on the same plant. The flowers are pollinated by insects, unlike *P. sanguisorba*, though the stigma is divided as in a wind-pollinated flower, and the character is doubtless inherited from a wind-pollinated ancestor resembling *Poterium*.

The fruit is dispersed by wind, the calyx is four-winged and encloses the achenes or fruits, helping to disperse them by the wind.

Being addicted to a sand soil it is sand-loving, or clay-loving, and found on a clay soil, but it usually grows on sandy loam.

Burnet leaf-spot, *Xenodochus carbonarius*, is parasitic upon it.

GREAT BURNET (*Poterium officinale*, A. Gray)

The moths, Brown Tail Moth (*Euproctis chrysorrhœa*), Reddish Buff (*Acosmetia caliginosa*), *Orthosia gracilis* feed on it.

The second Latin name refers to its use in medicine. It is cultivated as a fodder plant abroad. In early times it was a cure for wounds, being bitter.

ESSENTIAL SPECIFIC CHARACTERS:—

103. *Poterium officinale*, A. Gray.—Stem erect, branching above, leaves few, pinnate, smooth, leaflets 3–5 pairs, serrate, flowers purple in oblong head, calyx as long as filaments, fruit of 2 achenes, oblong, winged above.

Wild Carrot (Daucus Carota, L.)

So far there have been no traces of the Wild Carrot found in early deposits. In the North Temperate Zone it is found in Europe, N. Africa, N. Asia, as far east as India. It has been introduced into N. America. Though common, it is not known in N. Perth, Banff, Main Argyll, E. Sutherland, the Orkneys.

The Wild Carrot is a common meadow species growing in fields and meadows, or upland pastures on dry soils. The railway banks have now become a permanent habitat for it in many places. On rising ground it is especially common, and on hillsides amongst such plants as Great Burnet, Devil's Bit Scabious, Ox-eye Daisy, Knapweed, Goat's Beard, &c. It is also frequently to be seen by the wayside.

Fairly tall, erect, rigid, with a stiff, wiry stem, sparingly branched, clothed with bristles, and striated, Wild Carrot is distinguished by its foliage apart from its curiously nest-like umbels of flowers. The radical leaves are oblong with lanceolate leaflets with lobes on each side of the common stalk. The upper leaves are more triangular and larger, with sheathing leaf-stalks, thrice branched.

At first the umbel of flowers is cup-shaped or hollow, and this with its numerous rays and small deeply divided bracts or leaflike organs in the partial involucre or whorl of leaflike organs give it the appearance of a bird's nest.

There is a bright-red flower in the centre; the others white. The fruit is bristly, bearing numerous hooked spines. The stem is usually 1 ft. to 18 in. in height. Flowers are to be found in July and August. The plant is a biennial, propagated by seeds.

Compared with other umbellifers the flowers are large and conspicuous in proportion to the size and height of the stem. The umbels are white and purple in the centre, and bear a row of ray florets. The styles are erect, short, and thick. It is visited by numerous insects, and cross-pollination is in this way ensured.

Sixty-one insects have been noticed, 19 Diptera, 10 Coleoptera, 28 Hymenoptera, 2 Lepidoptera, 2 Hemiptera.

The fruits are provided with hooks which catch in the wool and fur of passing animals, and it is therefore dispersed by animals.

Wild Carrot is addicted to a sand soil and it is therefore a sand plant.

It is infested by the fungi *Plasmopora nivea*, *Phomis sanguino-*

lenta, and *Protomyces pachydermis*, and is galled by *Asphondylia Pimpinellæ*. The beetles *Melolontha vulgaris*, *Agriotes lineatus*, a Thysanopterous insect *Thrips vulgatissima*, three Hymenoptera (*Myrmosa melanocephala*, *Tiphia femorata*, *Mellinus sabulosus*), Hawk Moth and Lepidoptera (Swallow Tail (*Papilio Machaon*), Death's Head

WILD CARROT (*Daucus Carota*, L.)

(*Acherontia Atropos*), (*Botys palealis*), *Depressaria nervosa*, *Clisiocampa castrensis*, *Semasia rufillana*), and a fly *Psila rosæ*, feed on it, also a Homopterous insect, *Trioza viridula*.

Daucus is a Greek word denoting a kind of parsnip or carrot. *Carota* is a Latin word for carrot, derived from Greek. The Wild Carrot is called Bee's-nest, Wild Carrot, Crow's-nest, Dawke, Dill, Fiddle, Field More, Hill-trot, Mir-rot, Rantipole. Bird's Nest is given because the flower has a nest-like shape, of which resemblance

Gerarde remarks, "The whole tuft (of flowers) is drawn together when the seede is ripe, resembling a bird's nest". He speaks of it as "serving for love matters".

The Wild Carrot is the origin of the garden forms. It contains much sugar, and a spirit has been prepared from it.

Essential Specific Characters:—

132. *Daucus Carota*, L.—Root long, stem erect, rigid, downy, leaves tripinnate, leaflets pinnatifid, flowers white, central red, in large umbels, with trifid bracts below.

Devil's Bit Scabious (Scabiosa succisa, L.)

In Interglacial beds at West Wittering seeds of the Devil's Bit Scabious have been met with. It is found to-day throughout the Northern Temperate and Arctic Zones in Arctic Europe, Siberia, and N. Africa. Devil's Bit Scabious is found in every part of Great Britain, ascending to 2500 ft. in the Highlands.

This plant is a meadow species growing in fields and meadows at low as well as high elevations. It forms quite a feature of the fields laid to grass in summer, and is equally common upon the hillsides and along the roads and lanes all over the country, being widely dispersed and growing in some quantity.

The tall-flowered stems of this plant are conspicuous in the meadows in summer, and are easily recognized by the mode of branching of the flowering stems. The stem is simple—that is, not branched below, but branched above. The smooth leaves are hairy, are narrowly elliptical, egg-shaped at the base, the stem-leaves being linear and nearly entire.

Its principal feature, however, is its blunt rootstock, termed premorse, as though bitten off abruptly below, hence the name.

The beautiful lilac or blue flowers are borne on hemispherical heads, which have numerous bracts below, and the flower-stalks are long. The flowerhead contains many florets in its involucre or whorl of floral organs. The outer involucre or whorl of leaflike organs has membranous plaited scaly bracts, the receptacle being hemispherical. The corolla is equal and 4-cleft. The calyx is crowned by five bristles; the fruit is sub-cylindrical, with eight furrows.

The plant is about 18 in. in height. The flowers are late, opening in August, up to October. It is a perennial plant, increasing by division.

The flowerhead is hemispherical, the florets all one size, 50–80,

developing towards the centre. A fleshy ring above the ovary at the base of the style secretes honey, which collects in the narrow mouth of the tube 3–4 mm. long. Above the smooth part this is lined with hairs to exclude rain. The tube widens above to 2 mm., and four (or five) rounded lobes of the corolla (the external being largest) are easily thrust open, and the honey can be reached by short-lipped insects. The florets are conspicuous, and in sunny weather many insects settle upon them. The anthers ripen first, and anthers and stigmas ripen separately, so it is cross-pollinated. The stamens are bent inwards in bud, and straighten one by one when the flower opens, then when the style scarcely projects beyond the corolla the anthers open in succession. When the stamens are quite withered, and the anthers if the flower has been visited are shaken off, the style lengthens and the stigma is clammy, and it can only be pollinated if an anther is still dusted with pollen and accidentally touches the stigma.

Devil's Bit Scabious (*Scabiosa succisa*, L.)

The visitors are Hymenoptera (*Apis*, *Bombus*, *Andrena*, *Halictus*), Diptera (*Exoprosopa*, *Helophilus*, *Eristalis*, *Syrphus*, *Rhingia*, *Empis*, *Lucilia*, *Musca*), Lepidoptera (Small White (*Pieris rapæ*), Meadow Brown (*Epinephele* (*Satyrus*) *janira*), Small Copper (*Chrysophanus* (*Polyommatus*) *phlæas*), Silver Y Moth (*Plusia gamma*), *Botys purpuralis*), Coleoptera (*Crytocephalus sericeus*).

The fruits are surrounded by the four calyx-lobes, which do not fall, and being light these aid the wind in dispersing the fruit.

Devil's Bit Scabious is a clay-loving plant, growing in clay soil or sandy loam on a variety of rock soils.

A fungus (*Ustilago Scabiosæ*) attacks the anthers and forms

a black powdery mass. *Bremia lactucæ* and *Puccinia hieracii* also infest it.

Meligethes lidens, a beetle, two Hymenoptera (*Andrena hattorfiana*, *A. cetii*), the Lepidoptera *Nematois capriaselus*, *Pterophorus serotinus*, *Melittis artemis*, Satyr Pug (*Eupithecia Satyrata*), two Homoptera (*Eupteryx tenella*, *Aphalara nervosa*), are associated with this as a food plant.

Scabiosa, Brunfels, is so named from being or having been a remedy for scab, *scabies*; and *succisa*, Fuchs, is Latin for cut off below, in allusion to the premorse rootstock. It has many names: Bachelor's Buttons, Blue-ball, Blue-bannets, Blue Bonnets, Blue Buttons, Blue-caps, Blue-heads, Blue-kiss, Blue-tops, Bunds, Bundweed, Carl-doddie, Curl-doddy, Devil's Bit, Devil's Bit Scabious, Fire-leaves, Forbete, Forebit, Forebitten More, Gentleman's Buttons, Hardhead, Woolly More, Hardhead, Herbyw Ofbit, Remcope, Stinking Nancy.

As to the Blue Bonnets, Jameson says: "In Gothland in Sweden this plant has a fanciful name somewhat similar, Baltsman's Myssa, the Boatsman's cap or mutch"; and he says of the name Curl Doddy, "The provincial name is derived from the resemblance of the head of flowers to the curly pate of a boy, and is very ancient". Children in Fife thus address it:

> Curl doddy do my biddin,
> Soop my house, and shool my midden;

and as it untwists in the hand they say:

> Curl doddy on the midden,
> Turn round and take my biddin.

The name Devil's Bit is from the legend that the root was bitten off by the devil, who wished to destroy its properties, "for he needed it not to make him sweat who is always tormented with fear of the Day of Judgement", says Gerarde, who says he bit it from envy.

Devil's Bit Scabious yields a yellow and green dye. The plant is highly bitter, and it has been used for tanning. Swellings in the throat, Gerarde says, were cured by it.

Essential Specific Characters:—

148. *Scabiosa succisa*, L.—Rootstock premorse, stem erect, simple, leaves entire, oblong, upper narrower, flowers blue, all alike, corolla 4-cleft, involucel hairy, fruit subglobose.

Daisy (Bellis perennis, L.)

Found in the North Temperate Zone in Europe generally at the present time, there is nothing to indicate that the Daisy is an ancient plant in Great Britain. The Daisy is ubiquitous, growing in every part of Great Britain, and ascending to 3000 ft. in the Highlands.

So common is the Daisy that its occurrence is scarcely noted, and if it were not that it is absent from wooded districts one might consider it as the commonest of British plants, except the Annual Meadow Grass, but as the latter is driven from arable soil probably the two are about on a level in this respect. Fields, highways, hills, as well as dales, are everywhere studded with Daisies in the spring and summer months.

Daisy (*Bellis perennis*, L.)

The habit of the Daisy is the rosette habit. The plant may be quite hairless or hairy, according to situation. The root-stock is stout, with numerous stout fibres, and prostrate. The aerial stem is a scape. The leaves are all radical, as in true rosette plants, and lie on the ground, or the inner ones may be erect. They are stalked, inversely egg-shaped to spoon-shaped, fleshy, blunt or rounded at the tip, which is scalloped, toothed, with a broad midrib, dark green and frequently glossy.

The flowerheads are borne on simple, single scapes, with a yellow disk and a white or pink ray. The florets are occasionally all ligulate, or rarely all tubular. The ray florets are numerous in one series, ligulate. The arms of the style are linear, blunt, with a thick border. The disk florets are tubular, 4–5 toothed, the anther cells simple, the arms of the style short, thick, with papillose cones at the tip. The involucre or whorl of bracts is bell-shaped, the bracts in 1–2 series,

green, blunt, black at the tip. The achenes are flattened at the margin, somewhat hairy without pappus.

Flowering takes place in March up till August or later. It is perennial, and multiplied by division of roots.

The flowers are gynomonœcious, with female and complete flowers on the same head. The ray florets are female, as a rule. The disk florets are hermaphrodite. The ray florets are 5 mm. across, the disk 6 mm., so that the whole capitulum is about 16 mm. There are no stamens in the ray, and the styles have no sweeping hairs as happens in some cases, the two branches being covered throughout with larger stigmatic papillæ, receptive to pollen. The style is short in the complete disk florets, and is provided with a pollen brush, on the outer surface, from the broad part to the tip. The pollen brush serves as the style lengthens to sweep the pollen out of the anther cylinder, and to heap it up in a mass till insects visit the flower. The stigmatic papillæ are in the disk florets confined to a narrow line on each border below the broadest part. The stigmas after pollination has taken place are withdrawn into the tube, and this economizes the use of the pollen.

At sunset the florets close up, hence Daisy (daies eye), and in wet weather also.

The plant is visited by the Hive Bee, *Andrena*, *Halictus*, *Sphecodes*, *Nomada*, *Osmia*, *Myrmica*; flies, *Empis*, *Eristalis*, *Rhingia*, *Syritta*, *Melithreptes*, *Scatophaga*, *Lucilia*, *Musca*; and the butterflies *Polyommatus*; beetles, *Meligethes*, *Œdemera*, *Leptura*.

There is no pappus, but the achenes are provided with flattened ribs, which aid in wind dispersal.

Though the Daisy grows apparently everywhere in spring and early summer, from the wealth of flowers to be noticed on all hands, yet it has a predilection for sandy soil, and is more or less a sand plant. It will grow, too, on a clay soil, and in such cases is a clay plant.

A minute little cluster-cup fungus, *Puccinia obscura*, grows upon it. No insects feed upon it.

The name *Bellis*, Fuchs, is from the Latin *bellus*, pretty, and the second Latin name refers to the length of its flowering season and perennial nature.

So common a plant has an abundance of names, which, on account of its universality, we give in full: Bachelor's Buttons, Bairnwort, Banwort, Bennergowan, Bennert, Bennet, Benwort, Bessy-banwood, Billy Button, Boneflower, Bonwort, Briswort, Bruisewort, Cat-posy, Cockiloorie, Comfrey, Confery, Less Consound, Cumfirie, Daiseysheg, Daisy, Dog-, Shepherd's-, Small-, or the Children's Daisy, Dazeg,

No. 1. Daisy (*Bellis perennis*, L.)

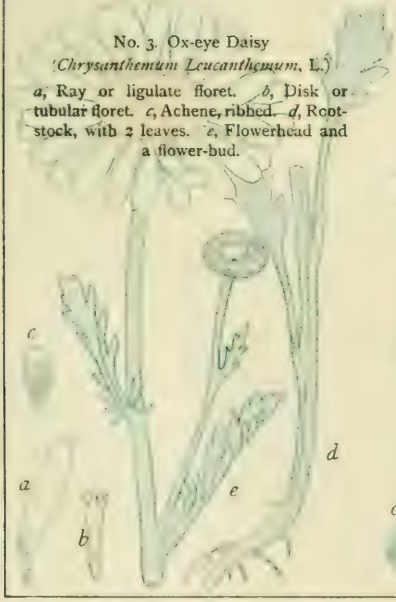
a, Ray or ligulate floret. *b*, Disk or tubular floret. *c*, Achene. *d*, Plant, showing rosette of radical leaves, and fibrous roots below, with 3 scapes bearing flowerheads in different stages.

No. 2. Milfoil (*Achillea Millefolium*, L.)

a, Ray or ligulate floret. *b*, Disk or tubular floret. *c*, Achene. *d*, Rootstock, with radical leaves. *e*, Upper portion of plant, with corymbose inflorescence.

No. 3. Ox-eye Daisy (*Chrysanthemum Leucanthemum*, L.)

a, Ray or ligulate floret. *b*, Disk or tubular floret. *c*, Achene, ribbed. *d*, Rootstock, with 2 leaves. *e*, Flowerhead and a flower-bud.



No. 4. Knapweed (*Centaurea nigra*, L.)

a, Ligulate floret. *b*, Complete floret. *c*, Fringed scale of involucre (phyllary). *d*, Achene, with pappus. *e*, Radical leaf. *f*, Upper portion of plant, with flowerheads in different stages and stem-leaves.

Dicky Daisy, Ewe-gowan, Gowan, May Gowan, Gowlan, Mary Gowlan, Hen and Chickens, Herb Margaret, March Daisy, Margaret's Herb, Marguerite, Maudlinwort, Mother of thousands, Silver Penny, Primrose, Sweep, Sweeps.

The name Bairnwort may be given because children gather it so much; but as to Benwort, of which it may be a variant, Turner says: "The northern men call this herbe a banwort because it helpeth bones to knyt agayne." The name Bruisewort is applied because "the leaves stamped taketh away bruises and swellings if they be laide thereon, whereupon it was called in olde time Bruiseworte". So at any rate says Gerarde. The name Daisy is from the A.S. *dæges eage*, eye of day, from its opening and closing its flowers with the daylight. In connection with the name May Gowan there is a Berwickshire saying: "Ye'll get round again, if ye had your fit (foot) on the May Gowan."

A Daisy is taken and its leaves plucked one by one to test sincerity by lovers, who say at the same time, "Does he love me a little—much—passionately—not at all?" when they count.

> La Blanche et simple Paguerette,
> Qui ton cœur consulte surtout,
> Dit, ton amant, tendre filette,
> J'aime, un peu, beaucoup, point du tout.

Girls put Daisy roots under their pillows to dream of their lovers. To dream of the Daisy is lucky in spring or summer, but not so in autumn or winter. The appearance of the Daisy helps the peasant in the north to mark the season's advance.

Spring has not arrived till you can set your foot on twelve Daisies.

When a tooth is extracted, to be free from toothache, in Thuringia, you must eat three Daisies.

They were scattered over graves, says Gay. The name Marguerite was erroneously derived from Margaret of Cortuna.

> There is a double flouret, white and red,
> That our lasses call herb-Margaret,
> In honour of Cortona's penitent,
> Whose contrite soul with red remorse was rent,
> While on her penitence kind heaven did throw
> The white of purity, surpassing snow;
> So white and red in this fair flower entwine,
> Which maids are wont to scatter at her shrine.

The ointment "Save" in Chaucer's day was partly prepared from the Daisy. It was said in the eighteenth century to be a cure for

hectic fevers caused by drinking cold water when overheated. In Germany it was eaten with meat as a potherb. Cattle, horses, and sheep do not touch it.

Chaucer eulogized it in his day:—

> In special one called Se of the Daie,
> The Daisie, a floure white and rede,
> And in French called La bel Margarete,
> O commendable floure above all flouris in the meede,
> Than love I most those flouris white and rede,
> Such that men callen Daisies in our Town.

Essential Specific Characters:—

152. *Bellis perennis*, L.—No aerial stem, but prostrate rhizome, leaves radical, obovate, crenate, dentate, flowerheads on scapes, white ray florets, yellow disk florets. Some flowers have all ligulate florets, or all tubular florets, bracts in one row.

Milfoil (Achillea Millefolium, L.)

This common Composite is found throughout the North Temperate and Arctic Zones in Arctic Europe, Temperate and cold North Asia, the Himalayas, and N. America, but is not found in any early deposits. It is found in all parts of Great Britain, and up to about 4000 ft. in the Highlands.

Yarrow or Milfoil is common in all sorts of habitats up and down the country. It is to be found in fields and meadows, especially dry pastures, along the roadside and on waste ground, preferring sandy soil, and growing on the margins of arable land, allotments, and gardens, in which last it is encouraged for its fever-curing properties.

The glistening leaves of the Milfoil with its thousands of delicate leaflets bathed in silvery dew on a frosty morning are a familiar sight not soon forgotten. The stems are erect, rigid, striate, and prostrate below, but ascend at the tip, and are angular. The leaves have the lobes on each side of the stalk divided again, slightly hairy, alternate, linear, narrowly elliptical, the radical leaves stalked, the segments very slender and narrow. The bottom of the stem is covered with a dense cobweb-like down.

The flowers are numerous, and borne in close terminal corymbs in which the flower-stalks are shortened and form a flat-topped flower-head. The ray florets are large in proportion, equalling half the whorl of leaf-like organs. The leaf-like organs are downy with a brownish margin blunt and hollow. The disk florets are funnel-shaped with a

dirty-yellow tube. The fruit is smooth and shining. The flowerheads are often pink.

The height varies from 1 to 2 ft. Flowers are to be found between June and September. Milfoil is a deciduous, herbaceous, perennial, propagated by division.

The head is made up of several small florets, which make it attractive, and lead to cross-pollination. The disk florets have a tube 2 mm. long, with a throat 1 mm. long, and wide, having five triangular

MILFOIL (*Achillea Millefolium*, L.)

teeth. At the base of the style a ringlike ridge secretes honey. The honey rises in the tube and short-lipped insects can reach it. The lobes of the style are pressed together when the flowerhead opens, and project with spreading hairs into the lower part of the cylinder. When the style lengthens pollen is pressed out of the upper end of the tube, the lobes of the style project and spread, turning the stigmatic ends upwards, bending the hairy tips back so that some pollen sticks to them, and so is not left for insects. When the pollen is pushed up the tube projects beyond the corolla. When the stigmas project the tube lies lower in the corolla, depressed by the contracting filaments.

In this way the stigmas may lie above the corolla where the pollen was. As the abdomen of an insect sweeps over a flower it touches many florets, and also causes cross-pollination.

Twenty florets develop towards the centre from the disk, 3 mm. broad, and the five marginal florets have an external lobe 3 mm. long and broad, so that the disk is 9–10 mm. across. The florets of each marginal ray have a highly developed corolla at the expense of the stamens, which are absent. The style has spreading lobes with stigmatic papillæ.

The fruit is compressed and margined, and thus adapted for wind dispersal. There is no pappus.

Milfoil is especially at home on sand soils, and is a sand plant, growing on many different rock soils.

The fungi *Puccinia millefolium* and *Sphærotheca humuli* are found upon it. The minute leaflets are galled by *Tylenchus Millefolii*, and by *Hormomyia Millefolii*. Many insects choose it for their food plant, e.g. beetles, *Cassida ferruginea*, *C. biber*, *C. subferruginea*, *C. sanguinolenta*, *Olibrus millefolii*; a Hymenopterous insect, *Prosopis Masoni*; several Lepidoptera, e.g. Beautiful Brocade (*Hadena contigua*), Straw Belle (*Aspilates Gilvaria*), Bordered Lime Speck (*Eupithecia succenturiata*), *Coleophora argentula*, Belted Beauty (*Nyssia zonaria*), Small Dusty Wave (*Acidalia incanaria*), *Dicranorampha petiverella*, *Bucculatrix cristatella*, *Pterophora ochrodactylus*, Netted Carpet (*Cidaria reticulata*), Essex Emerald (*Creometra smaragdaria*), Lesser Cream Wave (*Acidalia immutata*); two Homoptera, *Eupteryx tenella*, *Aphalara nervosa*; two Heteroptera, *Camptotrochus lutescens*, *Macrocoleus tanaceti*; and the flies *Hormomyia millefolii*, *Carpotricha guttularis*, *Cnemopogon apicalis*.

Achillea, Theophrastus, is named after Achilles, who is said to have first discovered that it healed wounds, and *Millefolium*, Tragus, is from the Latin *mille*, thousand, *folium*, leaf, the reference being to its much-divided leaves.

The following names show its universal use: Green Arrow, Arrow-root, Bloodwort, Camil, Cammock, Carpenter-grass, Thousand-leaved Clover, Devil's Nettle, Dog Daisy, Eerie, Garwe, Stanch or Stench Girs, Hundred-leaved Grass, Melefowr, Milfoil, Nosebleed, Old Man's Mustard, Old Man's Pepper, Wild Pepper, Sanguinary, Sneezewort, Tansy, Thousand-leaf Yallow, Yarrow, Yarroway.

Eerie is a corruption of Yarrow. "Lassies used to take it and put in their breasts" as a charm, repeating this rhyme:

> Eerie, eerie, I do pluck,
> And in my bosom I do put,
> The first young lad that speaks to me
> The same shall my true lover be.

Green Arrow is a corruption for Green Yarrow:

> Green Arrow, Green Arrow, you bears a white blow.
> If my love love me, my nose will bleed now,
> If my love don't love it 'ont bleed a drop,
> If my love do love me 't will bleed every drop.

"In some places it is called Carpenter Grasse, it is good to rejoyne and soundre woundes." The name Devil's Nettle is given because children draw the leaves across their faces, which leaves a tingling sensation. From the styptic properties it was supposed to possess it was called Stanch or Stench Grass or Girs.

Melefowr was for Milfoil. "Plucking ane herb called Melefowr quhilk causis the nose bleed, sitting on the right knee and pulling it behind the mid-finger and thombe and saying, 'nomine Patres Filii et spiritus sancti', was to impart the faculty of prediction." As to the name Nose Bleed, Parkinson says, "assuredly it will stay the bleeding of it". But this property of the plant seems to be popularly credited in more than one district, and it forms the basis of a love divination: "'Tis an old superstition to take a leaf and tell one to put it up his nose, turn it thrice round, and all the while think of his sweetheart, if his nose bleeds he is sure to get her. The application scarcely ever fails, at least if the leaf be smartly turned."

Yarrow was an old cure for ague. When carried about the person it was believed to drive away fear, and so worn in time of danger. It is bitter, and was used for a variety of complaints, as a cure for wounds, for spasmodics, and hypochondria. An essential oil has been distilled from the flowers. It is put in beer in Sweden. Brewed as a tea, it is a good remedy for colds and influenza.

Essential Specific Characters:—

157. *Achillea Millefolium*, L.—Stem erect, rigid, angular, woolly, leaves bipinnatifid, downy, leaflets linear, flowerheads small, numerous, in a corymb, terminal, disk florets white or yellow, ray pink or white, phyllaries glabrous.

Ox-eye Daisy (Chrysanthemum Leucanthemum, L.)

Fruits of the Marguerite, so welcome a sign of summer in our fields, have been found at Silchester. The distribution of this common plant is limited to the North Temperate and Arctic Zones in Arctic Europe, Siberia to Asia, and it is introduced in North America, ranging throughout Great Britain, and ascending to 2100 ft. in Wales.

The Ox-eye Daisy is a familiar sight in spring and summer in every meadow and field, and is also common on railway banks, contributing to make them unusually gay at those seasons with a wealth of white and golden bloom. It is to be found on hills, and in valleys, by the wayside, and even amidst the corn, being everywhere a favourite, common though it is. Every meadow or railway bank is covered with extensive patches of the Marguerite in summer, and when in flower it is a beautiful sight.

Photo. B. Hanley

Ox-eye Daisy (*Chrysanthemum Leucanthemum*, L.)

The Ox-eye Daisy has the rosette habit more or less. The plant is either devoid of hairs or sparingly hairy. The stem is erect, simple or branched, furrowed. The leaves are dark-green, bluntly cut or divided. The lower leaves are inversely egg-shaped, spoon-shaped, stalked, with the stalk winged, auricled; the upper are oblong, blunt, cut, stalkless, deeply divided nearly to the base at the base, half clasping.

The flowerheads are borne on slender stalks, broad (2 in.), solitary, terminal. The disk florets are yellow, the ray florets white. The phyllaries are blunt, lance-shaped, with a narrow, dark-purple, membranous border. The ligules are 6-notched at the tip. The fruits are all rounded, without a border, with equal ribs, those of the ray florets having a small crown.

Marguerites are commonly 2 ft. in height. The flowers may be gathered in June and July. The plant is perennial, increased by division of roots.

The flowerhead is large and conspicuous, 40 mm. across. The plant is gynomonœcious, the ray florets female, the disk florets complete. The ray florets are ligulate, the disk florets tubular. In the disk, 12–15 mm. across, there are 300 to 500 florets. The corolla is 3 mm. long. The ray florets are 20 to 25, and possess functionless stamens. The ray florets have a white external ligule, 14–18 mm. long and 3–6 mm. broad.

The throat of the disk florets is short, hardly 1 mm., and the honey is therefore accessible to short-lipped insects. In the male stage the pollen rises above the toothed corolla, in the second or female stage the stigmas take the place of the anthers, and are projecting. When an insect crawls across the capitulum it therefore cross-pollinates many florets. Spreading hairs on the style form a tuft which sweeps the pollen out of the tube as the style grows longer. Two separate broad rows of papillæ border the style below the tip, and pollen lies on the outer edges, so that self-pollination results if the pollen is not removed by insects, and when they do not visit the flower it regularly occurs.

The plant is visited by insects, Hymenoptera, Diptera, Lepidoptera, and Coleoptera.

The fruits are aided in their dispersal by the wind, being light and flattened.

The Marguerite is essentially a sand-soil lover. It may be found, however, on clay soil to some extent also, growing on sandy loam.

Phytomyza affinis mines the leaves. Three beetles, *Ceutorhynchus campestris*, *Longitarsus lævis*, *Mantura chrysanthemi*; two moths, *Sciaphila wahlbomiana*, *Bucculatrix aurimaculella*; a Homopterous insect, *Aphalara picta*; and the flies *Tephritis leontodontis*, *Spilographa artemisiæ*, *S. Zoæ*, *Chromatomyia albiceps*, all feed upon it.

Chrysanthemum is from the Greek words, *chrysos*, gold, and *anthos*, flower. *Leucanthemum*, Dioscorides, is from the Greek *leucos*, white, *anthos*, flower.

The Ox-eye Daisy is called White Bothen, Bozzom, Caten-aroes, Cow's Eyes, Daisy (Big, Bull, Butter, Devil's, Dog, Dun or Dunders, Field, Great, Horse, London, Midsummer, Moon, Ox-eye, Poor-land, Thunder), Daisy Goldins, Large Dicky Daisy, Dog-flower, Espibawn, Gadgevraw, Gadjerwraws, Girt Ox Eye, White Gold, Goode, Gowan (Horse, Large, White), White Gowlan, White Gull, Horse-pennies,

Hoss-daisy, Magweed, Maudlinwort, Mayweed, Moon, Moonflower, Moon-pennies, Dutch Morgan, Ox-eye, Moon Penny, Poverty Weed.

From its size and coarseness it is called Horse Daisy, and Midsummer Daisy from its flowering about Midsummer, Poorland Daisy from its growth on poor clay lands.

Though horses and sheep eat it, other animals will not touch it. The leaves are unpleasant, the smell aromatic, the taste neither hot nor biting. This plant was used in diseases of the chest, asthma, phthisis, and as a diuretic.

Essential Specific Characters:—

160. *Chrysanthemum Leucanthemum*, L.—Leaves mostly radical, lower petiolate, upper pinnatifid, sessile, obovate, ray florets white, disk yellow, phyllaries with narrow, purple, membranous border.

Knapweed (Centaurea nigra, L.)

Knapweed is well distributed at the present day throughout Europe. In N. America it is an introduction. No traces of it occur in any ancient deposit, in spite of its being so common to-day.

It is found in every district in Great Britain, and ascends to 1600 ft. in Northumberland.

No meadow would be complete without a sprinkling of the dark heads of Knapweed in summer. It is a plant that grows along every wayside, and is found on hills and dry pastures in great abundance, being addicted to both wet and dry ground.

The wiry hard stems of Knapweed are a familiar sight in a hayfield scattered here and there, and when in flower the plant is easily recognized. The stems are very erect and either simple or branched, furrowed, the branches bearing a single head of flowers.

In the autumn the prevalent habit is characterized by the half-erect branches. The lower leaves are angular, divided, with the lobes enlarged upwards, on long stalks, toothed, and the upper ones are without stalks, egg-shaped, entire.

The flowers or "hard heads" are purple with bractlike scales fringed with hairs at the margin, brownish-black, and egg-shaped, narrowly elliptical. The flowers differ, in some instances possessing a ray or not. The hair or pappus is short, or wanting. The fruit is grey, oblong, and downy.

The plant grows to the height of 1–2 ft. It is usually in flower in June, continuing late in the autumn, and even when frosts are frequent. It is perennial, and may be propagated by seeds.

The marginal florets are like those in the centre, but are sometimes enlarged and neuter as in *Centaurea Cyanus*. The corolla is tubular, and enlarged above, making it accessible to many insects. The flowerheads are purple and conspicuous. The central florets are bisexual, the filaments glandular, and the anthers have an appendage at the farther extremity.

KNAPWEED (*Centaurea nigra*, L.)

The fruits have short hairs which aid in their dispersal by the wind like other Composites.

Knapweed is a clay plant, growing on clay soil, or sandy loam, and is common on Triassic and Liassic formations, Boulder clay, &c.

A search over the leaves will reveal two kinds of cluster cup, *Puccinia arenariicola* and *P. centaureæ*. A gall, *Chiophora solstitialis*, infests it; two beetles, *Sphaeroderma cardui*, *Cassida vibex*; the moths *Parasia metznerinella*, *Coleophora conspiciella*, *C. alcyonipennella*, Common Heath (*Fidonia atomaria*), Lime Speck (*Eupithecia centaureata*, *Depressaria liturella*, *D. arenella*; a Heteropterous insect, *Oncotylus viridiflavus*; and the flies *Urellis clata*, *U. 4-fasciata*, *Trypeta jaceæ*.

Centaurea, Pliny, is from Centaur, which is fabled to have had

its foot cured by the plant. The specific name, *nigra*, is Latin for black. Knapweed is the same as Knobweed, from its knob-like head. So common a flower is certain to be known by a variety of names, such as Bachelor's Buttons, Ballweed, Belweed, Black Soap, Blue Tops, Boleweed, Bolwes, Bowweed, Bowwood, Bullweed, Bunds, Bundweed, Buttonweed, Centaury, Great or More Centaury, Churl's-head, Clobweed, Club-weed, Cnop-wort, Cockheads, Codweed, Crop-weed, Darbottle, Drumstick, Hardhead, Hardhead Horse, Hard-iron, Harebottle, Harsh-weed, Horse Hardhead, Horse Knobs, Horse Knops, Horse Knot, Horse-snap, Hurt-sickle, Hyrnehard, Iron-heads, Iron-weed, Knapweed, Knobweed, Knop-weed, Knot-grass, Knotweed, Lady's Cushion, Logger-heads, Matfellon, Shaving-brush, Sweeps, Tarbottle, Tassel, Yronhard.

Knapweed was called Bullweed because cattle were said to be fond of it, and Churl's Head from its rough hairy head, Codweed because the head is like a pudding bag. Drumstick is applied because the head is like a drumstick, Horseknot from being used in divination, and Knobweed from the round head.

In Chaucer's day it was called Matfellon, and it was one of the ingredients of the ointment "Save" for wounds and the pestilence. It was also used to promote appetite, with pepper.

Essential Specific Characters:—

174. *Centaurea nigra*, L.—Stem erect, rigid, furrowed, radical leaves lyrate, lobed, upper lanceolate, flowerheads purple, with ray or not, phyllaries with black fringe, pappus tufted.

Long-rooted Cat's Ear (Hypochæris radicata, L.)

Like the Hawkweeds, except the Mouse-ear Hawkweed, this is apparently quite a modern Composite. At the present day it is found in the Northern Temperate Zone in Europe, and N. Africa. In Great Britain it is found everywhere, except in Roxburgh, as far north as the Orkneys. In the Highlands one may find it growing at a height of 1600 ft., and it is native in Ireland and the Channel Islands.

The Cat's Ear is one of those exceedingly familiar meadow plants that are to be found practically in every field and meadow throughout the length and breadth of the land.

It is perhaps more partial to lowland districts, though it is also found on hills, and at high elevations. Like Hawksbeard it is found also on waste ground and along the wayside.

The aerial stems are scapes, or flowering stems. A characteristic

No. 1. Long-rooted Cat's Ear
(*Hypochœris radicata*, L.)

a, Ray or ligulate floret, with achene and pappus below. *b*, Radical leaf, runcinate type. *c*, Scape, with flowerheads in different stages. *d*, Scape, with fruits and pappus forming "clock", and reflexed phyllaries.

No. 2. Dandelion
(*Taraxacum officinale*, Weber)

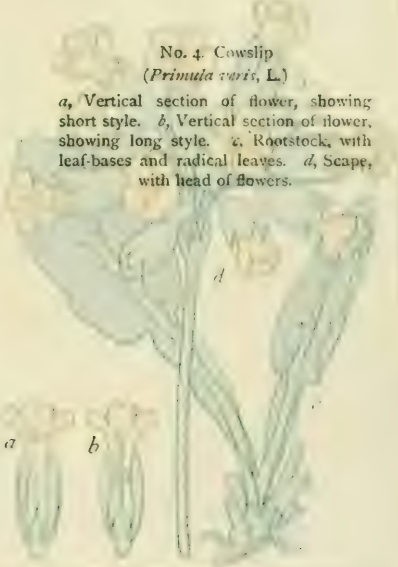
a, Ligulate floret, with achene and pappus. *b*, Achene. *c*, Achene, with pappus. *d*, Radical leaf. *e*, Scape, with flowerhead and outer recurved phyllaries. *f*, Scape, with fruits forming "clock" from the parachute-like pappus.

No. 3. Goat's Beard
(*Tragopogon pratensis*, L.)

a, Scape, with flowerhead and leaves. *b*, Scape, with fruits forming "clock".

No. 4. Cowslip
(*Primula veris*, L.)

a, Vertical section of flower, showing short style. *b*, Vertical section of flower, showing long style. *c*, Rootstock, with leaf-bases and radical leaves. *d*, Scape, with head of flowers.



1. Long-rooted Cat's Ear (*Hypochaeris radicata*, L.). 2. Dandelion (*Taraxacum officinale*, Weber). 3. [illegible]
[illegible] (*Hypochaeris glabra*, L.). 4. Cowslip (*Primula veris*, L.).

feature is the long root, which is white, simple, and milky, hence the English and second Latin name. The radical leaves are prostrate, lying on the ground in a rosette, flat, oblong, and the leaf segments are turned back, rough; toothed, hairy, the hairs originating from minute points.

The flowerheads are yellow, borne on branched scapes, which are thickened just below the flowerheads, and nearly erect. The whorl of leaf-like organs is shorter than the florets, which are overlapping, equal, and numerous, with ray florets, with five teeth, with yellow anthers forming a tube. The flower-stalks bear small scales near the top, and are often flattened along the sides.

Photo. W. E. May

LONG-ROOTED CAT'S EAR (*Hypochæris radicata*, L.)

The plant is about 18 in. in height. The flowers can be found in June up till September. It is perennial, increased by division of the root.

The flowerhead is yellow, large, and conspicuous, and is thus visited by numerous insects. The florets bear both stamens and carpels, with both ray and disk florets, the petals forming a tube which is hairy at the top, preventing the entrance of rain. The stamens are capillary, and the anthers unite to form a tube, as in the majority of Composites. The style is threadlike and as long as the stamens. The two stigmas are recurved to prevent self-pollination when insect visits are possible. Amongst the visitors are Honey Bee, *Bombus*, *Dasypoda*, *Panurgus*, *Colletes*, *Rhophites*, *Andrena*, *Halictus*, *Sphecodes*, *Diphysis*; Diptera (Syrphidæ, *Eristalis*, *Pipiza*, Conopidæ, *Sicus*, Muscidæ, *Demoticus*).

The fruits are provided with pappus, and are dispersed by wind.

The Long-rooted Cat's Ear is largely a clay-loving plant, growing on clay soil and also on sand soil.

The stems of the Cat's Ear are liable to be galled by *Aulax hypochæridis*. A beetle, *Cryptocephalus sericeus*, a Homopterous insect, *Aphalara picta*, and a fly, *Tephritis vespertina*, feed on it.

Hypochœris, Theophrastus, is from the Greek *hypo*, under, and *choiros*, a hog, the roots being eaten by pigs. The second Latin name refers to the long root. It is called Bent, Cat's-ear, Gosmore.

It is to be distinguished from *Leontodon autumnale* by its long root, apart from the following characteristics.

Essential Specific Characters:—

181. *Hypochœris radicata*, L.—Stem scaly, leaves radical, runcinate, lobes recurved, hirsute, flower-stalk forked, smooth, thickened above, flowerheads yellow, involucre shorter than florets.

Dandelion (Taraxacum officinale, Weber)

The Dandelion, which affords so dear a recollection of youthful days and clock-blowing, has been native in Britain since very early times. It is found, in fact, in beds of Interglacial, Late Glacial, and Neolithic age. It is found in the Northern and Southern Temperate Zone as well as in the Arctic Zone. It is common in all parts of Great Britain, as far north as the Shetlands, and also in Ireland and the Channel Islands.

The Dandelion is a widespread plant, which in spring and early summer makes the meadows bright with golden blooms. The typical form is found in moist meadows, but one form is more confined to dry soils, whilst another form grows in wet marshy ground. It is common, too, at the foot of walls, in villages, and on waste ground.

The Dandelion is a good example of a plant having the rosette habit. The plant is either smooth and hairless or cottony at the crown and involucre. The root is long, stout, brownish or black, with milky juice, which also occurs throughout the whole plant, serving to protect the aerial parts. The leaves are bright-green, all radical, entire or deeply divided nearly to the base, runcinate, with the lobes turned backward towards the centre, toothed, and are oblong to inversely egg-shaped, spoon-shaped, wavy.

The flowerheads are golden-yellow, borne on hollow, succulent, juicy, round, radical scapes, ascending or erect. The heads are broad, erect in bud. The involucre is bell-shaped, the outer phyllaries bent back, the inner erect. The outer corollas are sometimes brown on the back. The fruit, a cypsela, is pale-brown, linear to inversely egg-shaped, blunt, prickly at the top, with longitudinal furrows, and a long beak, as long as the fruit. The pappus has a short neck, which is a continuation of the receptacular tube, adherent to the ovary. In fruit it lengthens and bears the spreading hairy silky pappus.

DANDELION (*Taraxacum officinale*, Weber)

There are bristly points near the top of the inferior ovary which affix it to the soil.

The Dandelion is about 8 in. high. The plant flowers from March or April till October. It is perennial and propagated by division.

The flowerheads are conspicuous. They close up at night and when it is raining. They open at 5–6 a.m. and close between 8 and 10 p.m. at Upsala, but at Innsbruck they open between 6 and 7 a.m. and close between 2 and 3 p.m., showing that a slight difference in latitude greatly affects the opening of flowers.

In each capitulum there are 100–300 florets. It measures 30–50 mm. across, though the receptacle is 5–7 mm. across. The tube is 3–7 mm. long. The honey rises high up the tube. The style nearly fills the tube. The anther cylinder, $2\frac{1}{2}$–5 mm. long, projects from it, and the style is 3–5 mm. above this after lengthening. Upon this projecting portion are pointed hairs which sweep the pollen out of the tube and accumulate it. The style branches are $1\frac{1}{2}$–2 mm. long, and covered with stigmatic papillæ on the inner face. They bend over and backwards, making one and a half spiral turns, and in the absence of insect visitors, that may remove the pollen, self-pollination occurs.

The last phase is of advantage to the plant, which flowers perennially when insects are not flying, as in early spring and late autumn, or even winter. The pollen is variable in the same floret.

The flower is visited by the Honey Bee, *Bombus silvarum*, *B. confusus*, *B. barbutellus*, and other Hymenoptera, besides Diptera, Lepidoptera, and Coleoptera.

The fruits are provided with a tuft of hairs, forming the "clock" or pappus, which assist in wind dispersal.

The Dandelion grows on different soils, according to the forms (of which there are several) into which one may split it up. It is common on sand soil, other forms grow on clay soil, while one form (*palustre*) is a peat plant and requires rather peaty conditions.

The fungi *Puccinia variabilis*, *P. taraxaci*, *P. sylvatica*, and *Protomyces pachydermis* attack the leaves. Several insects adopt the Dandelion as a food plant, such as a beetle, *Meligethes symphyti*; several Hymenoptera, *Andrena albicans*, *A. filipes*, *A. tibialis*, *A. thoracica*, *A. nitida*, *A. nigroænea*, *A. gwynana*, and Lepidoptera—Buff Ermine (*Arctia lubricipeda*), The Shears (*Hadena dentina*), Cream Wave (*Acidalia remutata*), Gold Swift (*Hepialus hectus*), Clouded Buff (*Euthemonia russula*), Northern Rustic (*Agrotis lucernea*), Great Brocade (*Aplecta occulta*).

Taraxacum, Lonicerus, may be from the Greek *tarasso*, I disturb, from its medicinal effects. Dandelion is from the French *dent de lion*, in allusion to the leaf margin, and the second Latin name refers to the use in medicine.

The Dandelion is known by a variety of vernacular names, such as Bitterwort, Blowball, Blower, Canker, Cankerwort, Clock, Crow-parsnip, Irish Daisy, Dandelion, Dentelion, Dindle, Doon-head-clock, Fortune-teller, Gowan, Monkshood, One o'clocks, Priest's Crown, Stink Davie, Swine's Snout. It is called Priest's Crown and Monkshead because the naked receptacle after the fruits are dispersed is like the shaven head of a priest. As to the name Doon-head-clock, Mactaggart says: "Rustics, to know the time of the day, pull the plant and puff away at its downy head, and the puffs it takes to blow the down from it is reckoned by them the time of the day". Blowball, Blower, Fortune-teller, are all connected with the same choristic feature.

If seen in dreams the superstitious believed it was a bad omen.

It is called Peasant's Clock, the flower opening early in the morning.

> Dandelion with globe of down,
> The schoolboys' clock in every town,
> Which the truant puffs amain,
> To conjure lost hours back again.

The name Dent de lion has been connected with the sun, of which the lion is the symbol, the teeth in this way being rays round a golden head, the sun.

An Irish charm was to give the patient nine leaves of Dandelion, three leaves being eaten on three successive mornings.

Warts have been supposed to have been cured by the juice of the Dandelion in the Midlands.

The leaves are used in medicine for several remedies. In spring the leaves, blanched under a tile, are used as a salad, and resemble Endive. The French eat the long, milky roots as a salad, raw; and it is boiled in Germany as Salsify. The root dried and ground has been used for coffee. Pigs and goats are fond of it. It was used as a remedy for jaundice.

Essential Specific Characters:—

182. *Taraxacum officinale*, Weber.—Flowering stems scapes, leaves radical, runcinate, smooth, lobes recurved, sinuate, toothed, flowerheads large, yellow, outer florets brown beneath, outer scales of involucre reflexed, scape hollow, milky, pappus pilose, stalked, receptacle convex.

Goat's Beard (Tragopogon pratense, L.)

This plant is apparently quite a modern one, known only from its present distribution, Europe, N. and W. Asia as far east as the Himalayas.

It is found in Great Britain in the Peninsula, Channel, Thames, Anglia, and Severn provinces. In S. Wales it is absent from Radnor and Cardigan, Merioneth in N. Wales, but occurs in the Trent, Mersey, Humber, Tyne, and Lakes provinces, except the Isle of Man. In the W. Lowlands it is found generally, except in Wigtown and Renfrew; in the E. Lowlands generally, except in Peebles, Selkirk, Linlithgow; in the E. Highlands generally, except in Mid and N. Perth, Banff, and Easterness; in Clyde Isles, W. Sutherland, and Caithness, or from Lanark and Caithness to the S. Coast. It is rare in Scotland. In Ireland and the Channel Islands it is also native.

Goat's Beard is found in fields and meadows, especially in upland pastures laid to grass. It is found, moreover, more or less commonly by the side of pathways, and is common on railway-banks, and on allotment gardens and waste ground. But it is quite native in grass meadows, occurring in some abundance here and there.

Goat's Beard is an erect plant, with a cylindrical stem, with sheathing leaves arising mainly from the base, and branched. The leaves are tapering, narrowly elliptical, acute, and with the base expanded, clasping the stem, entire, smooth.

The flowerheads are greenish-yellow, and may be equal to, or less than the involucre, as here, or half as long (as in *T. minus*). The flower-stalks are cylindrical. The pappus hair has a stalked feathery down.

The Goat's Beard is 2 ft. high at the most. It is in bloom in June. It is perennial, propagated by division.

The flower closes at noon according to some, but the best time to see it wide open is at night or early in the morning (3 a.m.). The structure of the flowerhead is much like that of *Taraxacum*, the style being hairy above, with narrow lobes. The flowers when open are yellow and conspicuous, but are not likely to be visited by insects because of their crepuscular habit, i.e. open at night, and are more frequently self-pollinated on that account.

The fruits are provided with a tuft of hairs which assist in dispersing them by the wind, in the same way as the Dandelion, but forming a bigger "clock".

Goat's Beard is very largely a clay plant, and addicted to a clay soil, but will also grow on sandy loam, especially on cultivated ground. It is abundant on Triassic, Liassic, and Glacial clay and sands.

The fungus *Ustilago tragopogi* converts the inflorescence into a black powdery mass; *Puccinia tragopogi*, *Cystopus tragopogonis*, and *Bremia lactucæ* are other fungi pests. A moth, The Mouse, *Amphipyra tragopogonis*, and a fly, *Urellia stellata*, also attack it.

Photo. H. Irving

Goat's Beard (*Tragopogon pratense*, L.)

Tragopogon, Dioscorides, is from the Greek *tragos*, goat, and *pogon*, a beard, because of the bearded fruit, and the second Latin name refers to the habitat, a meadow.

Buck's-beard, Shepherd's Clock, Gait-berde, Goat's Beard, Go-to-bed-at-noon, Jack-by-the-hedge, John-go-to-bed-at-noon, Joseph's Flower, Nap-at-noon, Noontide, Sleep-at-noon, Star of Jerusalem are some of its common names. Of the name Go-to-bed-at-noon says Gerarde: "It shutteth it-selfe at twelve of the clock, and sheweth not his face open until the next daies sunne do make it flower anew. Wherefore it was called Go-to-bed-at-noon."

Joseph's Flower was a name given to it, according to J. C. Hare, because of the pictures representing Joseph, the husband of Mary, as a long-bearded man.

Bishop Mant says of the first name:—

> And goodly now the noon tide hour,
> When from his high meridian tower
> The sun looks down in majesty,
> What time about the grassy lea

The goat's beard, prompt his praise to hail,
With broad expanded disk, in veil,
Close mantling, wraps its yellow head,
And goes as peasants say to bed.

It is used like Salsify, and has a long root like a parsnip, with a mild, sweet flavour. It is dressed like Asparagus, grown like the carrot, and cultivated in France and Germany, but seldom in Britain.

Essential Specific Characters:—

185. *Tragopogon pratense*, L.—Stem erect, branched, glaucous, leaves clasping, erect, long, lanceolate, channelled, simple, alternate, flowerheads yellow, involucre as long as or shorter than the flower, florets ligulate, perfect, pappus feathery, anthers yellow.

Cowslip (Primula veris, L.)

The Cowslip ranges farther east than the Primrose in the N. Temperate Zone, where it is found in Europe, Siberia, W. Asia, N. Africa, but, like it, is unknown so far in early deposits.

In Great Britain it is found in the Peninsula provinces, in the Channel, Thames, Anglia, and Severn provinces, in S. Wales it does not occur in Radnor or Cardigan, in N. Wales not in Montgomery or Merioneth, but throughout the Trent and Mersey provinces, except Mid Lancashire, and in the Humber, Tyne, Lakes provinces generally. In the E. Lowlands it is general except in Wigtown, and in the W. Lowlands except in Peebles and Selkirk, in the S. Highlands except in Stirling, S. Perth, Elgin, Easterness, and in the W. Highlands in Westerness, Main Argyle, Dumbarton, and in W. Sutherland, and Caithness. In Northumberland it grows at 1600 ft.

There is no more common plant in most lowland counties of Great Britain in early spring than the Cowslip, which dots the meadows, fields, and upland pastures with its yellow flowers as uniformly as the Lady's Smock does the moister meadows and marshes. It also grows under hedgerows in the shade, in copses, and woodlands, when it is taller and finer in flower and foliage.

The general habit of the Cowslip is like that of the Primrose, but the scape bears more than one flower. It is a typical rosette plant.

The radical leaves are heart-shaped to egg-shaped, narrowed at the base, running down the stalk, wrinkled, with rounded teeth, shorter than those of the Primrose, hairy beneath.

The flowers are in umbels, funnel-shaped, drooping, yellow, with orange dots. The calyx is bell-shaped with short egg-shaped teeth,

loosely enclosing the corolla. The capsule is oval, and half as long as the calyx.

The scapes are 6–8 in. tall. The flowers may be sought in May and June. The Cowslip is perennial and easily propagated by division.

The Cowslip has flowers very similar to those of the Primrose or Oxlip, but the limb of the corolla is not flat but cup-shaped, and the throat is open, with obscure not thickened folds.

It has orange honey-guides, and the flowers are very strongly

Photo. B. Hanley

COWSLIP (*Primula veris*, L.)

scented. The Cowslip usually grows in the open, while the Primrose grows in the shade. It is visited by humble bees and *Anthophora pilipes*.

The capsule is 5-valved and opens out at the top, and the seeds are shaken out by the wind.

The Cowslip is a truly clay-loving plant, growing freely on a clay soil, and it is common on Liassic clay and Boulder clay.

Phyllosticta primulæcola attacks it. A moth, *Eupœcilia ruficiliana*, feeds on it.

The second Latin name means *of spring*, in reference to the time of flowering. The different names by which it is known are: Arte-tyke, Horse Buckles, Cooslip, Coostropple, Couslop, Cow Paigle,

Cowslap, Cowslek, Cowslip, Cowslip Primrose, Cowslop, Cow's-mouth, Cow-stripling, Cow-stropple, Crewel, Culverkeys, Fairy Cups, Galligaskins, Gaskins, Herb Paralysy, Herb Peter, Ladykeys, Lady's Fingers, May Flower, Paigle, Cow Paigle, Palsywort, Passwort, Peter, Petty Mullein, Plaggis, Plum-rocks, St. Peterwort.

Paigle is a name given to several different plants, and several sayings are current in connection with it in different parts.

"The yellow marigold, the Sunnes owne flower, Pagle, and Pinke, that Decke fair Floræs bower." Professor Skeat derives it from the French *paillole*, Italian *pagniola*, a spangle, the root being *paille*, straw, from Latin *palea*. As to the name Palsywort, Gerarde says: "They are thought to be good against the paines of the joints and sinewes", and "A conserve made with the flowers . . . prevaileth woonderfully against the palsie." Artetyke is a corruption of Arthritica, a name given because the Cowslip was supposed to be good for pains in the joints.

Photo. Matson

COWSLIP (*Primula veris*, L.)

The name Cowslip is supposed to be Cow's lip. In Yorkshire it is called Cooslop from Keslop, the prepared stomach of a calf used as rennet, and the wrinkled leaves and calyx were connected with that of the calf's stomach.

It is called Herb Peter because the flowers resemble a bunch of keys, the badge of St. Peter. Ariel is pictured by Shakespeare reclining in a "Cowslip's bell", the crimson spots being called "Gold Coasts Spots",—"these be rubies fairy favours".

It is the Key-flower in Germany. An ointment was formerly made of the flowers for the complexion, and supposed to take away spots by the Doctrine of Signatures.

Quite recently a writer said: "The village Damsels use it as a cosmetic, and we know it adds to the beauty of the complexion of

the town-immured lassie when she searches for and gathers it herself in the early spring morning".

This plant was called Our Lady's Bunch of Keys and St. Peterwort from its resemblance to a bunch of keys. It was supposed to induce sleep. Another legend has it that the nightingale is only to be heard when Cowslips are in profusion, but the nightingale's range is not so extensive as that of the Cowslip. It was used as a drug in the time of Chaucer. At the present day it is used in country districts for making Cowslip wine, which is very like the sweet wines of S. France.

Cowslip smells of anise. The leaves have been used as potherbs and in salads. Silkworms are fed upon them. Liqueurs and syrups are flavoured with the leaves.

It is not variable under cultivation, though it is remarkable that Parkinson and Gerarde speak of a double variety. Milton speaks of "the yellow Cowslip and the pale Primrose".

The Cowslip has been used as a corroborant and antispasmodic, and as an anodyne.

Essential Specific Characters:—

200. *Primula veris*, L.—Flowering stem a scape, leaves ovate, contracted below, flowers pale yellow, in drooping umbels, calyx campanulate, teeth ovate, corolla limb cup-shaped, capsule oval.

Yellow Rattle (Rhinanthus Crista-Galli, L.)

Though one of the Arctic plants, Yellow Rattle is not represented at present in ancient deposits. It ranges throughout the Arctic and Temperate N. zones in Arctic Europe, N. Asia, and N. America. It is found, moreover, throughout Great Britain as far north as the Shetlands, and ascends to 2500 ft. in the Highlands. It is found in Ireland and the Channel Islands.

No plant is more typical of low-lying meadow land than Yellow Rattle, for when grass is laid to hay in spring and early summer it is one of the commonest of flowers. To the farmer, as with Rest Harrow, it is a sign of rough and poor pasture. It grows mainly on wet clayey ground, along with Plantains, Cat's Ear, Dog Daisy, Early Purple Orchis, and other plants of the valleys.

This is an erect plant, either simple or branched, with a square stem, spotted with black or brown, and smooth.

The leaves are opposite, distant, stalkless, narrowly elliptical, heart-shaped, blunt-veined, smooth, net-veined, toothed, the notches nearly

No. 1. Yellow Rattle
(*Rhinanthus Crista-Galli*, L.)

a, Vertical section of flower. *b*, Ovary, style, and stigma. *c*, Capsule, cut open, to show seeds. *d*, Rootstock, with rootlets attached to rootlets of grass. *e*, Part of plant, showing flowers and capsules with bracts.

No. 2. Self-heal
(*Prunella vulgaris*, L.)

a, Vertical section of corolla. *b*, Calyx, with stigma and style projecting. *c*, Nutlet. *d*, Nutlet, cut open. *e*, Upper part of plant, showing stem-leaves, bracts, and spike, with the overlapping bracts and flowers.

No. 3. Early Purple Orchis
(*Orchis mascula*, L.)

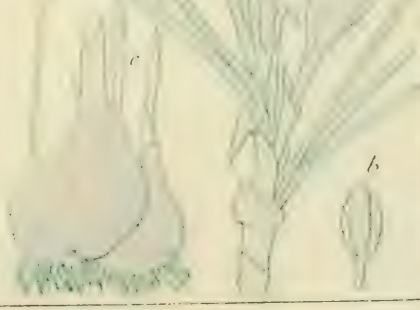
a, Section of flower, showing twisted ovary, spur, and exposing the pollinia and rostellum. *b*, Leaf, showing characteristic spots. *c*, Scape and inflorescence, showing the form of the lower (really upper) lip and the lateral lobes and upper (really lower) lip.

No. 4. Spotted Orchid
(*Orchis maculata*, L.)

a, Front view of flower, showing markings. *b*, Section of flower, showing pollinia and rostellum. *c*, Tubers and scape with leaves. *d*, Scape, with bracts and flowers.

No. 5. Purple Crocus
(*Crocus officinalis*, Huds.)

a, Stigma, magnified. *b*, Capsule. *c*, Corms, with sheaths and leaves. *d*, Plant, with leaf-sheaths and two flowers, showing anthers and stigmas projecting from the petaloid perianth.



1. [illegible] 2. [illegible] 3. Early Purple Orchis [illegible] *meinalis*, Huds.).

rolled inwards from the back. The second Latin name refers to their shape, like a cock's comb, or possibly to the calyx.

The flowers are yellow, borne in loose spikes on very short flower-

Photo. H. Irving

YELLOW RATTLE (*Rhinanthus Crista-Galli*, L.)

stalks, with an expanded, flattened, smooth calyx, with 4 equal teeth, pale-green, not falling. The corolla is gaping, the upper lip being helmet-shaped with a notch at the tip, the edges rolled inwards from the back, the lower lip divided halfway into 3 segments. The bracts

are egg-shaped, toothed. The capsules are included in the expanded calyx, and the seeds rattle about when ripe (hence the English name).

Yellow Rattle is 18 in. high. The flowers open in July and August. The plant is an annual propagated by seeds.

The anthers open widely, lie close to each other, and form enclosed in the upper lip a pollen reservoir. When this is penetrated by an insect pollen falls on the bee's head. The honey lies deep in the tube near the ovary on the receptacle, and the tube mouth is narrow. The two anthers-stalks situated forward lie close together and are clothed with pointed hairs on the inner side, so that the bee cannot insert its proboscis between them at that point, but where they are smooth. The bee, pressing the filaments back, shakes the anthers and dusts itself with pollen. The hairs prevent the pollen from being scattered.

There are two forms, one large-flowered form being cross-pollinated; the other, smaller, is self-pollinated. Yellow Rattle is visited by *Bombus*, and short-lipped insects cannot reach the honey.

The seeds are provided with a broad wing which aids their dispersal by the wind.

Parasitic on grasses, Yellow Rattle is a clay plant, and generally indicates by its presence poor clay soil.

The fungi *Ephelina radicalis*, Yellow Rattle root knot, and *Coleosporium Euphrasiæ* attack it.

Two moths also infest it, *Emmelesia* (*Lygris*) *albulata*, grass rivulet, *Botys fusialis*.

Rhinanthus, L., is from the Greek *rhinos*, nose, *anthos*, flower, from the shape of the upper lip of the corolla; *Crista-Galli*, Dodonæus, is the Latin for crest of a cock, in allusion to the shape of the calyx.

It is called Clock, Cock-grass, Cock's-comb, Cow-wheat, Dog's Siller, Fiddle-cases, Gowk's Sixpence, (Penny, Rattle) Grass, Hen Pen, Hen's Combs, Honeysuckle, Horse Pens, Locusts, Meadow Rattle, Money, Money-grass, Pence, Henny Penny, Penny Rattle, Penny Weed, Rattle, Rattle-bags, Rattle-box, Rattle-penny, Rottle Penny, Snaffles, Yellow Rattle.

This plant is called Rattle-penny and Money from its dry calyces rattling when shaken, and the shape of its round flat capsules. Gowk's Sixpence is the name conferred also from the shape of the capsules, and Gowk's Siller because, like the fool, it is unable to conceal its wealth.

Hen Pen is of double origin, the first from the shape of the calyx, the second from the flat seeds, like pennies. Yellow Rattle was called Locusts because in N. Bucks it was supposed to have been the food of St. John the Baptist. It was dedicated to St. Peter.

Essential Specific Characters:—

242. *Rhinanthus Crista-Galli*, L.—Stem erect, leaves lanceolate, serrate, opposite, flowers yellow, in a spike, with ovate bracts exceeding the calyx, the lobes of upper corolla-lip round.

Self-heal (Prunella vulgaris, L.)

This pretty Arctic species has been preserved in the early deposits, in Neolithic beds at Edinburgh, and Roman deposits at Silchester. It is found at present in the Arctic and Temperate Zones in Arctic Europe, N. Africa, Temperate Asia, America, and Australia, being thus widespread. It is very common in every part of Great Britain, and in Yorkshire is found up to an altitude of 2400 ft.

Self-heal is a representative meadow species, which is common in fields, meadows, and pastures at different elevations. It is quite at home in wet meadows which merge into a marsh formation.

It is common in damp woods also; but it is also frequent on lawns and turfy ground, where it covers wide areas, often to the exclusion of the grass itself.

The habit of Self-heal is either erect or prostrate. The whole plant is more or less hairy. The rootstock is creeping. The stems are erect or ascending, the branches often short. The leaves are egg-shaped to oblong, blunt, stalked, nearly entire or with a few teeth or divided. The upper leaves are stalkless.

The flowers are violet, purple, rarely white, in cylindrical whorls forming a dense spike, with two leaves at the base. The calyx is reddish-purple, with the very small teeth fringed with a few hairs. There are two kidney-shaped, or egg-shaped to heart-shaped, broad, long pointed bracts below each whorl which are fringed with hairs and green with purple edges.

The upper lip of the calyx has short, blunt teeth, the lower lip egg-shaped to lance-shaped, with blunt, pointed, teeth. The corolla is less than twice as long as the calyx. The nutlets are smooth and oblong.

Self-heal is about 1 ft. high. Flowers may be found between July and September. The plant is perennial, and propagated by division.

The flowers of Prunella are dimorphic. There are large, complete flowers, and others smaller and rare, which are female. In the latter only functionless stamens occur. The tube is 4–5 mm. long, and the style projects above and beyond the upper lip, the two stigmas being wide-spreading.

In the complete flowers the tube is longer, 7–8 mm. The longer

stamens divide into two spreading branches at the tip, the branches being unequal, and the shorter one with the anther lobes faces the centre, the other longer one outwards, its pointed ends resting on the concave surface of the upper lip, and this causes them to lie in such a position that the insect touches them on either side of the head. They open downwards and lie on each side of the stigma. The shorter stamens are similar in structure. The bee touches the lower stigma first with its back, and afterward is covered with fresh pollen. So that

Photo. Flatters & Garnett

SELF-HEAL (*Prunella vulgaris*, L.)

when insects visit the flower it is cross-pollinated, whilst in their absence self-pollination occurs and seed is set.

Self-heal is visited by the Honey Bee, *Bombus*, *Megachile*, *Anthophora*, *Cilissa*, *Lycæna*, *Hesperia*, *Melitæa*.

The smooth elongated nutlets when ripe drop out around the plant, assisted by the wind.

Growing on clay soil in a variety of situations it is a clay plant.

The fungus *Æcidium prunellæ* attacks the leaves.

Prunella or *Brunella*, Brunfels, is from the German *Bräune*, a kind of quinsy which the plant was supposed to cure, and the second Latin name refers to its widespread occurrence.

Self-heal is also called All-heal, Brown-wort, Brunel, Bumble-bees, Herb Carpenter, Proud Carpenter, Carpenter-grass, Carpenter's herb, Fly Flowers, Heart of the Earth, Hook-heal, London Bottles, Pick Pocket, Pimpernel, Prince's Feather.

Brunel is a modification of *Brunella*, from the German *die Bräune*, which Gerarde describes as "an infirmitie among soldiers that lie in campe".

Self-heal is called "Heart of the Earth" because it chiefly grows on thin, poor soils, where the farmers give it the credit of eating away all the substance of the soil. Because the corolla is shaped something like a billhook it was supposed to be (by Doctrine of Signatures) a vulnerary.

It was formerly applied in cases of quinsy. Formerly it was used in gargles, being aromatic and astringent.

Essential Specific Characters:—

255. *Prunella vulgaris*, L.—Stem erect, leaves ovate, entire, stalked, with 2 acute bracts at the base of the flowers, flowers purple, in whorls of 6, in a terminal spike, calyx flattened, dentate.

Purple Orchis (Orchis mascula, L.)

Like other Orchids this is known only from its modern distribution, which is the North Temperate Zone in Europe, N. Africa, and W. Siberia.

It is found in every county in Great Britain, except Glamorgan, S. Lincs, Isle of Man, Peebles, E. Sutherland, as far north as the Shetlands. It grows up to a height of 1500 ft. in the Lake District, and in Ireland and the Channel Islands.

This fine tall Orchid is a regular woodland species growing in clumps beneath the trees in the deepest shade in woods, copses, and plantations, and is strictly a shade lover like Dog's Mercury and Lords and Ladies, which grow side by side with it. It may also be found in pastures, but less commonly. The usual meadow Orchid taken for small forms of the Purple Orchid is the Green-winged Orchid (*O. Morio*). Its occurrence in meadows indicates former woodland.

From a tuberous base the stem rises erect, tall and graceful. The leaves are broad, spotted, oblong, narrowly elliptical, blunt. The stem is naked above and purple. The central vein in the leaves projects sharply below. The bracts are as long as the ovary, purple, narrowly elliptical, membranous, with twisted tips, nerved.

The flowers are deep-purple, large, in a loose spike. The lip has

rounded teeth, and is 3-lobed, as broad as long, with the margin bent back, the spur longer than the ovary, and ascending. The 2 outer sepals are acute, and bent back upwards.

The Purple Orchid is 1 ft. to 18 in. high, and the flowers are in bloom from April to May. It is perennial, propagated by division of the tubers.

The 3 sepals and 2 upper petals arch over the stigma. The lip is adapted for an alighting place, and is prolonged backwards to form a hollow spur with walls of delicate tissue.

Photo: Flatters & Garnett.

Purple Orchis (*Orchis mascula*, L.)

The stigma is just above the spur, with inferior lobes which are stigmatic surfaces, and the third forms the beak, full of clammy fluid, projecting into the mouth of the spur. The 2 lateral anthers are sterile scales, and the perfect one stands above the beak. The two cells are separated by a broad process connecting the anther cells with the filament, splitting longitudinally, and within lie the two masses of pollen grains, attached only by threads and adhering to the upper surface of the beak. When an insect thrusts its head into the spur it touches the beak, when the covering membrane splits, and curls back, and two small disks connected with the caudicles or stalks which bear the pollen masses, coated with sticky matter below, stick to the insect's head, and the fluid hardens like cement. The insect when quitting the flower bears the pollinia attached to the disks away on its head. The pollinia are at first erect, but when the disks dry they bend forward into an almost horizontal position, so that in visiting another flower they come in contact with the stigma, and cross-pollination is the natural result.

This Orchid is visited by the Humble bee *Bombus pratorum*, the flies *Empis livida*, *E. pennipes*, *Volucella bombylans*, *Eristalis horticola*.

The seeds being light and small are dispersed by the wind.

The Purple Orchid is a peat plant, and requires humus soil.

A fly, *Paralleloma albiceps*, is found on it.

Orchis, Theophrastus, is from a Greek word *orchis*, used for plants with a tuberous root.

The plant is called Drake's-feet, Frogwort, Gandergoose, Gandi gosling, Gethsemane, Geuky-flower, Giddy Gander, Goosie gander, Gowk Meat, Gramfer-greygles, Red Granfer gregors, Slander Grass, Greygles, Gussets, Kettle Case, Kettle Pad, King Finger, Long Purples, Man Orchis, Nightcap, Poor Man's Blood, Priest's Pintle, Purples, Rag-wort, Red Butcher, Red-lead, Ring Finger, Salep, Scab-gowks, Single Castle, Single-grass, Skeat-legs, Snake Flower, Soldiers' Jackets, &c.

PURPLE ORCHIS (*Orchis mascula*, L.)

The Purple Orchid is called Gethsemane because it was said to have grown at the foot of the Cross, and received drops of blood on its leaves.

The name Lover's Wanton is explained thus: "Rustics believe that if you take the proper half of the root of an Orchis and get anyone of the opposite sex to eat it, it will produce a powerful affection for you, while the other half will produce as strong an aversion".

> Then round the meddowes did she walke,
> Catching each flower by the stalke;
> Such as within the meddowes grew,
> As dead men's thumb and harebell blew.

The tubers are so called from their reddish colour.

Skeat-legs, scaet meaning a swathing, refers to the sheathing leaves. The dark flower spikes were called Adam, the pale ones Eve.

hence the name Adam and Eve. Children say the roots (tubers) were once the thumb of some unburied murderer, and call them Bloody Man's Thumb. There was a belief that Orchids sprang from the seed of the blackbird or thrush.

Jalep (Salep) was made from the tubers, and was much used in the East. The substance it contains is bassorine, which replaces the starch, and is dried and ground into powder.

Essential Specific Characters:—

291. *Orchis mascula*, L.—Aerial stem a scape, tall, leaves radical, lanceolate, with purple spots, flowers purple, in a lax spike, 2 sepals, reflexed upwards, acute, lip tri-lobed, bracts veined.

Spotted Orchid (Orchis maculata, L.)

Though an upland Arctic type this Orchid is not found in early deposits. It is distributed throughout North Temperate and Arctic Europe, except in Greece and in N. and W. Asia.

This species occurs in all parts of Great Britain, except in Cardigan, Montgomery, Isle of Man, Roxburgh, as far north as the Shetlands, and in the Highlands is found at 3000 ft. It grows in Ireland and the Channel Isles.

No more common Orchid is to be found than the Spotted Orchid, which is to be found growing in moist places in a variety of situations. It occurs in low-lying marshes, in wet meadows, or hollows in fields, bordering rivers and lakes. It also occurs on hillsides in wet places from which issue little rills or springs.

The Spotted Orchid has the usual Orchid habit, being erect. The tubers are palmate. The stem is slender, leafy above, solid. The leaves are narrow, lance-shaped to inversely egg-shaped, usually spotted with purple or black (hence *maculata*). The lower leaves are blunt or acute, broader toward the tip; the upper are linear to lance-shaped, and like the bracts. The bracts are awl-like, green, 3-nerved, the lateral veins conspicuous, the upper bracts as long as the ovary, the lower longer.

The flowers are lilac, spotted with rose or purple, or white. The spike is egg-shaped. The lip is flat, as broad as long, 3-lobed, the margins curved backwards, scalloped, the middle lobe narrower, and about as long as the lateral lobes, which are spreading. The spur is straight, awl-like, shorter than the ovary. The 3 sepals are spreading. The petals are converging.

The Spotted Orchid is about 1 ft. high. The flowers may be found

in June and July. The plant is a perennial, propagated by division of the tuberous root.

The flowers are stalkless in the axils of the bracts. Two of the petals arch over, and the third forms the spurred labellum. The column consists of the style and filament, which cohere, and the single anther is above, with a small round rostellum at the base and projecting over the entrance to the spur. At the back of this cavity lie the 2 stigmas, which form a sticky disk-like area below the rostellum or third stigma. An insect's proboscis thrust into the cavity towards the spur touches the rostellum, opening it, and the pollinia or pollen-masses are detached in an erect position, united by a netlike caudicle with a sticky disk below, which adheres to the bee's head, after it has been withdrawn from its gummy seat on the rostellum. The pollinia in thirty seconds bend forwards, and an insect in entering a second flower and trying to insert its proboscis into the spur leaves the pollinia attached by their club-shaped extremity on the stigmatic disk. Hence cross-pollination will occur.

SPOTTED ORCHID (*Orchis maculata*, L.)

The flower is visited by *Bombus pratorum*, *Empis livida*, *E. pennipes*, *Volucella bombylans*, *Eristalis horticola*.

The seeds are very small and light, and dispersed by the wind.

The Spotted Orchid is found on a clay soil, being a clay plant, or a peat plant growing in wet peat soil.

The Spotted Orchid is liable to attack by two fungi, *Melampsora repentis* and *Cæoma orchidis*.

The second Latin name refers to the spotted petals, the spots being honey-guides, or to the spotted leaves.

It is called Adam-and-Eve, Adder's-grass, Baldberry, Crawfoot, Crowfoot, Dead Man's Fingers, Dead Man's Hands, Hen's Combs, Lover's Wanton, Man Orchis, Nightcap, Red-lead.

Essential Specific Characters:

292. *Orchis maculata*, L.—Tubers palmate, stem tall, solid, leaves lanceolate, spotted, flowers lilac, spotted, sepals 3, spreading, bracts with three or more veins.

Purple Crocus (Crocus officinalis, Huds.)

The Purple Crocus is a southern plant found in Mid and S. Europe, and not earlier in the N. Temperate Zone. It is naturalized in Notts and Middlesex, and a few other places in England and Ireland.

Like the Yellow Crocus, which is found likewise in meadows in Warwick, Stafford, Salop, Notts, Derby, Chester, S. Lancs, S.W. Yorks, the Purple Crocus is but naturalized, and though established in the localities now known for it, it was doubtless an escape originally.

It grows in wet low-lying meadows by the margin of rivers in central and S. England.

This short-stemmed plant (the aerial stem is really a scape) is characterized by its bulb-like stem base, with fibrous coats, broad and flattened. The sheaths of the leaves are netlike, torn, dirty brown, and enclose the scape. The leaves are radical leaves, linear, furrowed, white below.

The flowers are purple and appear with the leaves. They are borne on erect scapes with hairs. The mouth of the flower is closed with hairs, and the segments are blunt. The stigmas, which are deep-orange colour, are expanded. The anthers are bright-yellow. The capsule is on a long, slender flower-stalk with small red seeds.

It is 6 in. in height. The flowers open in April. It is a perennial plant propagated by division of the roots.

In *Crocus vernus* honey is secreted by the ovary and rises in the tube, which is narrow and filled up by the style, nearly to the expanded mouth. Long-lipped Lepidoptera alone can reach it. The anthers ripen first. The ovary remains below the soil and is thus protected. The anthers dehisce away from the centre or extrorsely, and the stigmas unfold afterwards and touch an insect alighting on the petals. The stigmas are branched. Humble-bees can only skim the

surface of the nectary. The flowers being violet (or white) indicate adaptation to pollination by night-flying insects.

The Purple Crocus is visited by the Silver Y Moth (*Plusia gamma*), Painted Lady (*Pyrameis cardui*), which cross-pollinate it. If unvisited, the grooved stigmas passing between the anthers are dusted with pollen and the plant is self-pollinated.

The seeds, which are small, are contained in a capsule which opens above and allows the seeds to be jerked out by the wind.

PURPLE CROCUS (*Crocus officinalis*, Huds.)

The Crocus is a sand plant requiring a sand soil or sandy loam with some clay and humus.

Purple Crocus is infested with Bulb Sclerotinia (*Sclerotinia bulbosum*).

Crocus, Theophrastus, is the latinized form of the Greek name of the plant and its product saffron; and the second Latin name refers to its use in medicine.

It was supposed to inspire love. There is a proverb as to unexpected results: "You set saffron and there came up wolfsbane".

Purple Crocus was used for garlands in Greece.

This flower is said "to blow before the shrine at vernal dawn of St. Valentine".

It was sacred to Juno. It is, or was, considered unlucky to pluck it in Germany, and said to draw away the strength.

It was used for consumption and lung diseases. The Purple Crocus ripens its seeds more readily than the yellow, and after the mature ovary has lain buried in the soil it rises above the ground when ripe.

It is much cultivated and planted in gardens, where it is a useful border plant. Saffron is used by painters and dyers for pigments. It is also used in sauces, creams, biscuits, preserves, liqueurs, &c.

Essential Specific Characters:—

297. *Crocus officinalis*, Huds.—Leaves radical, linear, channelled, flowers purple, appearing with the leaves, stigmas dilated.

Section III

FLOWERS OF THE CORNFIELDS

FLOWERS OF THE CORNFIELDS

The flowers that follow man and the plough are perhaps no more artificial than those of the fields and meadows previously described, which have been equally disturbed by agricultural operations following the felling of forests, but there is a difference of degree, and a decidedly marked difference of origin as regards the unstable flora of a truly arable pasture, greater than that of one which is not actually under cultivation, unless we regard grazing as on a par with ploughing, which to be logical we ought to do. But with the former operation there is a marked physiological effect and a repeated reduction of all herbaceous growth to one level, while in the case of a cornfield we have free growth allowed till harvest, following seed ripening, and a temporary cessation of the struggle for existence caused by grazing. But, in the cornfield there is not that stationary association of species that a grass meadow possesses. It is largely ephemeral, the weeds (plants not classed as cultivated—as barley, wheat, oats, &c.) being of sporadic, alien or variable, colonist or denizen type, which may or may not persist perennially or annually.

Arable land generally is well drained and dry, and hence we may class it as pasture on cultivated soil, or under the plough. It is thus a part of the artificial though to some extent (because so stamped by time) natural mesophytic type of community, i.e. requiring a medium supply of moisture.

Really the cornfield flora is on a par with a waste land association (Vol. V, Section XI), which is here kept separate. But though there are many plants common to both, yet there are some peculiar to each; and because they have this distinctive character, though caused by the same abnormal factor, man, we keep them separate, as they are also topographically distinct. And this descriptive account of the common wild flowers blends the natural with the expedient; that is to say, the field botanist, whom we have especially in mind, finds here the most

natural botanical mode of mapping the district, combined with the readiest mode of surveying it from a practical point of view.

Moreover, associated with the striking alien plants that come up with cereal and root crops are a good sprinkling of the pasture grasses, &c., which persist in spite of cultivation, especially on the borders of cornfields where the plough does not disturb the turf. Of these other plants, we have included here three at least, the prickly multi-coloured Hemp-nettle, which lurks in the hedge, White Campion, which grows frequently elsewhere, and several Fescue grasses, which are found also at higher levels on dry hills and the sides of walls, such as Sheep's Fescue.

Here between the blades of wheat we expect to find the Mouse-tail. Abundant and pernicious in the farmer's opinion, the neat Corn Buttercup fills many a wide interspace left where the grain has not matured. Towering halfway as high as the cornstalks in the East counties, Larkspur here and there is frequent, with its delicate blue blooms.

Poppies spread a blood-red mantle over the golden grain in almost every field of corn, and lurking low down cowers the fœtid Earthsmoke with foliage like maidenhair. Everywhere the young blades of corn are outdone in the massing of colour by the Yellow Charlock, which, to the farmer's chagrin, studs the fields so plentifully in early spring. Sparingly the graceful woad-like Gold of Pleasure struggles upward, too, amid the ripening corn.

Purple and white, the lowly but pretty Candytuft in East Anglian cornfields brings a touch of the garden to the field. So too the little Heartsease, with its diminutive heads like dwarf pansies, recalls the rows of *V. tricolor* in the garden. The tall graceful White Campion opening to the honey-seeking insects at night is common here. Then no cornfield is complete without its Corn Cockles in the popular mind, but they are really more local than is usually supposed. The useful Spurrey spreads over the bare soil, affording fodder for cattle, but is little used in England. Common Flax reminds us of one of the sources of her greatness to-day, and once many a flax field could be seen in several districts, while now, as a rule, flax is imported.

On the stubble after the corn is cut, or amongst clover, Alsike Clover with its cream-and-pink orbs rises above the sandy soil laid bare at intervals. Shepherd's Needle with its comb-like seedcases, and its delicate little flowers and fine-cut foliage, is to be seen in most cornfields; and the foul and poisonous Fool's Parsley covers all the underglade with dark-green foliage; Field Madder and Lamb's Lettuce

both cover the soil at the foot of the cornstalks where light pierces the rows of haulms. Bright-golden appear the flowers of the beauteous corn marigold amid the grain, varied with the rich blue flowerheads of the corntlower. Seeking the sun the scented Corn Sowthistle slowly twists its shocks of golden bloom in the wake of Hyperion. Hiding away itself and its bloom Venus' Looking-glass is rarely seen, though it is fairly common. Small Snapdragon, Ivy-leaved Speedwell, Scarlet Pimpernel, wakeful up till morning, the hard-fruited Corn Gromwell, the prickly but pretty field Bugloss, are all familiar weeds here amid the ancient Wild Oat and the death-dealing Darnel grass.

Mouse-tail (Myosurus minimus, L.)

No trace of the Mouse-tail has been found in beds earlier than recent accumulations. It is a plant of the Warm Temperate Zone, found in Europe, W. Asia, N. Africa, and has been introduced in ballast into America and other countries. It is found in S. England, in S. Devon, S. Somerset, Wilts, Dorset, Isle of Wight, Hants, Sussex, Kent, Surrey, Essex, Herts, Middlesex, Berks, Oxford, Bucks, the whole of E. Anglia, W. Gloucestershire, Hereford, Worcester, Warwick, Stafford, Lincolnshire, Leicester, Notts, Derby, Chester, N.E., Mid W., N.W. Yorks, Durham, and Northumberland, and thus ranges from the last county to Kent and Devon, as well as in the Channel Islands.

The Mouse-tail, as almost implied by its name, is a diminutive plant, likely to be overlooked by all but the most observant. Its distribution shows that it is a plant of cultivated ground, coming up in cornfields, when the wheat is yet green, between the lines of grain It is fond of dry soil, and as such is a Xerophile, and though not confined to chalk districts is rather more abundant there than elsewhere. It has the grass habit, which may be regarded as an adaptive character here. It is also found in clover fields, and on the sides of paths in the dried-up pools where water has long accumulated. The Mouse-tail is associated with Plantain, Corn Buttercup.

It is a small, erect plant, with a fastigiate habit, i.e. with parallel ascending branches, the leaves, which are linear, expanded below, being clustered in a rosette, but erect, surrounding the taller receptacle, which resembles the mouse's tail, give it a plantain-like habit, in which again it resembles *Isoëtes*, or even *Limosella*.

This plant is unlike any other British plant, or the three mentioned, in the appearance its ripe carpels present, a plantain also having a

different flower. In the Mouse-tail it is yellow, and the petals are clawed. The flowers are borne on single scapes.

The sepals, 5–7, are closely parallel with the scape, and there is a scale at base. The Mouse-tail is 2–6 in. high. It is in flower from April to June. It is annual, coming up year by year in the same district.

The flowers are proterandrous, i.e. the anthers ripen first. After the anthers have withered, the top of the ovary elongates into a long cone and develops the stigmas. The elongation of the pistil axis makes possible the self-pollination of the neighbouring stigmas by means of the few anthers, which lie close around, the pollen emerging gradually by two lateral slits, the elongated axis (1–1¼ in.) bringing fresh stigmas in contact with the anthers. The Mouse-tail is pollinated by flies, Diptera, *Sciara*, *Chironomus*, *Scatope*, *Phora*, *Cecidomyia*, *Oscinis*, *Microphorus*, *Pteromalidæ*, *Ichneumonidæ*, *Haltica*, *Anthomyia*, *Melanostoma mellina*.

Photo. The Author

MOUSE-TAIL (*Myosurus minimus*, L.)

The fruit of the Mouse-tail is dispersed by the plant's own special mechanism. The achenes or fruits are small, numerous, and dispersed by the falling of the fruits around the parent plant. The styles do not fall off.

The Mouse-tail is a sand plant, frequenting districts with a sand soil, derived chiefly from the older sandy formations, from which are derived sandy loam, or one inclined to be oolitic, not limy or gritty. It is also found on the chalk.

No fungal pests attack it, nor is it a food plant for insects.

Dodonæus invented the name *Myosurus* (Greek *muos*, mouse, and *oura*, tail) from the shape of the scape, while *minimus* is Latin for very small.

Mouse-tail and Blood Strange are its only names.

Parkinson in the last connection refers to it as styptic, and says: "Blood-strange, I think corruptly from blood-staying".

ESSENTIAL SPECIFIC CHARACTERS:—

4. *Myosurus minimus*, L.—Sepals 5, spurred, petals with filiform claw, tubular, honey gland at base, 5 stamens, carpels imbricate, borne on a long scape, the seed pendulous.

No. 1. Mouse-tail
(*Myosurus minimus*, L.)

a, Scape, with flowers, magnified. *b*, Petal, showing tubular limb. *c*, *d*, Achenes from different aspects. *e*, Plant, with radical leaves and scapes.

No. 2. Corn Buttercup
(*Ranunculus arvensis*, L.)

Upper part of plant, showing tufted leaves (linear, trifid), flower open and closed, achenes with spines ("devil's coach wheels").

No. 3. Larkspur
(*Delphinium Ajacis*, Reichb.)

a, Section (vertical) of corolla. *b*, Raceme, with leaves below, showing spurred calyx and corolla.

No. 4. Fumitory (Earth-smoke)
(*Fumaria officinalis*, L.)

a, Vertical section of flower. *b*, Flower, from lateral aspect, showing scale and bract. *c*, Plant, with foliage, inflorescence, and fruit.

No. 5. Common Red Poppy
(*Papaver Rhœas*, L.)

a, Capsule, showing sessile, radiate stigma, and pore-like apertures. *b*, Plant, with foliage, and two flowers, one in bud showing sepals in place and the corolla folded, the other expanded, with many stamens.

No. 6. Gold-of-Pleasure
(*Camelina sativa*, Crantz)

a, Capsule, with seeds attached to septum. *b*, Sagittate leaves on stem and flowers in unexpanded state. *c*, Inflorescence (raceme) and fruits (siliques), in various stages.

Corn Buttercup (Ranunculus arvensis, L.)

No trace of achenes of this pest to the farmer has been found in Pre- or Post-glacial beds. It frequents the Warm Temperate Zone, including Europe, Temperate Asia, India, North Africa. It is more or less confined to cultivated areas, and so is absent from North Devon, Monmouth, occurring in South Wales only in Carmarthen, only in Montgomery, Flint, and Denbigh in North Wales, throughout the Mersey district, but not in Mid Lancs. In Scotland it is confined to Kirkcudbright, Ayr, Lanark, Berwick, Haddington, Edinburgh, Stirling, Perth, stretching from Perthshire to the South of England in general. It is found in Ireland around Dublin.

Corn Buttercup (*Ranunculus arvensis*, L.)

The Corn Buttercup is essentially a plant of the cultivated districts, being a regular denizen of the cornfield, in which it is, according to Watson, a colonist. It is a regular companion of Fool's Parsley, *Aethusa cynapium*, Venus' Comb, and similar followers of the plough, and it may be found with them also around stackyards. Being a tall plant it is bound up with

the wheat, and is held by the farmer to be a pest. But it has a pretty habit and bloom, and the prickly fruits are unique amongst English Crowfoots.

It is an erect plant, rather rigid, branched, with small leaves, smooth, linear, lance-shaped, and rather stout stems, and pyramidal from below upwards in outline. It grows in scattered groups, and its outline and shape are naturally modified by the distribution of the corn amongst which it grows, the close and erect habit being due to its being elongated.

This plant is quite smooth with furrowed stems, much divided, and with lower leaves, with leaflets in threes, the upper linear, and the carpels are prickly and hooked, large, flattened, and few.

The flower is pale-yellow. The stamens vary in number as do the carpels, and the former are sometimes wanting.

The Corn Buttercup is 1 to 2 ft. high, flowering in June (and May). It is an annual.

Hidden amongst the corn this plant has little chance of being cross-pollinated by insects, though it has honey-glands at the base of the petals, which are pale-yellow, glossy, and open. The sepals are also sub-erect. The stamens are numerous (16), and the stigmas are reflexed, the stamens being brighter in colour than the petals.

The fruit is dispersed by animals. The achenes are provided with numerous hooked spines, which assist in distributing them by means of the wool of animals' coats, in which they may catch.

Corn Buttercup is distinctly a sand plant, growing on sandy soil derived from sandy formations which furnish a sandy loam.

No plant or insect pests are known to infest this plant, but it is regarded itself as a pest by the farmer.

The name *arvensis* means growing on arable land.

The English names are Yellow Crees, Corn Crowfoot, Corn or Urchin Crowfoot, Crows'-claws, Devil-on-both-sides, Devil's-claws, Devil's Coach-wheel, Devil's Currycomb, Dill-cup, English Stavesacre, Goldweed, Gye, Hard-iron, Hedge-hog, Hellweed, Horse Gold, Hungerweed, Jack-o'-both-sides, Joy, Peagle, Pricklebacks, Scratch-bur, Starveacre, Yellowcup.

It was called by the name Starveacre because it indicated poor land, as also did Hungerweed. The name Urchin Crowfoot refers to its prickly fruits, which also account for Devil-on-both-sides, Devil's-claws, Hedge-hog, Pricklebacks.

Some of the folk in olden days called it Devil-on-both-sides, because of its supposed association with the Evil One.

Essential Specific Characters:—

9. *Ranunculus arvensis*, L.—Stem tall, leaves much divided, linear-lanceolate, calyx spreading, carpels beaked, spinous, nectary with a scale.

Larkspur (Delphinium Ajacis, Reichb.)

Larkspur is unknown in a fossil state. It belongs to the Warm Temperate Zone, growing in Central and S. Europe, North Africa, and has been introduced into the United States of America. It was regarded by H. C. Watson as an alien or colonist, and as naturalized in Cambridgeshire, but elsewhere sporadic.

The Larkspur is a plant of the Eastern counties, which has become established where arable land still remains. Doubtless, since it is an old garden favourite in another form, it was once much commoner than it is to-day. Now it is only with good fortune that one may expect to find it in East Anglia in the cornfields, where it gives just that blue tinge to the growing grain that is to be seen more extensively where the Cornflower grows.

Chalky or calcareous soil suits it best.

Larkspur is a tall, erect plant, with many spreading branches, and the numerous flowers in the raceme or flowerhead give it a handsome appearance, and this is noticeable in the cultivated form in our gardens. The leaves are much divided, with linear lobes.

Its first Latin name was bestowed on it in reference to the shape of the nectary, like the mythical dolphin. The second name was given in allusion to the fancied resemblance between some markings, like AIA, upon the flower. The terminal crowded racemes or flowerheads have as many as sixteen flowers, white, purple, blue, &c. The seeds, which are numerous, black, and angular, have transverse undulating ridges around them. The style is awl-shaped. The follicles or fruits are downy or smooth.

The plant is 1 to 2 ft. high, flowering in June and July, and is annual.

In this, as in *D. consolida*, 2 petals have united. The posterior sepals form a spur. The 2 upper petals have united by their backwardly-directed processes into a single spur in the point of which honey is secreted. The enlarged parts of the upper petals turned forward lengthwise are united into an inner spur, and when the bee enters cannot be thrust on one side. They form a sheath with the lower petals, only open below. At first the anthers, in the second case the stigmas, touch the bee below the head. The lower petals unite with the upper,

and yield at the side when the bee, which must have a long proboscis, attempts to thrust in its head. Cross-pollination is caused by insects, and self-pollination will take place in any case. Larkspur is generally pollinated by humble-bees.

Photo. J. H. Crabtree.

LARKSPUR (*Delphinium Ajacis*, Reichb.

The seed of the Larkspur is dispersed by the wind. The seeds are black and angular and ridged, and contained in a follicle or dry fruit, and are shaken out only by a strong wind.

The Larkspur is a lime-loving plant and requires a lime soil, being suited to districts where chalk or limestone contributes to form a subsoil of a limy character.

This plant is not infested by micro-fungi.

The moths *Chariclea Delphinii* and the Viper's Bugloss moth (*Dianthœcia Echii*) visit it, as also *Heliothis dipsacea*.

Dioscorides gave the name *Delphinium* (Greek *delphis*, a dolphin) from the form of the nectary. *Ajacis* is from *Ajax* (Greek, *Aias*), from markings like AIA. Larkspur is the only name, perhaps in allusion to the length of spur like the toe of the lark's foot.

The plant is a favourite in our gardens, and the flowers have been varied considerably by cultivation.

ESSENTIAL SPECIFIC CHARACTERS:—

14. *Delphinium Ajacis*, Reichb.—Stem erect, leaves alternate, multifid, flowers in raceme, sepals united, petals small, spurred, blue, white, pink, follicles 1 to 5, downy, seeds wrinkled.

Common Red Poppy (Papaver Rhœas, L.)

Unlike the Opium Poppy and Long Rough-headed Poppy, both of which appear in Neolithic beds (when they were cultivated), this species is not found so early.

It is found in Europe, N. Africa, W. Asia as far as India. It is found in 106 vice-counties of Great Britain, but not in Cardigan, Mid Lancs, Cumberland, Dumfries, Kirkcudbright, Stirling, or Elgin. It is rare north of the Tay; and occurs in Ireland and the Channel Islands. Watson calls it a colonist.

The Common Red Poppy which reddens, as though with blood-drops, the golden grain in autumn, is a widely distributed plant which has followed the plough, and comes up in every cornfield, and along the railway-bank, where weeds are liable to accumulate, being blown out of passing trucks or caught as by a barrier by the line of rail, and in all waste places, and by roadsides. Where we find Shepherd's Purse and the Golden Charlock, there also we shall find the Red Poppy.

This elegant plant, whose flowers are so fugacious or shortlived (hence *Rhœas*) and tend to tumble so soon, is an erect plant, with divided leaves, with many branches, which spread out in a nearly erect manner. The leaves are deeply notched and deeply divided (1–2).

The whole plant is thus pyramidal from below upwards. It grows in clusters amid the corn, or more thickly when it is more erect and less spreading, by the wayside.

The flower is scarlet with a black spot at the base, and in bud the flowers hang down but are erect afterwards.

The capsule or fruit is smooth and rounded, and the flower-stalk has spreading hairs. The filaments are awl-shaped, numerous, and there is no style. The stigma is convex, with the lobes overlapping.

In height this poppy reaches 2 ft., flowering from June to July. It is an annual, the seeds falling out by the opening of pores in the capsule beneath the stigma.

The sepals fall off as the flower expands. The flower has 4 petals, and many stamens closely surround the stigma and ripen before the flower opens, and are covered with pollen. This covers the lobes of the stigma which radiate from the centre of a circular disk on the top of the pistil, but the higher parts protrude, so that they are free from pollen. There is no honey, but insects alight on the broad stigma for pollen, and if another flower has been visited already cross-pollina-

tion follows. The petals are weak and liable to drop, so that the stigma is necessarily the resting-place.

The seeds of the Common Red Poppy are dispersed by the wind. The capsule or fruit is perforated at the top, and when the wind blows the seeds are scattered through the pores as pepper from a pepper-box, but here in an erect position.

It is a sand plant and requires a sand soil, being found on the older rocks largely of clastic origin, as well as on gravel and on lime soil.

Entoloma bicolor, a rare fungus, and *Peronospora arborescens* often destroy whole beds of cultivated poppies.

The plant is galled by *Aulax papaveris*, *Aulax minax*, *Cecidomyia brassicæ*, *Sciaphila wahlbomiana*; the Homopterous *Aphis brassicæ* and the fly *Chromatomyia albiceps* infest it.

Pliny gave the name *Papaver*, a poppy, which is the same as the Anglo-Saxon *popig*. *Rhœas*, given by Lobel (tenth century), is from Greek *rheo*, flow, meaning falling off, in allusion to the fugacious petals or milky stem.

The English names are Blind Eyes, Blindy-buffs, Bledewort, Canker, Canker Rose, Cheesebowl, Cockrose, Cock's-comb, Collinhood, Copper-rose, Corn Rose, Corn-flower, Cuprose, Cusk Darnel, Ear-aches, Fireflout, Lightnings, Maws, Poison Poppy, Pope, Ridweed, Soldiers, Thunder Bolts, Yedwark.

The Red Poppy is called Poison Plant in allusion to the supposed properties (cf. also Headache). To weed poppies is called "poping". Blind Eyes is the Yorkshire name, from a belief it will cause blindness placed too near the eyes. Cusk or cushion, a drinking-cup, alludes to the shape of the capsule. Poppyheads are said to cause violent earache if placed in the ear, and the same applies to headaches.

> Corn poppies that in crimson dwell,
> Called headaches from their sickly smell;

and again,

> When headaches rattle
> Pigs will sattle;

that is, fall in price, they being cheap in July. Irishwomen particularly object to poppies.

If the petals fall off, the would-be gatherer in Berwickshire was supposed to be struck by lightning, hence the name Lightnings. The Red Poppies which sprang up after Waterloo on the field are locally held to have sprung from the blood of the slain. Virgil calls it the Lethean poppy. From its sleep-producing properties it is the

COMMON RED POPPY (*Papaver Rhœas*, L.)

symbol of sleep and death. The heads were once steeped in wine and used to induce sleep. The petals are still employed to colour medicines. Owing to the quantity of the seeds Cybele, mother of the gods, is represented as crowned with poppy-heads.

This poppy is cultivated as a garden flower, both single and double varieties being known.

The juice is employed to form a sedative medicine. It was used in love divination, the leaf being prophetic. It was sacred to Venus. St. Margaret's Day (July 20) was celebrated in connection with the vanquished Dragon.

> Poppies a sanguine mantle spread
> For the blood of the Dragon that Margaret shed.

Essential Specific Characters:

18. *Papaver Rhœas*, L.—Stem hispid, bristles patent, many-flowered, leaves sessile, pinnatifid, flower scarlet, large, black at the limb, capsule globose, smooth, filaments subulate.

Fumitory (Earth-smoke) (Fumaria officinalis, L.)

Seeds have been found with flax seeds and weeds of cultivation in Neolithic deposits. Fumitory is confined to the Warm Temperate Zone, and is found in Europe, N. Africa, W. Asia, and has been introduced into the United States. It is absent from the following counties in Great Britain, but common elsewhere, viz.: S. Lincs, Main Argyle, N. Ebudes; and it ascends up to 1000 ft. in the north of England. It occurs in Ireland and the Channel Islands. By Watson it was regarded as a colonist.

The Earth-smoke is so constant an accompaniment of the growing grain that a cornfield would hardly be complete without it, and the widespread character of its distribution shows the length of its establishment, did not its occurrence in Neolithic deposits, with other weeds of waste ground, testify to this. It grows in the furrows, or around the borders, of wheatfields, associated with Corn Marigold, Corn Sow Thistle, *Sherardia*, and the usual plants of arable land, which wander afield to waste places around the straw-stack, farmyard, or mill.

The connection between this plant and Climbing Fumitory is seen in its spreading, not erect, habit, the principal stem which gives rise to others being weak and trailing over the surface if very long. The joints are swollen to add strength on this account, as the plant is tender and the stem is more or less wavy.

Earth-smoke may be recognized by its finely-divided bluish-green foliage, simulating umbellifers, or Hymenophyllous ferns, its versicolorous, purple and white flowers, nearly round fruits, with two sepals, lance-shaped, toothed, narrower and smaller than the corolla, and the lower petal of the four spatulate or spoon-shaped, the upper spurred or pouched. The pods are curved downward, erect, and shortly stalked. The leaves or petioles, which are sensitive, act as tendrils to support the plant. The raceme or group of flowers is long,

Photo. H. Irving

Red Rampant Fumitory (*Fumaria officinalis*, L.)

and many-flowered. Two ovules are contained in the ovary, but only one matures.

The stem may be 18–24 in. long. Flowers are seen from May to September. Fumitory is a common annual.

The flowers are inconspicuous, and little visited, therefore, by insects. The flower is much the same as in *Corydalis cava*, but is smaller, and instead of a spur there is a short round pouch formed by the upper petal and the two at the side which form a tube, hinged at the base, and honey is secreted by a short process from the upper stamen. Flowers are fertile to their own pollen, and the chief visitor is the hive bee. The honey being easily accessible can be obtained by many insects, but it flowers in the middle of the summer, and the small flowers and little honey, therefore, cause it to rely on self-pollination almost entirely.

Fumitory is dispersed by the agency of the plant itself. The

capsules are two-valved, and do not open, but the seeds are left to germinate around the parent plant.

The Fumitory is a sand plant, luxuriating in a sand soil, and growing on marly formations such as the Keuper, and sandstone such as the Middle Lias.

The only fungal pest is *Peronospora affinis*. No insects prey on it.

The name *Fumaria* was invented by Gesner from the Latin *fumus*, smoke, and *fumus terræ* (hence Fumitory) means earth smoke, while *officinalis* refers to its former medicinal use.

The English names are Beggary, Earth-smoke, Fume-of-the-Earth, Fumiterre, Fumitory, Fumusterre, God's Fingers and Thumbs, Snapdragon, Wax Dolls.

The old writers called it Fumitory, imagining that it was produced without seed from vapours rising from the earth. This may be connected with the fact that the root when just pulled up gives off a gaseous smell, like fumes of nitric acid. Others held it so because at a distance it looked like blue smoke.

It was "used when gathered in wedding hours, and boiled in water milk and whey, as a wash for the complexion of rustic maids". The juice was said to cure bad sight or clear it. In the fourteenth century it formed an ingredient in a remedy for bad blood and leprous diseases, but is of no medicinal value, though it was used for scurvy, eczema, &c.

Essential Specific Characters:—

22. *Fumaria officinalis*, L.—Stem erect, leaves bipinnate, leaflets cuneate, sepals not so wide as corolla tube, flower rose-coloured, capsule subglobose, retuse.

Gold-of-Pleasure (Camelina sativa, Crantz)

Seeds of this plant have not yet been found in Glacial beds, nor earlier than the present epoch. It is found in the Warm Temperate Zone in Central and S. Europe, and Temperate Asia. The occurrence of this plant in England is merely sporadic, and it is associated with other plants of alien origin and merely passing permanence. Its distribution is not therefore known.

Gold-of-Pleasure is one of those chance occupiers of the cornfield or flax field that delight the heart of the bird-fancier, who uses their seed for his stock, but it is not regularly found in its favourite stations year by year, coming up with grain sown yearly, or perchance here and there surviving a good cleaning of the stubble of last year. Flax-like it hides

amid the tall cornstalks, and is half-obscured unless one has eyes for the unexpected.

Tall and erect, with nearly entire leaves, which on the stem have ear-like lobes at the base, it is only branched at the top, and is a graceful plant, having the flax habit, as the Latin generic name implies.

Amid the corn it is elongated, and never becomes a branched, spreading, or cymose plant. The radical-leaves are stalked. With small yellow flowers, like a *Sisymbrium*, the Gold-of-Pleasure may be distinguished by the shape of the pods, which are swollen, blunt at the tip, the pouches keeled, the four keels continued in the long style, and the ultimate flower-stalks are spreading. The seeds are in two rows, without margins, oblong, and covered with small points.

Photo. The Author

GOLD-OF-PLEASURE (*Camelina sativa*, Crantz)

The stem varies in height from 2 to 3 ft. Flowers may be gathered from June to July. The plant is annual and propagated by seeds.

The flowers are small and largely hidden amongst the corn, so that insect visitors are few, and the petals are erect, the stigma undivided. Self-pollination is thus the normal mode of producing fertile seeds. The seeds of Gold-of-Pleasure are dispersed by the plant itself, the pods opening and allowing the seeds to fall immediately around the parent plant.

The soil required is a sand soil, and the plant is strictly a sand plant.

No fungi or insects are known to infest the plant.

The name *Camelina* is derived from the Greek *chamai*, in the ground, and *linon*, flax, while *sativa* is Latin, meaning sown or cultivated, as opposed to wild. The English names are Camline, Cheat, Dutch Flax, Gold-of-Pleasure, Myagrum, Oil-seed.

It is often, no doubt, introduced, as perhaps originally, with linseed.

Abroad it is cultivated for the sake of the oil in the seeds, which are used for different domestic purposes. It is valued as a bird seed and for feeding poultry. It is used in oil for soap-making, and in oilcake, for which it is cultivated in some places.

Essential Specific Characters:-

33. *Camelina sativa*, Crantz.—Stem tall, erect, radical leaves stalked, entire, those on the stem auricled, flowers yellow, minute, pods inflated, obovate, valves keeled.

Charlock (Brassica arvensis, O. Kuntze)

Widely dispersed as it is, no seeds of Charlock have yet been found in Pre- or Post-glacial beds. It is found in the Warm Temperate Zone, in Europe, N. Africa, N. and W. Asia, as far as the Himalayas, and has been introduced into America.

The Common Charlock, unfortunately for the farmer, is found in every county in Great Britain, and in Ireland and the Channel Islands. It is found at elevations of over 1000 ft.

Charlock is above all a constant denizen of cultivated ground, being evident when in flower in every cornfield, in some cases in such quantity as to give a sulphur-yellow colour to the field. But it often strays beyond arable land, and is found by the wayside with poppies on the bare ground where stone heaps have sometime stood, or along the margin of the macadam, where seeds accumulate in the gutter, amongst numerous similar stations. And then it is to be found in every stack-yard and on manure heaps, or where they have once been made.

Being short, roughly hairy, and branched often into two parts about halfway up the stem, Charlock is a compact shrubby plant, with stalked lower leaves, somewhat divided, with the lobes larger upwards, rough, and the upper stalkless, entire, finely toothed, with the lower part of the stem tinged a milky purple colour. It grows profusely in a scattered manner wherever it is found. An alternative Latin name, *Sinapis*, was given to indicate its turnip-like aspect.

The flowers are bright yellow, and the plant is well distinguished by its smooth, jointed, many-angled pods, which are longer by three times than the single-seeded beak, which is flattened at the sides and conical. The pods are nearly cylindrical. The seeds are black and numerous.

The plant sometimes grows to a height of 18 in. It is in flower from May till August. It is annual, and increased enormously by seed.

The stigma is mature first, when the flower is in bud, opening in the early morning. At the inner side at the base of the short stamens two

honey glands are situated, and two in the place of the functionless stamens that do not produce pollen.

The glands can be seen when the calyx expands, and are visible and accessible from outside. Insects can reach them without touching any of the other parts of the flower. The insect thrusts its proboscis down between the stamens, because the flowers are so close. The stamens later lengthen and are twisted outwards, and the opportunities for cross-pollination agree with the conditions in *Cardamine pratensis*. When the flowers wither and the stigma lengthens the anthers turn the pollen-covered sides upwards, bend downwards, and self-pollinate the plant. The visitors are Diptera (Syrphidæ), Hymenoptera (Tenthredinidæ, Apidæ), Coleoptera (Coccinellidæ), and Lepidoptera (*Euclidia glyphica*, *Burnet Noctua*).

Photo. B. Hanley

CHARLOCK (*Brassica arvensis*, O. Kuntze)

The seeds of Charlock are dispersed by the plant itself. The pods open and allow the seeds to be scattered around the parent plant.

It is a sand plant, and requires a sand soil, which may be derived from any of the older formations, such as Coal-measures, Keuper, Lias, &c., in which there are sandstones.

This plant is infested by *Ceuthorhynchus sulcicollis*, *Psylliodes chrysocephalus*, *Meligethes æneus*, *Balanienus brassicæ* (Beetles), *Athalia spinarum* (Hymenoptera), Large White (*Pieris brassicæ*), Small White (*P. rapæ*), Green-veined White (*P. napi*), Turnip Moth (*Agrotis*

No. 1. Charlock
(*Brassica arvensis*, O. Kuntze)

a, Petal, showing claw and limb. *b*, Silique. *c*, Part of plant, with leaves and inflorescence (raceme of flowers and fruit).

No. 2. Candytuft
(*Iberis amara*, L.)

a, Corolla. *b*, Capsule, with notch and stigma and style, showing seeds inside. *c*, Plant, with flowers in racemes and fruit.

No. 3. Heart's Ease
(*Viola arvensis*, Murr.)

a, Standard, ala, and lower lip of corolla, showing spur. *b*, Pistil and stamens, with tailed anthers. *c*, Capsule, with sepals detached. *d*, Plant, with flowers, fruits, foliage, and stipules.

No. 4. White Campion
(*Lychnis alba*, Mill.)

a, Petal. *b*, Group of stamens. *c*, Pistil, with feathery stigmas. *d*, Capsule, with teeth. *e*, Plant, showing flowers in different stages, and stem-leaves.

No. 5. Corn Cockle
(*Lychnis Githago*, Scop.)

a, Capsule. *b*, Plant, with foliage, flower closed up, and showing gamosepalous calyx with long calycine teeth, and flower expanded, with honey guides, and stamens and stigmas projecting in centre.

No. 6. Spurrey
(*Spergula arvensis*, L.)

a. Flower. *b*, Seeds, with wing at border. *c*, Plant, with flowers in various stages.

1. Charlock (*Brassica arvensis*, O. Kuntze). 2. Candytuft (*Iberis amara*, L.). 3. Heart's Ease (*V*
Murr.). 4. White Campion (*Lychnis alba*, Mill.). 5. Corn Cockle (*Lychnis Githago*, Scop.). 6. Spurrey

segetum), Cabbage Moth (*Mamestra brassicæ*), Bright-line Brown Eye (*M. oleracea*), *Plutella cruciferarum* (Lepidoptera) feed on it.

Brassica is Latin for cabbage, and *arvensis* means belonging to arable land.

It is called Charlock; Brassics (from the Latin which was used in old leases, in which were conditions as to its being kept under); Corn Kale, so called when hawked as a salad, before flowering, in Dublin. It has been grown as a salad, and mixed with Black Mustard as mustard. It contains an oil, and the seeds are hot and acrid.

Essential Specific Characters:—

34. *Brassica arvensis*, O. Kuntze.—Stem thick, hirsute, purple at the joints, radical leaves petiolate, sublyrate, upper sessile, dentate, flowers yellow, large, pods knotted, subcylindrical, many-angled, with conical beak.

Candytuft (Iberis amara, L.)

No instance of its occurrence before the present day is known as yet. It is found in the Warm Temperate Zone to-day in Europe to the south of Belgium. It is common in Great Britain, occurring in Somerset, S. Wilts, Dorset, N. Hants, Surrey, Herts, Berks, Oxford, Bucks, W. Norfolk, Cambridge, Carnarvon, Flint, Anglesea, Bedford, or principally, that is to say, in Mid and East England, and it is rare in Scotland, according to Watson, being only a colonist.

The Candytuft, as really but a wild form of the cultivated form, is in England an escape from gardens or cultivated sources. It is found in cornfields and on cultivated ground entirely, indicating its want of permanence and source of introduction. As a rule the soil it favours is dry, and it usually occupies a lowland station.

It is an herbaceous plant, erect, with a branched stem, giving it a shrubby appearance on a small scale. The leaves are narrowly elliptical with several blunt teeth, and the whole plant is fleshy. The stem is ribbed and downy along the ribs, smooth elsewhere. The leaves are not very closely placed, and are stalkless, and occasionally fringed to some extent with hairs.

The flowers are white or purple, two outer petals exceeding the others and spreading. The flowers grow in a corymb or flowerhead, or in lengthened racemes. The pods are heart-shaped at the tip, with a triangular notch, and the valves are winged, usually flat. The style is longer than the wings, and the stigma notched.

Candytuft rarely reaches a height of 1 ft., being usually 6–9 in.

It is in flower from June or July to August. It is annual and propagated by seeds.

The flowers, though conspicuous and fairly large, do not usually become cross-pollinated, owing to their place of growth, amongst corn, in which they are quite hidden, so that insects do not see the flowers.

Candytuft is dispersed by its own agency. The winged pods open and allow the seeds to fall out around the plant.

It is a lime-loving plant, and subsists mainly on a lime soil, furnished by rocks such as the Chalk, which produces a gravelly, flinty, and rubbly subsoil.

CANDYTUFT (*Iberis amara*, L.)

There is no fungus that infests it; but a beetle, *Psclliodes picipes*, and a moth, *Pionea margaritalis*, frequent it.

The name *Iberis* was given by Dioscorides, and refers to its being a native of Iberia, the old name for Spain. *Amara* means bitter, referring to the taste. Candytuft alludes to the habit of the flowers, and to its coming from Candia in Crete.

It is called Candytuft, Churl's Mustard, Clown's Mustard, Sciatica Cress.

It grows in a wild state in the eastern counties at Hitchin. It is cultivated for growing in the garden, where it is an improved form

of the wild plant, and is either white or crimson in colour. *Iberis umbellata*, which came from Candia, is a larger flower.

It is endowed with a very bitter taste, but has not been largely used except as a Cress or for such complaints as sciatica. It is not now employed for any such purposes.

Essential Specific Characters:—

36. *Iberis amara*, L.—Stem branched, spreading, leaves lanceolate, dentate, flowers in a corymb, petals unequal, the outer radiant, white or lilac, pods orbicular, winged, notched, with triangular lobes.

Heart's Ease (Viola arvensis, Murr.)

This plant has not been found in seed-bearing beds. The Marsh Violet, however, is found in beds ranging from the Pre-glacial to the Neolithic period. It is to-day found in the Temperate and Arctic Zones in Arctic Europe, N. Africa, N. and W. Asia, as far as Siberia and N.W. India. It is found in every county in Great Britain, as far as Shetland, as well as in Ireland and the Channel Islands. In Yorkshire and in Scotland it is found at altitudes of 1000 ft.

Heart's Ease is one of the commonest cornfield weeds, coming up not only in the furrows, but covering every available space it can obtain. In its forms it varies tremendously, and *V. tricolor* or the garden form will revert to a form like this. It is found also on waste ground around farmyards and by the wayside.

The stem is angular, spreading, and branched, and more or less lies on the ground except at the tip, the leaves have long stalks, and are narrowly elliptical, with rounded teeth or oval, the stipules are divided with lobes larger upwards, or deeply divided, and very variable. The whole plant is slender and delicate. Many plants grow together in a station, and vary much in general habit according to the crops with which they grow.

The flowers are white with a yellow centre, and the calyx is longer than the petals, and hairy. The capsule is rounded, and contains numerous brown shining smooth seeds, inversely egg-shaped.

The plant is usually 6 in. high, sometimes 9. It is in flower for nearly six months, from April onward. It is annual, and reproduced by the numerous seeds.

The Heart's Ease is pollinated by *Thrips*, though Darwin said if bees were excluded it was more or less barren. When the flowers were covered up they yielded only 18 capsules, in which some pos-

sessed several good seeds, some only 1–3; but 105 large capsules were produced when uncovered.

The few capsules formed when the plant is covered up are due to curling up of the petals when the stigma is covered with pollen. The flowers are visited by *Plusia*, and by Humble-bees, and *Rhingia rostrata*.

The plant is not frequently visited, but when insects do visit it the flower withers. For the secretion of the nectar certain atmospheric conditions are needed, and insects perceive it by the odour. There is a lip-like valve in the stigmatic cavity by which pollination is facilitated in *V. tricolor*, but not in this plant, the opening of the stigma lacking the lip, and it is curved inwards. The plant is self-pollinated soon after the flower opens. The pollen grains are 4- or 5-sided prisms.

The plant is dispersed by its own peculiar device, the valves of the capsule opening and expelling the seeds, when dry, by an explosive motion due to the shrivelling or drying up to which the parts are subjected,

Heart's Ease is a sand plant, which is especially characteristic of sandy formations, and requires a sand soil, or sandy loam, or alluvium.

The Queen of Spain Fritillary, and a Fly, *Lauxcania aeneæa*, feed on it, also the High Brown Fritillary.

The specific name *arvensis* was bestowed by Linnæus to indicate its predilection for arable ground.

The names given to *V. tricolor* apply to this plant—Beedy's Eyes, Bleeding Heart, Buttery-entry, Call-me-to-you, Cat's-faces, Cull-me-to-you, Face-and-Hood, Fancy Flamy, Garden Gate, Godfathers and Godmothers, Heart's Ease, Heart seed, Herb Trinity, Jack-behind-the-garden-gate, Jump-up-and-kiss-me, Kiss-me, Kitty-Run-the-Streets, Leap-up-and-kiss-me, Live- (and Love-) -in-Idleness, Love-true, Meet-her-i'-th'-entry Kiss-her-i'-the-Buttery, Monkey's Face, Pance, Step-mother, Three Faces in a Hood, Two-Faces-Under-the-Sun.

Flamy was the name given because its colours are like the flame in wood. Herb Trinity is given because of the three colours of the flower. Shakespeare uses the name Love-in-idleness.

> Maidens call it Love-in-idleness.
>
> *Midsummer-Night's Dream.*

Miss Alcott, in *Little Women*, has the following:—

> The story of panzy—how the stepmother leaf sat up in her green chair in purple and gold; how the two own children in gay yellow had each its little seat, while the step-children in dull colours both sat on one small stool, and the poor little father in his red nightcap was kept out of sight in the middle of the flower.

The name "Face-and-Hood" is in reference to the markings of the petals, which bear some sort of resemblance to a face, the limb of the flower being often dark and hood-like.

In *Midsummer-Night's Dream*, Oberon tells Puck to place a pansy

Photo. L. R. J. Horn

HEART'S EASE (*Viola arvensis*, Murr.)

on Titania's eyes to cause her to fall in love with the first object she sees when she wakes. The pansy was used in brides' bouquets.

Heart's Ease was reckoned a cure for heart disease. It was used as a decoration on Trinity Sunday. Though regarded as a cordial it has no such value.

ESSENTIAL SPECIFIC CHARACTERS:—

44. *Viola arvensis*, Murr.—Stem branched, angular, leaves oblong,

crenate, stipules lyrate, pinnatifid, flowers purple, white, yellow, petals shorter than the calyx, capsule globular.

White Campion (Lychnis alba, Mill.)

This plant has been met with in Neolithic beds at Fife. It is found to-day in the Temperate Zone in Europe, N. Africa, Siberia, Western Asia. It has been introduced in the United States.

In Great Britain it is absent from Worcester, and in S. Wales in Radnor. In N. Wales it occurs only in Carnarvon, Denbigh, Flint, and Anglesea. It is absent from Mid Lancs, Isle of Man, Peebles, Selkirk, Roxburgh, and in E. Highlands in Mid Perth, in W. Highlands in Main Argyle, Mid and North Ebudes, Caithness, Orkneys and Shetlands.

The night-flowering or White Campion is undoubtedly a follower of cultivation, for it is specially characteristic of the cornfield, where it is abundant and well-established. Not infrequently it will be found in place of its allied species, the Red Campion, lining the hedgerow in a district where corn is, or has been, largely grown, but it is on arable land that it is most conspicuous and at home.

This is a tall, smooth or hairy, graceful, slender plant, with egg-shaped, narrowly elliptical leaves, very similar in habit to the Red Campion, usually growing in scattered groups in cornfields or hedgerows, not in massive clumps like the latter. It is slightly clammy.

The flowers are white, and open completely at night, from six o'clock till nine next morning, when they droop, except in dull weather, when they are fragrant. The petals are divided halfway into two parts, the lobes approaching and broad, crowned, and the calyx teeth are long and linear, narrowly elliptical. The capsule is conical with 10 erect straight teeth, and no divisions. The seeds are small and numerous.

The plants are dicœcious, stamens and pistils occurring on different plants as a rule, or there may be three forms—male, female, and bisexual.

White Campion grows 2 ft. high, and is in flower in June and July. It is perennial and propagated by division.

In fertile pistillate or female flowers the honey glands are placed 20–25 mm. from the entrance in the fleshy part of the ovary, in barren staminate or male flowers at 15–18 mm. The upper part of the calyx in both forms is narrower. It is necessary for the insect to force this narrow passage with its head, and honey cannot be reached except by insects with a proboscis 15–20 mm. long. The flowers open in the

evening (hence *vespertina*, another name), and are pure white, suitable for crepuscular or evening visits. The stamens and pistil vary in length.

Of the diurnal or day visitors only pollen-seekers could obtain anything. It is thus adapted to night-fliers. The anthers ripen two at a time. The Elephant Hawk moth visits it and cross-pollinates it.

The seeds of White Campion are dispersed by the wind like many of the Caryophyllaceæ. The capsule or seed vessel opens at the top

Phot. T. H. Corbin

WHITE CAMPION (*Lychnis alba*, Mill.)

when ripe, and allows the seeds to be hurled to a distance by the wind or when the stem is shaken by passing animals.

It is a sand-loving plant, requiring primarily a sand soil, which is furnished by very different rock formations, the older Palæozoic, and even Oolitic or Cretaceous formations.

Two fungi, *Ascochyta cookei* and *Ustilago violacea*, infest this plant, but no insects.

The name *Lychnis*, Theophrastus, is from the Greek *lychnos*, lamp, in reference to the cottony substance on some species being used for lamp wicks. *Alba* refers to the white flowers.

It is called Bachelor's Buttons, White Bachelor's Buttons, Bull-rattle, White Campion, Cowmack, Cow-rattle, Cuckoo flower (White

Wild), Grandmother's Nightcap, Plum-puddings, White Robin, Snake's flower, Thunder Bolts, Thunder-flower.

Essential Specific Characters:—

48. *Lychnis alba*, Mill.—Stem tall, branched above, leaves oblong, downy, flowers white, fragrant at night, petals 2-cleft, calyx-teeth linear, capsule conical.

Corn Cockle (Lychnis Githago, Scop.)

As yet the Corn Cockle has not been met with in any Glacial or other early deposits. It is found in the Temperate Zone in Europe, Siberia, Western Asia, as far as Persia. It has been introduced into the United States. In every county of Great Britain will you find this plant except Mid Lancs, Stirling, Mid Perth, Westerness, Main Argyle, East and West Sutherland, Caithness, Hebrides, Shetlands. It was considered to be a colonist by Watson.

A district without Corn Cockles is as bad as one in which Red Campion is absent. Both are well-known country favourites. But while the last is found only on uncultivated ground, the Corn Cockle is essentially a follower of the plough, and is seldom found but in cornfields. But the seeds which are reaped with the corn when ripe get amongst fowl corn, being sifted into the offal or winnowing, and commonly appear in poultry runs, having been used for poultry corn.

The Corn Cockle is a rigid, tall, slender, repeatedly dividing, hollow-stemmed plant, very hairy, with swollen joints. The leaves are oblong, narrowly elliptic, keeled, at the base united, hairy both sides, with the longest hairs at the base.

The flowers are purple, they are not crowned and enclosed by longer linear green sepals, the petals being entire, and with long claws or stalks and with no scale on the blade. The flowers are single on long stalks. The capsule is 5-toothed, and the seeds have a shagreen surface, and are large, black, wedge-shaped or kidney-shaped with rows of points, the capsule being as large as an acorn.

The Corn Cockle is often 3 ft. in height. It flowers from June to July, and is an annual.

The nectaries are situated, as in *Dianthus*, at the bottom of a long, narrow tube, and from the position of the honey the flower is adapted to pollination by long-tongued Lepidoptera. The anthers ripen first, the stigma later, but occasionally together. In the order of development of the anthers (in some flowers there are no stamens) it resembles

Dianthus also. Species of *Silene* and *Lychnis* have a relation to species of *Dianthœcia* (Noctuidæ). The species pollinate *Silene* and *Lychnis*, and provide for their larvæ, which feed entirely on unripe seeds of these plants, but *Silene* and *Lychnis* are pollinated by other insects besides. The visitors are Lepidoptera (Large Skipper (*Hesperia silvanus*), Large White (*Pieris brassicæ*)), and Diptera (Syrphidæ, *Rhingia*).

The seed of the plant is dispersed by the wind. The seeds are blown out of the open capsule, which opens by 5–10 teeth or valves, by the wind, and the stem being tall and rigid, they are jerked a long distance away.

It is a sand plant, and addicted to a sand soil.

The plant is infested by such fungi as *Puccinia arenariæ*, *P. lychnidearum*, *Ascochyta Dianthi*.

CORN COCKLE (*Lychnis Githago*, Scop.)

Githago, Tragus, is derived from the resemblance of its seeds to those of the plant called gith by the Romans, our fennel-flower. It is called Bachelor's Buttons, Corn Campion, Corn Cockle, Cockweed, Corn-flower, Corn Pink, Drawk, Field Nigella, Gith, Gye, Hardhead, Nele, Papple or Pawple, Pink, Popille, Popple, Poppy Wild Savager. Field Nigella because it has a flower in structure like *Nigella*.

It clogs the millstones when used with corn. The seeds are used as a bird seed.

ESSENTIAL SPECIFIC CHARACTERS:—

51. *Lychnis Githago*, Scop.—Stem tall, wiry, dichotomous, flowers

puce, calyx-lobes longer than the corolla, downy, petals entire, not crowned, capsule with large hard seeds.

Spurrey (Spergula arvensis, L.)

Seeds of Spurrey have been found near Edinburgh in beds of Neolithic age. It is found to-day in the Northern Temperate and Arctic Zones, in Arctic Europe, North Africa, West Asia to N.W. Asia, and has been introduced into North America. Spurrey is found in every part of Great Britain, and ascends to a height of 1000 ft.

It is one of the usual weeds of cultivation associated with crops, and is seldom found far away from cornfields, where it is extremely abundant. If a field is allowed to return to seed or to become fallow, Spurrey may establish itself in the more open parts of such fields and remain for some period.

The plant is nearly erect, with branched stems, which are numerous, smooth, clammy above, bent like a knee, with swollen joints. The leaves are cylindrical, in whorls, in two rows, the inner shorter, or in opposite pairs with short leaf-buds in the axils, grooved beneath, with small semi-transparent stipules or leaves. A few plants grow together.

The flowers are white, arranged in a repeatedly dividing stalked cyme, the ultimate stalks being turned down in fruit, and clammy. The calyx is spreading, the petals are attached by a short claw, longer than the sepals. There are 5 stamens, fewer, or none. The capsule is nearly round, and protected by the permanent calyx. The seeds are rough, angular, kidney-shaped, with club-shaped warts, black, and bordered with a semi-transparent margin.

The plant grows to a height of 6–10 in. It is in flower from June to August. Being an annual it is reproduced by seeds only.

The flowers are very small, and as with Corn Buttercup and Gold of Pleasure not adapted specially for insect visits, having no scent. There are numerous pistils, and styles to the number of 5.

The seeds of Spurrey are dispersed by the plant's own mechanism. When ripe the valved capsule or seed vessel breaks open, and the seeds are dispersed around the parent plant.

This species is a sand plant and addicted to a sand soil, being found on a variety of formations, from the older arenaceous to the newer Oolitic and chalky formations.

It is infested by *Cystopus lepigoni* and *Puccinia arenariæ*. A beetle, *Cassida nobilis*, lives upon it.

CORN SPURREY (*Spergula arvensis*, L.)

The name *Spergula*, Dodonæus, is from the Latin *spargo*, I scatter, the seeds being widely scattered in cornfields, and *arvensis* denotes its preference for cultivated ground.

It is called Beggar-weed, Bottle Brush, Cowquake, Dodder, Dother, Farmer's Ruin, Toad Flax, Franke, Granyagh, Lousy Grass, Make-beggar, Mountain Flax, Pick Pocket, Pick Purse, Poverty Weed, Sandweed, Spurry, Yarr, Yarrel, Yawr, Yur.

The name Spurrey is said to be given because "on the stalk are set at distances, or joints, small narrow leaves, waving or bending, in the manner of a star or a spur rowel of many points". But Spurrey may be from Spergula. It was called Franke because it has the property of fatting cattle.

On the Continent it is used as fodder, and is thought equal to clover in France. Poultry eat the seeds. An oilcake is prepared from it, excellent for cattle. It can be sown and reaped in eight weeks. In times of famine it has been used to make bread.

Essential Specific Characters:—

58. *Spergula arvensis*, L.—Stem slender, suberect, leaves whorled, linear, subviscid, with chaffy stipules at the base, flowers panicled, small, white, petals entire, seeds with clavate papillæ.

Flax (Linum usitatissimum, L.)

This plant is one of the most anciently cultivated plants, found in Neolithic and Roman beds in Britain, Capsules and seeds of flax are common at Redhill, suggesting the bundles were steeped there. It was cultivated in Neolithic times. It occurs to-day where flax is cultivated either for oil or fibre, and has been so for 4000 to 5000 years in Mesopotamia, Assyria, Egypt, being still wild in the district between the Persian Gulf, Caspian Sea, Black Sea.

The early cultivation of this plant shows that it has been used in the weaving of textiles for a long period, and as its occurrence to-day is merely an indication of its escape from cultivation its habitat is always (in Britain) an artificial one. It is found on waste ground, in offal yards, millyards, docks, and granaries, and generally in and about towns where the seeds are liable to dispersal, or where canals and railways assist in the accidental scattering of seeds.

Flax has a characteristic habit of its own, being usually erect and single-stemmed. It has narrowly elliptical alternate leaves, which are ascending and linear. It is branched above, and smooth, the leaves close, without order, and 3-nerved.

The flowers, in a panicle, are blue and large. The 5 sepals are egg-shaped, acute, keeled, 3-veined, and the 5 petals are notched.

The capsule is smooth within, rounded, with 5 valves, and blunt, with a sharp point at the tip. The seeds are glossy, flattened at the side, the pods opening elastically.

It is often 18 in. high. The flowers bloom in June and July. It is annual.

Flax is like Purging Flax in the position of the honey glands, and the anther stalks are united below and form a fleshy ring in the hollow of the ovary, secreting drops of honey, which enlarge and reach the sepals below, from 5 glands on the outer surface opposite the stamens. The petals, which are much larger and blue, are attached to this fleshy ring just above the honey glands, and alternate with the stamens, the lower halves of the petals touching, becoming narrow at the base, and leaving a round opening just above the honey gland. The 5 anthers empty their pollen at the same time as the stigmas are ripe, and as the stigmas are on the same level, they become dusted with pollen, though the anthers are at first some distance from the stigmas, and thus avoid self-pollinating the plant. When a visitor comes from another flower and inserts its proboscis between the stigmas and anthers it cross-pollinates the flower, but if it approaches from outside it presses the anthers against the stigma and self-pollinates it. In the absence of insects the stamens bend inwards.

The visitors are Hymenoptera (Apidæ, *Apis mellifica*, *Halictus cylindricus*) and Lepidoptera Silver Y Moth (*Plusia gamma*).

The seeds of Flax are dispersed by the plant's own agency. The fruit is 5-celled, and divided into 2 chambers occasionally. The outer seed coat swells when moistened and glues the seeds to the ground. When ripe and dry the capsule opens by 10 slits, and the seeds are dispersed round the parent plant.

It is more or less a lime-loving plant, growing on a lime soil in chalk and limestone districts, but it is also at home on sand and gravel, which are also largely associated with both formations.

The fungi Flax rust, *Melampsora lini*, and Flax wilt, *Fusarium lini*, attack Flax.

The beetles *Aphthona euphorbiæ*, *A. virescens*, *Melolontha vulgaris*, and the moths Silver Y Moth (*Plusia gamma*), Broom Moth (*Mamestra pisi*), Sword-grass (*Calocampa exoleta*), feed upon it.

Linum, Theophrastus, is the Greek *linon*. Flax is cognate with the German *flachs*, and may be from the Latin *filum*, a thread, *filare*,

No. 1. Flax
(*Linum usitatissimum*, L.)

a, Flower, with stamens and stigmas exposed and corolla removed. *b*, Plant, with stem-leaves, flowers in various stages, and fruit.

No. 2. Alsike Clover
(*Trifolium hybridum*, L.)

a, Floret, magnified, showing papilionaceous corolla. *b*, Pod, with beak. *c*, Seed. *d*, Plant, with flowers in various stages.

No. 3. Shepherd's Needle
(*Scandix Pecten-Veneris*, L.)

a, Floret, magnified. *b*, Section of mericarp. *c*, Plant, showing foliage, flowers, and long-beaked fruits.

No. 4. Fool's Parsley
(*Æthusa Cynapium*, L.)

a, Floret from above, showing stamens. *b*, Mericarp, side view. *c*, Section of mericarp. *d*, Plant, showing bipinnatifid leaf, and umbel of flowers, with linear bracts of involucre.

No. 5. Field Madder
(*Sherardia arvensis*, L.)

a, Flower. *b*, Persistent calyx, enclosing seeds. *c*, Plant, showing whorls of leaves and flowers in a head.

No. 6. Lamb's Lettuce
(*Valerianella olitoria*, Poll.)

a, Flower in section, showing epipetalous stamens. *b*, Corolla and calyx. *c*, Nut. *d*, Nut cut open to show corky layers. *e*, Plant, showing foliage and inflorescence.

1. Flax (*Linum usitatissimum*, L.). 2. Alsike Clover (*Trifolium hybridum*, L.). 3. Shepherd's Needle (*Scandix Pecten-Veneris*, L.). 4. Fool's Parsley (*Æthusa Cynapium*, L.). 5. Field Madder (*Sherardia arvensis*, L.). 6. Lamb's Lettuce (*Valerianella eliturin*, Poll.).

Photo. H. Irving

FLAX (*Linum usitatissimum*, L.)

to spin. The second Latin name refers to its extraordinary usefulness to man. It is *llin* in Welsh, *lion* in Gaelic.

Flax is called Lint Bells, Lint Bennels, Blaebows, Flix, Lin, Line, Lint, Lint-bow, Vlix. A man in the flax trade in Dorset is called a linman. Line is pronounced lün (as in Norse or Danish) either in reference to the plant, or seed linseed, or fibre once prepared on

the lün-wheel. Fields in Westmorland still go by the name of Lün-holmes, Lindale, Lugnegnards.

Lintlaw, Linthill, in Berwickshire, and Linthaugh, probably derive their names from the cultivation of lint. Lint Bells, Lint-bows, mean the flowers and seed pods of flax.

Flax was worn as a talisman against witchcraft. One who spins after the Twelfth Night is bewitched. The fairies' clothes are made of fairy flax. On St. John's Eve men wearing wheat, women flax, meet around an historic stone and place wreaths on it, and if they are fresh for some time the lovers they represent will be united, but if they wither love will die. The proverb, "Get thy spindle and thy distaff made, and God will send the flax", enjoins faith. If the sun shines on New Year's Eve in Westphalia the flax will be straight. When Joseph and Mary were fleeing into Egypt the flax bristled up.

In Bohemia, if children dance in the flax they will grow up beautiful. To spin on Saturday in Germany is bad luck. They have this legend:

Two old women, good friends, were the most industrious spinners in their village, Saturday finding them engrossed in their work as on other days of the week. At length one of them died, but on the Saturday evening following she appeared to the other, who as usual was very busy at her wheel, and showing her burning hand, said:

"See what I in hell have won,
Because on Saturday eve I spun".

In Thuringia, however, they consider flax a lucky plant. When a young woman gets married she places flax in her shoes as a charm against poverty. It is supposed also to have health-giving properties. In Germany when an infant seems weakly and thrives slowly it is placed naked upon the turf on Midsummer Day, and flax seed is sprinkled over it, the notion being that just as flax seed grows so will the infant grow gradually stronger. If a person is dizzy in Thuringia he is advised to run after sunset naked through a flax field three times, and the flax will take upon itself the dizziness.

Flax has been used since prehistoric times, and the inner fibrous bark was used then as it is now. The fibres consist of bast, which is very strong, and with cells 20–40 mm. long. The Egyptian mummy clothes are made of flax. The tow was used by the ancients for wicks for oil lamps, and linseed for oil. It is used in oil painting.

Seed is sown broadcast in pulverized sandy loam in April. It is kept well weeded. When the seed is ripe it is pulled up by the roots, and capsules are removed by the combs, the stalks are tied in bundles,

and macerated in still water, kept below the surface by weights for about a fortnight, when it appears to be decaying and becomes soft. It is then taken out and laid on grass for another fortnight, dew and heat helping the decay. When dry it is tied up in bundles and stacked for manufacture.

If it is not steeped it is simply laid on the grass, a process known as dew-retting. But it has latterly been simply dried, bound, and stacked like corn, and the capsules and fibre separated by machinery, the fibre being much stronger by this process. It is bleached by the machine process by steeping in soft soap. The crushed seed yields an oil, used in poultices, for oilcake, and for manure.

The offensive nature of macerating it caused an Act, 33 Hen. VIII, c. 17, to be enacted in order to stop it:

> No person shall water any hemp or flax in any river, running water, stream, brook or other common pond where beasts are used to be watered, on pain of forfeiting for every time so doing twenty shillings.

Once hemp and flax grew in every garden. A premium was given by Parliament in the eighteenth century to encourage the growing of flax.

After growing it on land it is necessary to manure the ground well, and to have a rotation of crops.

> Urit enim lini campum seges.
>
> VIRGIL, *Georgics*, i, 77.

It is used as an emollient for coughs and lung troubles.

ESSENTIAL SPECIFIC CHARACTERS:—

66. *Linum usitatissimum*, L.—Stem tall, single, leaves broad, distant, lanceolate, alternate, flowers large, blue, sepals ovate to lanceolate, petals notched.

Alsike Clover (Trifolium hybridum, L.)

Like other Leguminosæ of quite modern date, the range of this introduced plant is included in the North Temperate Zone, in Europe, North Africa, and Western Asia. It is everywhere an introduction, being found with other clovers, Sainfoin, Lucerne, &c., grown for fodder.

As a fodder plant, too, Alsike Clover is a common companion of the cultivated Red and White Clovers. It is also found in many cornfields, and where roots are grown. It is frequent in old brickyards and some types of quarry, and on railway embankments. This may be due

in some cases to the growing of clover with wheat to serve as a second crop after the wheat is cut. In a general way it occurs in sandy places, and on waste ground, where it is quite established.

This is a handsome, tall, erect, or sometimes trailing, and clustered or branched species, with fresh bright-green foliage. The leaflets are oblong, with small sawlike teeth, and notched at the tip, the stem hollow, the stipules or leaves membranous with few nerves, the stalks long.

Photo. J. H. Crabtree

ALSIKE CLOVER (*Trifolium hybridum*, L.)

The flowerheads are in umbels, rounded, in threes, the stalks long, placed in the axils, the petals being white or rose-colour, and the teeth of the calyx are subequal, awl-shaped, and half as long as the corolla. The pods contain 4 seeds.

Usually Alsike Clover is about 9 in. to 1 ft. high. The flowers may be found in June, July, August, and September. It is perennial.

The flowers are larger than, but resemble those of *T. repens*, and are thus more liable to be cross-pollinated than smaller-flowered species which are inconspicuous. The flower is partly drooping after flowering and the calyx bell-shaped. The pods are enclosed in the calyx, which does not fall, and drop in the immediate neighbourhood of the parent plant.

Alsike is a sand plant and thrives well on a sand soil, derived from arenaceous rocks, such as Coal-measures and other sandstone formations.

Insect or fungal pests are unknown.

The name *hybridum* refers to a supposed *hybrid* origin, the plant being derived from *T. pratense* and *T. repens*, between which it is intermediate.

The plant is called Alsike or Alsike Clover. Linnæus found it

growing in the parish of Alsike, about ten British miles south of Upsala, and in Sweden it is known as Alsike Klover.

Essential Specific Characters:

80. *Trifolium hybridum*, L.—Stems spreading, branched, erect, leaves obovate, stipules ovate to lanceolate, flowers in globular depressed heads, white or pink, calyx-teeth subulate.

Shepherd's Needle (Scandix Pecten-Veneris, L.)

The Shepherd's Needle is known from its present distribution throughout the North Temperate Zone in Europe, North Africa, W. Asia, as far as the N.W. of India. In Great Britain it is not found in Mid Lancs, Westmorland, Kirkcudbright, Stirling, S. Perth, but occurs in the West Highlands except in Cantire and S. Ebudes, E. Sutherland, the Hebrides, and the Orkneys from Ross southwards, ascending to 1000 ft. in Yorkshire. Watson regards it merely as a colonist.

Shepherd's Needle is a common cornfield weed, growing amid the corn, where it is accompanied by Corn Buttercup, Poppies, Charlock, Heart's Ease, White Campion, Spurrey, Alsike Clover, Fool's Parsley, Field Madder, and other equally widespread followers of man and the plough.

Though usually consisting of several stems, Shepherd's Needle often has only one, and is not very tall, but branched, ascending, downy, with a purple stem below and purple stripes. The leaves are light green, deeply divided, with lobes on either side of the stalk, delicately cut, sheathed at the base, and finely fringed with hairs at the margin.

The flowers are in small umbels of 2 rays, with no general involucre, the partial whorl of leaf-like organs being much divided. Before pollination the involucre consists of 5 simple entire leaves, afterwards, even if only one flower is pollinated, they branch repeatedly. The flowers are white, 5–7, with petals blunt at the tip, the outermost the largest, spreading, with the tips turned in. The bracts in the involucre are divided into two halfway. The beak of the fruit is three times as long as the fruit. The fruit is rough, flattened on one side, finely furrowed on the other, with hairy edges.

The plant is not more than 1 ft. high. The flowers bloom in June and July. Venus's Comb, as the Shepherd's Needle is also called, is an annual, coming up spontaneously from seed.

The flowers are polygamous, small, and inconspicuous. There may be male flowers and bisexual flowers, and they may be homogamous,

anthers and stigma ripening together, or the anthers first. The staminate flowers are usually in the middle, or absent, but those in the umbels of the third order are male as a rule. The points of the petals are turned inwards. The styles are straight, the disk expanded. The whole contrivance of the flower shows that it lends itself to self-pollination, the flowers being little visited or liable to be visited by insects, because like other cornfield plants they are not generally accessible to insects.

Photo. Messrs. Flatters & Garnett

SHEPHERD'S NEEDLE (*Scandix Pecten-Veneris*, L.)

The long needle-like pods open and expel the seeds by an elastic movement.

Being a sand plant, Venus's Comb is addicted to a sand soil, and may also be a lime-loving plant growing freely on a lime soil on calcareous rock soils.

Like other plants of cultivated ground there are no fungal or insect pests that infest it.

Scandix, Theophrastus, is the Greek name for Chervil; *pecten veneris*, Dodonæus, is the Latin for Venus's Comb.

This plant has many common names: Adam's Needle, Beggar's Needle, Needle Chervil, Clock-needle, Lady's Comb, Venus's Comb, Shepherd's Comb, Coombs, Crake-needle, Crow-needle, Crowpecks,

Deil's or Devil's Darning-needle, Darning Needles, Devil's Elshin, Elshins, Ground Enell, Hedge-hog, Needle, Pink Needle, Old Wife's Darning Needles, Old Woman's Needle, Wild Parsley, Poke Needle, Pook Needle, Powkenely, Pound Needle, Powk Needle, Puck Needle, Shepherd's Needle, Stikpyle, Tailor's Needles, Throck-needle, Venus's Needle.

As to the name Venus's Comb, Gerard says, "After (the flowers) come uppe, long seeds very like unto pack-needles, orderlie set one by another like the great teeth of a combe."

There is a common saying, says W. K. Wise, "in the New Forest that two crow-pecks are as good as an oat for a horse", to which the reply is "that a crow-peck and a barley-corn may be".

This plant is called Adam's Needle from the long seed-pods, and the name Devil's Darning Needle arises from its long awns. Elshins, or awls, is the name given on account of the long-pointed fruits.

At first called Our Lady's Comb, this became Venus's Comb.

Essential Specific Characters:—

126. *Scandix Pecten-Veneris*, L.—Stem short, erect, leaves tri-pinnate, flowers small, white, in an umbel of few rays, fruit long, beaked, rough, with marginal bristles.

Fool's Parsley (Æthusa Cynapium, L.)

The antiquity of this umbellifer, in spite of its association with cultivated land to-day, is shown by its occurrence in Neolithic beds in Hants, and Roman deposits at Edinburgh.

It is found in the Temperate Zone in Europe and Siberia, and it has been recently introduced into N. America. In Great Britain it is not found in Cardigan, Isle of Man, Linlithgow, Easterness, and only in the Clyde Islands, in W. and N. Highlands, and in the Northern Isles, or from Elgin to the S. Coast. It is native in Ireland.

Fool's Parsley is a very characteristic plant of all cultivated ground, occurring there and elsewhere always as a weed. It is also a common plant around houses, in gardens, plantations, stack- and farm-yards, and is found on all pieces of waste land.

The burning properties of the plant, when taken, are referred to in the first Latin name. It is poisonous, and this may be indicated by its extremely smooth, shiny stem, and dark-green lurid colour. The main stem divides above, and the leaflets are all linear, narrowly elliptic, of one size, the leaves being several times divided, with lobes each side of the stalk. The stem is hollow and bluish-green. The

leaf-stalks have small membranous sheaths, and are ascending and furrowed.

The flowers are in umbels, and white, with smaller rays in the centre. There are no general bracts or leaves, and no general whorls of leaf-like organs. The partial involucres have bracts all one side, long and pendulous. The flowers are irregular, with no calyx-teeth, and notched petals. The fruit is green and finely furrowed.

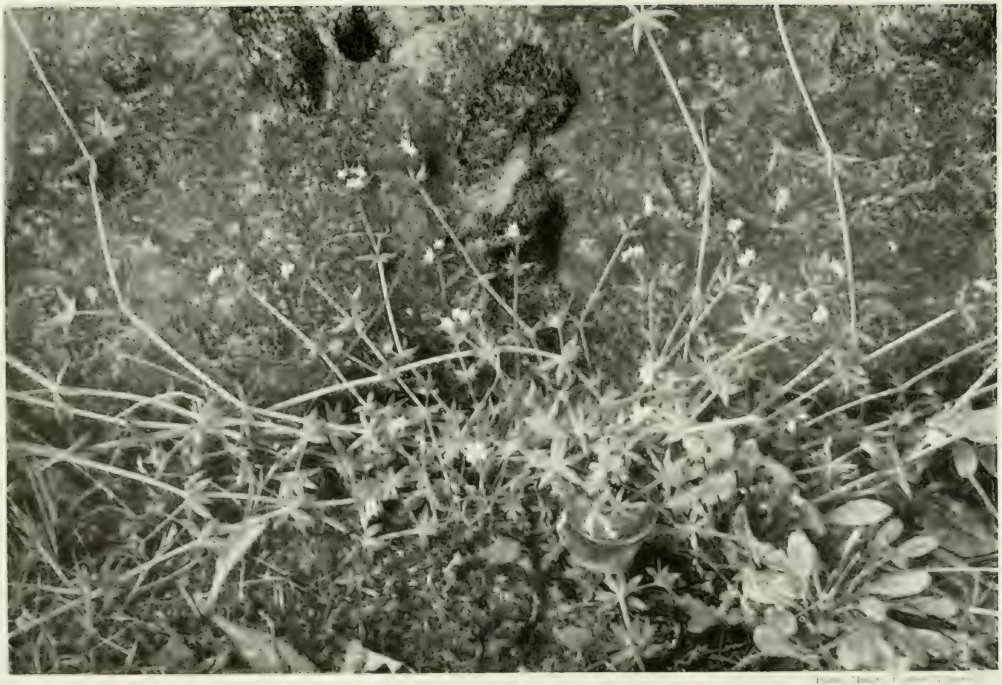
Fool's Parsley (*Æthusa Cynapium*, L.)

The Fool's Parsley is usually 1 ft. to 18 in. high. It is in flower from July to September. It is annual, and increased by seeds.

The flowers are white, small, and inconspicuous. As the plant has a disagreeable odour and is poisonous, it is on this account little, if at all, visited by insects. The petals are turned in, and the stigmas as well as the 5 turned-in stamens are short, and below the corolla, or more properly the stamens overtop the ovary, which is glandular. Self-pollination is therefore encouraged. Opinion differs as to whether the perfect flower matures the stigma or anthers first.

The seeds being flattened are more readily wind-carried, and when the old stems are dry the seeds are easily jerked out to a distance by wind or passing animals.

Fool's Parsley grows on sand soil, and is a sand plant, but it will grow in the shade on clay as well, though it is most prevalent on rock soils yielding a sandy loam, and limestone soils, those yielded by such



FIELD MADDER (*Sherardia arvensis*, L.)

geological formations as the Lias and the Great Chalky Boulder clay, to mention two out of many suitable formations.

A little fungus, *Puccinia bullata*, attacks it. No insects infest it.

Æthusa, Linnæus, is from the Greek *aitho*, I burn, in allusion to the hot taste, and *Cynapium*, Rivinus, from *kuon*, *kunos*, dog, and *apion*, parsley.

This plant is called Ass-parsley, Dill, Dog-poison, Dog's-Parsley, False Parsley, Fool's Cicely, Fool's Parsley.

Fool's Parsley causes vomiting when eaten, and is very acrid.

From common Parsley it is distinguished by the dark-green leaves, with finely-divided, and not yellow leaves. The three long bracts distinguish it from all others of this group.

Essential Specific Characters:—

129. *Æthusa Cynapium*, L.—Stem erect, branched, glabrous, leaves bipinnate, leaflets lanceolate, flowers white, with long bracts at the base of the partial involucres, fruit ribbed. Poisonous.

Field Madder (Sherardia arvensis, L.)

Found to-day (with no earlier records) in Europe, North Africa, and Siberia, Field Madder is a North Temperate Zone species. It is found in every part of Great Britain, except in Main Argyle, N. Ebudes, and the Shetlands.

Field Madder is a typical cornfield weed, which is seldom found elsewhere, except it be on ground allowed to lie fallow, once corn land. It is especially common on sand soil, and is widespread in the south on the chalk soils, but is abundant also in the Midlands and elsewhere. It is found with Corn Buttercup, Fumitory, Poppies, Charlock, Spurrey, Shepherd's Needle, Lamb's Lettuce, &c.

Having much the same habit as Woodruff, but being more branched, and lying flat or erect at one end, the stems are rough and square. The lower leaves are in 8's or 4's. The branches are quite rough. The upper leaves are 5–6, narrowly elliptic, and the lower ones are blunt with a sharp point at the tip, and often opposite.

The flowers, which are lilac or pink, are in terminal umbels. The calyx-teeth are 4–6, and the calyx does not fall off. The corolla is funnel-shaped with a slender tube. The involucral leaves are 7–8. The corolla is united into a tube. The simple anthers are pale purple. The fruit is oblong, divided longitudinally, containing 2 seeds, which are oblong, concavo-convex, with 3 points.

Field Madder is about 6 in. high. The flowers bloom from April to

September. The plant is annual or biennial, highly worth cultivating, and reproduced by seeds.

The flowers resemble those of Woodruff, but are lilac in tint. They are gynodiœcious. Though they are small they are numerous, and from association are the more conspicuous. The anthers or the stigmas may mature first. Self-pollination occurs. Flies visit the flowers.

The fruit is provided with a fringe of hairs on the teeth of the calyx, which enlarge after flowering, and is hairy, and dispersed by animals.

Field Madder is a sand plant, growing in a sand soil, but may be found commonly on lime soils.

Peronospora calotheca is a microscopic fungus that infests it. The Humming-bird Hawk-moth, *Phragmatobia fuliginosa*, and *Melanippe cristata* feed upon this pretty prostrate flower.

Sherardia, Dillenius, is a commemoration of Dr. Sherard, a native of Bushby in Leicestershire, b. 1659. The second Latin name indicates its preference for cultivated land.

This plant is called Allison, Dodger, Herb Sherard, Field Madder, Madderlen, Spurwort.

Essential Specific Characters:—

144. *Sherardia arvensis*, L.—Stem spreading, branched, prostrate, leaves 6 in a whorl, lanceolate, obovate, acute, flowers lilac, in a terminal umbel, calyx 4-fid, fruit small.

Lamb's Lettuce (Valerianella olitoria, Poll.)

Seeds of the Lamb's Lettuce have been found in Interglacial beds at West Wittering. The plant is found throughout the Temperate Northern Zone in Europe, N. Africa, and Western Asia. In Great Britain it is absent in Hunts, S. Lincs, Kirkcudbright, Stirling, Mid Perth, N. Perth, Elgin, Westerness, Cantire, S. Ebudes, N. Ebudes, W. Ross. Watson regards it as doubtfully native.

Corn Salad or Lamb's Lettuce is a typical cornfield weed, being always found on cultivated land unless it be waste ground, where it is sometimes to be seen. It grows with Heart's Ease, Corn Marigold, Venus's Looking Glass, Scarlet Pimpernel, Field Bugloss, Hemp Nettle, and many another sand-loving species.

Lamb's Lettuce is a short, erect plant, with an angular, furrowed, downy, slender stem, divided into two repeatedly, with numerous radical leaves, smooth-veined, spoon-shaped, the upper ones stalked, opposite, distant, fringed with hairs, and notched.

LAMB'S LETTUCE (*Valerianella olitoria*, Poll.)

The flowers are blue and numerous, borne in close terminal cymes, surrounded by long narrowly elliptic bracts. The fruit is naked, flattened, spuriously 2–3 celled, and contains one seed with a corky mass on one side; the barren cells touch, and are not furrowed, being separated from the fertile seed by grooves on each side. This reduction of the fertility of the ovules may conduce to the lightness of the seed, and enable it thereby to be more widely dispersed by the wind.

The plant is from 6 in. to 1 ft. high. It flowers in April and May. It is annual and propagated by seeds.

The flowers are small and lilac, and the plant grows amongst corn, and is therefore less likely to be insect-visited than the Marsh Valerian, though concealed honey is found. There are only 3 stamens and 3 stigmas, which are simple. The anthers and stigma may ripen together, or the latter first. The visitors are Coleoptera, Diptera, Hemiptera, Apidæ, Lepidoptera.

The fruit, besides being flattened, is spuriously 2-celled, and being small is easily dispersed by the wind.

Lamb's Lettuce is a cornfield plant, found on sand soil, and therefore a sand plant. It is also found on lime soils.

The moth *Caradrina cubicularis*, a Hymenopterous insect *Trioza centranthi*, and a fly *Chromatomyia albiceps* feed upon it.

Valerianella, Columna, is a diminutive of *Valeriana*, and the second Latin name refers to its use as a salad.

The English names are few, such as Cornel-sallet, Corn Salad, Lamb's Lettuce, Milk Grass, Potherb.

Gerard says: "In English the white potherbe, so called for that there is a blacke potherbe, which is called Alisander". The name Milk Grass may be said to be due to the following: "In June at a distance the fields look as if all covered with spilt milk, which is from a flower for that reason called Milk Grass (Lamb Lettuce), for it has now lain for six or seven years lee".

Lamb's Lettuce is used as a salad plant, and has been cultivated for a long time.

Essential Specific Characters:—

146. *Valerianella olitoria*, Poll.—Stem repeatedly 2-forked, spreading, slender, leaves ovate, toothed at base, flowers blue, in terminal cymes, capsule compressed, with ciliate bracts.

Corn Marigold (Chrysanthemum segetum, L.)

In spite of its being addicted to cultivated ground, and its suspicious status as a native, Corn Marigold is found in Neolithic beds near Edinburgh. Its present distribution is Europe, North Africa, and Western Asia. It is not found in Hunts or Stirling in Great Britain, but everywhere else. It was regarded as a colonist by Watson.

Photo Dr. Somerville Hastings

Corn Marigold (*Chrysanthemum segetum*, L.)

The Corn Marigold is entirely a cornfield plant, being rarely found elsewhere except as an escape from such cultivated districts, occasionally coming up in allotments and gardens and on waste ground. It is usually to be found on high ground on dry, sandy, or loamy hills.

A field studded with Corn Marigolds in flower is a sight to be remembered. It is a tall, branched plant, with an erect, woody stem, smooth, shiny, and rather bluish-green. The leaves are linear or oblong, narrowly elliptic, stalked, egg-shaped above, not downy, notched, toothed; the stem-leaves are alternate, stalkless, half-clasping the stem, oblong or egg-shaped above, with few teeth.

The flowerheads are golden-yellow (both disk and ray florets) and stalked, terminal, solitary, large, with leaf-like organs, with blunt, outer membranous margin, brown in colour. The first Greek name refers to the yellow colour of the flower. Small wart-like knobs occur on the upper sides of the corolla segments in the disk and in the ray.

This handsome plant is about 18 in. to 2 ft. high. Flowers are to be seen in June and July. It is an annual, propagated by seeds.

The flowers are large and conspicuous, of a deep golden yellow, both ray and disk florets, the former female, the latter bisexual. But

No. 1. Corn Marigold
(*Chrysanthemum segetum*, L.)

a, Ray or ligulate floret. *b*, Disk or tubular floret. *c*, Plant, with stem-leaves, flowerhead in bud and expanded.

No. 2. Corn-flower or Bluebottle
(*Centaurea Cyanus*, L.)

a, Disk or tubular floret. *b*, Phyllary. *c*, Flowerhead in bud, and upper stem-leaves. *d*, Upper part of plant, with flowerhead expanded.

No. 3. Corn Sow-Thistle
(*Sonchus arvensis*, L.)

a, Ray floret. *b*, Achene, with pappus. *c*, Inflorescence, with flowerheads in bud, and one expanded.

No. 4. Venus's Looking Glass
(*Legousia hybrida*, Delarbre

a, Calyx, enlarged. *b*, Upper part of plant, with stem-leaves and inflorescence.

No. 5. Scarlet Pimpernel
(*Anagallis arvensis*, L.)

a, Filament. *b*, Stamen. *c*, Pyxidium, with lid removed, showing seeds. *d*, Plant, with flowers in various stages.

No. 6. Field Bugloss
(*Lycopsis arvensis*, L.)

a, Corolla, vertical section showing epipetalous stamens. *b*, Nutlets, within calyx. *c*, Nutlet. *d*, Upper part of plant, showing stem-leaves and flowers.

(*Anagallis arvensis*, L.). 6. Field Bugloss (*Lycopsis arvensis*, L.).

it is one of those cornfield plants which are not easily accessible to insects, which cannot therefore cross-pollinate it.

The achenes are dispersed by the wind, the fruit being ribbed and winged, though in the case of ray florets they are not winged.

Corn Marigold is more or less strictly a sand plant, growing on sand soil. It is common on the sandy beds of the Lias, especially the Marlstone Rockbed.

The larva of *Phytomyza affinis* mines the leaves of this species and of *Chrysanthemum Leucanthemum*.

Chrysanthemum, Dioscorides, is from the Greek *chrysos*, gold, *anthos*, flower, and the second Latin name refers to its cornfield habitat.

The plant goes by many different names: Bigold, Boodle, Boswell, Yellow Bottle, Bothem, Bothen, Botherum, Bothul, Bozzom, Buddle, Budland, Golden Corn-flower, Corn Marigold, Fat Hen, Geal Gowan or Geal Seed, Gil Gowan, Gold, Yellow Gold, Golding, Goldings, Marigold Goldings, Goles, Golland, Gool or Goold, Gouls, Gowan, Gule or Yellow Gowan, Manelet, Marigold, Field or Wild Marigold, Marigold Goldins, Moon or Moons, Ox-eye, Ruddes, Sunflower, Tansy.

As to the name Boodle a writer remarks:

> "The brake and the cockle be noisome too much,
> Yet like unto Boodle no weed there is such".

In regard to Gool or Goold, the term gool-riding was applied to the custom of riding through a parish to observe the growth of this plant, and to fine the negligent farmer who allowed it to increase on his land.

"As yellow as a gowland" is a proverb in Yorkshire.

Essential Specific Characters:—

159. *Chrysanthemum segetum*, L.—Stem erect, branched, glaucous, glabrous, upper leaves clasping, dentate, oblong, lobed, flowerheads yellow, phyllaries broad, with margin membranous.

Corn-flower or Bluebottle (Centaurea Cyanus, L.)

Though the more native Knapweed is only known from its present-day distribution in Europe, West Siberia, N.W. India, being an introduction in N. America, the Corn-flower is found in Neolithic beds at Edinburgh with other weeds of cultivation and flax. In Great Britain it is absent from Monmouth, Brecon, Radnor, Carmarthen,

Montgomery, Merioneth, Pembroke, N. Lincs, Cumberland, Isle of Man, Dumfries, Wigtown, Selkirk, Stirling, Mid and N. Perth, Cantire, S. Ebudes, N. Ebudes, Orkneys, but elsewhere it is general from Moray to the English Channel, and in the Highlands grows at a height of 1000 ft. By Watson it was considered a colonist.

Bluebottle is a cornfield plant, always coming up spontaneously in cultivated fields, or on waste ground, or in gardens, being associated with such plants as Stork's Bill, Common Melilot, Chicory, Viper's Bugloss, Yellow Toadflax, and other casuals.

Apart from its lovely flowers, Bluebottle has a characteristic habit. It is an erect plant, with the stem repeatedly dividing, and thus inversely triangular in outline. The stems are slightly angular, and densely cottony and hollow. The stem-leaves are alternate, stalkless, linear, with several nerves, acute, the radical leaves broader, and more blunt, often deeply divided, covered like the stem with a web of cotton.

The flowers are of a deep blue, on simple flower-stalks with dark threadlike anthers. The whorl of leaflike organs has notched leaves fringed with hairs, narrowly elliptical, and overlapping semi-transparent margins which run back. The hair is shorter than the fruit. There are scales in the receptacle.

The stem is 1–3 ft. high. The Corn-flower is in flower in June and up till August or September. It may be annual or biennial and reproduced by seed. It is worth cultivating, and is indeed a garden plant.

The plant is downy, but the involucres forming the flowerhead are bordered with turned-back teeth, which serve as a *chevaux de frise* to exclude ants. There are no prickles on the stem and leaves. The ray florets are neuter. The anther-stalks of the stamens are able to contract, so that the anther-cylinder is drawn down 2–3 mm. and slowly up to 4–6 mm., returning to their original position in ten minutes. They lose the power of contraction when the stigmas are ripe. The ray florets are large and funnel-shaped, and radiate outwards, attracting insects, and make the width of the flower head 20–50 mm. On the opening of the flower the pollen lies between the pistil and the hood which the anther-heads form. The stamens are sensitive and contract when touched, so that they expose the pollen. The hairs are the sensitive portions. The stigmas later open and curl over, and the flower is bound to be pollinated.

Honey can easily be reached, for the flower is wider for 3 mm. above the narrow tubular part, up to the point where it is divided into narrow linear segments, and pollination is largely simultaneous.

There are few florets in the disk or centre, and the anther-cylinders project at distant points. On an insect touching them the anther-stalks contract, and the cylinder is depressed. A mass of pollen quickly emerges from the upper opening of the cylinder, and the style is projected 3-4 mm. beyond it. The Honey Bee, *Bombus silvarum*, *Megachile*, *Psammophila*, Diptera, *Empis livida*, *Eristalis arbustorum*, *Rhingia rostrata*, and the Silver Y Moth (*Plusia gamma*) visit it.

The pappus, which is shorter than the fruits, assists in dispersing the smooth achenes by the wind.

Corn-flower is a sand plant growing in sand soil, or sandy, gravelly beds, often on the chalk, where there is gravel and sand at the top.

The leaves are liable to attack by a clustercup fungus, *Puccinia suaveolens*.

A moth, *Depressaria liturella*, and a fly, *Trypeta colon*, are found on it.

CORN-FLOWERS (*Centaurea Cyanus*, L.)

Centaurea, Pliny, is from Centaur, in heathen mythology half-man, half-horse. Centaury helped to cure Chiron when one of Hercules's arrows entered his foot. The name was also Chironion. Chiron was versed in the knowledge of herbs. *Cyanus*, Pliny, is from the Greek *cyanos*, blue.

Bluebottle is called Bachelor's Buttons, Witch Bells, Blaver, Blaverole, Blawort, Blue Blawort, Blewball, Blewblow, Blue-blaw, Blue-caps, Blue-bottle, Blue-bonnets, Blue Poppy, Break-your-Spectacles, Brushes, Corn Centaury, Corn-binks, Corn-bottle, Corn-flower, Cuckoo-hood, Hawdod, Hurt-sickle, Knobweed, Knotweed, Loggerheads, Thumble, Witches' Thimble.

> "Gay lark-heels soon, and Bottles will o'er run
> The fields with numerous crops tho' never sown."

As to the name Hurt-sickle, Turner says: "Some herbaries call it

baptisecula or blaptisecula because it hurteth sicles, which were ones called of old writers secula". The name Loggerheads is given because of the resemblance of its knobbed involucres to a weapon so called, consisting of a ball of iron at the end of a stick.

In Goethe's *Faust*, Margaret selects it as the floral indication by which she may learn the truth respecting Faust:

> "And that scarlet poppies around like a bower,
> The maiden found her mystic flower.
> 'Now gentle flower, I pray thee tell
> If my love loves, and loves me well;
> So may the fall of the morning dew
> Keep the sun from fading thy tender blue.
> Now I remember the leaves for my lot—
> He loves me not—he loves me—he loves me not.
> He loves me! yes, the last leaf—yes;
> I'll pluck thee not for that last sweet guess.
> He loves me!' 'Yes,' a dear voice sighed,
> And her lover stands by Margaret's side."

Bluebottle has been known as a garden flower for a long time, and varies in colour under cultivation. Ink has been made from the juice of the flowers, which stain linen blue.

Essential Specific Characters:—

175. *Centaurea Cyanus*, L.—Stem tall, branched, downy, leaves lanceolate, lower dentate or pinnatifid, flowerheads blue, disk purple, phyllaries decurrent, fringed, pectinate, anthers dark, involucre greenish-yellow.

Corn Sow-Thistle (Sonchus arvensis, L.)

Though usually connected with corn-growing, and so modern, this plant can claim some antiquity, having been found in Lacustrine deposits of Neolithic age. To-day it is found in Arctic Europe, North Africa, Temperate Asia, and India. In North America it is an introduction. In Great Britain it is found in every part of the country except N. Ebudes, as far north as the Shetlands. In Northumberland it is found at 1000 ft. It occurs in Ireland and the Channel Islands.

Common Sow-Thistle is a frequent cornfield plant, growing in numbers amid the ripening grain, and as it is one of those plants that are especially sensitive to light it turns its head to the sun, being heliotropic in this respect, as are the leaves and flowers of many other plants. This plant grows also on waste ground, and is essentially a follower of man and the plough.

The root is milky, spreading, and difficult to dislodge. The stem

is tall, simple, with radical leaves divided, with lobes enlarged upwards the lobes turned back, heart-shaped at the base, the leaves being alternate, clasping, smooth, pale below, dark-green above. The edges are lined with prickles. Some leaves are linear-acute higher up.

The flowers are yellow, borne on flower-stalks which are highly glandular, with black or brown hairs, and in a sort of umbel also like the leaf-like organs, which are unequal, keeled, very hairy, and glandular. The fruit is rough and transversely downy, not beaked. The pappus is stalkless, the hairs numerous.

The plant is $1\frac{1}{2}$ ft. high. Flowers are to be seen in July and August. The plant is perennial.

Photo. B. Hanl.

Corn Sow-Thistle (*Sonchus arvensis*, L.)

The flowers are as conspicuous as those of the Dandelion, and built upon much the same plan, attracting many insects, though hidden, or rather appearing just above the corn before it is ripe. The corolla is yellow, like that of most hermaphrodite florets in Compositæ. Each floret is tubular, with a white tube, which is narrow and beset with hairs above, to preserve the honey at the base of the stigmas, and the limb is yellow, as long as the tube, with edges rolled from the back inwards.

The stamens unite to form a cylinder, the two threadlike stigmas are bent inwards, and the style is hairy above, with slender lobes. Thus cross-pollination is rendered possible by the sweeping of the pollen out of the tube away from the stigma. The plant is visited by the Honey Bee, *Bombus*, *Panurgus*, *Halictus*, *Nomada*, *Megachile*, *Osmia*, Syrphidæ, *Eristalis*, *Cheilosia*, Conopidæ, *Sicus*, Lepidoptera, *Hesperia*, Coleoptera, Curculionidæ, *Spermophagus cardui*, Malacodermata, *Malachius*.

The many rows of silky pappus or hair assist in the dispersal of the achenes by the wind.

Corn Sow-Thistle is a sand plant, fond of sand soil or sandy loam, growing on the sandy portions of the Triassic and Liassic formations, &c.

The fungi *Puccinia sonchi*, *Coleosporium sonchi*, *Æcidium sonchi*, *Bremia lactucæ* all attack it.

The three moths, *Hecatera serena*, July Chi (*Polia chi*), Shark (*Cucullia umbratica*), and two flies, *Eusina sonchi*, *Tephritis tessellata*, are found on it.

The name *Sonchus*, of Theophrastus, is from the Greek name of the plant, *sonchos*, and said to be from the Greek *söos*, safe, and *echein*, to have, because it yields a health-giving juice. The second Latin name proclaims its preference for cultivated ground.

The names Dindle, Gutweed, Hogweed, Rosemary, Swine Thistle, Tree Sow Thistle are also given to Corn Sow-Thistle. Gutweed is applied to it because of its long creeping roots, which wind about.

In Russia they say the plant belongs to the Devil. Like the Evil Spirit in northern mythology it is spoken of sometimes as sowing weeds amongst the good seed, from whence has originated, it is said, the popular saying, "Sowing one's wild oats". It was believed to reveal hidden treasure when appealed to, possibly because of its golden flowers and heliotropic property. Rabbits and hares are especially fond of it, hence their occurrence in cornfields. Goats, sheep, and pigs eat it.

The young tender leaves are eaten as greens and as spinach.

Essential Specific Characters:—

184. *Sonchus arvensis*, L.—Stem tall, simple, leaves runcinate, toothed, upper entire, long, flowerheads large, yellow, in corymb, peduncles and involucres glandular, hairy.

Venus's Looking Glass (Legousia hybrida, Delarbre)

This local elusive species is found south of Holland, and in N. Africa in the North Temperate Zone. In Great Britain it is found in the Peninsula province, except in N. Devon, and in the Channel province; in the Thames, Anglia, and Severn provinces, except in Monmouth; in the Trent province, except in N. Lincs and Notts; and in the Humber province, in Durham, and Haddington. Watson regards it as scarcely a true colonist. It occurs in the north from Durham to Cornwall and Kent, chiefly in the eastern counties. It is an introduction in Scotland.

Venus's Looking Glass is more common in the south and east, because it is best suited by a chalky or calcareous soil, and this type of rock soil is confined to those districts. It grows amid the corn in parts of the fields where the stalks are not close, and hides at the foot of the corn like Lamb's Lettuce, with which at a cursory glance it might be confused.

It is a weak straggling weed, with a simple or branched stem, branched at the base, and erect. The leaves are oblong, with rounded teeth, the radical leaves stalked, egg-shaped or spoon-shaped, and the stem-leaves are blunt.

The flowers are in the axils, nearly stalkless, lilac, few, terminal, or single. The calyx exceeds the blue corolla, which is open, and the segments are long. The corolla is wheel-shaped. The capsule is triangular and long.

Venus's Looking Glass is about 1 ft. in height. Flowers are found from May till August. It is an annual plant, and increased by seeds.

Photo. A. R. Horwood

VENUS'S LOOKING GLASS (*Legousia hybrida*, Delarbre)

The whole flower is like *Campanula*, but the ovary is very long, and narrower. The corolla-limb is peculiar, the corolla regular, wheel-shaped, with the anthers, which mature first, free, the corolla-lobes deep. The pollen is accumulated on the hairs of the style. Insects alight on them and carry away the pollen. At night the corolla folds up lengthwise, and the five lobes become dusted with pollen. When ripe the three stigmas lengthen, and insects deposit pollen on them from another flower, whilst at night the pollen on the corolla touches the stigmas.

In *Specularia perfoliata* the flowers are cleistogamic. In this species the flower grows hidden amongst the corn, and insects cannot find it, so that self-pollination is inevitable.

The capsule is long and narrow and ribbed, and the seeds may be partly dispersed like those of the censer fruits by aid of the wind.

This plant is largely a lime plant growing on a lime soil, but will also subsist on a dry sand soil. The Oolites are a specially favourite formation of this plant.

Legousia is from Legous, in honour of an early botanist, and the second Latin name refers to the twofold colour of the corolla, blue inside, lilac outside.

This plant is called Venus's or Our Lady's Looking Glass and Corn Violet.

Essential Specific Characters:—

189. *Legousia hybrida*, Delarbre.—Stem wiry, terete, sub-simple, glabrous, angular, leaves sinuate, radical leaves stalked, stem-leaves sessile, flowers few, solitary, lilac-blue, sessile, in the axils, corolla rotate, shorter than the rough calyx, capsule triangular.

Scarlet Pimpernel (Anagallis arvensis, L.)

This pretty trailing cornfield weed is apparently quite a modern plant in this country, not having been found in ancient deposits. At the present day it is found in Europe and N. Africa, Siberia, West Asia, as far east as the Himalayas in the North Temperate Zone. It is an introduction in North America. The Scarlet Pimpernel is found in every part of Great Britain except Peebles, Selkirk, Ross, and the Shetland Islands. It is thus common from Ross and Banff southwards. Watson regards it as a colonist in Scotland.

The Scarlet Pimpernel is a typical cornfield plant, growing in open, loamy, clayey fields, rarely lingering long in fields that have run to fallow. It is similarly found in all places that are connected with farming operations, and in the garden, being unable to compete with grass in a meadow, and on the sea coast it is found upon shingle and sand.

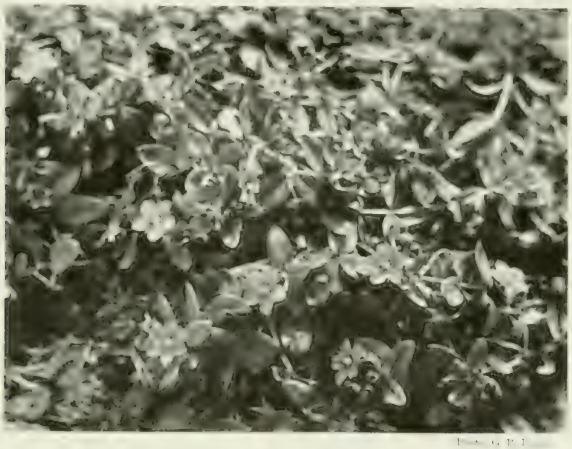
This plant has the habit of Wood Loosestrife, which has in fact been called Yellow Pimpernel. The stem is erect or lying on the ground, branched, square, smooth and twisted, with water furrows between the leaves. The leaves are opposite, stalkless, three-nerved, egg-shaped, narrowly elliptical, or heart-shaped, smooth, and with brown dots below.

The flowers are usually scarlet and solitary. They are borne in the axils on long, slender, turned-back flower-stalks. The calyx has a membranous margin and is triangular. The petals are purplish at the

base, and the edges are notched and hairy. The corolla is wheel-shaped. The capsule, a pyxis, is shining, 5-nerved, opening transversely, and containing many brown, angular seeds.

Scarlet Pimpernel is usually about 6 in. in height. The flowers bloom between June and September. It is an annual, propagated by seeds.

The flower, which contains no honey, is homogamous (the stamens and pistil maturing simultaneously), so that the flower is usually self



SCARLET PIMPERNEL (*Anagallis arvensis*, L.)

pollinated, as it is only expanded from 9 a.m. till 3 p.m., and few insects visit it. If insects visit it, it is both self- and cross-pollinated. The petals unite in a fleshy ring at the base and then spread out vertically 10–12 mm. The stamens are projected above the style, which is between them, and is bent down, and an insect settling on the lower parts towards the anthers, first touches the stigma, the anthers being covered with pollen. The stigma may also be self-pollinated. When the flower closes the stigma is drawn back and touches the 3 inferior stamens, which cause it to be self-pollinated, unless insects have visited the flower beforehand, and have removed its pollen, and transferred it, or fresh pollen, to the stigma. The petals soon drop, and as they fall touch the stigma with pollen.

The Scarlet Pimpernel is visited by a Hymenopterous insect, *Halictus morio*.

The capsule is a many-seeded fruit, and splits up transversely by a circular fissure round the middle when ripe, and the seeds fall out around the parent plant.

The Scarlet Pimpernel is essentially a sand plant growing on sand soil, usually where it is brought into use by cultivation.

The Lepidoptera, *Papilio machaon* (the Swallow-tail Butterfly), *Zygæna purpuralis*, and Angle Shades, *Phlogophora meticulosa*, are the only ones that are found on the plant.

The name *Anagallis*, Dioscorides, is of doubtful origin. The second Latin name refers to its preference for arable land. Pimpernel is from the Latin *bipinnella*, applied in the sixteenth century to plants with bipinnate leaves.

There are many names for this plant, as Bird's Eye, Bird's-tongue, Shepherd's Clock, Female Pimpernel (the var. *cærulea*), John-go-to-bed-at-noon, Male Pimpernel, Merecrop, Orange Lily Pernel, Pimpernel, Poor Man's Weather-glass, Shepherd's Calendar, Shepherd's Delight, Shepherd's Glass, Shepherd's Sundial, Shepherd's Warning, Shepherd's Watch, Sunflower, Tom Pimpernowl, Waywort, Wincopipe, Wink-a-peep, Weather-glass.

The last name but one is given "from the habit the flower possesses of closing and winking in damp and opening or peeping again in fine weather, and the same reason answers for Shepherd's Clock, &c., and John-go-to-bed-at-noon".

> "Boys that mark them shut so soon,
> Call John that goes to bed at noon."—CLARE.

This common wild flower was said by the credulous to counteract the evil designs of malevolent beings. The Scarlet Pimpernel was once used as a cure for hydrophobia. The taste of the plant is acrid, and it has been reported to have killed birds feeding upon it. The name *Anagallis* has been derived from the Greek *anagelao*, laugh, because it was used for liver complaints and removed low spirits. One writer says the flower opens at eight minutes past seven and closes at three minutes past two.

ESSENTIAL SPECIFIC CHARACTERS:—

205. *Anagallis arvensis*, L.—Stem prostrate or ascending, leaves ovate, dotted beneath, sessile, flowers scarlet, axillary, solitary, petals crenate, filaments free.

Field Bugloss (Lycopsis arvensis, L.)

Conspicuous and common in the cornfields this plant is found to-day (and not in any early deposits) in Europe, W. Siberia, W. Asia, as far as N.W. India. It has been introduced into the United States. Field Bugloss is found in every part of Great Britain, except Radnor, Cardigan, Montgomery; and up to 1000 ft. in the Highlands.

Field Bugloss does not ever, in spite of its name, occur anywhere except upon cultivated land. It is a familiar weed in the cornfield, where it grows side by side with the Poppy, Charlock, Corn Marigold, Common Sow Thistle. It is also to be seen in the vicinity of waste places and kindred spots where cultivated weeds abound.

Field Bugloss (*Lycopsis arvensis*, L.)

The first Greek name is said to refer to a fancied resemblance between the flower of the plant and a wolf's eye. It is a tall, erect, slender, usually unbranched plant, with a stem nearly angular, and very hairy or prickly. The leaves are narrowly elliptical, alternate, stalkless, blunt, and hairy, the hairs rising from a small wart-like or tuberous base or tubercle, wavy, pale underneath, turned back and clasping the stem.

The flowers are deep blue, and more or less turned to one side, nearly stalkless, in turned-back drooping cymes. The sepals are narrow, deeply cut, do not fall, and are erect. The corolla is funnel-shaped with a crooked limb, with a closed mouth and white scales. The nutlets are black, wrinkled, and netted.

Field Bugloss is about 1–2 ft. high. The flowers bloom in May right on until August. This plant is an annual, propagated from seed, and quite worth placing in the garden.

The flowers are similar to those of *Anchusa*, and they have similar contrivances for secreting, holding, protecting, and indicating the honey. The corolla is tubular, the mouth closed by five white hairy

scales. The tube is curved and longer than the limb. The stamens are included, small, and placed at the junction of limb and tube, with small anthers. The style is as long as the stamens, the stigma lobed and blunt. The flowers are visited and pollinated chiefly by bees, and partly by Lepidoptera, &c., *Hesperia*. The nutlets are dispersed when ripe around the parent plant.

Field Bugloss is a sand plant and addicted to a sand soil.

A microfungus, *Puccinia dispersa*, attacks the leaves.

Lycopsis, Dioscorides, is from the Greek *lycos*, wolf, *ops*, *opsis*, face, because the flowers were supposed to resemble a wolf's face; and the second Latin name indicates its preference for arable land.

The only name is Bugloss.

The Field Bugloss was held to be a remedy for carbuncle or the plague.

Essential Specific Characters:—

214. *Lycopsis arvensis*, L.—Stem erect, branched above, hirsute, radical leaves obovate, stem-leaves linear-ovate, sinuous, hispid, flowers blue, in cymes, subsessile.

Corn Gromwell (Lithospermum arvense, L.)

Corn Gromwell is found in Europe, N. Africa, Siberia, W. Asia, as far as N.W. India, in the North Temperate Zone, and has been introduced into the United States. It is unknown in any early deposits. In Great Britain this plant does not grow in Glamorgan, Brecon, Radnor, Cardigan, in South Wales, Montgomery, Merioneth, the Isle of Man, Dumfries, Wigtown, Kirkcudbright, Peebles, Selkirk, S. Perth, the whole of West Highlands except Mid Ebudes, W. Ross, Sutherland, Caithness, Orkneys, Shetlands, but elsewhere from Ross to the south coast. It is native in Ireland.

Corn Gromwell is one of the plants which seldom, if ever, subsist anywhere else except in cultivated fields of one description or another, being found with other plants, such as Gold of Pleasure, Corn Cockle, Flax, &c., which are only found in cornfields or in waste places, when they may reasonably be supposed to have sprung from a like origin.

The first Latin name (from Greek) refers to the hard stony character of the nuts or fruit. Corn Gromwell is a slender-stemmed plant, erect, branched at the base, with narrowly elliptical, linear, tapering, hairy leaves, the radical leaves stalked, the stem-leaves stalkless, clasping, hairy, and the hairs are bulbous both sides.

The flowers are small, creamy-white, growing in short cymes,

No. 1. Corn Gromwell
(*Lithospermum arvense*, L.)

a, Flower, enlarged. *b*, Upper part of plant, showing upper stem-leaves and flowers, also fruit, with persistent calyx.

No. 2. Small Snapdragon
(*Antirrhinum Orontium*, L.)

a, Flower, enlarged, showing personate corolla. *b*, Plant, showing axillary flowers, long calyx-lobes, and fruits.

No. 3. Ivy-leaved Speedwell
(*Veronica hederæfolia*, L.)

a, Capsules, with calyx-lobes. *b*, Plant, showing stem-leaves, flowers in various stages, and fruit.

No. 4. Hemp Nettle
(*Galeopsis Tetrahit*, L.)

Inflorescence, with flowers in axillary whorls and cutlets.

No. 5. Wild Oat
(*Avena fatua*, L.)

a, Floret, with long-stalked anthers and feathery stigmas, inner glumes, and long awn. *b*, Panicle, with spikelets.

No. 6. Darnel
(*Lolium temulentum*, L.)

a, Spikelet, enlarged. *b*, Floret, showing anthers overtopping glumes, and awn. *c*, Spike, with alternate, awned spikelets.

terminal, with long leaf-like bracts. The calyx is equal to, or slightly shorter than, the corolla, lengthening in fruit, and spreading, containing 3 or 4 pale-brown, polished nutlets, which are covered with dots, and wrinkled.

The plant is normally quite 2 ft. in height. It flowers in May and June. It is annual, propagated by seeds.

The honey, which is scanty, is protected by hairs and secreted at the base of the tube near the smooth ovary, the tube being 4–5 mm. long, 1 mm. wide in the lowest part. The stamens are inserted on the corolla below the middle. The anthers open inwards longitudinally, and pollen is set free before the flower opens, though in some the stigma is ripe first. The short style (2 mm.) ends in two small rounded lobes, with ring-like lobes beneath, which are covered with warts. They are level with the anthers, and take up the space to the base of the flowers. The stamens curve outwards at the top and guide the insect's proboscis to the flower centre, so that it passes between the anthers and the stigma. If in a young flower an insect thrusts its proboscis which bears pollen from another flower into it, it cross-pollinates it, and fresh pollen also adheres to the proboscis. As pollen is withdrawn it is finally self-pollinated, a mode which is necessary on account of the few insect visits and small flowers, growing amongst corn. It is visited by the butterflies, Large White (*Pieris brassicæ*), Small White (*P. rapæ*), and by bees and Syrphidæ.

CORN GROMWELL (*Lithospermum arvense*, L.)

The smooth nutlets when ripe fall around the parent plant, or are dispersed directly by birds, game, &c.

Gromwell is a sand plant, growing on rock soils which afford a sand soil.

A fungus, *Peronospora myosotidis*, attacks the leaves. Two moths, *Anesychia pusiella* and *A. decemguttella*, and a fly, *Chromatomyia albipes*, are the chief insect pests.

Lithospermum, Dioscorides, is from the Greek *lithos*, stone, and *sperma*, seed, alluding to the hard stone-like seeds; and *arvense* indicates its occurrence on arable land.

Gromwell is possibly from *granum milii*. It is called Bastard Alkanet, Lichwale, Painting Root, Pearl-plant, Salfern. Corn Gromwell is called Painting Root because girls in the north were said to paint their faces with the juice of the root on festival days.

The stony seeds were, by the "Doctrine of Signatures", used in cases of "Stone", hence lich wale, lythe wale, and stone switch. A red dye has been prepared from it for paper and linen. In Sweden the women stain their faces with it as rouge. The dye is readily applied to oily substances, hence the name Bastard Alkanet.

Essential Specific Characters:—

218. *Lithospermum arvense*, L.—Stem erect, branched, leaves linear-lanceolate, hispid, flowers creamy-white, nutlets tuberculate.

Small Snapdragon (Antirrhinum Orontium, L.)

This is a southern type of plant, and does not occur in early deposits. It is found in the N. Temperate Zone, South of Denmark, North Africa, N. and W. Asia, N.W. India, and is introduced in N. America. In Great Britain it is found in the Peninsula, Channel, Thames, and Anglia provinces, except in Hunts and Northants; in the Severn province, except in Monmouth and Warwick. In S. Wales it is found in Glamorgan, Carmarthen, Pembroke; in N. Wales in Merioneth, Carnarvon, Denbigh, Anglesey; and in N.E. York and Cumberland. It is very rare in Ireland, and occurs in the Channel Islands. It was regarded by Watson entirely as a colonist.

The Small Snapdragon is found chiefly on chalky and cretaceous soils in the south and centre of England, especially in cornfields, but sometimes on railway banks; and in cultivated ground it is accompanied by such plants as Mousetail, Larkspur, Candytuft, Flax, Cornflower, Venus's Looking Glass, and similar southern types of plants.

The Small Snapdragon is a simple or branched, erect, hairy-stemmed, low plant, with the leaves linear, narrowly elliptical, without stalks, opposite below, the upper ones alternate, turned back, and entire.

The flowers are reddish, solitary, stalkless, in the axils or in a leafy raceme, with a calyx with 5 linear segments that do not fall, equalling

or longer than the corolla, the upper ones being longest. The corolla is striped with veins, with a yellow palate or throat, somewhat hairy. The capsule is stalked, with angular, black seeds.

The plant may be 1 ft. high. July to September is the flowering season. It is annual, and increased from seeds.

The flower has much the same structure as in the Toadflax, being closed and accessible only to humble bees, and the stamens and pistil are arranged in such a way that other insects could not bring about pollination. Both anthers and stigma ripen together. The upper and lower lip (which opens by a spring) close the tube of the corolla. The stamens are under the upper lip, in pairs, the two longer stamens projecting.

SMALL SNAPDRAGON (*Antirrhinum Orontium*, L.)

The flowers are larger in *A. majus* and the entrance is more tightly closed, whilst the nectaries and honey receptacles are differently placed. The honey is secreted by the green, smooth, fleshy base of the ovary, of which the upper part is pale and covered with fine hairs, remaining fixed to the downy nectary and the base of the anterior stamens. The short, wide spur allows the insect to reach the honey with its proboscis from below. Above and in front there is a thick fringe of stiff, knobbed hairs on the angles of the anterior stamens. Pollen is deposited on the back of the bee.

The capsule opens by the bursting of 1 pore above and 2 below and the seeds fall around the parent plant.

The Small Snapdragon is a lime-loving plant, and requires a lime or chalk soil, being found mainly on chalk, limestone, or oolite.

A moth, *Mamestra persicariæ*, is found upon it.

Antirrhinum, Theophrastus, is from the Greek *anti*, and *rhin*, nose,

from the snout-shaped flower; and *Orontium*, Dodonæus, is an old mediæval generic name for Snapdragon. It is called Calf-snout.

This species is distinguished by the absence of a spur, in being annual, and having long pointed leaves in the calyx, whilst they are short and obtuse in *A. majus*.

Essential Specific Characters:—

230. *Antirrhinum Orontium*, L.—Stem short, leaves narrow, linear lanceolate, flowers purple, in a loose spike, sepals exceeding the corolla, linear.

Ivy-leaved Speedwell (Veronica hederæfolia, L.)

Familiar to us from its almost universal occurrence on cultivated ground this plant is found in the N. Temperate Zone in Europe, N. Africa, W. Asia, and the Himalayas. It is unknown in seed-bearing deposits. In Great Britain it is absent in Brecon, Radnor, Cardigan, S. Lincs, Isle of Man, Wigtown, Peebles, Selkirk, Stirling, Main Argyll, Mull, N. Ebudes, W. Ross, Caithness, and the Hebrides, as far as the Shetlands. It is found in Ireland and the Channel Islands.

Ivy-leaved Speedwell is a typical cornfield weed, which comes up year after year in great abundance in all cultivated fields, as well as in gardens, on waste ground, and by the roadside here and there. It is associated with Corn Buttercup, Poppies, Charlock, Heart's Ease, Spurrey, Fool's Parsley, and many other cornfield weeds.

The stem is trailing, branched, round, soft, covered with soft hair, stringy internally. As the second Latin and English names imply the leaves are ivy-shaped, i.e. 3–5 lobed, with wide angles. The leaf-stalks equal the leaves, and the leaves are alternate, heart-shaped at the base, fleshy, hairy.

The flowers are pale blue, in the axils, borne on 1-flowered flower-stalks, which in fruit are turned back. The sepals (4) are heart-shaped, acute, hairy on the margins. The corolla is bell-shaped, with oval petals, the lower of which are less than the calyx, and hairy within. The capsule consists of 2 swollen heart-shaped lobes, containing 2 seeds in each.

As a trailer the plant is not more than 3 in. high. It flowers in March up to June. The plant is annual, reproduced by seeds and division of the root.

The flowers are small and solitary, appearing in succession, the male and female organs ripening at once. They are less conspicuous than others in the same genus, being pale blue. Few insects visit

them, as with many other cornfield weeds. They give good seed, this being the commonest species of *Veronica*, so that the self-pollination which occurs when the flower expands must be effective. The anthers open before the flowers open, and their surface, covered with pollen, touches the stigma. The honey is secreted by a yellow, fleshy disk below the ovary at the base of the tube, and hairs protect it above. If insects visit it they are not more liable to cross- than to self-pollinate the flowers.

The Hymenoptera, *Andrena parvula*, *Halictus nitidiusculus*, *H. leucopus*, *H. albipes*, visit it in the spring on warm sunny days.

The seeds are contained in a capsule which breaks up into several parts, and the seeds are dispersed around the parent plant.

Ivy-leaved Speedwell is especially a sand plant, and nearly always found on sand soil or gravel.

Peronospora grisea and *Sorosphæra veronicæ* attack the leaves.

Photo, Dr. Somerville Hast

IVY-LEAVED SPEEDWELL (*Veronica hederæfolia*, L.)

Veronica, Fuchs, is from the Latin *vera*, true, and the Greek *eikon*, picture; and Lonicerus says it was called after some king of France, but it was probably named from Veronica of religious legend. The second Latin name, meaning "ivy-leaved", refers to the shape of the leaves.

This plant is called Bird's Eye, Botherum, Corn Speedwell, Dotherum, Hen-bit, Ivy Chickweed, Morgeline, Mother of Wheat, Winter-weed.

The petals were said to display in their markings a representation of the kerchief of St. Veronica, imprinted with the features of Christ. A legend runs that when Our Lord was on His way to Calvary bearing His Cross He passed by the door of Veronica, who, beholding the

drops of agony on His brow, wiped His face with a kerchief or napkin. The sacred features remained impressed on the kerchief.

Essential Specific Characters:—

234. *Veronica hederæfolia*, L.—Stem prostrate, leaves cordate, 5–7 lobed, petiolate, flowers pale blue, axillary, single, sepals ciliate, seeds concave.

Hemp Nettle (Galeopsis Tetrahit, L.)

This plant is found in Late Glacial beds at Twickenham, Neolithic and Roman beds deposits at Silchester. At Twickenham it was associated with Reindeer, Bison, and *Bos longifrons*, but not extinct animals, suggesting a transition period between Palæolithic and Neolithic. It is found to-day in the Arctic and Temperate Zones in Arctic Europe, N. Asia, W. Asia, to N.W. India, and is introduced into N. America. It is found in all parts of Great Britain, up to 1300 ft. in Northumberland. Watson regarded it as native or a colonist.

Hemp Nettle is found by the roadside, and in hedgerows, generally in the shade, and is frequent on the borders of cornfields, where perhaps it is most at home. But it is also to be found along other hedgerows in fields. It occurs again in waste places, suggesting it is largely a weed of cultivation.

Tall-stemmed and erect, the plant is well distinguished if only by its long, dense bristles. The stem joints are thickened above,[1] the leaves are hairy, egg-shaped, acute, notched, shortly stalked, with opposite branches.

The flowers are in dense whorls and white or purple or yellow. The calyx-teeth are long and come to a point, or are awl-shaped. The tube of the corolla is slightly expanded. The nutlets are large, green, and veined.

Hemp Nettle is 2 ft. high. The flowers open in July and August. It is an annual plant, propagated by seeds.

The tube is from 11–17 mm. long. The upper part for 4–6 mm. is expanded so that long-lipped bees can reach the honey. When fully developed the pistil lengthens. The honey is contained in the swollen base of the ovary, and lies in the smooth part of the tube which obliquely ascends. The corolla is divided into an upper lip which is arched over, covering the anthers, and a lower lip, trifid, for alighting, which has honey-guides or yellow spots with a network of red lines. There are two convex pouches in the sides of the lower lip which help a bee to insert its head. The anthers like boxes with a closed lid

[1] These act as pulvini and are connected with sleep movements.

open before the flower opens, with their pollen-covered surface downward. The style, which is bilobed, lies behind and above the anthers at first, the upper lobe being warty, the longer bent up. The bee in a younger flower first touches the anthers with its back, and then the papillose or warty stigma. Usually the bee's back touching the stigma lies between spots dusted with pollen in the same flower. The end of the style curves down, and the lower division projects between the anthers, and if the pollen is not removed it is then self-pollinated.

HEMP NETTLE (*Galeopsis Tetrahit*, L.)

Hemp Nettle is visited by the Hymenoptera *Bombus*, *Andrena*, *Melanostoma*.

The nutlets, which are slightly netted, when ripe fall around the parent plant.

Hemp Nettle is a clay plant growing on clay soil, or a sand plant growing on sand soil.

Several beetles, *Meligethes viduatus*, *M. ovatus*, *Chrysomela menthastri*, *C. fastuosa*, a moth, *Lygris alchemillata*, a Hemipterous insect, *Eysarcoris melanocephalus*, and a fly, *Chromatomyia albiceps*, are found on it.

Galeopsis, Dioscorides, is from the Greek *gale*, a weasel, and *opsis*, appearance, because the top of the flower is like a weasel's snout. *Tetrahit*, Dillenius, is from the Greek word for four, because of the four-angled stem.

The plant is called Bee-nettle, Blind Nettle, Dai-nettle, Day-nettle, Dea-Nettle, De-Nettles, Deye-Nettle, Dog Nettle, Donnine-thell, Female Hems, Glidewort, Bastard Hemp, Hemp-Nettle, Holyrope, Nettle Hemp, Stinging Nettle, Sting Nettle.

The names Day-nettle, Deye-Nettle are derived from the injurious effects of the plant, which stings severely, upon reapers.

Essential Specific Characters:—

257. *Galeopsis Tetrahit*, L.—Stem erect, hirsute, branched, swollen at the joints, leaves ovate, serrate, hispid, flowers white, or rose, in dense whorls, with long subulate calyx-teeth, corolla-tube as long as the calyx.

Wild Oat (Avena fatua, L.)

The Wild Oat is confined to the North Temperate Zone of Europe, N. Africa, Siberia, and N.W. India. It is not known in any early plant beds. In Great Britain the Wild Oat is found in all English counties, except N. Wilts, W. Kent, Monmouth, S. Lincs, Mid Lancs, Westmorland, Cumberland; in Wales, in Carmarthen, Cardigan, Carnarvon, Denbigh, Flint, Anglesey; in Scotland (probably introduced), in Ayr, Lanark, Roxburgh, Berwick, Haddington, Edinburgh, Fife, Kincardine, S. Aberdeen, Banff, Elgin, Easterness, Orkneys, and as far north as the Shetlands. It is a native of Ireland and the Channel Islands.

Regarded by Watson as a colonist, the Wild Oat is a plant only of the cultivated districts in this country, and is but a wanderer in Scotland. It is found on arable land in cornfields, as well as in all those quarters where corn is liable to be stacked or strewn near buildings, and on waste ground.

The Wild Oat is tall, erect, graceful, with glossy stout stems, and leaves alike both sides, flat, and slightly rough, the sheaths smooth, with a short torn membrane.

The flower-stalk is erect and spreading, with whorls of branches, roughish. The spikelets of 2–3 flowers are green, and drooping ultimately, with glumes 5-veined, the flowers shorter than the glumes, having a ring of hairs at the base. The awn is twice as long, and brown. The lower palea is divided into two halfway down.

The Wild Oat is 2–3 ft. high. The flowers are in bloom from June to August. It is annual, and propagated by seed.

The floral mechanism closely resembles that of other grass types, but there are 2–3 flowers in each spikelet. There are 3 stamens, short distant styles, and feathery stigmas. The flower is pollinated by the wind.

The fruit is provided with hairs at the top and attached to the glume, which has a twisted bent awn, and may be caught in the wool of sheep or blown away by the wind, and the awn being hygroscopic jerks the seed away.

WILD OAT (*Avena fatua*, L.

The Wild Oat is a sand plant and addicted to sand soil.

Barley leaf stripe, *Pyrenophora trichostoma*, attacks the Wild Oat.

Two beetles, *Lema Cyanella*, *L. melanopa*, and a fly, *Oscinus pusilla*, infest it.

Avena, Pliny, is the Latin for oat, and the second Latin name means insipid.

The plant is called Wild Aits, Drake, Flaver, Haver, Kentish Longtails, Wild Oat, Poor Oats, Sowlers, Uncorn.

The awn is hygroscopic, and has been used for artificial hygrometers and for fly-fishing.

The seeds lie dormant in the soil for a long time, retaining vitality a long time. The plant is the origin of the cultivated Oat, *A. sativa*.

Essential Specific Characters:—

335. *Avena fatua*, L.—Stem tall, leaves bright green, spikelets drooping at length, panicle spreading, hairs at base of the flower.

Darnel (Lolium temulentum, L.)

At the present day this pernicious plant is found in the North Temperate Zone in Europe, N. Africa, W. Siberia, and India, and has been introduced in N. America. Watson states that it has been found in sixty-four counties, but does not cite them, and says only: "It seems needless to enumerate counties and authorities in detail for a plant so uncertain of being refound in the same places (fields or even farms) from year to year". It is found as far north as the Shetlands, and in the Channel Islands and Ireland.

Regarded as a colonist by Watson, this plant is a very widespread grass, in most parts of the country growing on cultivated land, and coming up like other weeds spontaneously in cornfields as well as in waste places, being found sometimes with foreign plants, as well as in refuse thrown out at a mill in ballast, &c.

The stem is erect, with much the same habit as Rye, rough, with hairs turned back. There are no underground stems as in the latter. The membrane is quite short.

The panicle is a spike, with long-awned spikelets, of which there are six, less than the glume, or equal to it, the lower palea or inner glume being awned. The empty glume is longer, the upper glume divided into two halfway. The flowering glumes are swollen when in fruit.

Darnel is 18 in. in height. The flowers are in bloom in June up to August. It is annual, and the seeds are poisonous.

DARNEL (*Lolium temulentum*, L.)

The spikelets are disposed in a 2-ranked spike, and in 2 rows, with 3 stamens, distant feathery stigmas. The flowers are 3 to many, and anemophilous, pollinated by the wind.

The fruit is poisonous, light, and adhering to the palea, and is dispersed by the wind.

Darnel is a sand plant, and addicted to a sand soil.

Lolium, Pliny, is the Latin name for the plant, and the second Latin name, meaning "intoxicating", refers to its reputed effects upon those who eat it.

Darnel is called Bragge, Cheat, Cockle, Darnel, Dornel, Dragge, Drake, Drank, Dravick, Droke, Drunk, Drunken Plant, Eaver, Ivray, Jum, Lover's Steps, Ray, Riely, Rivery, Sturdy. The name Riely is thus explained by a writer of the early nineteenth century: "Well known in most counties in Ireland by the name *Rilch* and *Rivery*, for its intoxicating quality, whether taken in bread or drink. The Gaelic name is *Ruintclais*, called the loosening or purga-

tive grass, from *ruinnce*, grass, and *tealach*, loosening." A writer remarks as to the name Sturdy: "Near the sea-coast a sort of Poyson, I take it, called darnell, rises in the oats and other grain, very offensive to the brain, and cannot be cleaned out of the corn; ye country people call it *sturdy*, from the effects of making people light-headed".

The seeds cause giddiness, and there is a vertigo in sheep called "Sturdy" or "Staggers", hence probably the application to Darnel, and meat is said to be sturdied when it has much Darnel.

> "But Bragge amongst the corn aspires proudlie
> Onemphe eau lookinge above the reste,
> Advancing his brighte creste presumptuouslie
> Even to the stars, as though he were the beste,
> Who, being lighte, and fruitlesse of all grayne,
> For want of weight, showes all pride is vayne."

It is called Cheat, "from its resemblance to the grain amongst which it grows—a name applied, for the same reason, in some places to *Bromus secalinus*, L.".

"Darnel groweth amonge the corne," says Turner, "and the corne goeth out of kynde into darnel." Drunk refers to its intoxicating qualities.

Cokkil Meal, as it was called, was supposed to cure freckles. In Chaucer's day it was used for "festour and morsowe".

Essential Specific Characters:—

342. *Lolium temulentum*, L.—Stem erect, tall, leaves flat, long, ligule short, awn long, glumes longer than the spikelets.

Section IV

FLOWERS OF THE SEA-COAST

FLOWERS OF THE SEA-COAST

The maritime flora is composed of halophytes, which require a certain amount of salts, such as common salt, gypsum, magnesium chloride, in which to grow, making a saline soil. Such plants are little affected by altitude, and are cosmopolitan, e.g. *Salsola Kali*, *Glaux maritima*. *Salsola* also occurs in cornfields as a weed.

The flora is poor and open. The plants are xerophytes, for saline soil is physiologically dry; that is to say, the water, though abundant, is not available for absorption. They are unusually succulent, and have thick palisade-tissue to prevent transpiration being too free. They are at first dark-green, then yellowish, as a salt solution is not compatible with chlorophyll being made in the tissues. They have waxy coats, hairy coverings, thick, leathery, glossy leaves, assisting them to resist intense light, drought, &c. Doubtless the halophytic characteristics are counteracted by the xerophytic tendency, too much salt being deleterious even to halophytes. The rate of the absorption of water is slow owing to the saline matter in the soil. Transpiration is checked by the xerophytic character of the leaves and stem. The amount of water passing through the plant is thus limited, and the necessity for a reduction of surface and other adaptations to drought is thus clear. Halophytes may be situated on a rock soil, a sand soil, a clay soil, or they may be marsh plants as well.

Lithophilous Halophytes are Samphire, Sea Lavender, Thrift, &c.

Sea Kale, Saltwort, and other plants grow on sand soil, which is periodically saturated with sea water. Many have bluish-white stems, such as Rushy Wheat Grass, Sea Rocket, Yellow Horned Poppy, Sea Holly.

One may recognize zones which form radical associations from the sea to the shore. They have been called after the chief plants in each zone:—

1. Salicornietum, *Salicornia herbacea*.
2. Atriplicetum, with *Atriplex*, *Suæda maritima*.

3. Cakiletum, with *Cakile maritima*, *Salsola Kali*, *Arenaria peploides*, and *Crambe*, *Convolvulus Soldanella*.
4. Triticetum, with *Triticum junceum*, *Elymus arenarius*, *Ammophila arundinacea*, *Festuca arenaria*, *Plantago Coronopus*.

These are succeeded inland by a zone of Tamarisk, Hippophaë, Sand Sedge, Furze, &c., the first forming Tamarisk bushland in S. Europe.

Amongst clay-loving halophytes we have *Zostera marina*, which forms a zonal association called *Zosteretum*, followed by *Salicornia* above low-water mark.

Then comes Salt meadow land, with Sea Manna Grass, Sea Plantain, Sea Milkwort, Sea Lavender, Scurvy Grass.

The higher littoral meadows farther inland are made up of such plants as Sea Plantain, Sea Milkwort, Thrift, Centaury.

In salt swamps Common Sea Rush and Sea Club Rush are found. Amongst these maritime plants none is more beautiful than the gorgeous Yellow Horned Poppy, whose bluish-white foliage and rich yellow blooms followed by the long seed-vessel are a feature of every beach. Woad on the cliffs at Tewkesbury (much inland) is also found to grow luxuriantly at Wisbech, and having glaucous foliage it has a character in common with other truly maritime plants. Sea Campion with its cream-white flowers is of interest, because it is one of the few Caryophyllaceæ found along the coast.

Sea Kale, Sea Rocket, and Sea Holly all have foliage which adapts them to the coastal requirements. Thrift forms beautiful cushions on the rocks in Wales, on the coast as well as inland in the Highlands. Sea Lavender grows on rocks and on mud, forming a pleasing contrast, with its filmy flowerheads, to the more solid panicles of bloom of Thrift and Horned Poppy.

The pink flowers of Tamarisk along the sandhills give one an idea that the plant is an introduction upon our coast, as is usually agreed.

The delicate flowers of Sea Milkwort are very beautiful objects seen with a hand lens. The pink blooms of Centaury are not confined to the sea-coast, for it is also found inland. The Seaside Bindweed is perhaps prettier than our common form inland. Sea Plantain also grows on highland elevations inland. Saltwort is diminutive, interesting from its former use in making barilla. Sea Buckthorn, a feature of the east coast, forms dense bushes which are as spinose as, or more so than, a blackthorn hedge. Common Sea Rush, Sea Club Rush, Sand Sedge are all typical maritime grasslike plants, and Marram Grass, Rushy Wheat Grass, Lyme Grass help materially

VEGETATION OF THE SEA COAST

to keep the coasts intact from the ravages of the sea in many places. Hedgehog Grass, Squirrel-tail Grass, Seaside Manna Grass are typical seaside grasses which grow on sand or clay. Grass Wrack grows in the sea.

There are some 100 littoral plants, about 28 of which we have included. Three at least grow inland, Sea Campion, Sea Plantain, and Thrift. Some twenty more are natives of salt marshes, &c.

Yellow Horned Poppy (Glaucium flavum, Crantz)

No seeds of this plant have been detected in Glacial beds. It is a plant of the Warm Temperate Zone, common to Europe, N. Africa,

YELLOW HORNED POPPY (*Glaucium flavum*, Crantz)

and Western Asia. It has been introduced in the United States. It is absent from Merioneth and Flint in N. Wales, and occurs in N. Lincs only in the Trent province, and in the Humber province only in S.E. and N.E. Yorks. It is not found in the Isle of Man. In the E. Lowlands it only occurs in Berwick, Haddington, Linlithgow; in the E. Highlands only in Fife and Kincardine. It occurs also in Argyll, Dumbarton, Clyde Isles, and the Shetlands, and elsewhere on

the maritime coasts except in the counties named. It is found in Ireland and the Channel Isles.

The Yellow Horned Poppy takes the place on the sea-coast of the Red Poppies inland. It is a halophyte, addicted to salt, and occurs around the whole of the British coast except in the above counties. It grows on rocky coasts as well as in the flat eastern counties, forming beautiful clumps usually on sandy soil.

It is a very free-flowering plant, whose golden-yellow blooms form a pleasing contrast to the widespreading leaves of a bluish-white colour. The crisped wavy leaves, nearly clasping, conceal the robust, tall, branched stems, and give the plant a cabbage-like habit; the stem is smooth, the leaves stiffly hairy.

The long capsules or pods, 6–9 in. long, warted and rough, are curved, the seeds brown, with ridges enclosing squarish areas, and the lobes of the stigma (3) are spreading. The large, yellow, poppy-like flowers are 2–4 in. across and distinctly characterize the plant. They last two days.

The stem is 2–4 ft. high. Flowers last from June to October, and the plant is annual or biennial.

When pollinated by its own pollen the Yellow Horned Poppy bears seed. The flowers are conspicuous and suited to insect visits, the stigma being deeply lobed and serving for an alighting place.

The Yellow Horned Poppy is dispersed by its own agency. The pods are long and narrow, and the seeds are dispersed by the tension and splitting open of the pods when dry. The seeds are numerous.

The Yellow Horned Poppy is a halophyte, and requires a saline soil, such as that afforded by a maritime habitat.

Glaucium was the name given by Tournefort, from the Greek *glaucos*, alluding to the bluish-green colour of the leaves, and *flavum* alludes to the yellow flowers.

The English names are Horned Poppy, Sea Poppy, Spatmore, Squatmore. It is called Squatmore, or Bruisewort, because it was once employed in curing bruises. In the language of the western counties *squat* equals bruise, and a root is called a *more*.

This plant was regarded as a *herba mirabilis* in ancient times, being called *Ficus infernalis*. It was one of the plants used by witches in their potions. In the witches' song Ben Jonson says:

> "Yes, I have brought to help our vows,
> Horned poppy, cypress boughs,
> The fig tree wild that grows on tombs,
> And juice that from the larch tree comes".

No. 1. Yellow Horned Poppy
(*Glaucium flavum*, Crantz)

a, Pod, dehiscing, showing seeds within. *b*, Section of seed, showing embryo. *c*, Upper part of plant, showing upper stem-leaves, flower in bud, and expanded.

No. 2. Common Scurvy Grass
(*Cochlearia officinalis*, L.)

a, Capsule. *b*, Capsule, in section, with 4 seeds. *c*, Upper part of plant, showing stem-leaves and flowers in racemes, and fruits.

No. 3. Weld
(*Isatis tinctoria*, L.)

a, Flower, with perianth removed. *b*, Section of pod, with seed, showing incumbent radicle. *c*, Pod, exterior view. *d*, Raceme, with flowers and fruit and sagittate stem-leaves.

No. 4. Sea Kale
(*Crambe maritima*, L.)

a, Flower, with perianth removed. *b*, Anther, with tooth on filament. *c*, Pod. *d*, Raceme of flowers in various stages, with fruits and stem-leaves.

No. 5. Sea Rocket
(*Cakile maritima*, Scop.)

a, Two-jointed pod. *b*, Pod, showing upper joint exposed, with 2 seeds. *c*, Seed. *d*, Raceme of flowers, with upper stem-leaves.

No. 6. Sea Campion
(*Silene maritima*, With.)

a, Vertical section of flower. *b*, Pistil, showing 3 styles. *c*, Capsule, open above, and seeds being blown out. *d*, Plant, with leaves and flowers.

1. Yellow Horned Poppy (*Glaucium flavum*
3. Weed (*Isatis*
5. Sea Rocket (*Cakile maritima*, Scop.).

A yellow juice is afforded by the plant, which is poisonous and disagreeable, and has been said to cause madness. It is grown in gardens, and is a showy annual.

Essential Specific Characters:—

19. *Glaucium flavum*, Crantz.—Stem branched, smooth, with yellow juice, leaves glaucous, sinuate, rough, amplexicaul, radical leaves lyrate, flower yellow, large, capsule tuberculate, linear, 2-valved, stigma sessile.

Common Scurvy Grass (Cochlearia officinalis, L.)

The seeds of Common Scurvy Grass have never been discovered in Glacial beds up to the present. It is confined to the Arctic and sub-Arctic shores of Europe, N. Asia, and N. America, and the Alps of W. Europe. In the Peninsular province it is absent from S. Somerset, in the Channel provinces from Sussex, in N. Wales it does not occur in Merioneth, in the Mersey province not in Mid Lancs, and it is absent from Westmorland in the Lakes province. It is absent from Wigtown, Main Argyll, and Mid Ebudes; and in the N. Highlands occurs only along the coasts of Caithness, and amongst the Northern Isles it is absent from the Hebrides. But it is generally distributed around the other maritime coasts, as well as on some high mountains inland. It is found in Ireland and the Channel Islands.

The Scurvy Grass occurs around the coast on muddy seashores. It is a common associate of Sea Rocket, Sea Kale, Sea Bindweed, Sea Plantain, and many other strand plants. The form which occurs inland on alpine mountains is now separated as a distinct species (*C. græntandica*). This plant is perhaps more common on the west coast than the east, though where tidal rivers bring down mud and the coast is not so sandy it grows in every part of the country.

The plant is provided with many stems, usually ascending, and the radical leaves are kidney-shaped and stalked, those on the stem stalkless, clasping the stem, wavy, and angular. The whole plant is fleshy, and the first Latin name is given in allusion to the hollow, concave leaves, which are thus spoonlike. The stem is often stoloniferous, with trailing-stems.

The silicules or pods are nearly round, half as long as the flower-stalks. The flowers are white, and in loose corymbs. The style is very short. The seeds are large, the valves of the pod netted. The pods are 2-celled, with 4–6 seeds in each cell.

The height varies from 4–10 in. The plant is in flower from May to June or August, and is biennial.

The flowers are small, and are not conspicuous. The petals have but a short stalk. The stigma is simple, and cross-pollination is not so likely as self-pollination. The visitors are Diptera (Syrphidæ), *Eristalis tenax*, *Helophilus floreus*, *Melanostoma mellina*, Coleoptera, *Cetonia aurata*.

The fruit is dispersed by its own agency. The pods are globose, and contain many seeds, which are dispersed with the bursting of the capsule when dry and ripe, the seeds becoming turgid or swollen.

Common Scurvy Grass (*Cochlearia officinalis*, L.)

The seeds are flattened lengthwise, with a notch at the apex. The testa is brown and covered with wartlike projections, blunt, large, and crystalline in lines. In water these lengthen and become transparent, and there are then visible furrowed threadlike thickenings. They do not burst but become larger in water, and these mucilage cells help to fix the seed in the ground.

The plant is a halophyte or salt-loving plant, and requires a saline soil.

Scurvy Grass is not infested by fungi, but by such beetles as *Psylliodes marcida*, *Ceutorhynchus Cochleariæ*, *Phædon armoraciæ*, and Lepidoptera, the large White Butterfly, *Pieris brassicæ*, *Aplecta*, *Cidaria*, *Botys forficalis*.

Gesner gave the name *Cochlearia*, from Latin *cochlear*, spoon, in

allusion to the shape of the leaves, and *officinalis* means "used in medicine".

The English names are Bad Man's Oatmeal, Scrooby Grass, Scurvy Grass, Scurvy Cress, Scurvy Weed, Spoonwort, the latter alluding to the shape of the leaves.

The plant is endowed with antiscorbutic properties by the older writers, hence some of the names. It certainly contains much oil, and might be used more largely as a salad. It was used for ague in Gerard's day. It is a stimulant to the digestive organs.

Essential Specific Characters:—

29. *Cochlearia officinalis*, L.—Stems fleshy, numerous, rooting, radical leaves reniform, cordate, stem-leaves sessile, oblong, toothed, flowers small, white, capsule a subglobose pouch, style short.

Woad (Isatis tinctoria, L.)

In spite of its reputed use by the early Britons no trace of this plant has been found even in Neolithic or Roman deposits. It is found throughout Europe and in N. Asia. The ancient Britons are usually said to have used it to stain their bodies with a blue dye they prepared from it, and the Saxons imported it. Watson regards it as an alien and sporadic, except in the two localities where it is said to be wild.

Woad is regarded as wild on the cliffs at Tewkesbury on the banks of the Severn. It has become naturalized at Guildford, and is cultivated at Wisbech, where it is used to fix indigo. Its more or less restricted range in Britain does not give one an adequate idea of its former occurrence. If the Britons used it there should be some traces of it in Roman deposits, but, as we have seen, there are none.

Woad is a tall, erect plant, with a single main stem, dividing at the top into numerous branches devoid of leaves. The radical leaves are stalked, and oblong or tongue-shaped, those on the stem are arrow-shaped, with long, pointed ear-like lobes. The stem is stout and strong, and the plant is a vigorous grower, bluish-green and smooth.

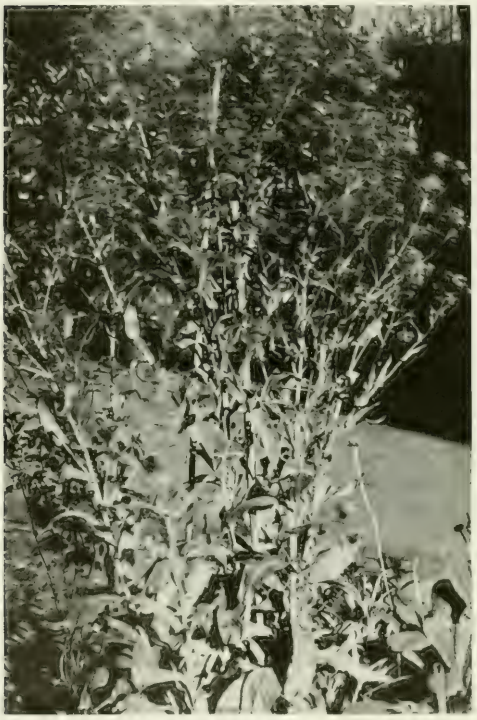
There are numerous, crowded yellow flowers in close panicles, with equal sepals and petals, the flower-stalks being slender and bent back in fruit. The pods are three times as long as broad, wedge-like, narrow below, broad in the middle or spoon-shaped, and blunt in front, with a narrow margin, and hang down when ripe, giving the plant a drooping appearance. When ripe they turn brown.

The stem grows to a height of 4 ft. when well developed. July

and August is the time to see it in flower, though it is occasionally in bloom in May. It is biennial.

The flowers are fairly large and conspicuous, and are numerous; but Woad is not largely visited by insects, and is as a rule self-pollinated.

The fruit is dispersed by its own mechanism. The pods do not open, but fall, partly aided by the wind, at some distance from the parent plant, being pendulous when ripe.



Woad (*Isatis tinctoria*, L.)

Woad is a sand-loving plant, and requires a sand soil, growing in districts where sandstone rocks contribute to form a sandy soil at the surface.

No fungus infests it, and *Aphis brassicæ* is the only insect that lives on it.

By Pliny, Woad was called *Glastum*, hence the name Glastonbury (Welsh *glas*, blue; Gaelic *glas*, grey, green). Woad is akin to *Vitrum*, the Latin name for it. Dioscorides gave the name *Isatis*, and *tinctoria* refers to the dyeing properties.

Woad is called Ash of Jerusalem, Dyer's Weed, Goud, Ode, Woad, Wad.

When the leaves are used as a dye they are covered with boiling water, steeped for an hour, and weighted down. The water is then poured off, and the leaves are treated with caustic potash and then with hydrochloric acid, yielding an indigo-blue. Woad mills are still worked at Wisbech, but the use of indigo has superseded it, and it is only used to fix indigo.

The plant was said to remove inequalities from the skin. When cultivated it is sown on freshly-ploughed land, well prepared, well pulverized, to produce large and good leaves, the plants being well thinned out, and the soil stirred between them.

Essential Specific Characters:—

37. *Isatis tinctoria*, L.—Stem erect, tall, radical leaves oblong, crenate, stalked, stem-leaves sessile, sagittate, flowers yellow, on slender pedicels, deflexed in fruit, in a panicle, pouch obovate, 1-seeded.

Sea Kale (Crambe maritima, L.)

There is, as usual in the case of most succulent plants, no instance of the occurrence of this plant or its seeds in Glacial, earlier, or later deposits. It is found generally from the coasts of Finland and the Bay of Biscay to the Black Sea. Two hundred years ago it was cultivated, and introduced to the Continent from Great Britain. It occurs in N. and W. Ireland. In Great Britain it is absent from W. Cornwall, S. Somersets, S. Essex, W. Norfolk, Carmarthen, Cardigan, Denbigh, Flint, S. Lincs, Durham, Northumberland, Cheviotland; and in Scotland it is found only in Kirkcudbright, Wigtown, Ayr, Berwick, Linlithgow, Fife, Clyde Islands, Cantire, Islay, Hebrides, but occurs on the remaining coasts. It is on the decrease in some parts. It is found in the Channel Islands.

The wild form of Sea Kale, much used as a salad, is found on sandy and shingly sea-coasts, and it is a halophyte or salt-lover. It is also a xerophyte, though requiring moist conditions, and may be called a strand plant. With it grow Sea Rocket, Sea Purslane, Sea Milkwort, Sea Holly, and other maritime species.

The first Latin name is the Greek for cabbage, with the habit of which it agrees. It has a thick fleshy root, a stout stem much branched, with wide, wavy, rounded leaves, toothed, and bluish-green. The stem and leaves are smooth, and the plant is compact, and as broad as long. It grows in clumps.

The flowers are white, large, and distinct, in corymbs containing several racemes, and much branched. The outer anther-stalks are forked and long. The pods are blunt or egg-shaped, on ascending flower-stalks, with two joints, one forming a flower-stalk, and there is no style.

Sea Kale grows to a height of 2 ft. The flowers are in bloom in June, July, and August. The plant is perennial, increased by division.

The diameter of the flowers is as much as 12 mm., and together

they form a conspicuous head. The petals form a tube by being enclosed by the sepals. The stalks of the petals, the stamens, and pistil are yellowish-green before they turn violet.

The anthers are yellow. Below the longer stamens are two round honey glands, which are large and green in colour. Two smaller ones lie at the base of the shorter stamens. The anthers in the longer stamens lie between knoblike extremities, perhaps helping to guide the insect's proboscis. The stigma is ripe first when the flower expands, and is overtopped by the longer stamens. The honey is attractive to the larvæ of a beetle (*Meligethes*), and they may help to cross-pollinate the flower.

Dr. Somerville Hastings

SEA KALE (*Crambe maritima*, L.)

The flowers are large and conspicuous, white, with the longer anther-stalks notched. The habitat being maritime the plant is not open to insect visits in great numbers, and self-pollination becomes a necessity.

The fruit of Sea Kale is dispersed by its own agency. The pods do not open to let the single seeds fall out, but drop off, and the seeds germinate around the parent plant. The pods are apparently stalked, the lower joint being without seeds and serving as a stalk to the upper, 1-celled and 1-seeded.

The plant is a halophyte or salt-lover growing in saline soil on the coast, and under cultivation in rich mould.

A beetle, *Psylliodes marcida*, is found on it.

The name *Crambe*, Greek for Kale, was given by Hippocrates, and *maritima* (Latin) refers to its habitat.

Sea Kale is called Sea Cabbage, Sea Cale, Sea Cole, Sea Colewort, Sea Kale.

It is cut by the people on the coast in the west of England, and used like asparagus, the young shoots being boiled. People watch

for the shoots and leaves pushing up from below ground. It was first employed in the garden about 200 years ago, and the practice was also afterwards copied on the Continent. In the garden it is sown in rich sandy soil, blanched and covered up to promote a quick and white growth (to improve the flavour) under pots, kale pots being now the vogue. The roots are taken up, and forced in a hot-bed or forcing-house, or covered with straw, &c., in the open like rhubarb, a frame being placed over the stools before the litter is put on. It is easily forced, and is productive the first season after sowing seed.

Essential Specific Characters:—

38. *Crambe maritima*, L.—Stem erect, tall, leaves sinuate, broad, glaucous, pinnatifid, dentate, flowers corymbose, white, pods ovoid, large, on slender suberect pedicels.

Sea Rocket (Cakile maritima, Scop.)

Though this plant is not found in any deposit in England it occurs in the Oak Zone abroad. It is confined to the North Temperate Zone, and found in Europe, N. Africa, and Ireland. It is absent from S. Lincs, Renfrew, W. Ross, but is found on every other British coast-line directly open to the sea up to Shetland. It is also found in Ireland and in the Channel Islands.

Like Sea Kale, Sea Rocket, which is associated with it, is fond of sand and shingle, and it forms fairly wide patches in company with Samphire, Thrift, Sea Lavender, Seaside Bindweed, Sea Plantain, Saltwort, maritime sedges and rushes, &c.

Like Sea Kale, again, the Sea Rocket is a bushy, compact, shrubby plant, with branched stems, the branches being arranged in a zigzag manner. It is also fleshy, and has bluish-green leaves, in this case more linear-pinnatifid, or with the lobes divided nearly to the base, or else quite entire. It is quite smooth, and has much the same appearance and habit as a broccoli. According to Lesage the leaves of other plants when grown inland may become fleshy if treated with salt.

The flowers are white, or purple, or lilac, in corymbs, and the flower-stalk is strong. The upper portion of the pod is spindle-shaped, the two joints are angular, the lower joint is smaller than the upper, the former being erect. The latter is pendent, and has two teeth at the base. The pods are square in section, and when ripe are ribbed.

The plant grows to a height of 9 in. or 1 ft. It is in flower from June to September. It is annual and reproduced by seed.

The anthers of the long stamens project slightly, and as pollen may

thus fall on the stigma self-pollination may occur. The flowers are scented. Two honey-glands, as in Sea Kale, lie at the base of the long and short stamens respectively. It is also visited by numerous insects. There is as much chance of cross-pollination in this plant as in the Sea Kale. The flowers, white and purple, are about the same size, but the stigma is stalkless, and there is little to prevent self-pollination as it is below the anthers.

The Sea Rocket is dispersed by its own special mechanism. The

Photo. Messrs. Flatters & Garnett

SEA ROCKET (*Cakile maritima*, Scop.)

pods do not open, but drop off, and the seeds germinate around the parent plant.

Sea Rocket is a halophyte or salt-lover, and requires a saline soil, growing generally on sandy coasts, and is thus a sand-loving plant.

The Sand Dart (*Agrotis ripæ*) is the only moth which feeds upon it in the caterpillar stage, and a beetle, *Psylliodes marcida*.

Linnæus adopted the name *Cakile* from Serapion. Cakile is said to be the Arabic name of the plant, but the significance (as applied to this plant) is unknown, while the Latin *maritima* refers to the plant's habitat.

Its English name Sea Rocket is the only one. It was reputed to be cathartic by the old botanical writers.

ESSENTIAL SPECIFIC CHARACTERS:—

39. *Cakile maritima*, Scop.—A bushy plant with glaucous, fleshy

leaves, rounded stem, glabrous, zigzag; flowers white or lilac, pouches with 2 seeds ensiform above.

Sea Campion (Silene maritima, With.)

This plant is found in Interglacial beds in Sussex. At the present day it ranges from the shores of Arctic Europe, from Italy westward to the Canaries, and northward to Norway and Finland. It may be

SEA CAMPION (*Silene maritima*, With.)

found around the entire coast of Great Britain, except in Merioneth, South Lancashire, and West Ross. It ascends to 3000 ft. in the Highlands.

The Sea Campion, or Seaside Catchfly if we may coin the name, is a familiar sight on all our seashores in the summer months, loving best the sandy tracts. It is thus a strand plant, a sand-lover, and a salt-lover, though occasionally it is found in Alpine tracts by streams, but this is the exception. It is practically thus a xerophyte or dry-soil type. It is associated with the Yellow Horned Poppy, Tamarisk, Sea Buckthorn, Thrift, and Centaury amongst other maritime wild flowers.

It is much less compact than Cheddar Pink, having numerous branched stems (being caulescent or forming aerial stems), the barren stems spreading, and suberect or prostrate, while a rosette of barren shoots is formed. The stems are not dwarfed as in Moss Campion. The leaves are oblong, tapering.

The flowering stems are panicled or solitary, and erect, the calyx bladder-like, swollen, netted, the flowers panicled, the petals white, cleft, and crowned. The nerves of the calyx are netted, and the capsule is not completely divided by septa. The flowers are larger than in the Bladder Campion. The bracts are herbaceous, and the styles are divided into two nearly to the base.

The plant is usually 9 in. high. The flowers are in bloom from August to September. It is perennial and propagated by division.

The tube is long and narrow, and the flowers are adapted to pollination by long-tongued Lepidoptera; the flowers are drooping in habit, with an inflated calyx, and the anthers are projected after they mature, and the flowers are proterandrous, i.e. the anthers ripen first. In *S. Cucubalus* the flowers are trimorphic.

The seeds of Sea Campion are dispersed by the agency of the wind. The capsule opens above, and the many small seeds, partly winged, are upset by gusts of wind and blown to a distance.

The plant is a halophyte or salt-lover, requiring a saline soil, and is a sand plant, addicted to sandy seashores.

Uromyces behenis and *Ustilago violacea* are parasitic fungi which live on it. The Netted Pug Moth (*Eupithœcia venosata*), Bordered Gothic (*Neuria Saponariæ*), *Gelechia leucomanella*, Barrett's Marbled Coronet (*Dianthœcia barrettii*), the Gray (*D. cæsia*), and the Pod-lover (*D. capsophila*) feed on it.

Silene, of Theophrastus, is from the satyr Silenus of ancient Greek mythology, and *maritima* refers to the habitat of the plant.

Sea Campion is called Thimble and the Witches' Thimble.

Essential Specific Characters:—

47. *Silene maritima*, With.—Stems numerous, spreading, leaves glaucous, entire, oblong, flowers white, solitary, erect, calyx inflated, petals notched, crowned.

Sea Purslane (Arenaria peploides, L.)

This maritime species has been found in the Interglacial deposits of Hants. It is found in the Arctic and North Temperate Zones on the shores of Western Europe, from the Arctic regions to Spain, and

No. 1. Sea Purslane
(*Arenaria peploides*, L.)

a, Petal, enlarged. *b*, Flower, with perianth removed. *c*, Capsule and seed. *d*, Plant, showing flowers and upper stem-leaves.

No. 2. Tamarisk
(*Tamarix gallica*, L.)

a, Flower, enlarged, with perianth removed. *b*, Capsule. *c*, Branchlet, enlarged. *d*, Plant, showing flowers in spike and leaves.

No. 3. Sea Holly
(*Eryngium maritimum*, L.)

a, Petal, showing notch and point turned in. *b*, Flower, with stamens, bristly calyx, and bract. *c*, Fruit. *d*, Upper part of plant, showing spinose leaves and flower-head.

No. 4. Samphire
(*Crithmum maritimum*, L.)

a, Floret enlarged. *b*, Fruit, showing persistent styles. *c*, Section of fruit. *d*, Upper part of plant, showing leaves and umbels of flowers.

No. 5. Absinth
(*Artemisia Absinthium*, L.)

a, Ray floret. *b*, Disk floret *c*, Involucre, with bracts, enclosing florets. *d*, Raceme of flowers, with stem-leaf below.

No. 6. Sea Lavender
(*Limonium vulgare*, Mill.)

a, Flower, enlarged. *b*, Radical leaf. *c*, Cyme, with flowers.

1. Sea Purslane (*Arenaria peploides*, L.). 2. Tamarisk (*Tamarix gallica*, L.). 3. Sea Holly (*Eryngium maritimum*, L.). 4. Samphire (*Crithmum maritimum*, L.). 5. Absinth (*Artemisia Absinthium*, L.). 6. Sea Lavender (*Limonium vulgare*, Mill.).

in Arctic America. In Great Britain it occurs on most parts of the coast, but is absent from East Sussex, Monmouth, Flint, Westmorland, Mid Ebudes.

The Sea Purslane is a *sine qua non*, as it were, of the flora that one meets with on most sea-coasts. It grows on every sandy beach, being a sand plant like the majority of the species of this group (hence the generic name), and is a salt-lover and one of the strand plants, accom-

Sea Purslane (*Arenaria peploides*, L.)

panied usually by such plants as Sea Rocket, Saltwort, Sea Milkwort, Sand Sedge, Marram Grass, and other plants.

It has a creeping habit, the so-called roots being really rhizomes. The stem is prostrate, then ascending, fleshy, forked, and the branches are suberect. The leaves are lance-shaped, stalkless, arranged in opposite rows, egg-shaped, acute, bent backwards, close, and single nerved, with the margins distinct. The whole plant is smooth, shiny, and dark green, like a Stonecrop or Sea Milkwort.

The flowers are white, solitary, axillary, the petals are inversely egg-shaped, the sepals blunt, single-veined, and shorter than the petals in the male, longer in the female flowers. The long and short stamens

alternate. The capsule is rounded, the seeds are inversely egg-shaped, large, and not numerous.

The height of this plant rarely exceeds 3 in. It is in flower from May till August. The perennial stems can be propagated by division.

The flowers are polygamous. The disk is glandular. There are 3–5 styles, and the flower is able to self-pollinate itself in the absence of insects, which do not visit it commonly, the species being a maritime with inconspicuous flowers.

The seeds are dispersed by the agency of the plant's own mechanism. The capsules break up along the valves when ripe and allow the small seeds to fall around the parent plant, which is usually found to grow in scattered clumps.

A fungus, *Cystopus lepigoni*, attacks *Arenaria*.

Heliothis peltiger (the Bordered Straw Moth) feeds on species of *Arenaria* also, and the beetles *Malachius marginellus* and *Cassida nobilis*.

Sea Purslane is a sand-lover and requires a sand soil, and as a salt-lover saline soil.

Arenaria, Linnæus, is derived from the Latin *arena*, sand, and *peploides* is from its resemblance to *peplion*, a purslane.

The Sea Purslane is called Sea Chickweed and Sea Sandwort.

It was thought to inspire love. Formerly it was occasionally pickled, like samphire, for which its fleshy foliage is suited. It was fermented in Ireland, and eaten as sauerkraut is in Germany.

The flower is very variable in the number of the stamens, a feature of the group.

Essential Specific Characters:—

57. *Arenaria peploides*, L.—Stem fleshy, creeping, forked, leaves in 4 rows, ovate, sessile, smooth, dark-green, flowers small, white, petals obovate, exceeding the sepals, from the angles of the stem.

Tamarisk (Tamarix gallica, L.)

This shrub has never been found fossil, but, even if it were native, it is unlikely that it will be preserved, as it rarely produces seed now in this country. The Northern Temperate Zone is its home, and it is found on the shores of the Atlantic and Mediterranean, and inland in Western Asia as far east as N.W. India. In the south and east of England it is an alien, being in all cases planted.

The Tamarisk is an evergreen shrub which is now one of the familiar members of the coastal flora (hence its inclusion in this work),

TAMARISK (*Tamarix gallica*, L.)

flourishing on sandy stretches, where it affords some shelter from the bleak east wind. It has served, moreover, with the native Sea Buckthorn, apart from Marram Grass and Sand Sedge, to bind together the otherwise shifting sands of the east coast.

So called from its native place in Spain, Tamaris, the Tamarisk is an evergreen shrub which is planted on account of its predilection for the sea. It is woody, erect, and possesses slender, feathery branches, with threadlike or awl-shaped leaves below, triangular, with earlike lobes above, overlapping, and small.

The flowers are pink, in spikes, which are lateral, close, alternate, slender, and with broad arrow-shaped bracts or leaflike organs below. The sepals and petals are five in number, the lateral ones do not fall, and all are united at the base, with apiculate anthers. The capsule, which is globular, 3-sided, is narrower at the top, and contains numerous feathered seeds, the hairs being lateral and terminal.

The Tamarisk is sometimes 12 ft. in height. The flowers bloom from May to October. It is a perennial shrub.

The flowers, though small, are rather conspicuous as a whole. This is one of those maritime plants which, though they flower late, are not attractive to insects, and have thus to rely on self-pollination very largely. The anthers are capable of moving when they are about to discharge pollen. There are several carpels and many stamens.

The Tamarisk is dispersed by the agency of the wind, and the seed is provided with a tuft of hairs which render it fit for wind dispersal.

Requiring a saline soil, it is a salt-lover, and is also a sand-loving plant, living on a sand soil.

No fungi or insects infest the Tamarisk, so far as is known.

Tamarix, Pliny, is the Latin name of the plant, and *gallica* refers to its French derivation (in our case).

The Tamarisk is called Cypress, Heath, Ling, and Tamarisk. Turner, in his *Names of Herbes*, says it was once called Heath: "the Schole maisters in Englande have a long time called *myrica* (Tamarix) heath, or lyng, but so longe have been deceyved altogether".

In Sicily they believed it was the tree upon which Judas hanged himself. It is cultivated as a hedge plant, and much used for this purpose along the coast, where nothing else will grow.

Essential Specific Characters:—

60. *Tamarix gallica*, L.—Shrubby, branches slender, leafy, flexible, leaves scale-like, glabrous, appressed, minute, flowers pink or rose in a panicle, capsule rounded, truncate.

Sea Holly (Eryngium maritimum, L.)

The distribution of Sea Holly to-day (as far as our knowledge goes) is limited to the North Temperate Zone in Europe, and N. Africa. In Great Britain it is absent from West Sussex, Northumberland, Wigtown, Berwick, as far as Aberdeen, and N. Ebudes, occurring on the coasts of other maritime counties, and to the north it is found in the Orkneys and Hebrides. It is found throughout Ireland.

A maritime species, addicted to a sandy habitat, on the shores of

Sea Holly (*Eryngium maritimum*, L.)

the British Isles, it is both a xerophyte or dry-soil type and a halophyte or salt-lover. It grows with Sea Kale, Sea Rocket, Samphire, Thrift, Sea Milkwort, and many other sand-loving species.

The English name suggests one of its main characteristics, its spinous character, like that of Holly, and its Thistle-like appearance. The plant is bluish-green in colour, and has stiffly hairy, spiny, leathery leaves, the radical leaves being rounded and 3-lobed, with cartilaginous margins, and folded. The stem is rigid, much-branched, with numerous leaves, the upper leaves clasping the stem and the lobes starting from a common centre. The plant has long thick roots.

The flowerheads, which are blue, are in heads with involucres, with a whorl of stiff coloured bracts or leaflike organs below, spinous, longer

than the heads. The scales in the receptacle are 3-toothed. The petals are narrow and deeply notched, turned down, and help with the anther-stalks to close the flower, though they can be pushed on one side by an insect.

Eighteen inches or two feet is the usual height of the Sea Holly. To find the flowers search the seaboard in July and August. Perennial, and increased by roots, the plant is well established in its habitats.

The flowers are small and inconspicuous, and not adapted for insect visits, like some other maritime species. The styles are threadlike and erect, and the petals are narrow and have the point turned in, whilst the umbels are in very dense heads, and are more liable in this way to be self- than cross-pollinated. The anthers ripen first. The honey is secreted by a disk with 10 rays at the base, and is concealed.

The achenes are flattened, and when ripe are aided in dispersal by the wind or passing herds, being detached and jerked to a distance.

Sea Holly is a salt-lover, and delights in a saline soil, and is also a sand plant, addicted to a sand soil.

The Lepidoptera Silky Wainscot, *Argyrolepia maritima*, *Conchylis francillana* and the Dingy Skipper *Thanaos* (*Hesperia*) *tages*, and a Heteropterous insect, *Therapha Hyoscyami*, feed on it.

Eryngium, Dioscorides, is latinized from the Greek name of the plant, and the second name (Latin) indicates its habitat.

Sea Holly is called Eringo, Eryngo, Sea Holly, Sea Holme, Sea Hulver, Ringo-roots.

The plant used to be employed as a love charm, and it was candied and sold in Shakespeare's day as the "kissing comfits" of Falstaff. In Sweden the tops are all eaten like asparagus. It is held by the Arabs to be a restorative, the chief virtue residing in the roots.

Essential Specific Characters:–

122. *Eryngium maritimum*, L.—Root fleshy, large, stem rigid, glaucous, leaves spinous, clasping, leathery, palmate, involucral leaves 3-lobed, flowers blue, in a dense head, with a whorl of bracts.

Samphire (Crithmum maritimum, L.)

The coasts of Europe to the south of France, and those of N. Africa, or the Temperate Zone, mark the present distribution of this plant, which is unknown in earlier times. It is found in Great Britain throughout the whole Peninsular province, and the South coast, on the East coast only in E. Suffolk, on the entire Welsh coast except Denbigh and Flint, throughout the Lakes province, in Kirkcudbright,

Wigtown, Ayr, or generally from Ayr southwards, and on all the Irish coasts.

Samphire is a maritime plant which grows on the rocky south and west coasts, where also are to be found Yellow Horned Poppy, Scurvy Grass, Sea Campion, Thrift, Sea Lavender, Sea Plantain, Saltwort, and other salt-lovers. It is found on stone walls as well as on rocks.

Like many other maritime species, Samphire is a fleshy plant with a more or less shrubby habit, compact, with suberect, branching stems. The leaves are several times divided with leaflets each side of a

Photo. Flatters & Garnett

SAMPHIRE (*Crithmum maritimum*, L.)

common stalk, linear lance-shaped, fleshy to succulent, acute above and below, and triangular. The leaf-stalks are short but stout, with long membranous sheaths.

The flowers, which are highly odorous, are white or yellow, in umbels with involucres, with lance-shaped, acute leaves, flat, and with stout peduncles. The bracts are spreading, small, and acute. There are no calyx-teeth, the petals are very small and soon drop.

In the Samphire the fruits are oblong, like barley, whence the first Greek name (latinized).

The plant is about 1 ft. or 18 in. high. It flowers from July to September. It is a deciduous, herbaceous perennial, multiplied by division.

The flowers are small, white, with minute petals with a long point, turned inwards, soon dropping, and with short styles. The plant is

inconspicuous, and owing to its maritime habitat not liable to be visited by insects. The anthers mature first, and only when the pollen is all shed does the stigma ripen.

The fruits are flattened, and so more easily dispersed by the wind. When ripe, being semi-detached, they are easily blown away.

Samphire is a salt-lover which requires a saline soil. It is also a sand plant and is addicted to a sand soil.

The only insect which feeds upon this plant is *Trioza crithmi*, a Homopterous insect. As in the case of other seaside species fungi do not attack it.

Crithmum, Dioscorides, is the Greek name of the plant, which may be from the Greek *crithe*, barley, on account of the shape of the fruit, and the second Latin name is in allusion to the habitat.

The plant is called Camphire, Peter's Cress, Crestmarine, Sea Fennel, Pasper, Pierce-stone, Sampere, Samphire, Rock Samphire, Sampier, Semper, Rock Semper.

Samphire was described by Gerard as yielding "the pleasantest sauce, and best agreeing with man's body, for the digestion of meats". It is liked by cattle. Samphire is used as a pickle and in salads, and as a pot herb. It can be grown in the garden in beds of sand, rubbish, or in pots, but should be supplied with barilla, as it is on the coast, from the sea breezes containing salt, and the salt blown upon it by the wind.

Essential Specific Characters:—

127. *Crithmum maritimum*, L.—Stem short, fleshy, glabrous, leaves glaucous, bi- or tri-pinnate, leaflets linear-lanceolate, flowers small, white or yellow, in umbels, with short bracts, fruit green or purple.

Absinth (Artemisia Absinthium, L.)

Absinth is not found in early deposits, but is confined at the present day to the North Temperate Zone, in Europe, N. Africa, N. and W. Asia, the Himalayas, and North America. In Great Britain it occurs in the Peninsula, Channel and Thames provinces, except in Bucks, in Anglia and the Severn provinces, in Wales in Glamorgan, Brecon, Carmarthen, Pembroke, Merioneth, Carnarvon, Denbigh, Anglesea, in the Trent province, except in N. Lincs, the Mersey province, except in Mid Lancs, the Humber province, except in S.E. Yorks, in the Tyne province generally and the Isle of Man; in Scotland in Berwick, Haddington, Edinburgh, Linlithgow, Fife, W. Perth, Forfar, E. Ross, Orkney, and Shetland. It ascends, as a

cultivated plant, to 2200 ft. in Northumberland. In N. and W. Scotland it is rare, and it is doubtfully native in Ireland.

Absinth is to all intents and purposes native only along the sea-coast, as Watson remarks, but it grows inland in a variety of places, having been used for medicinal and other purposes. So it is found on waste ground, and in gardens and similar places where it is evident that man has planted it.

Photo. W. E. Mayes

Absinth (*Artemisia Absinthium*, L.)

This is a tall, handsome, branched plant with bi- or tri-pinnatifid leaves, i.e. with lobes divided nearly to the base, and narrow linear-acute segments, with both sides of the rather broadly oval leaves silky and downy, white on both sides. The flowerheads are yellow, and arranged in hemispherical drooping heads. Only the outer florets, which are small, produce fruit. The receptacle is softly downy, with the outer phyllaries or whorl of leaflike organs linear and silky, the under ones round and scarious with a semi-transparent border.

Absinth grows at least 18 in. high, but often 3 ft. The flowers are in bloom in July and September. The plant is perennial and propagated by division.

The flowers in *Artemisia Dracunculus* are pollinated by the wind, and the same applies to this plant.

There is no pappus or hair, but the fruit or achene is adapted for dispersal by the wind, the branches being easily swayed to and fro.

Absinth is a sand-loving plant growing in sand soil.

A fungus, *Puccinia tanaceti*, is found on the leaves.

A beetle, *Mordellistaria pusilla*, several moths, Wormwood Moth (*Cucullia Absynthii*), Ling Pug (*Eupithecia minutata*), Bordered Lime Speck (*E. succenturiata*), Wormwood Pug (*E. absynthiata*), *Botys stictualis*, *Halonota bœcella*, and the Ground Lackey (*Clisiocampa castrensis*), *Grapholitha wimmerana*, *G. pipillana*, Ringed Carpet (*Boarmia*

cinctaria), two Homoptera, *Eupteryx tenella*, *Aphalara artemisiæ*, two Heteroptera, *Scherus bicolor*, *Plagiognathus albipennis*, and the flies *Cecidomyia foliorum*, *Spilographa artemisiæ*, *Leucopis annulipes*, are found on it.

The name *Artemisia*, Hippocrates, is derived, so Pliny says, from the goddess Artemis, goddess of Chastity, *Absinthium*, Dioscorides, is the Latin name for wormwood, taken from the Greek *apsinthion*.

The names Absinth, Maderwort, Mingwort, Mugwort, Old Woman, Warmot, Wormwood, are all applied to this plant.

In reference to Absinth, Benevenuto, 1612, says: "Absinth and poyson be my sustenance."

When seen in dreams it was regarded as a good omen. On St. Luke's day a maiden was told to "Take marigold flowers, a sprig of marjoram, thyme, and a little wormwood; dry them before a fire, rub them to powder, then sift it through a fine piece of lawn; simmer these with a small quantity of virgin honey, in white vinegar, over a slow fire; with this anoint your stomach, breasts, and lips, lying down, and repeat these words thrice:—

'St. Luke, St. Luke, be kind to me,
In dream let me my true love see.'

This said, hasten to sleep, and in the soft slumbers of night's repose, the very man whom you shall marry shall appear before you." It was called St. John's Girdle in Germany, and in Sicily St. John's Beard.

In the Middle Ages it was often used as a remedy. It is said to be tonic, antispasmodic, and antiseptic applied externally. It has also been used in fevers, gout, scurvy, dropsy. It is said to be of use as a stomachic. The seeds are used in rectifying spirits. It used to be hung up to prevent infection, and with Rue was put in the dock by the prisoner's side to prevent jail fever. It flavours absinth and is used in beer abroad.

Essential Specific Characters:—

162. *Artemisia Absinthium*, L.—Stem erect, bushy, leaves lanceolate, silky, segments blunt, bipinnatifid, flowerheads drooping, dull yellow, in hemispherical heads.

Sea Lavender (Limonium vulgare, Mill.)

The Temperate (Northern) Zone throughout Europe, N. Africa, and N. America marks the limit of the range of Sea Lavender to-day, no earlier records of its occurrence being known. In Great Britain it is absent from the coasts of East Norfolk, Monmouth, Pembroke,

Cardigan, Denbigh, Flint, S. Lancs, S.E. Yorks, Northumberland, but is ubiquitous elsewhere. In Scotland it is found on the coasts of Dumfries, Kirkcudbright, Wigtown, Fife. It is thus general from Fife to Kent and Devon. It is native in Ireland and the Channel Islands.

Sea Lavender is found on muddy shores, flat coasts, and estuaries, especially on the east coast as well as on the west, where the rocky foreshore is flanked by stretches of mud or sand. It is found where Thrift, Sea Purslane, Sea Milkwort, Seaside Bindweed, and Sea Plantain grow.

The aerial flowering stem is really a scape, and all the leaves are radical, having a wavy margin, with long leaf-stalks, and pinnately-arranged veins. The leaves are oblong, smooth, blunt, and mucronate, or bluntly terminated with a sharp point.

The flowers are small but conspicuous, blue, and borne on leafless scapes or flowering stems, which are numerous, angular, and bear terminal flowers in a much-branched corymb or panicle, each spikelet bearing two or three flowers, and the spikes are spreading and even curved backwards. The outer bracts or leaflike organs of the calyx are rounded on the back, the calyx lobes having intermediate teeth. The calyx and corolla each form a tube. There is honey at the base of the latter.

The plant is about 1 ft. high. It flowers between May and August. It is perennial, and propagated by division, and worthy of cultivation.

The flowers are dimorphic, of two types. Being a maritime plant the flower is not visited by insects like an inland species. The petals have long claws or stalks, the stamens are opposite the corolla lobes, and the anther-stalks are threadlike; the anthers open inwards, and the styles are free, their stigmas being hairlike or linear, and the flower is thus adapted to self-pollination. The anthers are ripe before the stigma.

The calyx is coloured. The calyx does not fall, and some flowers have undeveloped anthers; being membranous above, the capsule is dispersed by the wind.

Sea Lavender is a salt-lover and requires a saline soil, being also a sand-loving plant and growing on a sand soil.

A micro-fungus, *Uromyces limonii* attacks it. A beetle, *Apion limonii*, and a moth, *Adactyla bennetii*, are to be found upon it.

Limonium, Dioscorides, is from the Greek *leimonios*, belonging to a moist place or meadow, and the second Latin name refers to its common occurrence.

The plant is known as Sea Lavender, Lavender Thrift. A former name, *Statice* (now applied to Thrift), was given to Sea Lavender for the supposed property it possessed of stopping diarrhœa.

SEA LAVENDER (*Limonium vulgare*, Mill.)

ESSENTIAL SPECIFIC CHARACTERS:—

196. *Limonium vulgare*, Mill.—Flowering stem a scape, leaves radical, oblong, petiolate, mucronate, 1-ribbed, flowers purple, in a secund panicle in dense patent spikes, with outer bract rounded on back, scentless, flower-stalk angular, leafless, branched.

Thrift (Statice maritima, Mill.)

The pretty tufted Thrift is found in the Northern Temperate and Arctic Zones in Arctic Europe, Asia, N. America, and also in Chili. While thus a northern plant it has not been found to belong to any of the ancient deposits so far. It occurs on all the coasts of Great Britain, except those of estuaries in Middlesex and Lanark, and in the Highlands at the height of 3800 ft.

Thrift is a typical maritime species, which is perhaps more common on the west than the east coast, preferring rocks and stony shores to sandy or muddy districts. It is also to be found in Scotland at high elevations or mountain heights inland, where the same moist humid conditions exist that are prevalent at the seaside, so that it cannot strictly be regarded as always a salt-lover.

As with Sea Lavender the flowering stalks of Thrift are the only aerial stems, and are scapes. The leaves are all radical, linear lance-shaped, flat, blunt, and fringed with hairs at the margin, with one vein, and fleshy. The plant has a tufted habit.

The flowers are reddish-pink, and are borne on the scapes, which are downy and rounded. The outer calyx, or involucral whorl of leaflike organs of brownish, membranous bracts, is very characteristic, bracts coming also between the flowers. The hairs on the scape are spreading or turned back. The calyx has 5 downy ribs with acute segments, and the tube is hairy.

The plant is about 6 in. in height. It is in flower from May till July. It is a deciduous, herbaceous plant, increased by division.

The flowers are scented. The calyx is 5 mm. in length, and is violet above, strengthened by 5 shortly-toothed ribs. Hairs line the tube and so protect the honey. The anthers are above the latter, and in the centre are the 5 stigmas, which take the place of the former, moving to the margin, and the anthers become central. The stigmas make a spiral turn, and so touch the anthers.

The flower is conspicuous, more so than *Limonium*, to which otherwise it has some affinity. As the anthers open, the anther-stalks curve inwards, bringing the anthers immediately above the depressed centre of the stigma, on which they shed their pollen; the flower is thus normally self-pollinated.

The achenes are provided with a parachute-like wing, a persistent membranous calyx, to aid in wind dispersal.

This plant is a salt-lover requiring a saline soil, but it is also a rock

No. 1. Thrift.
(*Statice maritima*, Mill.)

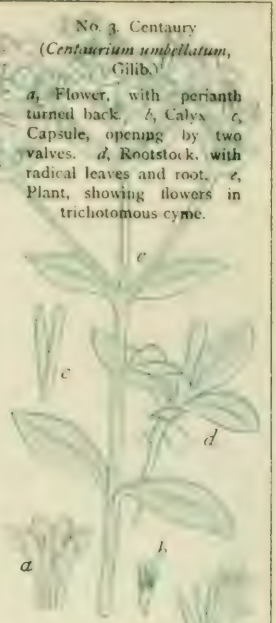
a, Flower, enlarged. *b*, Ovary with hairy styles. *c*, Plant, with head of flowers forming a cyme.

No. 2. Sea Milkwort
(*Glaux maritima*, L.)

a, Flower, with perianth turned back to show stamens and pistil. *b*, Fruit, a capsule. *c*, Plant, showing flowers in the axils.

No. 3. Centaury
(*Centaurium umbellatum*, Gilib.)

a, Flower, with perianth turned back. *b*, Calyx. *c*, Capsule, opening by two valves. *d*, Rootstock, with radical leaves and root. *e*, Plant, showing flowers in trichotomous cyme.



No. 4. Seaside Bindweed
(*Calystegia Soldanella*, Br.)

a, Capsule. *b*, Upper part of plant, showing leaves and funnel-shaped corolla with bract-like calyx.

No. 5. Sea Plantain
(*Plantago maritima*, L.)

a, Flower, enlarged. *b*, Capsule, opening along the middle transversely, with seeds within. *c*, Flower spike with flowers in male stage. *d*, Rootstock, with radical leaves.

No. 6. Saltwort
(*Salsola Kali*, L.)

a, Flower. *b*, Flower, enlarged, with perianth removed to show stamens and pistil. *c*, Utricle and calyx. *d*, Section of utricle, with persistent calyx, with seed showing conical helix. *e*, Plant, showing flowers and spine-like leaves and bracts.

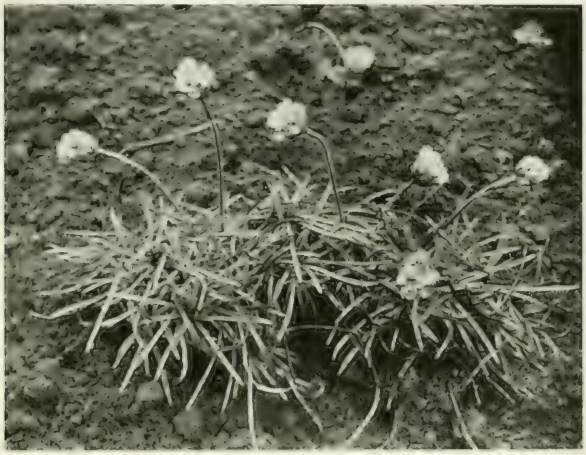
plant, growing on Cambrian and Silurian and other rocks, and is also a sand-loving plant growing on a sand soil.

Like Sea Lavender it is attacked by a fungus, *Uromyces limonii*.

A Thysanopterous insect, *Phlœothrips Statices*, and three moths, a Clearwing, *Sesia muscæformis*, *Sericoris littoralis*, *Gelechia bizella*, feed upon Thrift.

Statice, Dalechamps, is from the Greek name, denoting astringency, and the second Latin name refers to its habitat.

Attractive as Thrift is, it is called Arby, Cliff-rose, Cushion, Lady's



THRIFT (*Statice maritima*, Mill.)

or Sea Cushion, Cushion-pink, Marsh or Sea Daisy, Sea Gilliflower, Sea Grass, Lady's Pincushion, Pink, French Pink, Scawfell Pink, Sea Pink, Quishion, Rock Rose, Sea Turf, Thrift. As to the name Sea Daisy, Scrope says: "Even the hills afford good pasture, and are scattered over with the Sea Daisy and other plants". Names compounded with cushion all refer to the tufted habit of the plant.

Thrift is astringent, hence its reputed use. But the principal value of Thrift lies in its adaptation to the garden, where it is grown as an edging plant, and is very prolific.

ESSENTIAL SPECIFIC CHARACTERS:

197. *Statice maritima*, Mill.—Flowering stem a scape, leaves radical, tufted, oblong, mucronate, fleshy, linear, veined, flowers rose, in round heads, with downy scapes, and scarious involucre, with scaly bracts.

Sea Milkwort (Glaux maritima, L.)

This diminutive plant with its delicate flowers is represented in ancient deposits in Interglacial beds at West Wittering, Sussex. It is found in the Northern Temperate and Arctic Zones in Arctic Europe, except in Turkey, N. Asia, W. Asia, eastwards as far as N.W. Himalayas, and in North America. Sea Milkwort occurs on the coasts of every maritime county in Great Britain, except those of estuaries in Middlesex and Lanark, as in the case of the Sea Lavender.

Sea Milkwort is a maritime species addicted to the muddy shores

Sea Milkwort (*Glaux maritima*, L.)

of estuaries and coasts generally. In this it agrees with the habitats of Sea Lavender, Sea Plantain, Scurvy Grass, Sea Kale, Sea Rocket. It is found also in salt-pans in Worcester and Staffordshire.

This little plant is usually found in patches, like the Stonecrop and other semi-prostrate plants. It has a suberect stem, at first prostrate. The leaves are oval, bluish-green, smooth, stalkless, and entire. The root-stock is stoloniferous.

The small flowers are pink, stalkless, and unique amongst apetalous flowers. The flowers are suberect, with blunt segments. The calyx is bell-shaped, and does duty for the corolla, with membranous margins. The anthers are prominent. The capsule is small, globose, containing seeds which are plano-convex.

Sea Milkwort is about 3 in. high. The flowers are in bloom in May and June. The plant is perennial, and can be propagated from seed.

A small quantity of honey is secreted at the base of the calyx. The flowers, which lack a corolla, are small and inconspicuous, and the plant being maritime is little visited by insects. The stamens are shorter than the stigma, and the style is threadlike, the stigma blunt, and when mature the anthers are not quite projecting. Self-pollination is thus rendered easy. The capsule is 5-valved and splits open when ripe, and the seeds, which are few, are dispersed by the shaking of the flowering stems by the wind.

Sea Milkwort is a salt-lover, and requires a saline soil. It is likewise a sand-loving plant, and addicted to sand.

The leaves are attacked by a fungus, *Æcidium Glaucis*.

Glaux, Tournefort, is from the colour of the leaves, Greek *glaucos*, bluish-green, and the second Latin name indicates its maritime habit.

Milkwort, Black Saltwort, Sea Trifoly are the names popular usage has conferred upon this plant. In reference to the name Milkwort, Lyte says: "This taken with meate, or milke, or potage, ingendreth planty of milke: therefore it is goode to be used of nurses that lacke milke. The same virtue hath Polygala taken with his leaves and flowers."

It is a pretty little flower, and quite suited for garden culture in pots or sandy soil in the open.

Essential Specific Characters:—

204. *Glaux maritima*, L.—Stem sub-prostrate, fleshy, leaves glaucous, glabrous, ovate, opposite, flowers pink, in the axils, sessile, apetalous, calyx coloured, blunt.

Centaury (Centaurium umbellatum, Gilib.)

This maritime and inland plant is found in the North Temperate Zone in Europe, South of Scotland, N. Africa, and has been introduced in North America. It is unknown in any early deposits. In Great Britain it occurs on all the coasts, except Kincardine, N. Aberdeen, Banff, W. Sutherland, Caithness, Orkneys, and is rare in the Shetlands.

Centaury is essentially a maritime species, growing on practically all the coasts of counties in Great Britain where the shore is sandy. But it also occurs inland, and there grows on dry pastures and in sandy fields, often in quarries or pits where exposed rocks have produced a suitable sandy soil.

Centaury is a short, erect plant, repeatedly dividing into two above, with a single stem below, square-stalked, with oblong egg-shaped, lance-shaped leaves, with numerous parallel veins, and smooth, the upper leaves acute. There are numerous radical leaves.

The flower is red or pink, with two kinds of style, and borne in a panicled corymb of flowers, open in fine weather only. The flowers are nearly stalkless. The calyx, 5-fid, is less than the corolla, which is tubular, and the flowering stems are repeatedly divided. The 5 lobes of the corolla are oval. The lateral flowers are stalked, or stalkless between two floral leaves. The capsule is slender.

Centaury (*Centaurium umbellatum*, Gilib.)

The plant is about 6 in. to a foot in height. The flowers bloom in July and August, lasting 4 or 5 days, and are open from 5–7 a.m. up till midday, closing if it rains. It is a deciduous, herbaceous plant, propagated by seed.

The anthers and stigma are mature at the same time, and the flower is somewhat heterostylic, with pollen of different sizes. The flowers contain no honey, but are visited by Lepidoptera. The spiral stamens, like the twisting of the stigma in Sileneæ (which are pollinated by Lepidoptera), seem to be an adaptation to secure its being touched by the thin proboscis. At first the stamens and pistil are far apart, but approach later. Probably some soft tissue is pierced by the insect with the sharp points at the tip of the proboscis to get at the sweet sap. The flower is visited by the Humming-bird Hawk Moth, *Macroglossa stellatarum*, *Agrotis pronuba*, and other Lepidoptera, Bees, and by the Dipterous *Empis*.

The capsule is divided by septa, and when ripe the parts break away and fall around the parent plant, allowing the seeds to escape.

Centaury is a sand plant, and grows in sand soil on heaths and bare ground.

Centaury is a food plant for *Pterophorus hœuri*.

Centaurium, Dioscorides, is from the Latin, *Centaur*, Chiron the Centaur being reputed to have discovered its medicinal properties. The second Latin name refers to the umbellate head.

This plant is called Banwort, Bitter Herb, Bloodwort, Centaury, Little Centaury, Century, Christ's Ladder, Earth-gall, Feltrike, Feverfew, Mountain Flax, Gall-of-the-Earth, Gentian, Hurd-reve, Sanctuary. On the shores of the Moray Firth it is called Gentian, where an infusion is drunk as a tonic.

People used to burn it to expel serpents. An infusion was used to remove freckles. The plant contains a bitter principle like Gentian. It has been used as a tonic and febrifuge, and is a good stomachic.

Essential Specific Characters:—

209. *Centaurium umbellatum*, Gilib.—Stem erect, quadrangular, branched above, leaves ovate, upper acute, flowers pink, sub-sessile, in corymbose cyme, calyx less than corolla, lobes of latter oval.

Seaside Bindweed (Calystegia Soldanella, Br.)

This plant is not found in any ancient deposits. In the North Temperate Zone to-day it is found in Europe, South of Belgium, N. Africa, W. Asia, and the S. Temperate regions. In Britain it is found around the entire coast, except in E. Sussex, Denbigh, S. Lincs, Northumberland, Berwick, Fife, as far as Islay, but on the west to the southward, and in the Hebrides. It is native in Ireland and the Channel Islands.

The Seaside Bindweed is a strictly maritime plant, a salt-lover, and dry-soil type, growing on sandy coasts, where it obtains plenty of salt, and where dry conditions are ensured. It is associated with Sea Kale, Sea Rocket, Sea Milkwort, Samphire, and numerous other sand-loving marine plants.

This seaside species differs from other bindweeds in not having a climbing but a trailing stem. Its stem is prostrate, then ascending, short, slender, and only rarely twining. The leaves are kidney-shaped or heart-shaped, fleshy, with rounded lobes. The stems are often much below the surface in the sand.

The flowers are flesh-coloured, borne on 1-flowered flower-stalks, square, with membranous angles. The bracts or leaflike organs are less than the calyx, and egg-shaped. The flowers are large, axillary,

and the pink corolla is marked with longitudinal yellowish or red streaks. The capsule is large.

Seaside Bindweed is at most 1 ft. high. It is usually in flower in June and July, and is a perennial plant, which is increased very freely by division of the roots.

The flowers are complete and the plant is gynodiœcious. The flowers are as in *C. arvensis*, but they possess two bracts enclosing the calyx, and the stigma is broad. The stamens and pistil vary in length.

Photo, Messrs. Flatters & Garnett

SEASIDE BINDWEED (*Calystegia Soldanella*, Br.)

Being a maritime plant it is not visited to any extent by insects. In *C. arvensis*, which is pollinated like the Seaside Bindweed, the flowers are scented, opening between 7 a.m. and 10 p.m., closing at night and during rain. There is honey at the base of the tube. The stamens lie close to the tube and have enlarged bases. At their edge the anther-stalks are interwoven by stiff projections. The anthers open outwards and lie below the stigmas, which an insect touches first. The corolla may have a red band, the flower may be small, and there may be a pistillate type with short stamens and undeveloped anthers.

The capsule splits open when ripe, and is filled with black seeds, which are dispersed around the parent plant being aided partly by the wind.

The plant is a salt-lover, and grows in saline soil which is largely sand soil also.

A fungus, *Thecaphora hyalina*, attacks the leaves.

Calystegia is from two Greek words denoting calyx and cover, reference being to the two large bracts of the calyx. *Soldanella*, Dodonæus, is possibly derived from the Latin *soldo*, an Italian coin, because of its rounded leaves.

Sea Bells, Sea Bindweed, Sea Cawle, Sea Coale, Sea Cole, Sea Colewort, Sea Foalfoot, Scottish Scurvy Grass, Sea Withwind, are names it has been given. Sea Foalfoot is bestowed on it because of the shape of the leaves, and Scottish Scurvy Grass because, as Gerard says, "They use it instead of true scurvy grass (*Cochlearia officinalis*)". The plant is an acrid purgative.

Essential Specific Characters:—

221. *Calystegia Soldanella*, Br.—Stem prostrate, short, leaves fleshy, reniform, flowers pink, with yellow bands, bracts shorter than the calyx, on winged, square stalks.

Sea Plantain (Plantago maritima, L.)

Though an Arctic plant this maritime species, like some other maritime plants, is not represented in any ancient deposits. It is found to-day in Arctic and Temperate Europe, N. Africa, N. and W. Asia, as far east as the Himalayas, and in N. America. This plant is found around the entire coast of Great Britain, except in Middlesex, as far north as the Shetlands, and by mountain streams in Yorkshire and Perth up to a height of 1800 ft.

Sea Plantain is one of those species which are more or less confined to maritime conditions, existing there as a halophyte, growing in salt marshes close to the sea with Saltwort, Samphire, Sea Rush, Sea Club Rush, Sand Sedge, Marram Grass, and other seaside grasses that fringe the salt-pans and the coast. It also invades the inland streams in the far north at high altitudes, just as Thrift and some other plants do, growing in crannies and holes.

This plant has the grass habit with only radical leaves, the aerial stems being scapes only. The leaves are smooth, long, lance-shaped, erect,[1] fleshy, toothed, with three veins, narrowed into leaf-stalks below, and at the base downy, semi-cylindrical, not flat. The leaves vary in size from an inch to a foot and in other particulars.

The flowers are green, variable in number, borne on a rounded,

[1] In the broad-leaved types they are horizontal.

smooth scape, sometimes hairy. The anthers are yellow, on long anther-stalks. The 4 sepals are not winged, the tube of the corolla is downy, the placenta 2-winged, and the seeds are single in each cell, the capsule being 2-celled.

The plant is 6 in. to 1 ft. high. The flowers bloom in July, opening in fine weather closing when it is wet, and the plant is perennial, propagated by seeds.

The flowers are complete, homomorphous, the tube of the corolla downy, to catch pollen, and the stamens are long and thin, pale yellow,

Photo. Messrs. Flatters & Garnett.

Sea Plantain (*Plantago maritima*, L.)

sensitive, easily shaken by wind. In *Plantago lanceolata* the flower is proterogynous, the stigmas maturing first, and the plant is *gynodiœcious*, with female and complete flowers on different plants, while *P. media* is intermediate between them, being pollinated by the wind and also by insects, and less proterogynous, being dimorphic, with two forms of flower. Some of the species are cleistogamic with closed flowers. This one is pollinated by the wind. The style has two lines of hairs. The stigma is feathery. The anther cavity is small, and pollen is only dispersed if the stamens are violently shaken. The anthers open above. The pollen is a dry dust and is moistened by bees.

The capsule when ripe splits across, and sets free the large seeds, which fall around the plant, and being winged they may be blown some little distance by the wind.

The plant is a salt-lover and requires a saline soil, and is also a sand plant, and grows on sand soil, or a rock plant, growing on rocks.

It is galled by *Mecinus collaris*, a beetle. A Thysanopterous insect, *Thrips subatra*, is found on it, also two moths, *Fumea reticella*, *Gelechia instabilella*.

Plantago, Pliny, may be from the Latin *planta*, sole of foot, from the shape of the leaf, and the second Latin name indicates its habitat.

This maritime species is known by the names of Buck's-horn, Buck's-horn Plantain, Gibbals, Sea Kemps, Sea Plantain.

Lightfoot relates how he "went to Rummy Marshes, about two miles from Cardiff, where we saw large crops of the *Plantago maritima*, call'd here by the people Gibbals, which the hogs are very fond of. They root up the roots as we saw, and grow fat upon them, as we were assured."

Essential Specific Characters:

263. *Plantago maritima*, L.—Flowering stem a scape, leaves radical, fleshy, linear, convex below, scape terete, flowers 3–4, sepals not winged.

Saltwort (Salsola Kali, L.)

This is quite unrepresented as a maritime species in early deposits. It is found in the North Temperate Zone in Europe, N. and S. Africa, and N. and W. Asia, India, N. and S. America, Australia. In Great Britain it does not grow in W. Sussex, S.E. Yorks, Renfrew, Mid Ebudes, W. Ross, W. Sunderland, the Orkneys, and the Shetlands. It ranges from Caithness to the south coast, and is found in Ireland and the Channel Islands.

Saltwort is a maritime species, a typical salt-lover, on which account indeed it is used commercially to obtain salt, and is found on all the sandy coasts of Great Britain, growing in the same habitats as Sea Blite, Samphire, and many other true salt-lovers, abounding in salt and yielding alkali, whence the Latin, Arabic, and English names.

Saltwort is a spreading or prostrate plant, with hairy, limp, or fleshy stems. The leaves are awl-shaped, bluntly terminated with a sharp point, spinous, hairy, sub-cylindrical. The stem is finely furrowed, branched, wavy, angular, and rigid.

The flowers are small, single, pink, inconspicuous, with the winged appendages of the calyx spreading, scarious, or with a membranous margin, rose-coloured. The bracts or leaflike organs are 3, spinous. The segments of the perianth are as long as the appendages. The

flowers are axillary, the seeds are brown, and adhere to the membranous pericarp.

The plant is 6 in. to 1 ft. high. It flowers in July and August. Saltwort is annual, propagated by seeds.

The plant is dichogamous, the anthers and stigma ripening at different times. The stamens, 3–5, are hypogynous, the ovary superior, the anther-stalks linear. The style is elongate, and the stigmas attenuate. The plant is pollinated by the wind or is self-pollinated.

Photo. Messrs. Flatters & Garnett

SALTWORT (*Salsola Kali*, L.)

The anthers and stigma may ripen together, or the latter first. Pollen may be carried about by creeping insects.

The fruit is a utricle, is enclosed in a winged calyx, and may be dispersed mainly by the wind.

The plant is a salt-lover addicted to saline soil, and is also a sand plant flourishing in sand soil.

Three moths, the Sand Dart (*Agrotis ripæ*), Coast Dart (*A. cursoria*), and *Gymnancyla canella*, and a Heteropterous insect, *Orthotylus rubidus*, infest it.

Salsola, Cæsalpinus, is from the Latin *sal* or *salsus*, salt, from the abundance of alkali yielded by its ashes, and *kali* is an Arabic word for the ashes of the saltwort or the glasswort, or for the plants themselves.

Saltwort is called Eestrige, Prickly Glasswort, Kelpwort, Sowdwort, Sea Thrift. The name Prickly Glasswort is bestowed on it from

its prickly nature, and because it was used for the manufacture of barilla for glass-making.

Essential Specific Characters:—

266. *Salsola Kali*, L.—Stem prostrate, branched, leaves rough, spinous, subulate, with prickles at the extremity, flowers axillary, with 3 bracts at the base.

Sea Buckthorn (Hippophaë rhamnoides, L.)

Local and confined to the sea margin this plant is apparently not represented in any early deposits in Great Britain, but is recorded from the Oak Zone in Gothland. It is found in the N. Temperate Zone in Europe, N. and Central Asia, as far east as the Himalayas.

In Great Britain it is found in W. Cornwall, E. Kent, E. Suffolk, E. and W. Norfolk, Anglesea, N. Lincs, S.E. Yorks, N.E. Yorks, Dumfries, Wigtown, Ayr, Renfrew, Forfar, N. Aberdeen, Main Argyll, W. Ross, or from York to Kent and Sussex. It is common and only naturalized in Scotland and Ireland.

This is one of the peculiarly characteristic maritime species growing on sandy shores, where it is a salt-lover and a dry-soil type. It forms a natural defence by helping to bind the sand together. Doubtless this reason has caused it to be planted in some spots where it was not formerly present.

This is a compact prickly shrub, which is much branched and generally erect. The leaves are linear lance-shaped, silvery, with a furrow in the centre, limp, alternate, dullish green above. After flowering they elongate. There are red scales on the underside of the leaf.

Sea Buckthorn is a dicœcious plant, with axillary minute male flowers in clusters, the sepals broadly oblong. The flowers appear with the young leaves. The female flowers are solitary. The fruit is a berry, orange, enclosed in the calyx, membranous, with oblong seeds.

The plant is 1–8 ft. high. It flowers in May. The Sea Buckthorn is a shrub.

The plant is dicœcious, the male flowers minute in axillary clusters, the female solitary. The filaments are short and the anthers yellow. The flowers are pollinated by the wind. The bracteoles form a hood over the male flowers to protect them from the rain, separating when it is dry, allowing pollen to be blown away by the wind.

The utricle is orange-red when ripe, and probably principally dispersed by birds.

A beetle, *Haltica tamaricis*, a moth, *Gelechia hippophaella*, three Homoptera, *Cixius stigmaticus*, *C. remotus*, *Psylla hippophaës*, are found upon it. A Hawk Moth, with large orange caterpillars, feeds on it, resembling the yellow fruits.

Hippophaë, Dioscorides, is from the Greek *hippos*, horse, *phao*, shine; *rhamnoides* means buckthorn-like.

The plant is called Sea Buckthorn, Sallow Thorn, Willow-thorn, Wirwivvle, Wyrvivle.

Essential Specific Characters:—

273. *Hippophaë rhamnoides*, L.—Diœcious shrub, spinose, leaves linear-lanceolate, silvery, male flowers in catkins, female solitary, berries scarlet.

Common Sea Rush (Juncus maritimus, Lam.)

Few of the maritime species are preserved in seed-bearing beds, partly because no sections present themselves, and partly because the sea line in still earlier times was different, England being joined to the Continent, and most of the maritime species are of more recent date. The Common Sea Rush is no exception to this rule. This plant ranges in the N. Temperate Zone from Gothland to Turkey, N. Africa, W. Siberia, North America. In Great Britain it is absent in N. Wales from Merioneth, Carnarvon, in the Trent province from S. Lincs, in the Humber province from S.E. Yorks, not occurring in Cumberland in the Lakes province, the coasts of Berwick, Haddington, Edinburgh, Forfar, Aberdeen, Banff, Main Argyll, Mid Ebudes, and not in the N. Highlands or N. Isles. Elsewhere it is general around the coast from Islay and Elgin to the English Channel. It is common in Ireland.

The Common Sea Rush is familiar to all dwellers by the sea-coast, being a regular member of the Salt-marsh formation, where it forms a continuous fringe, as it does along the sea-coast itself. It grows with other Rushes, Sedges, and Grasses, helping in places to protect the coast from incursions of the sea.

Owing to its deeply-rooted character forming a densely-matted entanglement in which sand is retained, it is used as a coast protector in Europe and America. The first Latin name refers to the use made of Rushes as ropes, on account of their stringy nature. The stem is wiry, erect, slender, with pale sheaths. The leaves are rounded and acute.

The flowers are pale, apetalous, without a corolla, in a loose cyme which is terminal, and proliferous. The involucre consists of

SEA BUCKTHORN (*Hippophaë rhamnoides*, L.)

No. 1. Sea Buckthorn
(*Hippophae rhamnoides*, L.)

a, Staminate flower. *b*, Pistillate flower. *c*, Plant, with leaves and berries, showing also spines.

No. 2. Common Sea Rush
(*Juncus maritimus*, Lam.)

a, Pistil, with third stigma. *b*, Flower. *c*, Nut, with perianth segments. *d*, Seed, with embryo erect and albumen. *e*, Base of stem, showing leaf-sheaths. *f*, Inflorescence and sheathing bract.

No. 3. Grass Wrack
(*Zostera marina*, L.)

a, Pistil, with 2 stigmas. *b*, Stamen, alternate with *a*. *c*, Spadix, with stamens and pistils alternating. *d*, Utricle. *e*, Plant, showing leaves and spathe, with spadix removed from latter.

No. 4. Sea Club Rush
(*Scirpus maritimus*, L.)

a, Stamens and pistil, enlarged. *b*, Glume. *c*, Nut, with 6 bristles. *d*, Rootstock, with leaves and sheath. *e*, Flower-stalk, with flowers in cyme or cluster.

No. 5. Sand Sedge
(*Carex arenaria*, L.)

a, Flower, with anthers and glume. *b*, Nutlet. *c*, Flowering glume, enlarged. *d*, Panicle of flowers with fertile spikelets in axils of bracts. *e*, Stem, with sheaths and leaves. *f*, Barren spikelets.

No. 6. Marram Grass
(*Ammophila arenaria*, Link.)

a, Floret, with inner and outer glumes, and stamens and pistil, enlarged. *b*, Section of leaf. *c*, Stem, with sheath, ligule, and leaf showing inrolled margin. *d*, Spike, with flowers, and anthers in bloom.

2 perianth-segments, which are as spiny and as long as the capsule, which is oblong-acute. The dry perianth is regular.

The plant is 4 ft. high. It flowers in August. Sea Rush is perennial and propagated by seed.

The stigma matures before the anthers, and self-pollination is thus rendered impossible. As in the other species of the genus the flowers are pollinated by the agency of the wind. There are 6 stamens, a short style, 3 stigmas, with wart-like knobs all over. The flowers last for a day and a half, the female condition only a day. The flowering is intermittent.

The capsule splits when ripe, and the seeds are numerous and dispersed close to the parent plant, this species growing in clumps covering wide areas.

The plant is a salt-lover, and grows in saline soil, being at the same time a sand plant, and addicted to sand soil.

Sea Rush is liable to attack by a fungus, *Sclerotinia curreyana*. Rushes, maritime and inland, are the resort of numerous Coleoptera, e.g. *Agonium micans*, *A. puellus*, *Demetrius unipunctulatus*, *Quedius semiæneus*, *Crepidodera transversa*, *Cercus rufilabris*, *Telephorus ovalis*; Heteroptera, *Teratocoris Saundersi*, *Mecomma ambulans*, *Cyrtorrhinus caricis*, *C. pygmæus*; Homoptera, *Liburnia venosa*, *L. limbata*, *L. douglasi*, *Livia juncorum*.

Photo, Messrs. Hallett & Garnett

COMMON SEA RUSH (*Juncus maritimus*, Lam.)

Juncus, Pliny, is the Latin for rush. The second Latin name here refers to the maritime habitat.

The roots strike deep into the sand, and a clump forms a regular network or matted mass, and is excellent for reclaiming shifting sands. Hence it has been planted for coast protection with *J. acutus*, &c. The stems are cut down when ripe, and dried like corn, and used for bedding, fodder, &c.

ESSENTIAL SPECIFIC CHARACTERS:

305. *Juncus maritimus*, Lam.—Stem tall, erect, leaves terete, acute, long, flowers in long lax raceme, perianth-segments as long as capsule.

Grass Wrack (Zostera marina, L.)

This is not known in early deposits, though *Zostera*-like foliage occurs in estuarine deposits, but it is found in plant beds in S. Sweden in Gothland. To-day its distribution is around the North Temperate and Arctic coasts. In Great Britain it is absent from the coast of N. Devon, Cardigan, Merioneth, Denbigh, Flint, Westmorland, Dumfries, Berwick, Aberdeen, Banff, Mid Ebudes, but is generally distributed elsewhere, around the coast of other maritime counties, as far north as the Shetlands, and in Ireland and the Channel Islands.

Photo. A. R. Horwood

Grass Wrack (*Zostera marina*, L.)

This is one of the few marine, aquatic plants which grow in salt water at low-water mark, and they are typical of the flora of estuaries, and coasts which exhibit numerous small bays and inlets, especially on sandy and muddy coasts.

The habit is that of a submerged, streaming seaweed. The leaves are grass-like, borne on flattened or nearly round stems, and are long, lance-shaped, wavy, blunt, with 1–7 nerves, bright green, and entire. The first Greek name indicates their ribbon-like character.

The flowers are green, enclosed in a spathe or sheath which is like a hollowed-out leaf, on a long, stout flower-stalk, like the leaves, enclosing a spadix with anthers and an ovary, in two series, opposite, the ovary alternating with the stamens, and stalkless. The capsule contains 1 ribbed seed, and is furrowed, and the seed milky-white. The spadix is not banded and contains many flowers. The top of the spathe exceeds the spadix. There is no extine in the pollen.

Grass Wrack is 1–3 ft. long. It flowers in August and September. Grass Wrack is perennial and propagated by seeds.

The stamens with 2 half-anthers and the carpels with 2 stigmas are borne in two rows on a spadix enclosed in a spathe. The flowers are submerged. The pollen tubes are long thread-like bodies, which float in sea water at any depth, having the same specific gravity. The hairlike stigmas being large and projecting easily catch some of the threads, and are pollinated in this way by water as trees are by the wind.

The fruit is an achene, which is furrowed, and the plant being immersed the seeds are dispersed by water.

This species is aquatic and confined to sea water.

A beetle, *Hæmonia Curtisi*, is found on it.

Zostera, Linnæus, is from the Greek *zoster*, girdle, in allusion to the long strap-shaped, streaming leaves. The meaning of the specific name is obvious.

Grass Wrack is also called Barnacle-grass, Drew, Sweet Grass, Grass-weed, Mallow, Sleech, Widgeon Grass, and Sea Wrack. Another name is Bellware, this plant being the "Seaweed" from which kelp is made.

The leaves are used as manure in Sweden and Holland, and used for stuffing packing-cases, beds, and cushions, being flexible. It is used for the covering of liqueur flasks. It is also employed for thatching, roofs thus made lasting over 100 years. Grass Wrack is also used for packing glass and china.

Essential Specific Characters:—

317. *Zostera marina*, L.—Leaves broadly linear, veined, submerged, flower in spadix, fruit a nut.

Sea Club Rush (Scirpus maritimus, L.)

Found in Neolithic deposits at Southampton docks, like other maritime but Arctic species, this is represented in plant beds of Glacial and later age. It is found to-day in N. Temperate and Arctic Europe, N. Africa, W. Siberia, N.W. India, and N. America. In Great Britain it is found in Surrey, Berks, and Middlesex, on the banks of the Thames, and in Cambridge and Huntingdon, Worcester, Warwick, Stafford, Montgomery, and Perth amongst inland counties, and is absent from the coastal counties of Cardigan and Westmorland, ranging elsewhere; but is not found in Banff and Elgin, S. or Mid Ebudes, W. Ross, and farther north or west it is only found in the Hebrides, and from Ross and Skye it is general elsewhere to the English Channel. It is also a native of Ireland and the Channel Islands.

Sea Club Rush is one of the commonest maritime species, being found more continuously along the coast on sandy shores and in estuaries and salt marshes than any other plant. It is also, like Golden Dock, found inland. It grows above high-water mark on sand dunes, as well as farther inland.

The stem is 3-angled and leafy, from a tuberous root. The stems are tufted, and bear leaves at the base, which are broad, long, and keeled, with channels.

Photo. Messrs. Flatters & Garnett.

SEA CLUB RUSH (*Scirpus maritimus*, L.)

The flowers are borne in a dense terminal cyme or cluster, the spikes being stalkless or stalked, with long leafy bracts. The glumes are smooth, blunt, with a sharp point, divided nearly to the base, and there are 6 bristles. The nut is 3-sided, flattened lengthwise, and shiny.

The plant is 2–3 ft. high. Flowers are to be found in July up to September. It is perennial, and propagated by suckers.

The flowers are pollinated by the wind, bisexual, with similar floral mechanism to the Bulrush.

The fruit is a nut, indehiscent, which falls when ripe to the ground, and is dispersed by the plant itself or by the wind.

Sea Club Rush is a salt-lover, addicted to a saline soil, and at the same time a sand plant, being more essentially the latter than the former.

It is infested by a Homopterous insect, *Paramesus nervosus*.

The second Latin name refers to its maritime habitat, and *Scirpus* is Latin for rush or bulrush.

The plant is called Spurt, Star Grass.

The roots taste sweet, and have been ground and used for flour. The plant is relished by cattle, and also especially by swine.

SAND SEDGE (*Carex arenaria*, L.)

SEASIDE MANNA GRASS (*Glyceria maritima*, Mert. and Koch)

Essential Specific Characters:—

321. *Scirpus maritimus*, L.—Stem cæspitose, leaves numerous, furrowed, linear, spikelets in cyme, many, brown.

Sand Sedge (Carex arenaria, L.)

This common maritime sedge is found in the North Temperate Zone in Europe and Siberia, but not in any early plant beds. It occurs in all maritime counties, except W. Kent, S. Lincs, N. Ebudes, as far north as the Shetland Islands. Inland it is found in Surrey, Norfolk, Suffolk, Ireland, and the Channel Islands.

The Sand Sedge is a familiar seaside species, which is very widely distributed and common on sandy coasts, growing on sand dunes and elsewhere at high-water mark amongst grasses and herbage, and helping to bind it together by its numerous stolons.

From a creeping root, which forms a matted kind of growth over a wide area, the stems are but short, with long, underground trailing shoots lying on or near the surface, curved, 3-sided,[1] and roughish. The leaves are rigid, with the margins rolled back. The bracts resemble the leaves, the lower ones being subfoliaceous and membranous.

The flowers are in spikelets, borne in a terminal spike, with barren upper male flowers, the fertile ones below, many-flowered, crowded, and interrupted. The spikes are flattened at the margin, and pale brown. The nut is brownish in colour, and flat, plano-convex, with 2 ridges. There are 2 stigmas with branched styles. The spikelets are more or less unisexual.

The Sand Sedge is 6 in. high. The flowers are found in June. The plant is perennial, propagating itself rapidly in loose sand, on which account it is used for planting to keep the coast unimpaired.

The flowers are proterogynous, the stigmas ripening first, bringing about cross-pollination, and they are wind-pollinated. The flowers are solitary, and the lower are female, the upper male, and those in the middle are bisexual. There are 2–3 stamens and 2 stigmas.

The nut, a utricle (one-seeded), when ripe falls in the immediate vicinity of the parent plants, being indehiscent, and thus clumps of the plant are formed in course of time. The plant is also reproduced vegetatively to a very great extent.

It is a salt-lover, living in a saline soil, and at the same time a sand plant, requiring a sand soil.

Two stages of the fungi *Puccinia arenariicola* and *P. schœleriana*

[1] Possibly connected with the threefold arrangement of the leaves.

attack this plant, the first stages in each case growing on a Composite plant. This and other Carices are also liable to be infested by *Sclerotinia duriæaina*.

A beetle, *Anthicus bimaculatus*, is found amongst herbage made up of this sand sedge.

Carex is the Latin word for reed-grass or sedge, and the second Latin name indicates its preference for a sandy habitat. It is called Sea Bent and Stare.

The Sand Sedge has been planted on dykes in Holland to prevent the incursions of the sea, and has been used for this purpose on the British coast. From the roots a sort of sarsaparilla has been made in Germany. Sedges have been used as fodder for cattle, for thatch, and fuel. Some species are used like Raffia Grass to tie up vines, or to put between the staves of casks to make them water-tight, and they have also been woven over Florence flasks, or used for chair bottoms.

Essential Specific Characters:—

325. *Carex arenaria*, L.—Stem rough above, soboles long, leaves linear-lanceolate, spike oblong, interrupted, upper spikelets male, fruit ovate, broadly winged.

Marram Grass (Ammophila arenaria, Link.)

This littoral grass is found in the North Temperate region in Europe and N. Africa, not having yet been found in any Glacial plant beds. In Great Britain it is found on the coast of all maritime counties except W. Kent, Gloucs, S. Lincs, Westmorland, I. of Man, Lanark, Perth, Westerness, Main Argyll, N. Ebudes, Ross, E. Sutherland, as far north as the Shetlands. It is a native of Ireland and the Channel Islands.

Marram Grass is a common maritime species, so much so as to form practically an association along the littoral with different species of Agropyron and Elymus. It grows only on sandy coasts, being strictly a sand-lover, as the second Latin name indicates, and frequents sandhills at high-water level, invading the sand dunes inland for some distance. It has been regularly planted in Norfolk for coast protection, and laws regulate its removal.

The stem is tall, erect, stout, rigid, from a creeping root (with numerous tubers), which is matted and binds the sand around its base closely together. The leaves are long, smooth on the outside, rough within, with their edges rolled inward, acute, and bluish-green, with

long sheaths at the base, and the ligule is torn, long, and split into two portions.

The panicle is cylindrical, linear, stouter in the middle. The glumes are long, acute, with hairs a third as long as the palea. The anthers are yellow and linear.

Marram Grass is 2, 3, or 4 ft. high. Flowers may be found in July. The plant is a perennial, propagated by division, and widely planted.

The flowers are bisexual, and pollinated by the wind. There are 3 stamens, short styles, and feathery stigmas. The anthers are yellow and linear.

The fruit is attached to the glume, and is dispersed by the latter by aid of the wind.

The plant is a salt-lover and grows in saline soil, and is at the same time a sand plant, and grows in the sand.

Photo, Messrs. Fiatt

MARRAM GRASS (*Ammophila arenaria*, Link.)

It is attacked by a fungus, *Ustilago hypodytes*, and is galled by *Eurytoma hyalipennis*. A Heteropterous insect, *Chorosoma schillingi*, and a Homopterous insect, *Liburnia boldi*, are found on Marram Grass.

Ammophila is from the Greek *psammos* (= *ammos*), sand, and *philco*, I love, and the second Latin name refers to the sandy habitat. *Marram*, Danish *Markalm* = sea haulm or straw.

This plant is called Bent, Broad Bent, Helme, Marram, Mat-grass, Mat Reed, Signs, Spire, Stare.

On account of the long creeping rhizomes it is used for binding sand together, and has helped to reclaim much land on the east coast. It is both planted and encouraged on the Norfolk and other coasts, having rhizomes 30 ft. long sometimes, which are used as ropes. It is used for thatching. So important was the service it rendered in staving back the advance of the sea that it was held to be penal to

destroy it, laws being framed to prevent its destruction. It has been used for mats (hence the name).

Essential Specific Characters:—

332. *Ammophila arenaria*, Link.—Stem tall, erect, leaves involute, glaucous, long, panicle in spike, cylindrical, glumes keeled.

Hedgehog Grass (Cynosurus echinatus, L.)

This common maritime grass is found in the North Temperate Zone in Mid and S. Europe, N. Africa, and West Asia, but not in early plant beds. The typical station for this species is in the Channel Islands, and it is merely an introduction on the coasts of Great Britain, as well as inland, as it is also in Ireland. In its native habitat this grass grows on the seashore on coasts normally sandy. It has been brought over to England, and is found on the British coast, but in inland stations it has been dispersed with ballast, coming up in waste places, mills, offal yards, and so on.

The stem is erect, with broad, flat leaves, and the plant is in general taller and larger than the Common Dog's Tail Grass. The bracts are comblike, with long points.

Hedgehog Grass has a dense, spikelike panicle which is narrowed, glossy, lobed, and with comblike branches which have awl-like segments, with a membranous edge, and rough. The awns are short, and as long as the palea. The empty glumes are hyaline, or semi-transparent, the flowering ones green.

This grass is 1–2 ft. high. The flowers are in bloom in July. The plant is annual and propagated by seeds.

The spikelets are in a dense panicle and dimorphous. The floral structure is similar to that of other grasses, with 3 stamens, yellow anthers, short and terminal styles, and feathery stigmas. The flowers are wind-pollinated. The anthers and stigma ripen at the same time.

The fruit is light, and easily dispersed by the wind, the glume and palea being attached to it.

The plant is a salt-lover and found in saline soil.

A butterfly, the Small Heath (*Cœnonympha pamphilus*), is the only insect which is attracted by it.

Cynosurus, Linnæus, is from the Greek *cuon*, dog, and *oura*, tail, from the shape of the spike, and the second Latin name refers to its spinous character. The only name cited by Britten & Holland is Cock's Comb Grass.

No. 1. Seaside Manna Grass
(*Glyceria maritima*, Wahl.)

a, Floret, with stamens and versatile anthers, with palea, with inflexed edges, and flowering glume. *b*, Pistil, with 2 feathery stigmas. *c*, Spikelet, with anthers appearing between glumes of upper florets. *d*, Stem, with leaves and sheaths and flowers in panicle.

No. 2. Hedgehog Grass
(*Cynosurus echinatus*, L.)

a, Floret, with ciliate palea, awned flowering glume, and within stamens, with yellow anthers, and pistil with stigmas (feathery); empty glumes below. *b*, Floret, with pectinate empty glumes and spikelet with glumes and anthers. *c*, Plant, with rootstock, roots, leaves, sheaths, and panicle with spikelets and pectinate empty glumes.

No. 3. Rushy Wheat Grass
(*Agropyron junceum*, Beauv.)

a, Floret, with stamens, long filaments, and purple anthers, palea and flowering glume. *b*, Spikelet. *c*, Flowering stem with leaves, sheathed below, and spike with alternate spikelets.

No. 4. Squirrel-tail Grass
(*Hordeum maritimum*, With.)

a, Pistil, with 2 feathery stigmas, lodicules below. *b*, Bisexual middle spikelet with palea, awned flowering glume, and awned setaceous empty glumes. *c*, Lateral floret with awned empty glumes; awns longer than the glume, curved flowering glumes, and rachilla. *d*, Flowering stem, with sheathing leaf and spike, with awned spikelets.

No. 5. Lyme Grass
(*Elymus arenarius*)

a, Bisexual floret, with stamens, pistil, palea, and 5-nerved flowering glume. *b*, Spikelet, with empty glumes, flowering glumes, and anthers half exserted. *c*, Rootstock, with stem and sheathing leaves. *d*, Flowering spike, with spikelets.

1. Seaside Manna Grass (*Glyceria maritima*). 2. Hedgehog Grass (*Cynosurus echinatus*). 3. Bushy Wheat Grass (*Agropyron junceum*). 4. Squirrel Tail Grass (*Hordeum maritimum*). 5. Lyme Grass (*Elymus arenarius*).

HEDGEHOG GRASS (*Cynosurus echinatus*, L.)

SQUIRREL TAIL GRASS (*Hordeum maritimum*, L.)

Essential Specific Characters:—

337. *Cynosurus echinatus*, L.—Stem erect, flowers in dense raceme, the awns as long as the palea, with bristly bracts.

Seaside Manna Grass (*Glyceria maritima*, Mert. et Koch)

(See illustration on p. 211.)

In common with other maritime plants our only knowledge of this grass is obtained from its present-day distribution in the N. Temperate Zone in Europe, N. Africa, Siberia, and N. America. It is found around the whole of the British coasts, except in Pembroke, Cardigan, Merioneth, Denbigh, Lincs, as far north as the Shetlands. It is also a native of Ireland and the Channel Islands.

The seaside form of Manna Grass is a very universally dispersed maritime species, which is typically a salt-lover, and is found almost exclusively on coasts that are muddy or sandy, occurring in the same stations as *G. distans* and various other grasses.

The stem is round and smooth, the root fibrous, creeping, and with long trailing shoots, rooting and leafy. The leaves are acute, with a strong ridge, the margin rolled inwards, with smooth sheaths, and a long blunt ligule.

The flowers are borne on a one-sided panicle, which is branched and narrowed, with solitary or the lower 2-3 short branches, horizontal, sometimes turned down, with a nearly round rachis. The spikelets are 5-flowered and blunt, linear, 5-nerved, the empty glumes subacute. The lower palea is blunt apiculate, rolled inwards.

The plant is about 1 ft. high. It flowers in July. Seaside Manna Grass is perennial, increasing by means of its stolons.

The flowers are pollinated by the wind, and the stigmas mature first, ensuring cross-pollination. The stamens are 3, the styles are short or wanting, and the stigmas feathery, the spikelets being 5, in a narrowed panicle.

The fruit, covered by the glume, is light, and wind-borne.

This Manna Grass is a salt-lover, and grows in a saline soil. It is also a sand plant, and addicted to a sand soil or a dirty loam. A moth, *Epichnopteryx reticella*, is found to infest it.

Glyceria, R. Brown, is from the Greek *glukeros*, sweet, in allusion to the sweet grains, and the second Latin name refers to the habitat (maritime).

Essential Specific Characters:—

339. *Glyceria maritima*, Mert. et Koch.—Root creeping, fibrous.

leaves involute, ribbed, ligule blunt, panicle contracted, lower palea blunt, spikelets compressed.

Rushy Wheat Grass (Agropyron junceum, Beauv.)

This is a common maritime grass, found in the N. Temperate Zone in Europe, N. Africa, and N. America. It is found in every maritime county in Great Britain, except S. Lincs, Westmorland, Kirkcudbright, Linlithgow, S. Perth, N. Perth; but there is some doubt as to what was meant by the name in early days, so that it is uncertain if all the older stations are correct. It is thus found from the Orkneys to Devon and Kent, and in Ireland and the Channel Islands.

The Rushy Wheat Grass is a characteristic shore or sand plant, which helps to form a regular botanical association with Lyme and Marram Grass, all of which grow on sandy shores and cover a wide area, extending from high-water level to some distance inland.

The stems are bluish-green, prostrate below, with creeping roots, then ascending, smooth, with thick leaves, with the margin rolled inwards, hairy on the ribs below, with smooth sheaths, and a short ligule.

The panicle is a loose, stout, curved spike, with 4–5 flowered spikelets, with glumes with 9 nerves, and without awns. The rachis of the panicle is smooth, fragile, separating above each spikelet. The spikelets are distant, glossy, pale, thick, the flowering glumes are slightly nerved, the empty glumes strongly so, and blunt.

The plant is 1 ft. to 18 in. high. It is in flower in July and August. The plant is perennial, propagated by soboles or underground creeping shoots.

The floral symmetry resembles that of Darnel, and both are anemophilous in their mode of pollination, the stigma maturing before the anthers.

The fruit is light, and adhering to the palea, which has keels fringed with hairs, and it is easily dispersed by the wind.

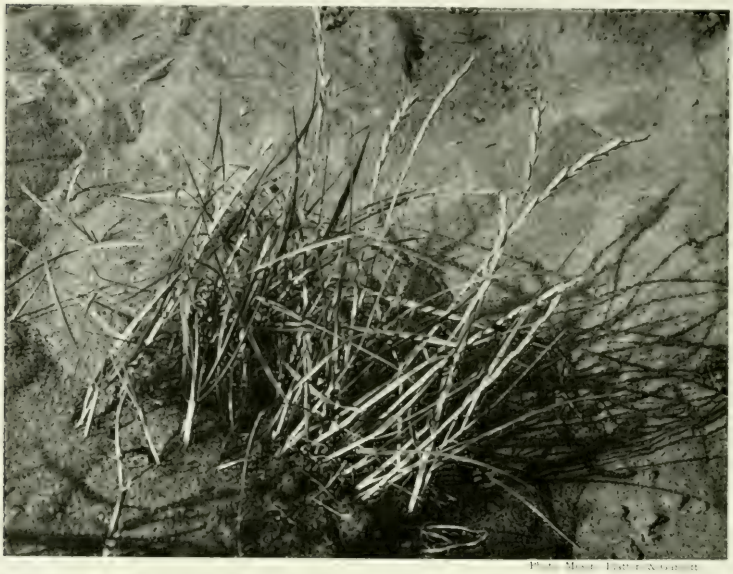
This grass is a halophyte or salt-lover living in a saline soil, and also a sand plant living in sand soil.

It is attacked by a Smut, *Ustilago hypodytes*.

Agropyron, Gaertner, or *Agropyrum*, is from *agros*, field, and *puros*, wheat, and the second Latin name refers to the rush-like or jointed stem. This plant is called Bent, Bentles.

The name Bentles is given to low, sandy, flattish land on the seashore of Suffolk, where nothing but this coarse grass grows. It is

useful in binding the sand together and preventing erosion. It is from this group, formerly included in *Triticum*, that the wheats are derived.



Rushy Wheat Grass (*Agropyron junceum*, Beauv.)

Essential Specific Characters:—

343. *Agropyron junceum*, Beauv.—Root creeping, stem glabrous, prostrate, leaves involute, ribbed, hairy, rachis tender, awnless glumes ribbed, outer palea blunt.

Squirrel Tail Grass (Hordeum maritimum, Huds.)

(See illustration on p. 217)

The distribution of this universal maritime grass is from Denmark southwards, in Europe, and in N. Africa. In Great Britain it is found throughout the Peninsula province, in the Channel province, not in Wilts, only in Essex, and W. Kent in the Thames province, E. Suffolk, Norfolk, Cambridge, W. Gloucs, Glamorgan, Carnarvon, N. Lincs, S.E. Yorks, N.E. Yorks, Durham, southwards to Kent, and is absent in Wales elsewhere, and in the Channel Islands.

Squirrel Tail Grass is another of those maritime species which

on the south and east coast make a characteristic feature of coastal botanical formations, growing on sandy coasts, and invading the inland districts in a few places where dunes abound.

The stems are prostrate, afterwards erect, smooth, rounded, with numerous leaves. The leaves are short, flat, bluish-green, rough, with downy lower sheaths, the upper ones swollen. The ligule is very short.

The flowers are in an erect spike, with 3 spreading spikelets, rigid, with all the glumes rough, and the inner glume of the middle spikelet is egg-shaped, the others are bristle-like, the lateral florets being lanceolate and imperfect. The spike is erect and thick.

The plant is 1 ft. in height. Flowers are in bloom in June and July. Squirrel Tail Grass is an annual, propagated by seeds.

It is anemophilous, and pollinated, like Common Wall Barley, by the wind. The spikelets are in groups of 3 on the rachis, and form a dense spike. Each is 1-flowered when perfect, but the central or two lateral flowers are often male or sterile.

The fruit is light, and adapted for wind dispersal. Squirrel Tail Grass is a salt-lover, and grows best in saline soil, being also a sand plant and addicted to sand soil.

This plant is galled by *Cecidomyia destructor*, *Diplosis flava*, and another fly, *Oscinia tritici*.

The second Latin name refers to its maritime habitat, and the generic name is the Latin for barley.

This grass is called Squirrel Tail Grass and Squirrel Tail.

Essential Specific Characters:—

346. *Hordeum maritimum*, Huds.—Stem and leaves as in 345, glumes asperous, inner of lateral florets subovate, spike erect, nearly round.

Lyme Grass (Elymus arenarius, L.)

Lyme Grass is not found in any early plant beds. It is distributed in Europe, N. Asia, and N. America in the Temperate Zone. In Great Britain it is found in Somerset, Dorset, S. Hants, Sussex, E. Suffolk, Norfolk, Merioneth, Carnarvon, Anglesea, N. Lincs, S. Lancs, S.E. Yorks, N.E. Yorks, Durham, Northumberland, Cheviotland, Cumberland, Ayr, Haddington, Fife, Kincardine, Aberdeen, Banff, Elgin, Easterness, Westerness, Clyde Is., Cantire, N. Ebudes, W. Ross, Sutherland, Caithness, Northern Isles. From Essex and N. Wales it ranges to the Shetlands, and occurs in Ireland and the Channel Islands.

Lyme Grass is a familiar seashore grass which forms quite a feature along the coast. It grows on sandy shores associated with Hedgehog Grass, Seaside Manna Grass, Squirrel Tail Grass, Sand Sedge, Common Sea Rush, and other maritime favourites of the botanist.

The stems are robust, smooth, round, and give rise to soboles or underground trailing shoots. The leaves are broad, rigid, straight, and erect, with smooth sheaths, which are furrowed, with a short ligule.

Photo, Messrs. Flatters & Garnett

LYME GRASS (*Elymus arenarius*, L.)

The flowers are in an upright, dense spike, with 3-flowered spikelets, and downy. The lower and upper ones are in pairs, the intermediate ones in 3's with a flat rachis. The glumes are downy, lanceolate, not longer than the spikelets. The plant is 3–6 ft. in height. It flowers in July. The plant is perennial, propagated by soboles.

Lyme Grass is anemophilous, with spikelets in two rows, 2–6 flowers in each. There are 3 stamens, and the 2 stigmas are feathery and subsessile. The fruit is attached to the palea, and the glume awnless, but readily dispersed by the wind.

The plant is a halophyte, addicted to a saline soil, being likewise arenophilous and found in sand soil.

A fungus, *Ustilago hypodytes*, infests it. Three moths, the Lyme Grass (*Tapinostola elymi*), Shore Wainscot (*Leucania littoralis*), and the Rustic Shoulder-knot (*Apamea basilinea*), are found upon it.

Elymus, Dioscorides, is the Greek word for a kind of millet. The second Latin name refers to the sandy habitat.

The plant is called Narrow Bent, Mother of Bent, Lyme Grass.

As a littoral plant it is valuable in binding together the shifting sands on the sea-coast. It contains a large percentage (30%) of sugar.

ESSENTIAL SPECIFIC CHARACTERS:—

347. *Elymus arenarius*, L.—Soboliferous, stem tall, erect, leaves broad, long, ligule short, spike dense, erect, glumes not as long as the spikelets, downy.

SOME GENERAL HINTS AND NOTES

SECTION II

FIELDS AND MEADOWS

Accessibility of the Meadows.—A meadow or pasture is perhaps for field work the most accessible type or habitat for purposes of teaching botany first-hand. As a rule, in most parts of the country permission need not be obtained for this or any other purpose, if it be a legitimate one, hence the advantage of studying the meadow from this one point alone.

There are generally public footpaths across meadows leading from one place to another, and these can always be used, each district usually having its own footpath maps, which should be secured as a guide to the topography of the district and to avoid trespassing. In general, meadows laid to grass must not in summer be entered, nor those that abut upon woods where game is preserved, and where there are coops with hens and young pheasants.

Care should also be taken to close every gate, as this is a frequent source of annoyance to farmers, as is also the breaking down of fences in going from one field to another. If these precautions are taken few farmers will make any objection to excursions across country, except in areas where game is preserved.

If in any particular district such common rights are not recognized it is advisable to obtain permission, which, as a rule, owners or occupiers will grant for such purposes.

A word should here be said as to the necessity of preserving wild plants, and protecting them from any possible chance of extermination by exercising, in the case of rare species, if it is desired to make collections, great care in picking plants in such a way as not to endanger their chance of perpetuating themselves, and where only a few plants are to be seen none should be picked.

Some remarks should be made as to collecting and observing, but only general directions can be given here. Reference should be made to the author's *Practical Field Botany* (Griffin & Co.) for full details on this subject.

Plants should be collected in a fresh state, and it should be settled beforehand whether they are for study merely or for preservation. As complete a specimen as can be found should be selected, and this should be a typical one without any abnormal characters.

Observations should be made on the spot, and for this reason the pupils should be provided with notebooks, pencils, sketching blocks, squared paper, materials for making maps, callipers for measuring, dissecting instruments of a simple kind, apart from those appliances, &c., that are required for definite survey work if such is undertaken on more scientific lines. For elementary work, of course, fewer and more simple appliances will be sufficient.

Meadows once Common Land.—Originally meadows and pastures were forest lands. Gradually, owing to one cause or another, these forests were cut down. A great part of the land not under cultivation or planted with trees was common land, upon which the countryman could graze his cattle, &c., free of rent or tithe. But gradually these rights of the people, as they were looked upon, were taken from them, and to-day very little common land exists. In some cases these lands were enclosed so long ago as the sixteenth century, but the bulk of the common land was enclosed in the seventeenth and eighteenth centuries.

The significance of the enclosure of land is very important, and is usually ignored in studying the character of vegetation. But upon a meadow or pasture the effect has been profound. Instead of wide stretches of pasture

or meadow we have the squares, rectangles, or irregular areas known as fields, separated from each other or from roads by boundary fences.

In a pasture, particularly, the effect is very marked, and has a tendency to encourage the supremacy of the Grasses and the ousting of the less sturdy, herbaceous, succulent plants. In fact, they are driven to the boundaries or hedges and ditches in many cases, such plants as White Dead-nettle and a host of others not being able to cope with the stronger plants. The planting of hedges with trees at intervals, whilst quite artificial, has a tendency to equalize matters or to preserve the balance, and woodland types find a suitable habitat there. The moisture-loving plants, driven from the open field by over-drainage, can be shown to have found refuge in the ditches.

Where walls and dykes (i.e. deep ditches or streams used as fences) are the boundary fences the conditions of course vary again, rock plants growing on the walls and aquatic plants in the dykes.

To-day it can be shown in each district that there are few heaths and commons left. As a rule, they are the special resort of gipsies. They may also be shown to have a different type of flora to that of the meadow or pasture, which are derived very largely from them. These points made clear will throw a flood of light upon the character of meadow-land vegetation.

The Expansiveness of the Fields.—What will at once strike the observant mind is the open character of meadow lands as a rule, if one ignores the boundary hedges. A stretch of meadows unrelieved by woodland or water appeals at once to one as a great expanse characterized by its openness.

With this broad fact is connected the main character of meadow and pasture plants. They are as a rule sun plants, being on all hands exposed to the heat and warmth of the sun. There are no longer as a general rule trees giving an ample shade above, and the shade plants in the meadows for this reason seek the shelter of the hedgerow, where they can lurk in the undergrowth much as they did formerly when denizens of the forest.

In examining the meadow or pasture some plants will be found that have not yet retreated to the hedge or become extinct, such as Wood Betony, whilst in the hedge itself the Greater Stitchwort may be found. Both indicate woodland conditions formerly. Amongst the grass, or upon banks, mosses and other lowly plants will be found, also, that have survived the conversion of woodland into meadows. The discovery of such relics will provide at least one problem of interest in this direction.

Lowland and Upland Meadows.—The surface of the country, once perfectly level, has become extremely diversified, owing to various causes, such as disturbance of the crust, denudation and river development.

We therefore find that meadows may be lowland or upland in character. The lowlands are characterized by such well-known plants as Meadow Sweet, Great Hairy Willow Herb, &c., whilst upon the uplands grow Dropwort, Lady's Mantle, and many others. As a rule, the plants of the lowland meadows are allied to the marsh plants, and have come to us from the north with the Great Ice Age, or previously, whilst the upland plants are, though at the highest altitude palæarctic types, usually of southern origin.

The vegetation of the upland meadows has an affinity to the vegetation of a hill, but in the last case the flora may be much less disturbed and influenced by cultivation, and in this way the floras are distinct. Altitude can thus be shown to cause great differences in a flora.

Northern and Southern Meadows.—As we travel northwards from the English Channel to the north of Scotland a great change is to be noticed in the character of the meadows and pastures. This is due not only to the difference of soil in the south, a great part of this being made up of chalk, with calcareous pastures dotted with fragrant orchids and many plants not usually seen elsewhere, but also to the difference in climate. For the south coast as a rule is warmer than the Midlands, and the latter much warmer than the north of Scotland. In the south we have southern plants, some of which, such as the Cornish Heath, are allied to the plants found in the Pyrenees.

In the north of Scotland the plants of the Highland pasture are more allied to the plants that are found upon the Alps in Switzerland, where many Saxifrages and Stonecrops, and other cold-enduring plants, thrive even above the snow line. But even in the lowland meadows in the north the plants again are very different, and are known as a whole as Scottish types, though some British types found in N. England also grow there. The rocks also are much older and the soils they form very different.

The southern plants are also known as English types, excluding the Pyrenean types, and are of southern origin. It may be possible to get the pupil to note these facts, when holidays are taken in different districts, by suggesting the drawing up of a list of the plants seen in each district.

Wet and Dry Meadows.—A very few simple observations will enable the pupil to discover that meadows differ very greatly in the relative water content. It will be seen very readily that the influence of a cold clay soil is to make some meadows wet or even water-logged. In other cases the soil may be found to be very dry, and at certain seasons of the year to exhibit a parched appearance, especially in seasons of drought. This would naturally be connected with the existence of a sandy soil. A few rough examinations of soil may with advantage be undertaken to elicit these facts. But the appearance of a cracked surface in summer will very quickly suggest the fact that the soil is a clay.

As a rule, too, the contour of the surface will mould itself according to the distribution of wet and dry meadows, and a connection will be observed between the occurrence of hollows where water will usually lie, and hilly or slightly rounded surfaces where it will run off. So that the difference between soils and the occurrence of hollows and slopes will suggest the division of meadows into wet and dry meadows. Then the plants that are respectively found in each will readily be recognized after a little practice. The occurrence of Clovers and Sandworts, or such very dry soil plants as Mouse-ear Hawkweed, which also grows on walls, will indicate dry soils. The extensive patches of Sedges, Rushes, and Spike Rushes which are found in wet spots will indicate on the other hand wet meadows.

Slope and Aspect.—If the relation of the meadows and pastures to the drainage of the country be studied, it will be seen that streams and rivers are arranged upon a definite system. In many cases the streams may be found to run in parallel series. And between one system of streams and another there may be seen to be dividing ridges which determine the areas of drainage of each system. This will be at once connected with the natural slope of meadows on either bank of the stream. The influence of such slopes may be regarded as the cause of distribution of certain plants at certain points. The aspect of the slopes will be found to have an important bearing again upon the occurrence of a plant, some species preferring a north, south, west, or easterly aspect.

These facts may be illustrated by the drawing up of a list of the plants found to grow on the different aspects. The same thing will be noticed in regard to the banks of a ditch or hedge, and it will be recognized that banks or slopes are the special habitat of some plants, as Ivy, Ground Ivy, &c.

Effect of Grazing of Animals. In addition to the effect of enclosure, which has been pointed out, there is the effect of the grazing of animals. Enclosure has resulted in this case in limiting the area to be grazed or browsed. Consequently the influence of this factor to-day is much greater than in the past. It is readily appreciated in a pasture. In times of drought the surface is almost entirely dried up and parched where animals are in the habit of grazing.

Several effects are produced by all classes of animals. The flowering stems and the later fruits are necessarily reduced in number by the browsing of animals. The normal struggle for existence, it may be pointed out, is thereby also greatly accentuated. For the tenderer succulent plants are liable to disappear, or to retreat to the hedgerow, where they are more or less protected, owing to the possession of thorns and prickles or spines by the Hawthorn, Bramble, Sloe, Rose, and other plants. Such fodder plants as Furze are protected by their needle-like spines. Trees in the hedgerow, as the Elm or Ash, are protected by their hard bark and by the tree habit, which raises the main branches and foliage above the reach of animals that relish the leaves, &c.

Among herbaceous plants, thistles and Rest Harrow are protected by their sharp spines, the Sow Thistle by its prickly leaves. The Dandelion and Goat's Beard possess a bitter juice which is distasteful to cattle as a rule. Some plants, as Alkanet, Comfrey, and Borage, are provided with stiff bristly hairs. The Nettle, found also in fields, which protects the other plants below it, is provided with stinging hairs containing a poison.

The White Dead-nettle has a bristly calyx which may assist it in being protected. Some plants that are poisonous, as Hemlock, grow in fields. This latter has a nauseous smell and spotted stem. The Bittersweet is also poisonous, and the flower a purple colour, with a central yellow cone, which is also a warning sign. The common Buttercups, owing to their acridity and power of blistering, are thus protected.

Grasses and Sedges in meadows are often protected by the sharpness of the leaf margin in the former, e.g. Tussock Grass, or by the triangular sharp-edged stem, as in the latter. These are only a few of the facts that may very usefully be pointed out, or better, discovered by the pupils, in studying the relation of grazing to the meadow or pasture.

Apart from these general features, it may be seen that it makes a great deal of difference what class of animal grazes a meadow. For instance, when sheep are continually grazing it may be noticed that crested Dog's Tail grass,

Sheep's Fescue, and other grasses with sharp or filiform flower-stalks, have the bottom leaves alone browsed, and the flower-stalks are left. Where cows or horses browse such grasses are eaten entirely. Where donkeys are kept in meadows by the sea, thistles and other plants are eaten, whereas inland where donkeys are rarer they are left.

Meadow and Pasture.—Though it is a very well known fact to those brought up in the country that a meadow differs greatly from a pasture, yet the townsman treats both alike as fields, and save at haytime rarely distinguishes them. Even those who are conversant with the country, if not intimate with the methods and practice of farming, are liable to overlook this fact, which is of the greatest importance from the botanical standpoint, as has already been pointed out under other heads.

The essential differences between them should be properly grasped, and then the difference in the flora of each will soon be appreciated.

A meadow is subjected to several different changes during the year. About March the surface is covered with a dressing of soil or manure, and in many cases basic slag is employed. This has a beneficial effect upon grass for a certain time (after which it is deleterious if continually used), but it kills off such plants as orchids.

This dressing is evenly strewn over the surface by a brush- or chain-harrow. The grass is laid between April and June or July. The meadow is then cut after the flowers have all bloomed and seeded, and the Grasses in particular are ripe. It then assumes a sere aspect till it becomes green again, but all its former diversity vanishes until late in autumn. When the new grass has become strong, often yielding a second crop in good years, it may in October or earlier be turned into pasture for the time being.

The pasture may or may not be a meadow originally. And as a rule meadows are periodically turned into pasture, and pastures are allowed to be laid to grass. But as a matter of fact, apart from this rotation, there is usually another reason for the setting aside of certain fields for pasture, and others for grazing, in addition to the general convenience of position upon a particular farm. This is due to the character of the vegetation, some fields being better suited to the one than the other. The reasons for this vary in each area owing to the difference of soil.

Pupils may be set to examine each to discover the differences. As a rule, dry ground is given up to pasturage, and moist ground to meadows, so that one has a natural division into dry pastures, often hilly, and wet meadows, generally lowland.

One feature that must not be overlooked is the greater intensity of the struggle for existence in the pasture than in the meadow, and a good deal of interesting work awaits the pupil in estimating the reasons for this, and in collecting details to explain it.

Cultivation and its Effects.—Subsequent to the cutting down of the continuous aboriginal forests and the making of clearings the country was crudely drained and cultivated. A great deal of this had been already done at the time of the Norman Conquest, for the survey speaks of so many carucates of land, or land under the plough, in each village. And certain parts of the country bear unmistakable signs of this, especially in the Midlands, the land of ridge and furrow. The ridge and furrow was the result of the old-fashioned mode of ploughing, the furrows being the drainage system, the ridge being prepared for the raising of corn.

The boundaries of such fields at right angles to the ridge were termed sillons, and were caused by the necessity of going round the ends, and not up and down alternate furrows as nowadays. These sillons exist to-day, and may be seen to coincide sometimes with present boundaries.

Thus meadow and pasture were once corn land in many cases. Where no such furrows exist the ground may (1) not have been drained and cultivated in early days, or (2) may have been once ridge and furrow and since cultivated recently. In modern cornfields and fields relaid, or "seeds", and fallow land, the ridge and furrow are obliterated. The present system of drainage with pipes is relatively modern, dating usually from the sixteenth or seventeenth century in early cases, but from the eighteenth or nineteenth more generally.

The difference between meadow, pasture, seeds, and fallow should be noted, and lists of plants on each compared. The two last are at first transitional from cornfields with a broken open surface

The effect of cornfields upon the surrounding grassfields should be noticed. It is a neglected feature. The introduction of many cornfield and waste-ground plants into fields is due to the influence of wind blowing seeds, cartage, &c. Where a cornfield is dirty, the surrounding fields will soon be filled with thistles, &c.

Modern Meadow Plants.—The origin of the present meadow plants must be sought in the far past. Apart from the derivation of the vast bulk of meadow and pasture plants in the way described, i.e. after tree felling, cultivation, drainage, enclosure, &c., there were

originally certain areas where trees did not grow, usually at high altitudes or near the coast, where in the distant past the forerunners of the plants of the present open spaces were already evolved.

Some of these belong to those northern plants which were driven south from the far north with the Ice Age, and retreated to the north again, or the tops of high hills, when the country became milder.

Certain of these northern plants are common associates of the wet meadows, such as the White Clover, Red Clover, Meadow Sweet, &c., and many have been found in beds of Preglacial and later ages. In each area the river valleys of a district should be carefully investigated to obtain traces of seeds to determine what was the type of vegetation in each district.

Meadow Habitats.—By referring to the summary of the British Flora, in Vol. V, it will be seen that in addition to the score or more of common plants described in detail in this volume, there are over 150 other British plants that are found in meadows or pastures of one type or another, some being common species, others extremely rare.

In studying this section the opportunity may be taken to treat these other species in the same way as those fully described, in other words to elaborate a short life-history of some of the more familiar ones; and to make notes upon them all.

The Grass Habit, &c.—In studying meadow and pasture vegetation one outstanding feature will soon make itself apparent, namely, the prevalence of what may be best described as the grass habit of the vast majority of the plants that make it up.

An examination of a field will show that the bulk of the plants are Grasses. This will be found out by making a careful survey field by field on lines suggested later. The dominance of the Grasses and the usefulness of the cereals from prehistoric times is one outstanding feature of civilization.

The grass habit has succeeded, along with the tree habit and shrub habit, over and above all other types put together, and the various reasons for this, and its bearing upon plant life and distribution, will afford a great deal of instructive inquiry. The grass habit, in a few words, has been acquired because it enables the greatest number of individuals to survive in the struggle for existence in the least possible space, and at the same time by its peculiar adaptiveness to wide open spaces to occupy by far the greatest area proportionally of the earth's surface successfully.

Attention should be directed to the existence of plants in the meadows with other habits, such as the rosette habit of many Composites, as the Dandelion, &c., the pyramidal habit of others, as Meadow Crane's Bill (inversely pyramidal), and other types.

Diversity and Brilliance of the Colours of Meadow Plants.—A noticeable feature of the plants of open meadows and pastures is the predominance of brilliant flowers, and these are not less remarkable again for their diversity of colour.

Though we cannot definitely say the colours of flowers are brilliant and brightly coloured merely to attract insects to perform, in return for honey or pollen, the much-needed office of cross-pollination, yet the two are obviously connected. It is a fact worthy of notice that the fields are especially the happy hunting-grounds of all manner of insects. Beetles, flies, butterflies and moths, bees and wasps, dragonflies, and all the other less-known orders are fully represented in the life of the meadows. And with the hum of the bees, the drone of the wasp, the buzzing of flies, one notices that the fields are covered continuously with masses of bloom from March to September. Early one sees the lilac Lady's Smock, and later on, the primrose-tinted Cowslip, the golden Dandelions, the golden Buttercups, the crimson Clover, the lovely blue Meadow Crane's Bill. These grow so densely that the fields are one mass of colour. Compare this with a woodland or a lake or a salt marsh, and one is at once struck with the beauty and diversity of the flowers of the fields.

Height of Meadow Plants.—An interesting feature of meadow vegetation is the resemblance it presents to the types of plants to be distinguished in a woodland. These consist of a tree zone, the highest, with a lower stratum of scrub, and the ground flora or lowest stratum. It is probable that the tree type, which usually has a more or less even or level upper surface, has its normal level regulated by the effect of wind, and where the wood is dense by the effect of the close grouping of the ultimate branches.

The lower zones are regulated by the influence of light, and by the adaptation of the plants to the overlying zones of tree and scrub, and, of course, the character of the soil, &c.

The same factors regulate the association of the three tiers in a meadow. The Grasses represent the tree zone, and their height may be largely said to be regulated by the influence of the wind. As a rule, the Grasses are of the same height generally, but there are giants (as amongst the trees) such as Tussock Grass, and dwarfs, as Annual Meadow Grass.

The scrub zone may be said to be represented

by such plants as thistles, which (like scrub) have a more close-set spreading habit than the tree type, here the Grasses. The ground flora is made up of trailers, such as the Yellow Cinquefoil, frequent also on roadsides and banks, and rosette plants, such as the Daisy. In the case of these their close or open character is due to the effect of the two higher zones, or overcrowding and the dominance of sturdier plants, apart from main causes such as soil.

An interesting inquiry may here be set on foot as to the chief plants in each zone, and at different points vertical sections may be made from the highest to the lowest zone to show the relation of one to the others, especially in relation to the amount of light.

The types of meadow along the coast, in the lowlands and in the highlands, on nearly bare rocks or upon thick soils, may be studied in relation to height, and compared.

Flowering of Meadow Plants.—The openness of the meadow as a whole causes the flowering of meadow and pasture plants to be less restricted to certain seasons than in the case of woods where more sun (later in the summer) is needed for fruition, e.g. for bulbous plants. So that on the whole, disregarding the differences in latitude, and their effect on different areas, meadow and pasture plants bloom far earlier than other types. Thus amongst Orchids the Green-winged Orchid is in flower before the Purple Orchid of the woods, as is the Spotted Orchid in front of the Marsh Helleborine, whose moister habitat retards its blooming.

As a whole, most meadow plants are perennials, though some, as Annual Meadow Grass, are annual. As part of the dominant vegetation of the earth this is quite natural, for the perennial has a far greater chance of succeeding than the annual, and the biennial than the annual.

As in all types of vegetation, the flowering periods of certain groups of plants are characteristic of certain months. Thus the Composites are, as a rule, late-flowering, the Autumnal Hawkbit lingering far on into winter even. The Grasses also flower rather late, usually between May and July. But Vernal Grass and Meadow Foxtail are to be found in flower in April. There are also phases of flowering. The spring is characterized by the Lady's Smock and Lesser Celandine, and some early Buttercups and Daisies. Later, the Cowslips, Clovers, Self-heal, Bugle, come on, whilst last of all, the Meadow Saffron revives the touch of spring when the thistles are specially in evidence.

In this connection the pupil may be asked to note all the flowers in season in each month, and compare the lists. Such lists kept each year show whether any season is backward or forward, and lists made in different counties show the range of variation owing to latitude, temperature, &c.

Insects and Meadow Plants.—As has been pointed out, the meadow is the home, as it were, of insect life, and this has a great significance, for by the agency of insects the plants of the meadows are better able to cope with the adverse conditions of existence. For without the advantage of cross-pollination the seeds are not so likely to be fertile.

The brilliance of the meadow flowers and the number of flowers of the same kind make the meadow especially suited to insect life. It is an interesting and engaging occupation to watch the wanderings of any particular insect from one flower to the next, and by practice and study the exact name of the individual insects may be learnt. The experiments of Lord Avebury may be repeated for every type of insect and a study made as to which colours most attract each insect; whether insects fly from plants having a certain coloured flower to flowers of a different colour, and the order of these; and the preference for any particular colour may be noted.

The absence of night-flowering plants and nocturnal butterflies or moths (which are more often found in woods) may be noticed.

Dispersal of Fruits and Seeds of Meadow Plants.—The points first noted, the expansiveness and openness of the meadows, will here again, as in the last section, be shown to have great significance in the life of the meadow plants when the question of fruit and seed dispersal is considered.

Amongst meadow plants there are few, except some of the large Umbelliferæ, and such Composites as Burdock, that have large seeds or fruits. The hedgerow and woodland plants include many that are edible, and devoured by animals, especially birds, and these are heavy, e.g. Acorn; these are external agents.

But the two main external agents amongst meadow plants are the wind and animals, and in the latter case the seeds are not eaten, but catch in the wool or fur of passing animals. Thus the fruits of the Burdock have long hooks which catch in the wool of sheep.

Wind, however, plays the greatest part in the dispersal of seeds of meadow plants; for as a whole the seeds are small, and are thus easily blown away either directly or by some special device adapted to wind dispersal. All the grasses are dispersed in this way, as indeed they are pollinated also, viz. by the wind.

Great Burnet pollinated by the wind has its

fruit dispersed in the same way. The gregarious plants are dispersed usually by the wind. The Composites generally, such as thistles with feathery pappus, the Dandelion and Goat's Beard with their parachute arrangement, disperse their fruit with the assistance of the wind.

The small seeds of the Orchids, those of the Campions, &c., with a sort of "censer" fruit, are jerked out of the capsules by the swaying of the fruit-stalks in the wind. The catapult arrangements of such plants as the Meadow Crane's Bill are devices of the plant itself. Of these the majority are hedgerow plants which, growing in sheltered spots, require such assistance to disperse them to a distance.

Clayey Meadows, Sandy Meadows, &c.—One of the most important factors in causing the distribution of plants is the character of the soil. There are some fifty geological formations which are distributed in different parts of the country, and these are responsible for the different types of soil. Of these there are six or seven, clay and loam, siliceous soils, sand, lime or chalk, humus, peat, saline soil.

The soil of meadows and pastures is of one of the first four types as a rule. Where peat or humus are present the vegetation is usually of moorland or heath type, and by the sea the salt marsh is largely saline.

Where a clayey meadow exists we shall find such plants as the Pilewort and the Cowslip. On a sandy meadow the clovers, especially White Clover, are common. A limestone or chalk meadow is indicated by such plants as Knapweed, Salad Burnet, Cicely, Bur Parsley, Purple Scabious, &c. Lady's Smock, Meadow Crane's Bill, Yellow Rattle, Spotted Orchis usually indicate sandy meadows with some peat and a little lime in the soil, as they are very often members of a marshy type of flora. In saline soils of salt marshes, which are converted into meadows by the sea very often, the Sea Aster, Wild Celery, Sea Milkwort, and many other maritime plants are found.

It will be very useful for pupils to draw up lists of plants found upon different types of soil in meadows and pastures, and to compare them.

Drainage and its Effect upon Meadows.—Not less profound than the effect of tree-felling and cultivation upon the original forest land has been that of drainage. Apart from the conversion of the forests into corn lands by the ridge-and-furrow method which at once disturbed the plant formations native to the soil, the influence of modern drainage has been still more marked by (1) causing wet meadows to become dry, (2) causing bog and marsh plants to disappear, (3) assisting the work of tree-felling and other modern causes in making the whole country much drier as a whole.

The whole of the Fens has been converted in this way during the last two hundred years from aquatic vegetation into meadow and arable land. In other parts unreclaimed land, often swampy, boggy, or waste, more especially in lowland regions, has become ordinary pasture. Many persons living to-day can testify to this, and it is going on at the present time on a grand scale in Ireland.

So that it is only here and there, in areas largely given up to meadows to-day, that it is possible to find any traces of the original vegetation, so many different stages has it gone through owing to different causes. But there do exist what the author has called "vestiges" or "vestigial floras" that help one to understand what the virginal character of the vegetation really was. These are quite isolated and owe their isolation largely to drainage.

General Methods of Survey.—(a) *The Field Itself.*—The author has recently had to undertake the survey of a particular district upon ecological lines, and has found that the introduction of a novel plan of work has been the most productive of results, and is adapted to all classes of workers.

In this system fields are studied one by one. An Ordnance map of the district is procured, and upon this the fields are numbered. In the field the plant-lists bear the same numbers as those given to the fields on the map.

The plan adopted is to make a general survey of the field by considering the abundance or dominance of the Grasses in the first place. The one which is most dominant is put down first in the list, and the percentage may be stated in relation to that of other Grasses. Then the next most common Grass is put down second, and the others in their order, and so on. In a dry field one may have an abundance (75 per cent) of Yellow Oat Grass or Sheep's Fescue; in a wet meadow Tussock Grass may locally be dominant. As meadows are artificial enclosures, the dominance or frequency in one has to be contrasted and checked by that of other fields. (The terms used are abundant, locally abundant, frequent, occasional, rare.)

After the Grasses have been put down, the rest of the plants are noted in order of abundance or by frequency or percentage. When a detailed survey is required, a plot is staked out in squares, and every plant is noted and mapped on squared paper.

(b) *Ditch.*—The examination of the ditches surrounding a field may come next. These are likewise artificial, but may indicate in connection with the type of water (hard or soft) the character of the natural aquatic

vegetation from which they are derived. The ditch is rather too small to treat in the same way as a river or stream, and to show the zonal arrangement or riparial vegetation, floating plants, submerged plants, &c. But where these different types or others (on the basis of *Nymphæa*, *Hippuris*, *Hydrocharis* types, &c.) occur they should be noted. It is as well, if this can be done, to note the absence or presence of Algæ, Liverworts, or Mosses (the last on banks usually), as these also throw a light upon the vegetation.

A list of the plants upon the ditch banks may be made, each bank being kept separate for this purpose. The direction and slope of the ditch, and the character of the soil, should be noticed.

All ditches do not contain water all the year round, and this should also be stated. Some ditches are perennially dry, and many are filled with thorns cut from a layered hedge. The fact that a ditch has been just cleared out should be noted, and it is important to compare the new flora of such a ditch with the result of a former examination. The seedlings that come up will not all live, but all should be observed and put down in the memoranda on the spot. Where bridges and culverts exist, these should be examined. Many lichens grow on the stones or brickwork.

(c) *Hedge and Hedgerow.*—The hedge forms an artificial barrier to the field or division between two ditches and contiguous fields. It serves two purposes in the main apart from the use it has as a boundary: (1) it acts as a barrier to dispersal of seeds, and thistle down will not travel beyond it usually, hence the affinity of some thistles for the hedgerow; (2) it serves, as pointed out already, as a retreat for the shade-loving plants; and we may add (3) it forms a line of distribution by aid of birds, &c., for the dispersal of seeds carried by such agency from one point to another. The hedgerow is thus an important factor in botanical work in the meadow.

The method of survey may be carried out as for woods. The trees, which are mainly planted like the hedgerow, should be noticed in order of frequency. Their influence upon the plants covered by their overshadowing branches should be noted. It is often very marked. The lichen and moss flora upon such trees may be studied by advanced pupils, and the several aspects taken up by each noted. The hedgerow plants may then be noted in the same way. The direction of the hedgerows, as in the case of the ditches, should be stated.

Then the ground flora beneath should be noted, as in the case of the plants in the open field, the frequency estimated, and the plants on the different sides should be distinguished. Where the hedge bank has no ditch its flora will differ from that of a ditch bank.

Climbing plants should be put down separately, and a distinction drawn between the trailing plants in the hedge bottom and the erect types.

(d) *Ponds.*—In many if not most fields there are one or more ponds. These isolated tracts of aquatic vegetation should be studied separately, though as parts of the meadow flora. They are often artificial, but some are natural pools adapted to agricultural purposes.

The plants growing on the banks may be noted first. Then the vegetation around the margin, such as Sedges growing in the water, but sending up erect stems and leaves. Occasionally in large pools there are patches of Reed-mace and Reeds, forming a further type or reed swamp. The floating plants may be studied by themselves, then the submerged and half-submerged types.

The pupil should be on the lookout for such rare plants as *Hydrocharis* or Frogbit, or others that give the pool or pond a special character.

As in the case of ditches, the presence or absence of Algæ and other Cryptogams should be noticed if possible.

See also Section VIII (Vol. IV).

SECTION III

CORNFIELDS

Similarity of Cornfields to Fields.—The cornfield characters are in many respects similar to those of grass fields, meadow, or pasture. Within the term cornfields are included all types of arable or cultivated land which are subjected to the plough, a factor which is of the greatest importance. For this mechanical instrument alone causes all the difference between the close grass of the meadow surface and the open broken ground of the cornfield.

The first characteristic common to ordinary

fields and cornfields and allied cultivated tracts is their accessibility. At least the margins of such fields usually grassed over may be examined.

They were once like meadows occupied by woodlands, and in many cases common land. Their expansiveness is similar (though they are less continuous) to that of meadows. The cornfield plants are sun plants, though the ground flora, as in meadows, is obscured by the higher zones. This is one of their most marked characteristics. As in the case of meadows, some are lowland, some are upland, but few range above an altitude of 1000 ft., whereas meadows occur at higher levels.

The Impermanence of Cornfields.—There is a marked contrast between the longevity of the meadow and the cornfield. In the former there is but a slight disturbance of the main conditions when a meadow is converted into pasture, or vice versa. But in a cornfield there is the yearly ploughing, harrowing, sowing, drilling, rolling, hoeing, cutting, reaping, and harvesting, and a repetition of this process for the next crop.

It is important to remember that the plants of especial interest to the botanist in a cornfield are treated as weeds, and are there on sufferance, their eradication (total or partial) depending upon the diligence or laxity of the farmer. In the meadow no such artificial selection or division into weeds or crops takes place, if one excludes thistles and a few other plants that are distasteful as hay, or useless, e.g. Yellow Rattle. Hence one reason for the ephemeral character of the denizens of the cornfield, or colonists as they are called.

Another equally important factor in regulating the permanence of the cornfield flora is the rotation of crops, of which more is to be said later. Owing to the exhaustion of the soil by certain crops of a highly-specialized character, such as wheat, the plants that grow in cornfields are rendered unstable, because each different type of crop brings with it in the sowing, and by reason of the different method of tillage, a different set of weeds.

A further reason for the short life of cornfield plants is the possible return of arable to pasture or fallow. All these facts should be studied in detail.

Cornfields and Woodlands: some Similarities.—In describing the tiers of plants in a meadow attention was drawn to the analogy between this and that noticed in woodlands. An even more marked similarity exists between this arrangement of crops and other plants in a cornfield pure and simple and that observed in woods. In this case the tree zone is represented by the corn itself and those giants of the cornfield, such as Corn Cockle, Corn Sow Thistle, &c., which tower above their fellows. This, of course, obtains only in the summer, when the stalks are tall and close set. They provide an ample shade for the lower zones of plants.

Intermediate between the tree zone and the lowest zone (ground flora) is a middle zone, comparable with the scrub of the woods, which consists of such medium plants with a widespread pyramid habit as Corn Buttercup, or the later Fool's Parsley. These have narrow leaves, adapted to growth amongst close, erect plants such as cereals, an adaptation not noticed definitely so far. Below come the trailers, dwarf plants, such as Scarlet Pimpernel, and short erect plants (with linear leaves) as Least Spurge. Rosette plants, as Great Plantain, are found like the Daisy covering the surface. There are some climbers, too, as Corn Bindweed or Small Convolulus.

Denizen and Colonist Flora.—The plants which are found in cornfields are a motley assemblage. Some are pure aliens and of merely sporadic occurrence, as Larkspur, Gold of Pleasure, Venus's Looking Glass. Charlock is a denizen. Corn Buttercup, Red Poppy, Fumitory, Candytuft, Corn Cockle, Venus's Comb, Corn Marigold, Cornflower, Snapdragon, Wild Oat, and Darnel are colonists, which were defined by Watson to be weeds of cultivated land, by roadsides or about houses, only existing here as long as human agency provides suitable conditions. The denizen is apparently indigenous, but liable to some suspicion of having been originally introduced by man, as the Horse-radish and Melilot. The alien plants are certainly or very probably of foreign origin, though now more or less distinctly naturalized, as among trees the Sycamore and the Bird Cherry. The casual was accidentally imported or strayed from cultivation, not truly naturalized, and generally unable to maintain itself from year to year, as the Caraway, and perhaps Larkspur.

Native plants are believed to be truly aboriginal species, and amongst cornfield plants perhaps the following are native: Scarlet Pimpernel (this grows also in woods and on shingle), Corn Gromwell (Common Gromwell grows by the roadside), Hemp Nettle, also a wayside plant.

The Limits of Cultivation.—Several reasons determine the limits between which cultivated plants will grow and thrive. These in general are similar to those which regulate the distribution of all plants, but they apply in a more marked degree. For the cultivated cereals,

and most of the cornfield weeds, are essentially southern plants, hence they will not grow where northern plants are quite at home.

Soil, altitude, and climate are the three essential factors for plant growth; the first is especially important in determining the distribution of cereals. The best soil is a loam or clay, with some proportion of silica or sand. Calcareous soils and marl, which contains up to 25 per cent of lime, are also suitable. Sandy and siliceous soils are in general too dry or close, or barren in alumina. Rocky districts, such as those of Scotland, and high hills in England and Wales, are better suited for oats, but even here this crop does not flourish beyond a certain altitude. The limestone massifs of the Pennine Chain are also too bare and lacking in deep soil for cereals.

Altitude, however, governs the distribution of cereals mostly, for with increase in altitude there is increase in rainfall, and this is deleterious. Watson established a zone, the Agrarian zone, up to 1000 ft., above which cereals do not usually grow well. Climate, again, has the same effect as altitude, and for this reason the south and east of England and Scotland are best suited for cereals. The N. and W., and the whole of Ireland, are too moist and wet as a whole.

Arable Land Mainly Confined to Lowlands.—Apart from the limits of cultivation owing to altitude, there are some considerations which tend to confine the distribution of the cereals, and hence cornfield plants, as a rule, to the lowlands.

In the first place the lowlands as compared with the highlands are far more easy to cultivate. For in the plains the surface is more level, and ploughing and kindred operations are less arduous, though the slopes of many uplands, as on the chalk, are often given up to cereals. But on the chalk as on other hilly tracts the soil, owing to denudation, rain wash, &c., is very shallow, and the ground becomes more and more stony the more it is tilled. Hence the lowlands offer better conditions, for almost universally they possess a deep soil.

Another and very important reason is that the lowlands as a rule are more closely connected with the main systems of railway, canals, &c., and transit is easier.

Another reason is the better drainage of the lowlands. River systems form a natural drainage for the plains, and artificial drainage also is more readily applied, being impossible in the uplands, save for the natural fall of the surface waters by gravity, its distribution and direction being difficult on hill slopes, as the occurrence of springs shows. In valleys, too, there is a natural alluvium, and the river gravels, which are especially suited to light and early crops, are made use of by the agriculturist who knows the local geology.

Difference between the Plants of the Hedges and Furrows.—The cornfield as a complete whole is a composite type of vegetation. Apart from the portion of each field under cultivation, there is usually a grassy strip along the borders, varying in width according to circumstances, and in some cases as extensive as the grass rides in a wood. Beyond this zone or border comes, as a rule, a ditch with banks on either side. Then there are also the boundary hedges in most districts, or in some areas dykes or ditches alone, with no other boundary, and in the north of England, Wales, and Scotland, stone walls.

Each of these extensions or limits to the cornfield is of particular importance in studying a cornfield flora, and special attention should be devoted to them. For not only do they form a transition from the grass-field type of vegetation upon which they abut, but they also serve in the case of the grass fringe to stabilize the cornfield flora, and in the case of the ditch and hedge to retain certain of its constituents. The weeds that can subsist under such conditions (more intense than on the open ground of the cultivated area) are thus selected as the dominant and sturdier types, e.g. White Campion and Hemp Nettle.

The Affinity of Cornfield Plants for Waste Ground.—The soil conditions of the cornfield exhibit a striking similarity to those of the waste place and kindred habitats. It might be in some ways better to combine the two. But there is in the first place a greater similarity between the character of the meadow and the cornfield, the origin of which is the same; and in the second place there is a marked difference between the character of the cornfield and all cultivated land, and that of the waste place. For in the former certain definite operations are continually going on which are responsible very largely for the associated cornfield wild plants, whilst the very nature of the waste places, and the absence of any such operations, renders such habitats entirely lacking in the chief characteristics that distinguish cultivated land from all other types.

None the less the essential connection between many descriptions of waste place associated with farming causes the flora of the two to be essentially similar. For there is, in the first place, a continual carting of materials from the cornfield to stackyards and similar storage areas, when seeds are being continually dropped or dispersed, so that their range

is extended. In the second place, waste ground is usually broken and open, and thus suited to the colonization of plants derived from cornfields. In the third place, the origin of the waste-ground plants, such as aliens and casuals, is essentially the same. They have been brought from elsewhere by the same agencies.

The Grass Habit in the Cornfield.—If the growth habits of the plants are studied it will be seen that though there are three zones of plant societies, as in woods and meadows, and though several types of habit may be distinguished, yet, considered generally, a dominant habit is resolved from the manifold conditions of the cornfield which is in all particulars analogous to that of the chief characteristics of meadows and pastures. This is the grass habit.

The cereals themselves are Grasses, and are associated, like meadow-grasses, in close rank. It is one feature of a cornfield that it should make for this manner of growth in order that there may be the greatest possible result in the least possible space, and the exact balancing of the conditions most favourable to attain this end.

Consequently this factor has the most profound effect upon the associated cornfield weeds. All the plants that may be said to belong to the tree type or zone, such as Gold of Pleasure, Flax, Corn Cockle, Chicory, Corn Sow Thistle, are of the grass habit more or less. Many, too, in the two lower zones (scrub and ground flora) adopt the same habit, as Spurrey, Shepherd's Needle, Lamb's Lettuce, Mousetail, &c.

Absence of Brilliant Colours in the Cornfields.—One usually associates a cornfield with masses of scarlet poppies or sulphur-yellow Charlock. In favoured localities a touch of puce or magenta is lent by the Corn Cockle, but this plant seldom grows *en masse*, and the same may be said of the Cornflower, which like the last is dying out of the cornfield. On rich red soils the Corn Marigold may here and there contribute a golden glow to the cornfield.

These, however, are the jewels of the cornfield, as the buttercups and lady's smocks and red clovers are in the meadows. As a whole we may indeed regard the cornfields as devoid of brilliantly-coloured flowers. Many are white, or nearly so, such as Candytuft, Heart's Ease, White Campion, Spurrey, Shepherd's Needle, Fool's Parsley, Lamb's Lettuce, Blue Sherardia (pale lilac), Corn Gromwell, Hemp Nettle (white or pink), and a number apetalous.

This may be connected with another factor which is characteristic of the cornfield, namely, the inaccessibility of the cornfield plants to the insects that visit, as a rule, the brilliantly-coloured flowers.

Late Flowering of the Cornfield Weeds.—The majority of the cornfield plants do not flower so early as those in the meadows. There are, of course, as in all different types of vegetation, natural or artificial cycles of flowering. For each month is characterized by the flowering of some particular species, whilst locally some are perennially in flower, e.g. Shepherd's Purse, Groundsel, White and Purple Dead Nettle, and in the cornfield the Heart's Ease also. Some of the Speedwells are also in bloom nearly all the year round. Blue Sherardia flowers as early as March, and as late as November.

The earliest-flowering cornfield plants include Mousetail, Ivy-leaved Speedwell, Heart's Ease, Lamb's Lettuce (April). In May Corn Buttercup, Fumitory, Charlock, Venus's Looking Glass, Field Bugloss, Corn Gromwell, begin to flower. The majority appear in June, which is somewhat late compared with the season for flowering in other habitats. Such are Larkspur, Poppies, Candytuft, Charlock, White Campion, Corn Cockle, Spurrey, Flax, Alsike Clover, Shepherd's Needle, Corn Marigold, Bluebottle, Scarlet Pimpernel, Wild Oat, Darnel. Several of these continue till September, e.g. Alsike Clover, Cornflower, Scarlet Pimpernel. Still later in flowering are Fool's Parsley, Corn Sow Thistle, Small Snapdragon, Common Hemp Nettle.

The reason for this late flowering is the disturbance of the ground in February and March.

Annual Character of Plants.—One feature of the cornfield is its ephemeral character. This lack of permanence of conditions makes itself felt upon the plants associated with the corn itself. It can hardly be otherwise. For the time which elapses between one ploughing and the next precludes the continuity of the bulk of the plants in the cornfield beyond one season. Thus all but three of the plants whose life-history has been described in detail are annuals which must germinate in March and April, and flower and fruit from June till September.

This indeed is the only adjustment that can be made, and it is owing to their annual character that nearly all the cornfield plants bloom so late. White Campion (June to July), Alsike Clover (June to September), Corn Sow Thistle (July to August), are three cornfield perennials that grow in cornfields.

Two others, Cornflower and Blue Sherardia, both of which flower up till September, may be annual or biennial. So that there seems

to be a tendency for the plants to struggle towards perennial habits.

Relative Absence of Insects.—Emphasis has been laid upon the close ranks of the corn itself and the struggle of the plants towards the light. The cornfield is indeed extremely inaccessible for all classes of animal life; attention should be drawn to this aspect, and lists of animals noticed drawn up.

It is true that one may find a good many insects and other small animals in a cornfield especially associated with the ground flora, where beetles, spiders, and myriapods are not uncommon. Often one may see butterflies soaring over the cornfield, but few of them settle, and the food plants of their larvæ are not usually cornfield species.

The night-flowering Catch-fly and the White Campion are exceptions to this rule that plants depending on Lepidoptera are absent from the cornfield. Cross-pollination by insect agency is on the whole rare.

Difficulties of Natural Seed Dispersal.—The groups of plants found in cornfields are as a whole deficient in adaptation for seed dispersal by animal agency; for except the Field Bugloss, Corn Buttercup, and Wild Oat, there are none which are likely to catch in the wool or fur of animals.

Only a few have special devices of their own apart from the external agency of the wind for dispersal to a distance, such as Shepherd's Needle and Heart's Ease. The seeds of Gold of Pleasure and Corn Gromwell may be eaten by birds.

A large number are dehiscent, dry fruits, which split open when ripe, as Charlock and Larkspur, and the Scarlet Pimpernel has a special type, or pyxis, with a lid which opens when the seeds are ripe. The bulk of the plants have fruits of the pepper-box type, as the Poppy, or censer fruits, which scatter their numerous small seeds, when the wind jerks the flowering stems, around the plant itself. In a high gale they may be driven some distance. A few, as Corn Sow Thistle, have a feathery pappus which assists in their dispersal by the wind.

The closeness of the cornstalks, by its shielding effect, rather counteracts the action of the wind. And the seeds of the majority of the plants are thus as a rule scattered over a small area. Hence the patches of the same plant in a cornfield in addition to the even dispersal of most as a result of harrowing, &c.

Man's Agency.—In a cornfield one is met at every turn by artificial agencies. Not least is the direct intervention of man causing the distribution of cornfield weeds. The cultural operations themselves are so far-reaching that there is very little scope for any other natural agency in the matter, except that of the wind, which may not only disperse the seeds in one cornfield over the whole area, but also cause dispersal from one area to another.

The operations of preparing the ground for corn are not in themselves selective so far as the dominance or otherwise of the plants associated with corn are concerned, though indirectly they are so, as has been shown. But there is a direct influence upon the weed flora when weeding is undertaken, as in clean fields it always is. In this case the farmer or his men exercise a good deal of personal discrimination as to what plants are to be specially eradicated and what may with advantage be left. Thistles are of course exterminated where possible, and so are such Grasses as Couch Grass. The Corn Buttercup and Charlock also are regarded as special enemies of the farmer, and in some areas the Corn Marigold has been laid under the ban, and a royalty paid upon its eradication. Such poisonous plants as Fool's Parsley and Darnel are harmful for wheat-growing purposes, and are also exterminated wherever they occur. Hence the character of the cornfield flora must be regarded as largely dependent upon man himself.

Easier Struggle for Existence.—There are two distinct features of the cornfield that are compensative in effect in relation to each other. The struggle of the cornfield weeds amongst the corn towards the light has already been emphasized, and this may be said to mould their characters more than any other factor. The difficulties that cornfield plants have to contend with in this connection are very great; and they would be even more so if the plants were perennial, and under necessity of storing up reserves to help them over the resting season and to make a fresh start in spring. But this duty is not required of them. Hence the light requirements are not so vital as might seem to be the case.

If this were so, however, the plants have not to struggle for their existence against overcrowding or lack of nutritive elements derived from the soil, for the latter is open and not thickly colonized, so that the intensity of the struggle for the light is directly counteracted by the favourable conditions in the soil. This is shown by the luxuriance of such plants as Red or White Dead Nettle growing in a turnip field, compared with their growth in a cornfield, and Selfheal is a good example of the same kind of thing. Wall Speedwell, which sometimes grows in a cornfield, is much more luxuriant than when growing on a wall, and

so is Creeping Speedwell, which grows usually in meadows.

Effect of Dressing, &c.—A cornfield or allied cultivated tract is unique amongst botanical habitats in the fact that the soil is enriched each year with some form of manure or dressing. Normally no other type of vegetation receives the same type of dressing. Humus accumulates in a wood or hedge, and as a thin layer in meadows, whilst peat and humus (thick) play a great part in moors, bogs, and heaths. But though these are organic soil renewers, they do not resemble in effect the artificial dressings in the cornfield.

The direct result of such manuring is to cause the plants (weeds included) in a cornfield to present generally a robust, well-matured appearance. They are usually luxuriant and in marked contrast to similar or allied species growing elsewhere. The peat or humus-loving plants are not represented as a whole in the cornfield flora, and most of them are fond of clay, sand, or lime, and these soils are improved by the addition of manure in one form or another. At the same time there are some plants that dislike dressing, and will not grow under such conditions. The discovery of the requirements of plants in this respect will be an object for inquiry here also.

Effect of the Soil.—The conditions required for the effective growth of a cereal crop are light but fertile soils, which are dry and warm. The soils that furnish these conditions are mainly sandy loams, clayey loams, and calcareous soils. Rocky, too sandy, or siliceous soils do not give a deep or rich soil. Heavy clays are also unsuitable. Marls are, however, well suited for cereals.

These conditions are not always found in the soil itself without cultivation or improvement, hence the plants that would naturally come up in a cornfield are not always to be found on the soil, but are replaced by others, that may be introduced from elsewhere. But in some cases the weeds that are common to the district are able to adapt themselves to the altered conditions, and where a sandy soil is improved by the addition of lime, plants that prefer the former may still linger, and where the latter is the principal natural soil the addition of loam may not affect the lime-loving plants.

As a rule, the cornfield plants are those that grow naturally upon a sandy soil or a sandy loam. A few such, as the Hemp Nettle, are lovers of clay as well. A fair proportion are characteristic of limestone or chalk areas, such as Larkspur, Candytuft, Flax, Venus's Looking Glass, Small Snapdragon. Some are able to subsist on either, as the Red Poppy, Shepherd's Needle, Fool's Parsley, Lamb's Lettuce, Cornflower, and Blue Sherardia.

Dry-soil Types.—The preponderance of the sand plants in cornfields owing to the conditions required by cereals, such as lightness and dryness of soils, is a well-marked feature, which is explained by the processes to which a cornfield is subjected in fitting it for cultivation.

The transition from the damp conditions of the woodland to those of a meadow is less great than from those of a meadow to those of a cornfield. It is true that the cutting down of trees has a great effect upon a district in making it as a rule much drier, and a meadow also has usually been drained before it is used for pasturage, &c.

In a cornfield, however, these conditions have been already fulfilled before a further stage, that of cultivation and better drainage, with yearly ploughing, is attained. These last factors tend to make the soil very much drier, and owing to this a cornfield is the extreme stage towards dry-soil conditions, which in a meadow are not nearly so well marked. The shielding of the lowest zone of plants amid the corn in mid and later summer does not prevent the free access of the sun to the soil and the rapid evaporation of the surface moisture.

Consequently, as would be expected from the natural predilection of the great majority of the plants for sandy soils, the plants in a cornfield are mainly xerophilous or dry-soil types. There are, in fact, few if any of them, except perhaps Corn Sow Thistle and Mousetail, that will grow in a moist habitat. White Campion is intermediate in this respect.

Methods of Survey.—The mode of examination of a cornfield flora differs very little from that of a meadow or pasture, except that the cereal itself supplies the dominant plant.

Proceeding to examine the cultivated area first of all, it may be pointed out that Grasses have been artificially eliminated, and therefore the best means of studying the flora is to take each tier or zone by itself, and to estimate the dominance of the several plants that make up each zone. In some fields Creeping Thistle will be dominant in the zone corresponding to the tree zone, with Corn Sow Thistle proportionally next so.

In the intermediate zone, if the Creeping Thistle does not occupy this, we may have Corn Marigold, Charlock and Corn Buttercup may come next. In the ground flora the dominant plant may be Ivy-leaved Speedwell, early in the year, and Scarlet Pimpernel later.

Mousetail grows sporadically in the furrows rather than in large societies. The vegetation of the borders, especially the cornfield plants,

should next be studied as in a meadow, since Grasses are here allowed to grow. The ditch and hedge should be also treated as in the case of a meadow or pasture, the definite occurrence of cornfield plants being especially noted.

SECTION IV

THE SEA-COAST

Zonal Character of the Coastal Vegetation.—The vegetation of the sea-coast differs from every other type of vegetation in that it is entirely restricted to the junction of the sea with the land. This causes at once a more or less uniform altitude, the sole difference in this respect being defined by the rockiness or otherwise of the seaboard. Thus the maritime plants are at once confined to a fringe along the coast of little extent, rarely encroaching inland more than half a mile, or a little more where salt marshes, which are secondary products of the coastal vegetation, are concerned. It is, in fact, the marginal action of the sea, with its saline waters and peculiar deposits, that determines the formation of maritime vegetation.

There are two limits to the action of the sea, high-water mark and low-water mark, and as regards flowering plants these have little or no effect upon distribution. It is on the deposits thrown up and conserved above the high-water mark that the maritime plants are especially found, and these form the first zone, which may in the case of a low shore line be of sand or shingle. Where there are cliffs lashed at high tide by the sea there is a single zone, the rocks and cliffs. But on a low shore there are usually parallel with the first sandy shore or shingle beach dunes of æolian origin, whilst a third zone is constituted by the salt marshes on the landward side of the dunes, though these may not everywhere be present, nor are dunes always developed on a low shore. To leeward of the salt marshes there may be a second line of dunes, and then inland vegetation. There are normally three or four zones of vegetation on the sea-coast.

Absence of Trees on the Sea-coast.—One feature of most maritime tracts is the almost universal absence of trees. This is due to the regular occurrence of sea breezes and land breezes, which constantly subject the coast to unusual wind force, so that trees are unable to flourish except in a dwarfed state, and generally have their branches blown landwards. The exposed nature of the sea-coast also, apart from the wind, contributes to the absence of trees. Another reason is the character of the soil, which is saline, and usually of coarse texture unsuited to tree growth.

The fact that along most coasts there are relics of ancient submerged forests does not denote that the maritime border was formerly more suited to such conditions, but is an indication of the great amount of submergence or sagging that has occurred. Such forests were originally not only above the sea-level but a good distance inland. The maritime formations are thus without any native forests of their own. From this cause there is generally a relative absence of humus in the soil, except in the salt marshes where semi-marine peat is formed.

An exception must be made to the foregoing general rule in the case of sheltered coves and estuaries, as in Devonshire, Somerset, &c., where trees grow down to the sea margin, at any rate on rocky coasts. There are some shrubs that are characteristic of the sea-coast, such as Tamarisk, Sea Buckthorn, Cotoneaster, and Elder is in many places common, as also the Tea Plant.

Exposure of the Sea-coast.—Except upon lofty hills and mountains no type of vegetation is so much exposed as that of the sea-coast. It is this factor which causes the vegetation to have so distinctive a character, not only as regards height and form, but also in regard to its physiological adaptation to dry conditions. One reason of this exposed character is the relation of the sea to the land. The maritime zones are constantly being exposed to the land and sea breezes, which set up regular air currents periodically. The general absence of trees or of shrubs thus subjects the ground vegetation to the influence of the wind and the other factors.

The winds which blow to the land bring with them salt, which accumulates upon the coastal vegetation, and for this reason the maritime plants are halophytes, or plants adapted to soil in which there is a large proportion of chloride of sodium, as well as some bromides and iodides.

There are also frequent sea-mists, which may be distinguished in this connection from the normal landward breezes, since they do not possess much force, but are characterized by their saturated condition. To these sea-mists may largely be attributed the high percentage of saline matter in the coastal sands, shingles, and salt marshes. Frequently also sand storms are set up which have several different effects, such as the burying of the plants in sand, and the erosion by sand blast of those that are exposed.

The waves also are powerful factors upon the sea-coast, exposing plants to destruction by the erosion of the coast. They also, in the case of land to the leeward of dunes or shingle, have a beneficial effect by making the conditions saline. It is usually when there are gales that such occurrences take place. Thus many factors contribute to the exposure of the sea-coast.

Erosion of the Coast.—One of the most marked features of the present conditions so far as the sea-coast is concerned is the erosion of certain portions of the east and south coasts, and to a far less degree of the west and north coasts.

Whilst there has been accretion or addition to the coast in some areas erosion has been going on from time immemorial. So long ago as the Roman period the Wash area has been protected by banks in order to prevent the farther advance of the sea.

The sea margin is in fact continually changing. Generally speaking, however, a distinct difference exists between the west and north coasts and the south and east coasts. Along the former there has been little destruction, and some addition, whilst on the latter there has been almost generally a depletion of the land, with some exceptions.

This is due to the fact that the older and harder rocks are mainly found on the west and north, whilst the newer and less resistant rocks are found on the east and south. The occurrence of hard rocks, however, such as the chalk, locally, on the east and south coast, as in Yorks, Norfolk, and Sussex, causes the coast to preserve its contour intact, whilst alternating soft bands, often where river estuaries occur, are the areas where the coast has been destroyed. Along the east coast, however, there is a drift of shingle southwards to the Thames, so that some parts are preserved, or there may even be some accretion, as at Blakeney and Lowestoft, and along the Essex coast.

West and East Coasts.—As one passes from the west of England to the east one is struck by one important feature at least, apart from the difference in the character of the coast, the one rocky and elevated, the other flat. For owing to the beneficent influence of the Atlantic Drift, which flows to the west of Ireland, and is felt in the St. George's Channel, the temperature of the west coast is much higher than that on the east coast. This of course makes the west coast much moister or more humid. The hills are nearer the west than the east coast, hence the rainfall is again much heavier in the west than the east.

On the east coast the climate is cold; winds reaching the coast from the Atlantic are already deprived of their moisture, and the easterly winds from the Continent are dry. The east is much drier as a whole, therefore, and there is much less rain.

In South-west Ireland the temperature in winter is like that of the Mediterranean. The coldest area is in Central England northwards to Scotland. The rockiness of the west and south coast is another factor. Hence we have on the west coast rupestral plants such as Welsh Poppy, Thrift, and Scurvy Grass, on the muddy sandy east coasts Sea Lavender, Sea Kale, Saltwort, &c.

All these factors—higher temperature, more humid conditions, and a rocky substratum—cause the western plants to differ from the eastern, as may be illustrated by lists of plants from each. The same applies largely to the north and south coasts. The western plants are Atlantic types, the eastern Germanic.

The Limitations of Seaside Vegetation.—There are one or two features of maritime regions, so far as the British Isles are concerned, which influence the vegetation they support that ought to be pointed out, as they are peculiar to this type. In the first place, as briefly mentioned, the coastal border is near the sea-level. The temperature therefore is more or less uniform, and were it not that there is a marked difference on the west to that on the east, and relatively between that on the north and south coasts, the effect of altitude would be negligible in this case, and the sole influence upon temperature would be owing to latitude.

As a whole the altitude at which maritime plants grow, except a few inland types, as Thrift, Sea Plantain, and Scurvy Grass, varies between 1 and 100 ft., so that all the plants are of the ascending type, though they do not actually encroach upon other types owing to the necessity of saline conditions in the soil and the restriction of this to the sea border. Another feature is the generally uniform aspect of plants on each of the coasts north and south, east and west. Each seaboard is more or less restricted to certain classes of wind,

even if the uniform land and sea breezes were not equally influential in this respect.

Again, the sequence of changes from one type of maritime zone to another is quite definite, and there are few sea-coast types that are to be found inland under other conditions, except some Grasses (as Seaside Manna Grass), Buckshorn Plantain, Woad, and Centaury, and these are chiefly sandy-soil types. The vegetation of the sea-coast is thus as a whole more or less specialized, and does not grade into inland types. This is an important feature upon which due emphasis should be laid. The occurrence of many inland plants on the sea-coast on the contrary is an equally noticeable feature, e.g. Scarlet Pimpernel on shingle, &c.

Composite Types of Seaside Vegetation.—The title of this section may seem paradoxical compared with the last. But whilst the conditions of vegetation are limited to certain types, the types met with upon the sea-coast are sufficiently diverse or composite. Thus there are sandy tracts of sea-coast, and others that are muddy. There are the mouths of estuaries, and alluvial flats or warp. There are again stretches of shingle with peculiarities of their own. Where rocks bound the sea-margin there are diverse types of soil derived from each type of rock. There are the special types of sand-dune, usually mobile, unless well stabilized by dune plants, such as Lyme Grass or Dwarf Willow, as in Anglesey.

There are again open or closed bays with brackish water in which Grass Wrack, *Naias*, and *Ruppia* grow, with characteristic brackish-water Algæ and Mollusca. The salt marshes finally form another type, and one with very marked characteristics. In addition to these genuine maritime plant-formations there is a large flora of alien plants which have established themselves along the coast, on kitchen middens or elsewhere. The neighbourhood of docks and ports is particularly favourable, especially where grain is imported, for the introduction and establishment of such plants. The inland flora again is always encroaching upon the coast flora. So that taken as a whole, though the alien plants and those found near docks and ports rightly belong to other sections, the flora is decidedly composite.

Dry-soil Conditions of Coast Vegetation.—The plants that grow by the sea-coast, also called strand plants, are distinguished from the inland types. The latter are adapted to a moderate supply of moisture, and are known as mesophytes, as meadow plants. They also differ from those that are adapted to dry summer conditions and cold or wet winter conditions, or tropophytes, such as deciduous trees, &c. Strand plants are in fact especially adapted to dry conditions. The same applies to the dunes and salt marshes as to the sandy sea-coast. This is due to the fact that in absorbing water, coastal plants would necessarily absorb a large proportion of salt, and since this would upset the balance of nutritive materials, the plant therefore takes up less water than it otherwise would do.

To compensate for this, the plant has a reduced leaf surface, few of the plants, except Yellow Horned Poppy, Sea Kale, and some few others, developing broad leaves. Most are linear or narrow and oblong. They are also, as a rule, fleshy and thick and succulent, e.g. Samphire, Oraches, Sea Holly, Saltwort, &c.

The stems are equally fleshy and succulent. The herbaceous types, as Sea Blite, Sea Heath, have heath-like, small, short, linear leaves. The majority of the maritime plants are dwarf, and not luxuriant, and many are procumbent or trailing. Other factors are the thick cuticle or epidermis preventing ready transpiration. The stomata are also sunk in this thick cuticle, assisting the plant in fitting itself to physiological drought.

The sandy and shingly character of the sea-coast, and the wind, cause the substratum on which they grow to be destitute of moisture, and the plants have largely to rely on atmospheric moisture.

Modern Character of Sea-coast Vegetation.—The sand and shingle cast up by the agency of the sea is of purely modern origin. Marine deposits in fact belong to the latest geological period, the recent or Quaternary epoch.

It is also known that England was connected with the Continent in Preglacial times, and during some part of the Glacial period, hence the present maritime flora is of comparatively modern type. Apart from the records of a few present maritime plants in Glacial and later beds the succession is broken, for apart from *Naias*, which occurs in the Preglacial Cromer Forest Bed, there are no earlier records of marine types that are connected with our present maritime flowering plants.

Amongst those described, two are found in the Oak Zone in Scandinavia, Sea Rocket and Sea Buckthorn; three in Interglacial beds in this country, Sea Campion (found to-day, inland, on the hills), Sea Purslane, Sea Milkwort; and the Sea Club Rush is found in Neolithic beds. The raised beaches and shingle beaches found inland are of modern origin also.

Isolation of Maritime Types on Hills.—The occurrence of certain typical maritime plants upon inland mountains, and their absence

from intervening lowlands, constitute one of the most curious facts of plant distribution. Discontinuous distribution, as shown by Dr. A. R. Wallace, is an indication of the antiquity of the plant types so dispersed. Hence it may be considered that the occurrence of such plants as Scurvy Grass, Thrift, Sea Plantain, Sea Campion, &c., inland on lofty mountains is connected with the existence in earlier times of sea margins, of which there are indications (not where these plants occur) elsewhere at a distance from the sea.

There are other reasons for the occurrence of such types inland away from the sea. It is quite possible that the seeds of such plants may be conveyed thither by animal agency, especially birds. Wild fowl, ducks, geese, swans, plovers, and many other birds frequent the coast on migration, and also inland lochs and upland moors and bogs. Some maritime birds, as the Dotterel, Redshank, Blackheaded Gull, and others, leave the sea-coast during the breeding season to seek such habitats as the inland types of maritime plants frequent.

Whatever be the cause of the isolation of these maritime plants upon hills inland, their occurrence in such spots is of the greatest interest, and any observations that may be made upon these points will assuredly be prolific in results.

Inland Salt-marshes.—In the case of the montane types of maritime plants described in the last section, there were no conditions inland resembling those on the sea-coast to account for the occurrence of Thrift, &c., in alpine situations. In the case of certain inland salt-marshes, however, the conditions are similar to those on the sea-coast; that is to say, they are suited to halophytes, plants that require salt or brackish water. In the neighbourhood of Droitwich, famous for its brine springs, such plants are to be found, also in the Severn valley from the Salwarpe valley to Droitwich, and in the Tewkesbury and Evesham district.

At Longdon and Welland marshes *Œnanthe pimpinelloides*, *Œ. lachenalii*, *Œ. silaifolia* (all maritime species of Dropwort), Golden Dock, Sea Club Rush, and Alexanders occur. If the land were submerged 100 ft., the tide which comes far up the Severn would reach this point. Woad was found on cliffs also in the Severn valley. Parsley, Fennel, Soapwort, and *Carum segetum* also grow at Dodderhill in the same region. Dittander, a salt-marsh plant, occurs at Salwarpe, and *Senecio squalidus* at Droitwich.

Between Droitwich and Hawford Lock grow Celery, Sea Milkwort, Sea Spurrey, Sea Orache, Sea Arrow Grass, Sea Club Rush, *Juncus compressus*, and Brookweed. In the valley of the Trent, near Stratford, 250 ft. above the sea, also grow Sea Spurrey, Celery, Sea Aster, Sea Milkwort, Sea Arrow Grass, Sea Club Rush. Sea Stork's Bill is also found in various parts of Worcestershire. Wherever these plants occur there are salt springs, hence their occurrence inland. They may have been introduced by birds that frequent maritime salt marshes.

The Sandy Coasts, Muddy Estuaries, Rocky Coasts.—The first zone is made up of sandy coasts, muddy estuaries, rocky coasts, and sea cliffs. Of the plants here described in detail the bulk grow on sandy coasts, as Sea Kale, Sea Rocket (both also growing on shingle), Sea Campion (also on shingle and dunes), Sea Purslane (also on shingle), Tamarisk (also on dunes), Sea Holly, Absinth, Sea Lavender (also in salt marshes), Centaury, Seaside Bindweed (also on dunes), Sea Buckthorn (also on dunes), Grass Wrack (in estuaries in water), Sand Sedge (also on dunes), Crested Dog's Tail Grass, Seaside Manna Grass, Squirrel Tail Grass.

Scurvy Grass grows on muddy coasts, Woad on cliffs, and Samphire and Thrift on rocks, the latter also in salt marshes and on sand. Amongst other plants that are found upon the sandy coasts are Sea Radish, Bloody Crane's Bill, Scotch Rose, often farther inland, Cotton Weed, Small Yellow Gentian, Buckshorn Plantain (also often far inland), Rupture Wort, Sea Spurge, Asparagus, Baltic Rush, Bulbous Meadow Grass. On muddy coasts Beet is to be found. On sea cliffs and rocky coasts the following occur, amongst many others: Queen Stock, Wild Cabbage, Isle of Man Cabbage, Tree Mallow, Lovage, Blue Gromwell, the latter also on shingle.

It is thus evident that the flora of the first maritime zone is of an extremely diverse and interesting character, and that it is highly adapted to travel inland where conditions are suitable, for many are common to the other zones.

The Shingle Beach.—The extent of the shingle beaches around the British coasts is strictly limited, therefore the extent of the flora which is established upon them is not great. Furthermore, it is an extremely mobile formation, and the age of the shingle beach is distinctly recent in the majority of cases. Again, the flora is made up largely of the few plants with long far-reaching roots that can establish themselves and adapt their growth to the movement of the shingle, which is liable to frequent additions to or removal of the component pebbles.

A striking feature of the shingle beach is the manner in which laterals are formed at

right angles more or less to the main bank, and the part played by plants that help to stabilize the newly-formed shingle, such as Shrubby Sea Blite, is of the greatest interest. The work of this natural shore preserver, ably described by Prof. F. W. Oliver at Blakeney, is of supreme importance.

The plants that are most frequently found upon shingle beaches on the east and south coasts of England are Yellow Horned Poppy, Sea Kale, Sea Rocket, Sea Campion, Sea Purslane, Sea Holly, Orache, Curled Dock, Ragwort, Marram, Seaside Wormwood. The latter in some places, as at Salthouse, helps to establish embryonic dunes where the Shrubby Sea Blite is less dominant.

The Sand Dunes.—The sand dune is just as local along the British coasts as the shingle beach. Sand dunes, in the same way as shingle beaches, owe their preservation, once they are accumulated, to the action of a few dominant plants that in this case help to bind them together by the development of long rhizomes which reach far down into and amongst the loose sand, and by interlacing and constant multiplication form a strong and resistant barrier (when compared with the sand) to the further effect of the wind.

Whilst shingle beaches are a direct product of marine action, dunes on the coast are due to æolian agency, though the material is directly brought into its position upon the coast by the same agency, or the sea. Dunes are if anything of much quicker growth than shingle beaches, and as readily destroyed in the absence of binding Grass rhizomes. So important is the office of Marram, Lyme Grass, &c., in binding the sand together that there was once a law made to prevent these useful plants from being destroyed. In such low-lying countries as Holland such a law is of primal importance.

The plants that are found most commonly on sand dunes are Saltwort (also on sandy shores), Seaside Bindweed, Sea Buckthorn, the Creeping Willow (acting as a sand binder in Anglesey), Sand Sedge (a most useful sand binder), Marram, Lyme Grass, Rushy Wheat Grass, Squirrel Tail Grass. Others not described in detail here are Sea Campion, Sea Purslane, Sea Rocket, and Sandhill Cat's Tail.

The Salt Marsh.—The salt marsh is as a rule protected from the sea by a shingle beach, or dune, or sandy bank, or line of cliffs, but usually one or other of the former. It consists of low-lying meadows by the sea, which have at some period become inundated by the sea, have become salt or brackish, and have continued to be so. In addition to periodical reflooding, there is a certain amount of creep of salt water through the sand or shingle. This makes the marshes salt.

Amongst the true salt-marsh plants may be found a large number of ordinary meadow types. But sometimes these are driven out by the salt-marsh plants entirely. Here one may find that one salt-marsh plant occurs to the exclusion of all others, e.g. Buckshorn Plantain, there Sea Aster, or again *Juncus Gerardi*, &c. Frequent plants in the salt marsh, which usually grow in extensive societies or associations, are Sandwort (several kinds), Sea Lavender, Sea Milkwort, Sea Plantain, Shrubby Sea Blite, forming small plantations 2–3 ft. high and several acres in area, Samphire, Sea Rush, Sea Club Rush, usually in water, in drains, &c.

Others not described in detail here are Marsh Mallow, Dittander, Sea Heath, Seaside Clover, Slender Hare's Ear, Hog's Fennel, Sea Aster, Golden Samphire, Sea Wormwood, Marsh Samphire, Sea Blite, Sea Arrow Grass, forming large tussocks in wet submerged places, Long-bracted Sedge, Perennial Beard Grass, Nit Grass, &c.

The Habitats of Coast Plants.—The four zones of sea-coast vegetation above referred to furnish a variety of habitats, as each is distinct in itself. On the sandy coast there are long stretches of sand where plants grow in extensive patches, or discontinuously. Such a coast may be diversified with rocks jutting out here and there, and there may be creeks and pools caused by storms which quickly become colonized by Samphire, Ruppia, &c. The sand may be grass-grown, and stretch inland.

The muddy coast also furnishes a diversity of habitats. As a rule, it is in the mouth of an estuary. On some coasts, however, the shore is eaten out of a clayey formation.

The rocky coast is usually made up of hard granitic, siliceous, sandstone, limestone, or other old rocks, or of modern chalk or sandstone, or Crag, covered by Boulder Clay. The influence of the soil will here determine the flora which comes down to the sea-coast, and is mingled with the true coastal vegetation, such as Scurvy Grass, Thrift, Sea Lavender. Here and there on such rocky coasts trees and shrubs may shelter the vegetation, and give it an extraordinary luxuriance where the climate is warm and moist, as in the south-west.

The shingle beach affords a uniform type of habitat suited only to a few types. The dunes also exhibit a uniform vegetation made up of a few special types, the sandy and saline soil suiting a minority. But in both of the last cases there are frequently many weeds

of inland origin which are widespread and able to grow almost anywhere.

The salt marsh varies considerably in regard to the degree of moisture. In some cases there are few or no pools, in others these are general. In some cases there is a struggle between inland types and salt-marsh plants, in others the latter are entirely dominant.

The Habits of Sea-coast Plants.—The special factors of the maritime habitats cause the plants in each zone to have marked characteristics. Generally the sandy coast vegetation is composed of fleshy herbaceous types having a branched or pyramidal habit. In many cases the upright erect habit, giving the plants a strict appearance, is developed. Others are trailers, as some Oraches, Sea Bindweed, Sea Purslane, &c., and Sea Heath is a shrubby type of trailer. Some are rosette plants, as Thrift, Buckshorn Plantain (and these are most general on rocky coasts). The grass habit is adopted by a few, as Centaury, Woad, and the number of Sedges and Grasses is large. A few are shrubs, as Sea Buckthorn, Tamarisk (the latter with ericaceous habit), Cotoneaster, the first spinose.

On the shingle the habit is trailing, and the plants produce resting shoots or hibernacula, as in Sea Purslane, Sea Campion (procumbent). A few are pyramidal, and all are fleshy, with the Sea Kale type of habit, as in Sea Holly, Yellow Horned Poppy, &c.

On the dunes the habit is trailing, as in Seaside Bindweed, with subterranean stolons, and the grasses produce long rhizomes, deeply rooting. The grass habit is the dominant one. In the salt marshes the habit is largely the grass habit of the rushes, sedges, and grasses. The shrub type is represented by Sea Blite. A few have the rosette habit, as in Sea Lavender, Thrift, Buckshorn Plantain. The trailing habit is adopted by Sandwort, Sea Milkwort, Procumbent Sea Blite. Arrowgrass and Sea Plantain also have a grasslike habit. The bulk of the plants are fleshy, except the grasses, &c., and the shrubby types. Samphire has a very marked strict habit.

The Height of Maritime Plants.—Most of the maritime plants are herbaceous perennials. Only a few attain the size of shrubs, and these are quite local. Trees as a whole are absent. The factors which regulate the height of maritime plants are chiefly wind, and the various ways in which they are subjected to exposure. The manner in which the few trees that grow by the sea-coast are affected by wind and dwarfed has been shown. The shrubs, as Tamarisk and Sea Buckthorn, are affected in much the same way. Many of the plants, especially those that grow next to the sea in the first or second zone, are trailing or procumbent plants, as Sea Bindweed, Sea Purslane, Sea Campion, &c.

The succulent character of so many of the maritime plants prevents them from attaining any great height, apart from the foregoing factors. Their increase by growth is thus lateral, not upward. The softness or looseness of the soil also favours a low shrubby habit, even amongst those that are more diffuse, as in the case of Yellow Horned Poppy and Sea Kale. Plants with the erect habit frequently also have a procumbent habit in some situations, and there are some plants again, of which there are several species, in which one is erect and others are procumbent, showing that the latter is of advantage to the plant, and an adaptation to maritime conditions. Of such type are Shrubby Sea Blite, which has an allied species, Procumbent Sea Blite, and Samphire, of which there are numerous species (recently defined by Dr. C. E. Moss), in which all stages from the erect to the prostrate habit are represented. These facts tend to show that the height of maritime plants is generally low, since a low height is most favourable in such habitats.

The Flowering Seasons of Maritime Plants.—Maritime plants labour under disadvantages. They are subjected to continual wind-force and exposure, and where sea mists are constant, a reduction in temperature (otherwise normal at the coast) occurs, and frequent moisture, so that they are as a whole late in flowering. The radiation from sand and shingle is very rapid, and therefore the ground temperature is relatively high, with rapid cooling as a result. But the plants are subjected to a physiological drought, and the necessity of developing long and far-reaching rhizomes and thick and long roots, with, as a rule, enormously developed vegetative organs, may have much to do with this feature.

The insects that pollinate the maritime plants are largely drawn from the order Coleoptera or Beetles, and as a whole these insects are late in appearing. This may be in part the reason.

The earliest flowering plants amongst those described in detail do not put forth so great a number of leafy shoots, or develop rhizomes on a large scale, and are shrubs, trailers, or rosette plants, as, in May, Sea Milkwort, Scurvy Grass, Sea Purslane, Tamarisk, Sea Lavender, Thrift, Sea Buckthorn. In the next month, June, Yellow Horned Poppy, Sea Kale, Sea Rocket, Seaside Bindweed, Sand Sedge, Squirrel Tail Grass commence to flower. July is, however, essentially the month when maritime plants are generally blooming, as Woad,

Sea Holly, Samphire, Absinth, Centaury, Sea Plantain, Sea Club Rush, Marram Grass, Crested Dog's Tail Grass, Seaside Manna Grass, Rushy Wheat Grass, Lyme Grass, and these continue in flower till August and September. Not until August do Sea Campion, Sea Rush, and Grass Wrack commence to flower.

The Duration of Maritime Plants.—There are several reasons why maritime plants should be uniform in their duration. They flower late as a whole, hence there is scarcely scope for many of an annual or biennial nature. The depth to which their rhizomes and roots penetrate demands that they should be of long duration, for such a foothold must be obtained before the necessary flowering and seeding can occur, and this takes a long time to secure.

The possibility of germination is rather remote, for there are so many disadvantages with which the seeds have to contend, even if they are not blown completely away from their suitable habitat (as may happen in a large number of cases). This causes the small patches of many species. Hence it is not surprising that maritime plants are almost entirely of a perennial character. The great development of the vegetative parts of such trailers as Sea Campion, &c., and their resting buds or hibernacula, are all characteristic of perennials.

A few, however, are annuals, producing much seed, as Yellow Horned Poppy, which, sometimes, may be also perennial. Sea Rocket, a fleshy plant, is also annual, and so again are Saltwort, Crested Dog's Tail Grass, and Squirrel Tail Grass. Scurvy Grass and Woad are biennials. All the rest are perennials, herbaceous, and deciduous, and except two shrubs die down in winter as a rule.

Pollination of Seaside Plants.—As one walks along the shore one is struck by the almost entire absence of land animals. All the forms one meets with are in fact marine animals, and these are the flotsam and jetsam of the waves, save in the little pools left by the tide where some living shells, starfish perchance, or sea urchins, manage to survive. Rocky coasts are more prolific. But the most obvious factor to the entomologist is the absence of insects. This applies to the low sandy stretches. Chalk cliffs and other rocky coasts with land plants, such as heaths, &c., are, however, very often the habitat of butterflies. Beetles are the most frequent insects on the coast, and a few species are known to inhabit the salt water itself.

These facts have a considerable bearing upon the pollination of plants along the shores. For in the absence of insect visitors plants adapted for cross-pollination by insects are unable to effect cross-pollination. It, however, self-pollination is also possible seed will be set. Sea Campion is proterandrous whilst Sea Rush is proterogynous, two examples showing that there is a tendency to promote crossing. Sea Lavender is dimorphic. Several sea-coast plants are pollinated by aid of the wind, as Absinth, Sea Plantain, Saltwort, Sea Club Rush, and the grasses Crested Dog's Tail, Seaside Manna Grass, Rushy Wheat Grass, Squirrel Tail Grass, Lyme Grass are also pollinated by the wind. Grass Wrack is pollinated by water.

Dispersal of Seaside Plants.—The special character of the maritime habitats of plants naturally affects dispersal of seeds of plants. One feature to be noticed is the "spot-bound" character of many of them. Many species of seaside plants are restricted to a few localities. In other cases they are confined to small patches, perhaps owing to the character of the soil. The dominant types, however, as the Grasses on the sand dunes, locally form continuous associations. The less dominant types are in such cases discontinuous or sporadic.

In the salt marshes a number of the species form again extensive societies, or even associations, the conditions being more uniform. The seeds of maritime plants are, as might be expected where wind plays so great a part, largely carried by the wind. The following are dispersed by this agency, viz.: Woad (partly), Sea Campion (censer fruit), Tamarisk, Sea Holly, Samphire, Absinth (pollinated by the same agency), Sea Lavender, Thrift (parachute arrangement), Sea Plantain, Saltwort, and the Grasses.

The Yellow Horned Poppy disperses its seeds by aid of the tension in the pod, which causes the pod to split open and to jerk the seeds, which are numerous, to a distance. Other plants, as Scurvy Grass, Woad (partly), Sea Kale, Sea Rocket, Sea Purslane, Centaury, Seaside Bindweed, Sea Rush, Sea Club Rush, Sand Sedge, and Marram have also devices of their own for dispersal of their fruits and seeds. In Sea Buckthorn the berries are dispersed by birds. Grass Wrack is dispersed by aid of the water.

The Soil of Maritime Plants.—The outstanding feature of maritime vegetation is the saline character of the soil. Probably the area to which the land is subjected to spray from sea breezes is the limit of the area in which the soil is saline. Rocky coasts and those fringed by sand dunes may in a measure be less subjected to impregnation with salts from the sea.

Since the soil along the coast is largely

sandy, it is quite natural that the maritime plants for the most part are equally at home upon sand soil without salt. Experiments made by the author with plants from each zone show that all of them can subsist inland in river silt without salt. The Yellow Horned Poppy, for instance, will grow and produce abundant flowers and seed in an ordinary gravel drive, and Sea Campion is if anything more luxuriant in river alluvium. Sea Heath does well under the same conditions. At the same time the xerophytic characters evoked by the excess of salt are largely lost when these plants are grown inland.

Methods of Survey.—The zonation of the maritime plants and the diversity of the vegetation necessitates to some extent a different method of survey of each zone. But generally the method of studying meadow or pasture plants may be applied here, more especially in regard to the salt marsh, in so far as the mapping of the association is concerned.

The problems of soil character, origin of each formation, and its inception and growth, which are rather the work of the advanced student, need not be detailed here fully (see Professor Oliver's work on Blakeney).

In the case of the sandy coast, and the muddy coast, it is important to consider the continuous or discontinuous character of the plants that one notices. The distance of each from the sea at high tide, the zonation of each type within the first zone, the slope of the shore, and the aspect are each objects for study. The adaptations of the plants to the halophytic conditions are also points for observation. The shingle beach may be studied in the same way. On the sand dunes the part played by the Marram, Lyme Grass, and other Grasses in protecting the sand from erosion, and the influence of the Grasses upon the other types, will be the principal features to be studied. In the salt marsh the associations should be studied with a view to discovering the effect of one type upon another, and the order of colonization of each plant.

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